Hearing Impairment

A 3-in-1 Medical Reference

Medical Dictionary

Bibliography &

Annotated Research Guide

to Internet References

ICON Group International, Inc.

Hearing Impairment

A Medical Dictionary, Bibliography,
and Annotated Research Guide to
Internet References

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FORWARD

In March 2001, the National Institutes of Health issued the following warning: "The number of Web sites offering health-related resources grows every day. Many sites provide valuable information, while others may have information that is unreliable or misleading."[1] Furthermore, because of the rapid increase in Internet-based information, many hours can be wasted searching, selecting, and printing. Since only the smallest fraction of information dealing with hearing impairment is indexed in search engines, such as **www.google.com** or others, a non-systematic approach to Internet research can be not only time consuming, but also incomplete. This book was created for medical professionals, students, and members of the general public who want to know as much as possible about hearing impairment, using the most advanced research tools available and spending the least amount of time doing so.

In addition to offering a structured and comprehensive bibliography, the pages that follow will tell you where and how to find reliable information covering virtually all topics related to hearing impairment, from the essentials to the most advanced areas of research. Public, academic, government, and peer-reviewed research studies are emphasized. Various abstracts are reproduced to give you some of the latest official information available to date on hearing impairment. Abundant guidance is given on how to obtain free-of-charge primary research results via the Internet. **While this book focuses on the field of medicine, when some sources provide access to non-medical information relating to hearing impairment, these are noted in the text.**

E-book and electronic versions of this book are fully interactive with each of the Internet sites mentioned (clicking on a hyperlink automatically opens your browser to the site indicated). If you are using the hard copy version of this book, you can access a cited Web site by typing the provided Web address directly into your Internet browser. You may find it useful to refer to synonyms or related terms when accessing these Internet databases. **NOTE:** At the time of publication, the Web addresses were functional. However, some links may fail due to URL address changes, which is a common occurrence on the Internet.

For readers unfamiliar with the Internet, detailed instructions are offered on how to access electronic resources. For readers unfamiliar with medical terminology, a comprehensive glossary is provided. For readers without access to Internet resources, a directory of medical libraries, that have or can locate references cited here, is given. We hope these resources will prove useful to the widest possible audience seeking information on hearing impairment.

The Editors

[1] From the NIH, National Cancer Institute (NCI): **http://www.cancer.gov/cancerinfo/ten-things-to-know**.

CHAPTER 1. STUDIES ON HEARING IMPAIRMENT

Overview

In this chapter, we will show you how to locate peer-reviewed references and studies on hearing impairment.

The Combined Health Information Database

The Combined Health Information Database summarizes studies across numerous federal agencies. To limit your investigation to research studies and hearing impairment, you will need to use the advanced search options. First, go to **http://chid.nih.gov/index.html**. From there, select the "Detailed Search" option (or go directly to that page with the following hyperlink: **http://chid.nih.gov/detail/detail.html**). The trick in extracting studies is found in the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer, and the format option "Journal Article." At the top of the search form, select the number of records you would like to see (we recommend 100) and check the box to display "whole records." We recommend that you type "hearing impairment" (or synonyms) into the "For these words:" box. Consider using the option "anywhere in record" to make your search as broad as possible. If you want to limit the search to only a particular field, such as the title of the journal, then select this option in the "Search in these fields" drop box. The following is what you can expect from this type of search:

- **Children's Literature for the Primary Inclusive Classroom: Increasing Understanding of Children with Hearing Impairments**

  Source: American Annals of the Deaf. 142(5): 350-355. December 1997.

  Summary: As a result of recent Federal legislation and positive research findings of educators, children with disabilities, including those with **hearing impairment,** are being included in general education classrooms. This development has many implications at the state, district, and classroom levels. While helping the child with disabilities assimilate into the general education classroom may appear to be the teacher's primary challenge, increasing awareness and understanding among those students without disabilities is a growing concern of educators. This article explores the use of children's literature featuring children with disabilities as one way to promote

this understanding. This article includes an annotated bibliography of children's literature featuring children with **hearing impairment,** along with related classroom activities to enhance experiences with the books. Many of the selections integrate incidental factual information about hearing loss, descriptions of assistive equipment, or methods of facilitating sign language instruction. An understanding of communication both within and outside the community of people who are deaf or **hearing impaired** can be developed through these books and the related activities (discussion, writing, art, drama, music, and research). 22 references. (AA-M).

- **Hearing Impairment and Cognitive Decline in Senile Dementia of the Alzheimer's Type**

  Source: Journal of the American Geriatrics Society. 34(3): 207-210. March 1986.

  Summary: Data from a longitudinal study were analyzed to determine if auditory status predicted cognitive functional decline in senile dementia of the Alzheimer's types (SDAT). As part of a larger study, 156 consecutive SDAT outpatients had received a comprehensive medical evaluation including baseline screening for **hearing impairment** and serial assessment of cognitive function. Age and cognitive function at entry to the study were greater among individuals with impaired hearing than with normal hearing. The demographic profiles of the impaired and normal hearing groups were otherwise similar, as was the prevalence of depression. Decline in cognitive function one year later, however, was nearly twice as great in the impaired hearing groups. 22 references. (AA-M).

- **How Common Is Hearing Impairment in Osteogenesis Imperfecta?**

  Source: Journal of Laryngology and Otology. 115(4): 280-282. April 2001.

  Contact: Available from Royal Society of Medicine Press Limited. Publications Subscription Department, P.O. Box 9002, London W1A 0ZA, United Kingdom. E-mail: rsmjournals@roysocmed.ac.uk.

  Summary: Hearing impairment has long been recognized as a common feature in osteogenesis imperfecta, a genetic disorder involving defective development of the connective tissue and characterized by brittle and fragile bones. The figures in some publications could be taken to imply that, with increasing age, the proportion of osteogenesis imperfecta patients with **hearing impairment** approaches 100 percent. This article reports on a study that examined the incidence of hearing loss in a large survey of 1,394 patients with osteogenesis imperfecta. The authors found that the most common age of onset was in the second, third, and fourth decades of life. At the age of 50, approximately 50 percent of the patients had symptoms of **hearing impairment;** over the next 20 years there was little further increase. Differences were shown between patients with different clinical types of osteogenesis imperfecta as delineated in the Sillence classification; hearing loss was significantly less common in the type IV disease than in the type I disorder. Among the 29 families with osteogenesis imperfecta type IA there were distinct differences in the likelihood of hearing loss. These findings provide insights which will be valuable in giving patients advice on the likelihood of developing hearing loss in the future. 1 figure. 3 tables. 15 references.

- **Science, Medicine, and the Future: New Interventions in Hearing Impairment**

  Source: BMJ. British Medical Journal. 320(7235): 622-625. March 4, 2000.

Contact: Available from BMJ Publishing Group. P.O. Box 590A, Kennebunkport, ME 04046. (800) 236-6265. Website: www.bmj.com.

Summary: Hearing impairment is the most prevalent sensory deficit in the human population, with about 1 in 800 children born with a serious **hearing impairment** and more than 60 percent of people aged over 70 suffering from hearing loss sufficient enough to require a hearing aid. In this article, the author summarizes recent progress in understanding the biology of deafness and outlines some possibilities for alternative treatments that may be available in the future. The author contends that sign language may be useful for a tiny proportion of those affected (those with profound childhood deafness) but for the vast majority of people with impaired hearing this is not an option, and social isolation combined with economic and educational disadvantage is the common outcome. Cochlear implants have improved the hearing of many adults and children with profound deafness, and surgery can relieve middle ear problems such as otosclerosis (which affects only a small proportion of **hearing impaired** people), but there is no medical (as opposed to surgical) treatment available for most people with sensorineural **hearing impairment.** Topics include the role of genetics, the importance of early diagnosis, gene therapy, drug treatment, and hair cell regeneration. 3 figures. 22 references.

- **Early Identification and Management of Hearing Impairment**

  Source: American Family Physician. 51(6): 1437-1446. May 1, 1995.

  Summary: In this article, the authors remind readers of the positive impact of the early detection and treatment of hearing loss in children. They stress that the family physician is in an excellent position to identify **hearing impairment** at an early stage. Topics covered include office-based evaluation, including physical examination and tympanometry; auditory function tests, including behavioral observation audiometry, the Crib-O-Gram, auditory brainstem response (ABR), otoacoustic emissions testing, visual reinforcement audiometry, conditioned play audiometry, and conventional audiometry; and intervention considerations. One chart summarizes the potential neurodevelopmental-behavioral complications of various levels of hearing loss. 1 figure. 5 tables. 18 references. (AA-M).

- **Hearing Screening: Aspects of Epidemiology and Identification of Hearing Impaired Children**

  Source: International Journal of Pediatric Otorhinolaryngology. 49(Supplement 1): S287-S292. October 1999.

  Contact: Available from Elsevier Science. P.O. Box 945, New York, NY 10159-0945. (888) 437-4636. Fax (212) 633-3680. E-mail: usinfo-f@elsevier.com.

  Summary: Mass screening of hearing in children is based on the concept of secondary prevention. This article explores the aspects of epidemiology and the identification of **hearing impaired** children in programs of hearing screening. In recognition of the importance of an early identification and intervention in children with congenital or early acquired (neonatal period) hearing disability, numerous hearing screening programs have been introduced throughout the world. The devastating consequences of an early hearing disability on the speech, language, and social development of a child, and the estimated prevalence rates of at least 1 to 1.5 per 1000 live births with congenital permanent **hearing impairment,** represent an important health problem. The increase in the estimated prevalence of permanent **hearing impairment** in childhood, reaching at least 3.6 to 8.2 percent of live births by 5 to 9 years of age further emphasizes the

importance of the problem. The author stresses that the delayed identification of children with congenital or early acquired hearing disability should result in the implementation of universal neonatal hearing screening. In addition, the negative impact on the learning processes during school age from **hearing impairment** acquired throughout childhood seems to justify the introduction or maintenance of a hearing screening at school entrance. Implementation of efficient hearing screening programs throughout the neonatal period, infancy, and childhood could result in secondary prevention of this important health problem. 1 figure. 3 tables. 36 references.

- **Non-Syndromic Hearing Impairment: Gene Linkage and Cloning**

  Source: International Journal of Pediatric Otorhinolaryngology. 49(Supplement 1): S159-S163. October 1999.

  Contact: Available from Elsevier Science. P.O. Box 945, New York, NY 10159-0945. (888) 437-4636. Fax (212) 633-3680. E-mail: usinfo-f@elsevier.com.

  Summary: Non syndromic **hearing impairment** (NSHI) affects approximately 1 in 2000 newborns and is a significant cause of hearing loss in the elderly. Although the phenotype is quite similar, NSHI is extremely heterogeneous, with over 40 genetic loci now known. A number of the relevant genes have been cloned. This article addresses gene linkage and cloning in regards to NSHI. The authors focus on connexin 26 (gap junction protein beta 2) and alpha tectorin (the gene responsible for some types of deafness). The localization of genes for NSHI is the prologue to their cloning. Cloning, in turn, presages a revolution in the study of **hearing impairment** that will impact both the clinical and basic sciences. Already, autosomal recessive NSHI is no longer a diagnosis of exclusion: approximately 50 percent of neonates born with severe to profound **hearing impairment** have deafness B1 caused by connexin 26 mutations. In families with autosomal dominant NSHI, it appears that mutations in some genes may be recognizable by their audiometric configuration. Elucidating the functional biology of these genes will help to unravel the mysteries of hearing and enhance efforts in hearing habilitation. 2 figures. 1 table. 26 references.

- **Classroom Acoustics for Children with Normal Hearing and with Hearing Impairment**

  Source: Language, Speech, and Hearing Services in Schools. 31(4): 362-370. October 2000.

  Contact: Available from American Speech-Language-Hearing Association (ASHA). Product Sales, 10801 Rockville Pike, Rockville, MD 20852. (888) 498-6699. TTY (301) 897-0157. Website: www.asha.org.

  Summary: Past investigations demonstrate that the acoustic environment of a classroom is a critical factor in the academic, psychoeducational, and psychosocial achievement of children with normal hearing and with **hearing impairment.** This article examines several acoustical variables, such as noise, reverberation, and distance between speaker and listener, which can have a negative effect on speech perception in classrooms. The authors examine the effects of these variables on the speech perception abilities of both children with normal hearing and children with hearing loss. The authors conclude by suggesting appropriate acoustical criteria for children in educational settings. Considerable speech perception data suggest that for maximum communication to occur in classrooms, speech to noise ratios (SNR) should exceed positive 15 decibels, unoccupied noise levels should not exceed 30 to 35 dBA, and reverberation levels should not surpass 0.4 to 0.6 second. 3 figures. 4 tables. 65 references.

- **An Increasing Prevalence of Hearing Impairment and Associated Risk Factors Over Three Decades of the Alameda County Study**

  Source: American Journal of Public Health. 87(3): 440-442. March 1997.

  Summary: The authors assessed the prevalence of and risk factors associated with **hearing impairment** among persons 50 and older. Using a study conducted in Alameda County, California, over three decades, the authors were able to calculate the prevalence of age- adjusted **hearing impairment** among 5,108 persons. A logistic regression analysis was employed to examine risk factors associated with **hearing impairment** using data from 1974 to 1994 in the Alameda study. The authors found that the prevalence of **hearing impairment** nearly doubled among study participants between 1965 and 1994, with men accounting for a disproportionate share of the increase. Risk factors included high-noise-exposure occupations for men and ototoxic drug use for both men and women. The authors found that exercise was a protective factor against hearing loss, and concluded that the significant increase in **hearing impairment** over the past 30 years was a source of concern.

- **Enhancing the Conversational Skills of Children with Hearing Impairment**

  Source: Language, Speech, and Hearing Services in Schools. 28(2): 137-145. April 1997.

  Summary: The conversational skills of children with **hearing impairment** have been found to resemble those of children with learning disabilities and are often inadequate for successful mainstreaming. This article proposes strategies for enhancing the conversational skills of children with **hearing impairment.** The author contends that the pragmatic skills of children with **hearing impairment** can be enhanced by maximizing the opportunities to practice conversational behaviors in therapy. The author discusses the use of clinician-designed thematic role-play scenarios during auditory training. Clinicians must provide opportunities for language to be produced, maximize active participation, attend to content and form, and interact at an appropriate level. The author notes that if children with **hearing impairment** are allowed to observe and practice appropriate conversational behaviors from an early age, perhaps they will be better prepared for mainstreaming and receive greater social acceptance from their peers with normal hearing. The article concludes with a sample conversational scenario featuring Halloween trick or treating, with followup conversations and explanations. 1 figure. 14 references. (AA-M).

- **Intervention for Children with Hearing Impairment in General Education Settings**

  Source: Language, Speech, and Hearing Services in Schools. 28(4): 355-361. October 1997.

  Summary: The majority of children with **hearing impairment** are educated in classes along with normally hearing peers. This article describes intervention for children with **hearing impairment** in these general education settings (mainstreaming). With hearing losses ranging from mild to profound, these children require services to optimize their use of residual hearing and reduce the secondary effects of hearing loss, such as communication deficits and academic delays. The author describes the characteristics of the mainstreamed education setting, the kind and quantity of support services available, and the delivery of those services in a mainstreamed setting. For most of these students, the speech-language pathologist will be the on-site specialist responsible for designing a collaborative rehabilitation and education plan that addresses all deficit areas and for assisting in its implementation in the classroom. Intervention considerations discussed include the evaluation components, test modifications, and therapeutic principles. The speech language pathologist's role may include: assuming responsibility for

amplification, establishing an auditory learning program, interpreting performance relative to the **hearing impairment,** knowing typical patterns of performance, determining the appropriateness of the mainstream placement, selecting targets from multiple deficit areas, recognizing subtle areas of difficulty in milder impairments, and acting as a consultant to the general educator. 11 references. (AA-M).

- **Accessibility for the Hearing Impaired**

  Source: International Journal of Pediatric Otorhinolaryngology. 49(Supplement 1): S55-S58. October 1999.

  Contact: Available from Elsevier Science. P.O. Box 945, New York, NY 10159-0945. (888) 437-4636. Fax (212) 633-3680. E-mail: usinfo-f@elsevier.com.

  Summary: The social anthropology of mild hearing loss is gradually being accepted, as it affects both children and adults. With this comes the understanding that effective aural communication requires adequate sound sources and a good transmission medium as well as good hearing. If the first two conditions are met, much hearing disability might be managed without resorting to a hearing aid. So contends the author of this article in which a plea is made for better accessibility for the **hearing impaired** by improving environmental conditions for acoustic signals, especially speech. The classroom environment should be made hearing friendly, avoiding acoustically extreme conditions such as open plan configuration, proximity to excessive transportation sounds (airport flight path, highways), and hard walls and ceilings. Similar changes should be made for the elderly. Simple connection of the TV set to the home hi fidelity stereo system would solve many of the problems leading to the enjoyment of the television and would also allow placement for a speaker near the person with **hearing impairment.** Lecture halls, recreation rooms, meeting rooms, churches and gymnasiums need to focus on increasing their acoustical friendliness. The author concludes that the provision of accessibility for the **hearing impaired** will do much to alleviate learning disability in the young and loneliness in the elderly, without throwing the total burden on the **hearing impaired** themselves. 1 figure. 5 tables.

- **Teaching Students with Hearing Impairments**

  Source: Journal of Developmental Education. 20(3): 10-16. Spring 1997.

  Summary: There are growing numbers of students with hearing impairments on college campuses today. Due to current admissions and placement testing practices and differences between written English and American Sign Language, many of these students are admitted into developmental education programs. This article addresses the common concerns and potential needs of students with hearing impairments, focusing on how developmental education faculty can meet the instructional needs of this population. Topics include the Americans With Disabilities Act (ADA) and its application regarding guidelines for addressing the communication needs of people with hearing impairments; use of auxiliary aids and services, including interpreters, notetakers, transcription services, telephone amplifiers, assistive listening devices, captioning, and TTYs; oral communication, including speechreading and the use of assistive listening devices such as FM systems; use of interpreters in the classroom; suggestions for better oral communication; written communication and considerations for learning written English when one's first language is American Sign Language (ASL); and faculty responsibility. Faculty members should be aware that they bear the responsibility for insuring that students with **hearing impairment** have equal access to the information presented in their classrooms. The authors note that many of the

suggestions for serving students with hearing impairments will improve the learning environment for all students. 18 references. (AA-M).

- **Impact of Hearing Impairment: A Global Health Problem**

  Source: International Journal of Pediatric Otorhinolaryngology. 49(Supplement 1): S51-S54. October 1999.

  Contact: Available from Elsevier Science. P.O. Box 945, New York, NY 10159-0945. (888) 437-4636. Fax (212) 633-3680. E-mail: usinfo-f@elsevier.com.

  Summary: This article addresses the impact of **hearing impairment,** characterizing it as a global health problem. **Hearing impairment** is a substantial worldwide problem mainly affecting the adult population. The prevalence of permanent childhood **hearing impairment** (PCHI) is relatively small (1 in 752) but the effects of PCHI are substantial. The authors report on a study in which children with PCHI (aged 4 to 12 years, n = 100) who use spoken English as their first language were assessed for cognitive and behavior performance (controls included hearing children and children with otitis media with effusion, or OME). There was a trend in performance across severity for all assessments, with differences for IQ between hearing controls and PCHI, causing concern for the pervasiveness and impact of even moderate PCHI. Furthermore, these effects are present even when early intervention has taken place. The authors call for additional studies on the effect of family and quality of life (including the adequacy or appropriateness of family support), in order to guide intervention to facilitate cognitive development and behavior. 5 figures. 2 tables. 7 references.

- **Efficacy of Early Identification and Intervention for Children with Hearing Impairment**

  Source: Pediatric Clinics of North America. 46(1): 79-87. February 1999.

  Contact: Available from W.B. Saunders. Periodicals Fulfillment, 6277 Sea Harbor Drive, Orlando, FL 32887-4800. (800) 654-2452. Website: www.wbsaunders.com.

  Summary: This article explores the efficacy of early identification and intervention for children with hearing loss. The authors first explain why hard data has been so difficult to obtain in this situation, then note that time and technology have combined to make this data accessible. Neurologists have analyzed the early development of the infant brain, audiologists are using technical instrumentation to identify hearing losses at birth, and universal newborn hearing programs have produced adequate numbers of infants to facilitate research projects demonstrating the efficacy of early intervention at birth. The authors discuss reports establishing the biobehavioral nature of language and the need for early intervention, retrospective studies on early intervention, and prospective studies on early identification and intervention. From these findings, they conclude that identification of hearing loss by 6 months of age, followed by appropriate intervention, is the most effective strategy for the normal development of language in infants and toddlers with hearing loss. 5 figures. 23 references.

- **Adolescents' Attitudes Toward Their Peers with Hearing Impairments**

  Source: Journal of Educational Audiology. 8: 1-8. 2000.

  Contact: Available from Educational Audiology Association. 4319 Ehrlich Road, Tampa, FL 33624. (800) 460-7322. Website: www.edaud.org.

Summary: This article reports on a study in which a questionnaire was distributed to 80 adolescents with normal hearing to determine whether gender or the presence of a classmate with a **hearing impairment** affected attitudes toward socialization with, appearance of, and achievement of peers with hearing impairments. While some negative attitudes continue to exist toward those with **hearing impairment,** the degree of negativity appears to have decreased compared to studies conducted in the 1980s. These results suggest that educational programs should continue to be implemented in the home and at school to further improve acceptance of children with hearing impairments. The authors consider the impact of other psychosocial factors, including the desire to appear politically correct, on the study's results. The presence or absence of a classmate with a **hearing impairment** did not have a significant impact on the attitudes towards classmates with hearing impairments. Appended to the article is a copy of the questionnaire used in the study. 3 tables. 14 references.

- **Production and Perception of Syllable Stress by Children with Normal Hearing and Children with Hearing Impairment**

  Source: Volta Review. 101(2): 51-70. Spring 1999.

  Contact: Available from Alexander Graham Bell Association for the Deaf and Hard of Hearing. Subscription Department, 3417 Volta Place, NW, Washington, DC 20007-2778. Voice/TTY (202) 337-5220. Website: www.agbell.org.

  Summary: This article reports on a study of the production and perception of syllable stress by 15 children with a severe or profound hearing loss; these were compared to those of 15 children with normal hearing of the same ages (10 to 13 years). The children were recorded while reading 10 Hebrew bisyllabic minimal pairs differing only in their stress pattern. The children's productions were evaluated acoustically and perceptually. Also evaluated were children's stress perceptions of an adult speaker's recordings of the same minimal pairs. The production results showed that, in general, the fundamental frequency (FO) was higher and the duration of syllables was longer across stressed and unstressed syllables spoken by the children with hearing loss compared to those of the children with normal hearing. Some children with hearing loss were less successful in conveying the stress information, demonstrating individual differences in using acoustic parameters for stress production. With respect to stress perception, the children with hearing loss achieved a score of 80.3 percent compared with a 100 percent score by the children with normal hearing. Significant correlations were also found between stress production and perception, and between stress perception and residual hearing in the children with hearing loss. The authors also discuss the similarities and differences between findings for the Hebrew stimuli and previous findings for English stimuli. 4 appendices. 3 figures. 2 tables. 26 references.

- **Family with Autosomal Dominant Inherited Dysmorphic Small Auricles, Lip Pits, and Congenital Conductive Hearing Impairment**

  Source: Archives of Otolaryngology-Head and Neck Surgery. 126(5): 639-644. May 2000.

  Contact: Available from American Medical Association. Subscriber Services, P.O. 10946, Chicago, IL 60610-0946. (800) 262-3250 or (312) 670-7827. Fax (312) 464-5831. E-mail: ama-subs@ama-assn.org. Website: www.ama-assn.org/oto.

  Summary: This article reports on a study that examined 3 generations in a family for congenital conductive **hearing impairment,** dysmorphic small auricles (external ear), and lip pits. The study was conducted at the Department of Otorhinolaryngology at the University Hospital Nijmegen, in Nijmegen, the Netherlands. Twenty members of the

family were included. Seven members of the family had bilateral dysmorphic auricles. Three subjects had either a pit or dimple in the lip. Two subjects had congenital conductive **hearing impairment.** Using gene linkage, the authors conclude that these autosomal dominant, inherited branchial anomalies present a new separate branchial arch syndrome. The anomalies are presumably developmental defects in the first and second branchial arch that occurred during the sixth and seventh weeks of gestation, resulting in an auricle abnormality (first and second arch) and an abnormal incus and stapes (first and second arch). 4 figures. 2 tables. 15 references.

- **Functional Status and Hearing Impairments in Women at Midlife**

  Source: Journal of Gerontology: Social Sciences. 55B(3): S190-S194. May 2000.

  Contact: Available from Gerontological Society of America. 1030 15th Street NW, Suite 250, Washington, DC 20005.

  Summary: This article reports on a study undertaken to address the prevalence of clinically assessed high frequency **hearing impairment** (HFHI) and self reported **hearing impairment** (SRHI) and to examine the association of these hearing impairments with physical and mental functioning in African American and Caucasian women at midlife. The sample included 467 women who participated in the Michigan Functioning Substudy of the Study of Women's Health Across the Nation. The prevalence of unilateral HFHI was 26.6 percent (n = 68) and prevalence of bilateral HFHI was 12.0 percent (n = 56). Prevalence of SRHI was 16.7 percent (n = 78), with minimal overlap between HFHI and SRHI (n = 36). In analyses, HFHI in one ear only was not associated with physical or mental functioning and bilateral HFHI was associated with limited mental functioning only. SRHI was associated with limited physical and mental functioning. The authors conclude that poor correlation of HFHI and SRHI in this population, combined with the significant association of SRHI with both measures of functioning, indicates that the two methods may be measuring different aspects of impairment. SRHI may facilitate early identification of individuals with hearing related functional limitations. 2 tables. 23 references.

- **Beyond the Child: Hearing Impairment and the Family**

  Source: Volta Voices. 2(5): 14-22. September-October 1995.

  Contact: Available from Alexander Graham Bell Association for the Deaf. 3417 Volta Place, N.W., Washington, D.C. 20007. Voice/TTY (202) 337-5220; Fax (202) 337-8314.

  Summary: This article stresses the role of hearing, speech, and language professionals in helping parents to cope with parenting children who are **hearing impaired.** Topics covered include the need to address the family environment in any program of intervention; the emotions that may affect parents of deaf children; the role of motivation in learning; using natural situations to encourage language growth and auditory function; child development; the importance of parental support groups; the role of the professional as liaison between parent and adults who are **hearing impaired;** the multicultural aspects of having a child with a disability; early identification and intervention; the parents' role in teaching and education of **hearing impaired** children; the need for professionals to become empathic, active listeners; family dynamics, particularly regarding siblings; developing a team relationship with parents; and how the clinician's role, like the parents', changes over time. One sidebar summarizes guidelines for working with families of children who have hearing impairments. 16 references.

- **World Health Organisation and the Prevention of Deafness and Hearing Impairment Caused by Noise**

  Source: Noise and Health. Volume 1: 6-12. September-December 1998.

  Contact: Available from Noise and Health. Institute of Laryngology and Otology, University College London, 330 Gray's Inn Road, London WC1X 8EE, United Kingdom. +44 171 915 1575. Fax +44 171 278 8041.

  Summary: This article summarizes the activities of the World Health Organization (WHO) in its efforts to prevent deafness and **hearing impairment** caused by noise. The WHO Programme for Prevention of Deafness and **Hearing Impairment** (PDH) is especially targeted at developing countries where there is a serious lack of accurate population based data on the prevalence and causes of deafness and **hearing impairment,** including noise induced hearing loss (NIHL). However, opportunities exist for prevention of NIHL by primary, secondary, and tertiary means and it is necessary for countries to measure the size of the problem and adopt strategies for its prevention. The author describes the two WHO resolutions passed in relation to PDH (1985 and 1995); these resolutions affirmed that much deafness and **hearing impairment** is avoidable or remediable and that the greatest needs for the problem are in developing countries. WHOPDH addresses problems in this field of public health which are amenable to intervention, giving priority to the poorest developing countries. These problems include ototoxicity, chronic otitis media (ear infection) noise damage to hearing, inherited and congenital causes of deafness, and the provision of appropriate affordable hearing aid services. The PDH program has developed a standardized Ear Disease Assessment Protocol to enable countries to conduct national surveys rapidly. The article also reports briefly on a recent PDH meeting at WHO (Geneva, October 1997); the participants emphasized that NIHL is the most prevalent irreversible industrial disease and the biggest compensable occupational hazard. The meeting recommended that all countries implement the National Programmes for the Prevention of Noise Induced Hearing Loss, integrated with primary health care, including elements on health promotion and measures to reduce noise sources, and introduce legislation and effective hearing conservation. 2 tables. 7 references. (AA-M).

- **Americans with Disabilities Act: Is It Really Helping the Hearing Impaired?**

  Source: Hearing Journal. 52(2): 17, 20-22, 24, 27-28. February 1999.

  Contact: Available from Lippincott Williams and Wilkins. Customer Service, P.O. Box 1175, Lowell, MA 01853.

  Summary: This article takes a look at the changes that have taken place since the passage of the Americans with Disabilities Act (ADA) in July 1990, focusing on those changes and support services designed to help people with **hearing impairment.** The author reports that one of the major impediments to the successful use of newly installed assistive devices is the lack of education to encourage their use. Owners and managers need information about the entitlements that are guaranteed by the law and they usually need professional guidance to implement the required accommodations and systems. Similarly, **hearing impaired** people (who in most cases are not easily recognizable as disabled) must be more forthcoming about their disability, both in requesting that accommodations be made and in using them once they are available. The article summarizes the four titles of the ADA, discusses the increase in the market for consultants, describes the new legal specialty of disabilities law, and reports on some cases in which the ADA was invoked in the legal setting.

- **Impact of Vision and Hearing Impairments on Health in Old Age (editorial)**

  Source: Journal of the American Geriatrics Society. 47(8): 1029-1031. August 1999.

  Summary: This editorial on the impact of vision and hearing impairments on health in old age serves as an introduction to a research article in the same issue that investigates the prognostic value of such sensory impairments (Reuben et al). In the editorial, the author maintains that the impact sensory impairments have on a person's quality of life is significant enough to justify the vigorous search for better prevention and treatment strategies. The author briefly reviews research studies in this area, then outlines three general areas to consider when explaining the relationships of vision and hearing with disability: the effect of underlying conditions and risk factors that affect both sensory loss and disability; a direct effect of sensory loss on disability; and an indirect chain of events whereby sensory loss leads to conditions that subsequently cause disability. The author concludes that although sensory impairments are very common in old age, their severity and impact can be prevented or lessened with appropriate care. 21 references.

- **Early Identification and Intervention for Children Who Are Hearing Impaired**

  Source: Pediatrics in Review. 19(5): 155-165. May 1998.

  Summary: This review article is designed to provide primary care physicians with information about the development of the ear and the onset of hearing. This information is necessary to identify audiologic health care needs of infants and children. The authors discuss the indications for referral for audiologic evaluation, the components of audiologic testing, the degrees and types of hearing loss, and the management of the child with **hearing impairment.** Early identification of and intervention for all children who have hearing impairments are still unattained goals in the United States. Physicians typically are the first persons to obtain the medical and family history of infants and children and are the primary professionals confronted with parental concerns about hearing loss. Heightened awareness of the common causes of hearing loss in infants and children can facilitate prompt and appropriate referrals to audiologists when hearing loss is suspected. A child who has suspected or diagnosed global delays or speech and language delays should be referred promptly for audiologic testing. Children who have severe emotional or neurological impairment can be tested accurately by using evoked response testing. A strong, interactive relationship between physician and audiologist is needed to attain the common goals of providing the earliest and best possible diagnosis of and optimal management for pediatric patients that are **hearing impaired.** The article concludes with a quiz of eight clinical situations. 3 figures. 6 tables. 7 references. (AA-M).

- **Prevalence of Hereditary Hearing Impairment in Adults**

  Source: Scandinavian Audiology. 28(1): 39-46. 1999.

  Summary: This study examined the prevalence of hereditary hearing impairments in a sample of 1,237 subjects born between 1900 and 1969. The sample was divided into subgroups by decade of birth (1900-1909, 1910-1919, etc.). When compared to the general population, the prevalence of hereditary hearing loss ranged from 0.8/1000 for females and males born in 1960-1969 to 10.4/1000 for females born in 1900-1909. The overall prevalence was 3.2/1000. Tests of hearing levels revealed significant reductions in hearing sensitivity at age 60. Almost half (47 percent) of the subjects were diagnosed with otosclerosis. Forty percent of the study participants exhibited late-onset hereditary hearing impairments. The records compiled for this study can be used for the examination of rare diseases and future research about hereditary hearing loss.

Federally Funded Research on Hearing Impairment

The U.S. Government supports a variety of research studies relating to hearing impairment. These studies are tracked by the Office of Extramural Research at the National Institutes of Health.[2] CRISP (Computerized Retrieval of Information on Scientific Projects) is a searchable database of federally funded biomedical research projects conducted at universities, hospitals, and other institutions.

Search the CRISP Web site at **http://crisp.cit.nih.gov/crisp/crisp_query.generate_screen**. You will have the option to perform targeted searches by various criteria, including geography, date, and topics related to hearing impairment.

For most of the studies, the agencies reporting into CRISP provide summaries or abstracts. As opposed to clinical trial research using patients, many federally funded studies use animals or simulated models to explore hearing impairment. The following is typical of the type of information found when searching the CRISP database for hearing impairment:

- **Project Title: 2002 INTERNATIONAL HEARING AID RESEARCH CONFERENCE**

  Principal Investigator & Institution: Soli, Sigfrid D.; Vice President; House Ear Institute Los Angeles, Ca 90057

  Timing: Fiscal Year 2002; Project Start 21-AUG-2002; Project End 31-JUL-2003

  Summary: (provided by applicant): The 2002 International Hearing Aid Research Conference (IHCON) will be the second meeting of a biennial research conference formed by combination of two previous hearing aid research conferences, the Lake Arrowhead Conference, Issues in Advanced Hearing Aid Research, sponsored biennially by House Ear Institute (HEI) from 1990-1998 and the Hearing Aid Research and Development Conference co-sponsored biennially by the National Institute on Deafness and Other Communication Disorders (NIDCD) and the Department of Veterans? Affairs (DVA) from 1995-1997. The purpose of 2000 IHCON and the previous conferences has been to advance our knowledge and to facilitate progress in research and development through the exchange of current research findings and technical advancements related to the treatment of **hearing impairment** with hearing aids. A hallmark of both conferences has been their ability to draw together the disciplines and specialties essential to the advancement of hearing aid research. A primary goal of the 2002 IHCON is to build upon the strengths of the previous conferences to offer a multidisciplinary research conference that will better meet the needs of the hearing aid research and development field.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: A NOVEL EAR CAMERA FOR MAKING CUSTOM-FIT HEARING DEVICES**

  Principal Investigator & Institution: Zhuang, Ping; Genex Technologies, Inc. 10605 Concord St, Ste 500 Kensington, Md 20895

  Timing: Fiscal Year 2003; Project Start 15-DEC-2002; Project End 14-JUN-2003

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[2] Healthcare projects are funded by the National Institutes of Health (NIH), Substance Abuse and Mental Health Services (SAMHSA), Health Resources and Services Administration (HRSA), Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDCP), Agency for Healthcare Research and Quality (AHRQ), and Office of Assistant Secretary of Health (OASH).

Summary: (provided by applicant): More than 28 million Americans suffer from some type of **hearing impairment,** according to the statistics from National Institute on Deafness and Communication Disorders (NIDCD). It is estimated that over 260 million people are **hearing impaired** worldwide. Based upon the huge population involved, the **hearing impairment** is the number one disability in today's world. Fortunately, many of these people can benefit from the use of hearing aid devices. However, hearing aids cannot work for everyone. Those who can be helped need to be carefully fitted in order to gain the enhanced hearing functionality. Current manufacturing process of custom-fit shells of hearing aids is highly labor-intensive and manual process and quality control of the fitting/performance of hearing aids is difficult. The custom-fitting process starts with taking ear impression of a patient at the office of an audiologist or dispenser. There are 8000 hearing aid dispensers' throughput the United States, many can make a ear impression for a fee. The impression is then shipped to manufacturer's laboratory. Each shell has to be custom-made by skilled technicians using manual operations. The quality and consistency of the fitting vary significantly with technician's skill level. A typical process of producing a shell takes about 40 minutes from start to finish. Major drawbacks of manual process include: Speed: manual and lengthy fabrication process and not scalable for mass production; Delay: The mailing of physical impressions from dispensers to manufacturers takes several days to deliver. Quality: lack of consistency of quality, resulting in high level of re-make and return of products (currently the typical return rate is very high (25%)); and shortage of skilled worker and long training time. Genex Technologies, Inc (GENEX) proposes herein a SBIR project to develop a novel Three Dimensional (3D) Ear Camera technology that promises to eliminate traditional physical ear impressions, thus revolutionizes current custom-fit hearing aid fabrication process and brings audiologists into a new era of "digital audiology". The technical objective of this SBIR effort is to investigate the feasibility of a miniature, non-contact, lowcost, handheld 3D camera that enables audiologists to acquire multiple 3D images of external ear (auricle) and era canal, and to produce complete 3D digital ear model that serves as a "digital ear impression". The digital ear impression data is then sent instantly to manufacture's lab via Intemet, reducing dramatically the delivery time. The digital impressions enable the hearing aid manufacturers to take advantages of the latest breakthrough of computer-aided-design (CAD) and computer aided manufacturing (CAM) technologies and product mass customization hearing aid device within one-day time frame. Even including the quality insurance, electronics calibration, and shipping back the hearing-aid device, the entire process making custom-fit hearing aid devices would be shorted from weeks to few days. More importantly, the digital impression technology to be developed herein would improve the quality of fit, thus enhance the hearing functionality for impaired people.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: AGING AUDITORY SYSTEM--PRESBYCUSIS AND ITS NEURAL BASES**

  Principal Investigator & Institution: Frisina, Robert D.; Professor; International Center for Hearing & Speech Research; Rochester Institute of Technology 1 Lomb Memorial Dr Rochester, Ny 14623

  Timing: Fiscal Year 2002; Project Start 01-MAY-1992; Project End 31-MAY-2003

  Summary: Aging Auditory System: Presbycusis and its Neural Bases: The process of aging in modern, technologically advanced societies is accompanied by **hearing impairment** known as presbycusis. This age-related disorder often causes significant communication problems in person who have had no previous hearing or speech

deficits, resulting in impaired relationships at home and in the workplace, as well as increased costs to the individual, families and society. After reaching 60 years, the percentage of the population experiencing difficulty in perceiving speech doubles per decade, 16% at 60, 32% at 70, 64% at 80, and virtually all of the population beyond 85 years of age. The major goal of this proposal is to increase our knowledge of auditory processing deficits of presbycusis and to advance our understanding of its neural bases. A thematic focus is applied to distinguishing the effects of peripheral and central nervous system aging effects. This proposal puts forth a five-year series of interrelated hypothesis tested with tightly coupled and truly interdisciplinary experimental and clinical methodologies. These investigations in mammals examine both human and animals populations. Disciplines of neuroimaging, psychoacoustics, audiology, evoked potentials, and reflex psychology are brought to bear on testing hypothesis in human subjects. Scientific disciplines of reflex psychology, evoked potential and single-unit neurophysiology, neuroanatomy, neuroimaging, and cellular physiology will test hypothesis utilizing animal populations. Comparisons will be made between young, middle-age and elderly subject groups to determine aging effects in hearing loss, and comparisons will be made between subjects with cochlear sensitivity losses and those with normal hearing to assess the effects of peripheral hearing loss. Special attention will be given to interdisciplinary, repeated- measure experimental designs, quantitative multivariate data analyses, in determining the effects of different types of background noise on neural and perceptual processing. The goal of this hypotheses-testing thrust concerning the neural bases of age-related hearing los is to contribute knowledge that eventually leads to medical interventions that prevent, alleviate or minimize the hearing and communication problems with presbycusis.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: AUDITORY NEUROBIOLOGY AND BIOPHYSICS**

  Principal Investigator & Institution: Kim, Duck O.; Professor & Director of Research; Surgery; University of Connecticut Sch of Med/Dnt Bb20, Mc 2806 Farmington, Ct 060302806

  Timing: Fiscal Year 2002; Project Start 01-DEC-1986; Project End 31-JAN-2004

  Summary: The long term objective of this research is to understand the physiological and anatomical mechanisms of the cochlear nucleus (CN) which underlie auditory signal processing. The CN is divided into a dorsal and ventral division (DCN and VCN). In several mammals, the granule cell layer (GCL) and subjacent areas called the small cell cap (SCC) and extemal cell-poor rind encapsulate as a marginal shell the central core of the VCN. The marginal shell is a unique area in that auditory nerve inputs to it are nearly exclusively from low spontaneous rate (SR) fibers. The low-SR AN inputs, together with inputs from collaterals of medial olivocochlear neurons, are postulated to make neurons of the marginal shell optimally suited for encoding the intensity of acoustic stimulus. Presently, little is known about the physiological characteristics of the marginal shell or its neuroanatomical projections. The SCC is considerably enlarged in the human CN, suggesting that the SCC may play an important role in the hearing process particularly in humans. The hypotheses are that the VCN marginal shell is different from the VCN central core in single-unit physiological characteristics regarding SR, maximum response, threshold, dynamic range and slope of the response-level function for pure tone and wideband noise, temporal discharge pattern, excitatory-inhibitory area type, and amplitude-modulated tone encoding properties (Hypothesis 1) and in anatomical projections (Hypothesis 2). Specific aim #1 is to determine basic physiological characteristics of single units in the marginal shell of the cat in terms of the

above measures and to evaluate Hypothesis 1. Specific aim #2 is to determine neuroanatomical projections from the VCN marginal shell and core of the cat to targets in the hindbrain and midbrain and to evaluate Hypothesis 2. As a part of Aim #2, we will also evaluate whether or not projections to olivocochlear neurons are more numerous from the VCN shell than from the VCN core. The information to be obtained from this research should ultimately contribute to improving prosthetic devices (cochlear and brain-stem implants and hearing aids) for people with sensorineural **hearing impairment.**

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: AUDITORY PROCESSING AND SENSORINEURAL HEARING LOSS**

  Principal Investigator & Institution: Summers, W V.; Research Scientist; U.S. Walter Reed Army Med Center 6900 Georgia Ave Nw Washington, Dc 20307

  Timing: Fiscal Year 2002; Project Start 01-JAN-1998; Project End 31-DEC-2004

  Summary: (From applicant's abstract): Listeners with sensorineural **hearing impairment** frequently show deficits in speech understanding, particularly in difficult listening situations involving competing sounds. There may be especially large deficits relative to normal-hearing listeners in the context of dynamically-varied maskers such as speech from a single additional talker or reverberation - the types of maskers commonly found in the real world. These perceptual deficits do not reflect simply the absolute sensitivity loss and reduced audibility of the target speech. The research proposed here focuses on influences of cochlear damage on auditory processing of signals that are audible to listeners with sensorineural hearing loss. In normal-hearing listeners, outer hair cells within the cochlea actively influence cochlear mechanics through a process referred to as the cochlear amplifier or active mechanism. Reduced influence of the active mechanism on internal processing may contribute significantly to the deficits that hearing-impaired listeners experience in identifying complex sounds like speech in competing sound environments. The proposed studies are directed studying the influence of the active mechanism on the processing of audible signals and a means of assessing active mechanism status in individual hearing-impaired listeners. The first set of experiments evaluate a possible psychoacoustic means of assessing active mechanism status in normal-hearing and hearing-impaired listeners. Later studies apply these findings to tasks involving speech-like material and to running speech in order to clarify the role of the active mechanism in the processing of speech in competing sound.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: AUDITORY TEMPORAL PROCESSES, SPEECH PERCEPTION AND AGING**

  Principal Investigator & Institution: Gordon-Salant, Sandra M.; Professor; Hearing and Speech Sciences; University of Maryland College Pk Campus College Park, Md 20742

  Timing: Fiscal Year 2002; Project Start 15-MAR-1991; Project End 31-JAN-2007

  Summary: (PROVIDED BY APPLICANT): The project proposes a program of studies in speech perception and auditory psychophysics to examine the hypothesis that many of the predominant difficulties in speech understanding for elderly listeners are related to underlying problems in auditory temporal processing. Of the many forms of degraded speech observed to be difficult for elderly listeners, those that involve an alteration of speech rate appear to produce the largest age-related recognition deficits. Alterations of speech rate may be viewed as a form of degradation in temporal aspects of speech segmental cues and speech prosody, and these types of distortions are the focus of

investigation in the next project period. Moreover, psychoacoustic results demonstrate that large age-related difficulties in temporal processing exist for the perception of auditory tempo and rhythmic characteristics of sequential stimulus patterns. Listener processing difficulty could be attributed to peripheral and/or central processing mechanisms, as well as various cognitive factors, including the degree of familiarity with prosodic features of different native languages. The project examines the relative contribution of peripheral **hearing impairment,** type of stimulus temporal complexity and cognitive demand on the processing of temporal segmental and prosodic cues in speech and non-speech stimulus patterns. The project comprises four stages of investigation, each consisting of a series of speech and non-speech discrimination and recognition tasks. Stages 1 and 2 investigate the sources of age-related differences in temporal sensitivity for discrimination and identification of speech and non-speech segments presented as isolated target stimuli or as embedded in sequential stimulus patterns. Stage 3 measures the influences of listener age on discrimination of temporal cues for prosody that characterize different languages. Stage 4 will examine psychoacoustic models of temporal processing and identify stimulus parameters contributing to age-related differences in understanding accented English. Participants in the project will include groups of subjects that differ by age and hearing sensitivity.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: AUTOSOMAL DOMINANT HEARING LOSS**

  Principal Investigator & Institution: Friderici, Karen H.; Associate Professor; Pathology; Michigan State University 301 Administration Bldg East Lansing, Mi 48824

  Timing: Fiscal Year 2002; Project Start 01-MAY-2001; Project End 30-APR-2004

  Summary: (Adapted from applicant's abstract): Twenty-eight million Americans suffer from **hearing impairment.** By age 80 about half the population has age related hearing loss (presbycusis). While some degree of presbycusis can be ascribed to environmental exposures a significant fraction is genetically determined. To understand the etiology of age associated **hearing impairment** it is necessary to understand both the molecular physiology of hearing and the molecular pathology of bearing loss. Identification and characterization of the genes that contribute to the hearing process are required to accomplish this goal. This study proposes to identify and begin to characterize a new gene that causes progressive hearing loss. This autosomal dominant loss begins at high frequencies in the second decade. The chromosomal region containing the gene has been narrowed to approximately 100 cR10,000 at 1 7q25. The DFNA2O chromosomal region will be narrowed by establishing a physical contig across the region and mapping and typing additional polymorphic markers. The DFNA2O causative gene wifi be identified in the narrowed region by evaluating positional candidate genes for cochlear expression and for disease causing mutations. Verification will include sequence analysis of a candidate gene in three affected families. Once identified, the gene will be examined for its potential role in the etiology of presbycusis. The frequency of sequence polymorphisms will be ascertained in the general population and their relationship to presbycusis will be examined in an adult population stratified by age and degree of hearing loss. Postlingual hearing loss genes can be considered potential candidates in the multifactorial causes of presbycusis. DFNA2O an excellent candidate because of its clinical phenotype. Understanding the function of this gene will provide significant insights into the hearing process. Population variations may help to understand its contribution to presbycusis. This knowledge could lead to treatment or prevention of some forms of hearing loss during aging.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: CENTRAL AUDITORY SYSTEM EFFECTS OF AUDITORY DEPRIVATION**

  Principal Investigator & Institution: Tucci, Debara L.; Associate Professor of Surgery; Surgery; Duke University Durham, Nc 27710

  Timing: Fiscal Year 2002; Project Start 01-APR-2002; Project End 31-MAR-2007

  Summary: (provided by applicant):The long-term goal of this work is to understand the structural and functional changes imposed on the central auditory system by conductive **hearing impairment.** A secondary goal is to determine the factors that govern the potential for reversibility of these changes. The clinical implications of this work are that many children experience conductive hearing loss during early development, in a time period that coincides with that of rapid acquisition of speech and language skills. Childhood conductive hearing loss is known to be associated with deficits in auditory processing skills, some of which persist even after the return of normal hearing. The nature of the functional and neuroanatomical changes in the central auditory system that underlie these deficits is unknown. The hypothesis underlying this proposal is that chronic conductive **hearing impairment** in early life results in structural changes in the central auditory systems, which are related to functional deficits in central auditory processing. These effects are age-dependent, and more severe in the developing animal. The severity of the structural change will affect the potential for reversibility when normal hearing is reinstated. Experiments are proposed to achieve three specific aims designed to address this hypothesis: 1) to define the effects of conductive hearing loss on activity in the auditory nerve and central auditory system, and assess the agedependent interactions; 2) to define the metabolic and structural changes that occur following unilateral conductive hearing loss in the developing and mature animal; and 3) to investigate factors that govern the reversibility of the above changes. We hypothesize that the potential for reversibility will depend upon the type and severity of the structural modification induced by conductive impairment, and the developmental stage of the animal at the time of the insult.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: CENTRAL FACTORS IN AUDITORY MASKING**

  Principal Investigator & Institution: Kidd, Gerald J.; Communication Disorders; Boston University Charles River Campus 881 Commonwealth Avenue Boston, Ma 02215

  Timing: Fiscal Year 2002; Project Start 01-JUL-2000; Project End 30-JUN-2005

  Summary: The goal of this work is to gain a better understanding of the role of central factors in auditory masking in listeners with cochlear hearing loss. The work has theoretical significance for the study and remediation of **hearing impairment** by aiming to better understand the causes of the communication difficulties experienced by listeners with cochlear hearing loss. The proposal is based on a theory that identifies two types of masking that occur at different physiological levels. Peripheral or "energetic" masking occurs because of overlapping patterns of excitation in the cochlea and has been studied in detail for many years. Central or "informational" masking involves cognitive processes related to the perceptual organization of sound images and the analysis of sound patterns. Informational masking is not well understood, and occurs despite a robust representation of the signal in the auditory periphery. The purpose of this study is to extend the work on informational masking to listeners with hearing loss. This knowledge is critical because of the prevalence of auditory pathologies affecting the sensory mechanism and the extreme difficulty in communication such pathologies often cause, particularly in noisy listening conditions. Although it is clear that sensory

pathology affects the spectral and temporal analyses performed at the periphery, there appears to be a significant component to masking that cannot be attributed purely to peripheral deficits. The plan is to test the hypothesis that listeners with sensorineural hearing loss experience abnormally large amounts of informational masking in certain conditions and make poor use of the cues that normally reduce informational masking. This hypothesis will be examined through a series of psychoacoustic experiments employing listeners with cochlear hearing loss. The goal is to relate the amount of informational masking to factors such as etiology and configuration of loss, auditory filter characteristics and processing efficiency, age and speech recognition in noise.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: CLONING OF NON-SYNDROMIC DEAFNESS GENES DFNA29 & DFNA32**

  Principal Investigator & Institution: Li, Xiaoyan C.; House Ear Institute Los Angeles, Ca 90057

  Timing: Fiscal Year 2002; Project Start 09-FEB-2001; Project End 31-JAN-2004

  Summary: (from applicant's abstract): The long-term goal of this study is to understand the function and dysfunction of hearing at the molecular level. **Hearing impairment** is the most common human sensory disorder. Approximately 70 million people worldwide suffer from hearing loss over 55 dB. Genetic factors are one of the most important causes for **hearing impairment.** Approximately one in every 2,000 children is born with severe to profound hearing loss due to a genetic cause. Non-syndromic hearing loss occurs in isolation, and it accounts for approximately 80% of hereditary deafness. Studies on the molecular basis of non-syndromic hearing loss, especially the late onset forms, are not only important for improving our understanding of the molecular mechanisms of auditory development and function, but also for developing more precise genetic counseling and therapeutics for both genetic and environment-related **hearing impairment.** We have mapped two new deafness loci, DFNA29 and DFNA32, using linkage analysis on two large US families with non-syndromic autosomal dominant progressive hearing loss. The PI proposes to identify the responsible genes, and to explore their function in the hearing process. The following specific aims are proposed: (1) Refine the critical region of DFNA29 and DFNA32 using recombinational mapping and linkage disequilibrium strategies. (2) Establish permanent cell lines from both affected and unaffected individuals by Epstein-Barr virus transformation. (3) Identify the molecular basis of these loci using a positional candidate gene approach. (4) Establish expression patterns of the genes responsible for DFNA29 and DFNA32 in the developing auditory and vestibular systems using PCR, RT-PCR, and RNA in situ hybridization. This specific aim represents a long-term direction of the study.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: CLONING TWO NEW DEAFNESS MUTATIONS**

  Principal Investigator & Institution: Johnson, Kenneth R.; Research Scientist; Jackson Laboratory 600 Main St Bar Harbor, Me 04609

  Timing: Fiscal Year 2002; Project Start 01-JAN-2000; Project End 31-DEC-2004

  Summary: Impairment of hearing is the most common sensory deficit in human populations and affects about one of every 1,000 children. The mouse is an excellent model for studying human hearing disorders because of the anatomical and functional similarities between the mouse and human inner ears. In mice, mutations affecting the

vestibular system of the inner ear often result in a characteristic circling or head bobbing phenotype; many of these mutations also affect the cochlea and cause deafness. Two independent spontaneous mutations responsible for such abnormal behavior were discovered at The Jackson Laboratory and mapped to Chromosomes (Chr) 9 and 17, at positions where no other mouse mutations or deafness genes have been located. Both mutations when homozygous cause deafness, as assessed by the absence of auditory brainstem responses to stimuli greater than 99 dB SPL. Preliminary light microscopic analysis of cross-sections from cochleas indicate that both mutations cause neuroepithelial defects. Mouse mutations with similar defects have been shown to be models for human nonsyndromic hearing loss. On the basis of known human-mouse genetic map relationships, the new mouse mutations may be homologous to the human nonsyndromic deafness genes DFNB16 and DFNA13. The object of this proposal is to clone both of the mouse mutations by the positional-candidate gene approach. Preliminary mapping results have localized each mutation to within a 5 cM interval. These intervals will be further refined to less than 0.2 cM by recombinational analysis of extended linkage crosses. Physical maps will then be constructed and candidate genes within these regions will be screened for mutations. The human homologues of the genes shown to be mutated in mice will be identified for evaluation as candidates for human deafness. Mouse mutations enable studies of inner ear anatomy and development that are not possible in humans; such studies help elucidate pathways critical for the normal development and physiology of the ear. Another objective of this proposal is to establish a time course of pathology and gene expression in inner ears from mutant and control mice. The molecular identification and pathological characterization of these two new mouse mutations causing deafness will provide valuable models for understanding causes of **hearing impairment** in humans and for developing possible treatments and therapies.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: COCHLEAR NERVE DEVELOPMENT**

  Principal Investigator & Institution: Echteler, Stephen M.; Children's Hospital of Philadelphia 34Th St and Civic Ctr Blvd Philadelphia, Pa 191044399

  Timing: Fiscal Year 2001; Project Start 01-MAR-1990; Project End 31-MAR-2005

  Summary: The major aim of this research is to learn about the cellular, and ultimately the molecular, interactions that produce an ordered set of neuronal connections within the mammalian auditory periphery. Mammals possess two classes of auditory receptors, termed inner and outer hair cells, that project to the brain through separate neural components of the auditory nerve. Within the cochlea, auditory neurons innervate hair cells with astonishing accuracy; most form a single punctate synapse with only one receptor. Past work has shown that, during cochlear development, this neural specificity arises through extensive structural remodeling of individual cochlear neuron arbors, most of which form transient, supernumerary connections with outer hair cell receptors. During this process, up to 30% of all cochlear neurons die within the neonatal ear. This application, for renewal of a project in its 6th year, proposes to continue investigations into the formation of cochlear innervation by examining the cellular interactions between developing auditory neurons and hair cells, in-vivo, within the developing gerbil and, in vitro, within developing organotypic cultures of gerbil cochlea. Three sets of experiments are proposed: 1) The timecourse and spatial distribution of programmed auditory neuron death will be determined within the developing ear, by DNA labeling of apoptotic cells and serial reconstruction of the developing spiral ganglion; 2) Factors affecting the survival and programmed death of auditory neurons within the

developing ear will be investigated by examining, both in vivo and in vitro, the cellular expression patterns of two cochlear neurotrophic molecules (BDNF and NT-3) and their receptors (trk B and trkC) using in situ hybridization and immunocytochemistry. 3) The influence of these neurotrophic factors on the formation of neural connections to inner and outer hair cells will be assessed by examining the structural development of individual auditory neuron arbors, labeled with neural tracers and reconstructed by light and confocal microscopy, within organotypic cultures that have been enriched for NT-3 and/or BDNF or depleted of these neurotrophins by the addition of trkB-IgG and trkC-IgG fusion proteins. Eighty-percent of all significant **hearing impairment** in the U.S is caused by the permanent loss of auditory neurons and receptors. It is crucial to understand the cellular interactions that form and maintain these sensorineural elements if effective biological strategies are to be devised for their protection or repair.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: COMPUTATIONAL INVESTIGATION OF EUSTACHIAN TUBE FUNCTION**

  Principal Investigator & Institution: Ghadiali, Samir N.; Children's Hosp Pittsburgh/Upmc Hlth Sys of Upmc Health Systems Pittsburgh, Pa 152132583

  Timing: Fiscal Year 2002; Project Start 15-AUG-2002; Project End 31-JUL-2004

  Summary: (provided by applicant): The objective of this application is to investigate how the mechanical and anatomical (geometrical) structure of the Eustachian tube (ET) affects its ability to regulate Middle Ear (ME) pressure. Normally, this function is achieved by the intermittent opening of the ET due to the contraction of the surrounding musculature. Clinical and experimental studies have demonstrated that disruption of this opening mechanism results in one of the most common childhood diseases, otitis media with effusion (OME), and the associated **hearing impairment.** To obtain a fundamental understanding of the ET structure-function relationship, we propose to create a computational model that is capable of simulating both mechanical and anatomical variations. This model will be used to perform detailed simulations of ET opening phenomena during swallowing under various mechanical and anatomical conditions. As such, this work will elucidate how the interaction between mechanical and anatomical properties affects ET function. In addition, experimentally measured structural properties from normal adults will be incorporated into the model to obtain a better understanding of the "normal" ET structure-function relationship. The specific aims of this project are: 1) Develop a 2D computational model to investigate the influence of structural properties on ET opening phenomena during swallowing; 2) Develop and compare a 3D reconstructed mode of the ET with a 2D approximation to determine the importance of 3D geometrical variations; 3) Utilize the computational model to investigate and quantify ET opening phenomena in normal adults. The proposed work will elucidate how the mechanical and anatomical properties of the ET influence opening phenomena. In addition, we will establish normative data on the ET's mechanical and anatomical structure. This information is vital to the long term goal of this research which is to develop effective treatment strategies based upon the underlying structural deficiencies for persistent OME. Further, the results of the proposed research will provide the basic data which can be used as a comparative database for future studies that will quantify the ET structure-function relationship in OME patients, evaluate computationally various clinical therapies, and develop refined computational and/or experimental models.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: CORE CENTER**

  Principal Investigator & Institution: Dooling, Robert J.; Professor; Psychology; University of Maryland College Pk Campus College Park, Md 20742

  Timing: Fiscal Year 2002; Project Start 01-AUG-2002; Project End 31-JUL-2007

  Summary: (provided by applicant): The overall goals of the Core Center are to: bring together 13 investigators working on different aspects of hearing and communication disorders, increase the efficiency and productivity of their individual efforts and ongoing collaborations, integrate investigators studying basic hearing mechanisms in animals with investigators studying human **hearing impairment,** and provide opportunities for newly developing collaborations to reach fruition. The investigators participating in this application represent an extraordinary range of hearing science from anatomy and physiology of hearing in insects to the psychoacoustics of complex sound perception in humans. Existing projects include sound localization in bats and birds, prey-predator interactions in insects and bats, hair cell regeneration in fish and birds, recovery of hearing and vocalizations in birds following hair cell regeneration, the precision of time resolution in bats, birds, normal, hearing-impaired, and aged humans, and the ontogeny of auditory time resolution in animals from insects to birds. Several projects focus on psychophysical or physiological aspects of temporal processing in either normal-hearing or hearing-impaired humans. The research base consists of a total of 14 research projects on different aspects of auditory research: six NIDCD R01s, one NIA and one NIMH R01, one ONR MURI grant, one NSF grant, and four NIDCD R03s. Several projects are focused on auditory "specialists" organisms showing unusual sensitivities and novel auditory mechanisms and adaptations. All investigators are attempting to explain complex auditory behavior by discovering, modeling, or gathering data to test anatomical and physiological mechanisms. While each of these projects is independent, there are multiple areas of interface, overlap, and collaboration among investigators. Significant opportunities to advance auditory science exist at the interfaces of these projects. Providing the resources to realize these opportunities is the purpose of this P30 application.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: DEVELOPMENT OF A SCHOOL-BASED HEARING CONSERVATION PROG***

  Principal Investigator & Institution: Flamme, Gregory A.; Prev Med & Environmental Hlth; University of Iowa Iowa City, Ia 52242

  Timing: Fiscal Year 2002; Project Start 30-SEP-2002; Project End 29-SEP-2004

  Summary: There is a high prevalence of **hearing impairment** in rural areas, with substantial impairments appearing in adolescence and early adulthood. Adolescents who work on farms or in agribusiness are at a much greater risk of **hearing impairment** than their peers. Training hearing protection habits is needed before the onset of **hearing impairment,** and school systems represent a logical place to address this need. This project will develop and evaluate two hearing conservation programs, one for fourth graders and one for seventh graders. The fourth grade program will include hearing tests and an educational program designed to provide knowledge about auditory anatomy and physiology, knowledge about risk factors for hearing damage, instruction in avoiding hearing damage, and signs of hearing damage. The seventh grade program will consist of hearing tests, education programs, hearing protection device use, display of the sound levels produced by various sound producers (farm equipment, shop equipment, etc.) and a simple procedure to monitor their daily

exposure to hearing damage. The seventh grade program incorporates components of the Health Belief Model and the Theory of Self Efficacy.

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- **Project Title: DEVELOPMENTAL EFFECTS OF METHYLMERCURY**

  Principal Investigator & Institution: Burbacher, Thomas M.; Associate Professor; Environmental and Occupational Health Studies; University of Washington Grant & Contract Services Seattle, Wa 98105

  Timing: Fiscal Year 2002; Project Start 10-DEC-1986; Project End 31-JAN-2004

  Summary: The broad, long-term objective of this research is to provide a comprehensive evaluation of the effects of in utero methylmercury (MeHg) exposure at different stages of the life span of Macaca fascicularis monkeys. Previous studies of Macaca fascicularis exposed in utero to MeHg and controls have described effects during infancy, adolescence and adulthood. The primary goal of the initial 2 years of this application is to continue to assess the effects of in utero MeHg exposure on the adult functioning of these same monkeys using operant procedures that are also sensitive to changes in function typically observed in primates during aging. The primary goal of the last 3 years is to provide housing and care for these monkeys to keep the group together for later studies of MeHg and aging effects on performance. The specific aims of the studies proposed in years 1 and 2 of this application are to test the following hypotheses: (1) In utero MeHg exposure results in high-frequency **hearing impairment** in adult Macaca fascicularis. MeHg exposed monkeys will exhibit elevated hearing thresholds at frequencies of 25,000 Hz and above on a test of pure tone detection, (2) In utero MeHg exposure slows the speed of information processing in adult Macaca fascicularis. MeHg exposed monkeys will exhibit increased reaction times compared to controls on a Choice Reaction Time test as the number of response choices increase, and (3) In utero MeHg exposure results in impaired spatial memory in adult Macaca fascicularis. MeHg exposed monkeys will exhibit significant decreases in % correct responses on an Indirect Delayed Response test that uses irrelevant stimuli to interfere with attention and memory. During years 3-5, the specific aims of the project are to: (1) provide housing and care for these monkeys to keep the group together for further studies after this grant period, and (2) evaluate visuospatial orientation, fine and gross motor coordination, menstrual cyclicity, and the general health status of these monkeys using observational techniques in order to detect gross changes related to MeHg exposure and/or aging. Future studies will be aimed at evaluating the effects of in utero MeHg exposure on the performance of these monkeys at a stage in the life span when impaired functions due to aging are typically observed. Exposure of the fetus to MeHg via maternal consumption of contaminated fish continues to be a major public health concern. The major focus of the public health concern regarding MeHg exposure is the possible immediate and long-term effects of in utero exposure on postnatal growth and function. This study was designed to complete our evaluation of the effects of in utero MeHg exposure on adult primate sensory and N cognitive functioning, while providing baseline data for studies of these monkeys after this grant period, when the monkeys are 19 years of age and over. The proposed studies take full advantage of the history of these monkeys and represents the best possible use of this valuable resource.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: DEVELOPMENTAL ORIGINS OF THE INNER EAR SENSORY ORGANS**

  Principal Investigator & Institution: Collazo, Andres; Scientist Ii and Section Chief; House Ear Institute Los Angeles, Ca 90057

  Timing: Fiscal Year 2002; Project Start 29-SEP-1999; Project End 31-AUG-2004

  Summary: Problems during inner ear development can result in hearing and balance disorders. Almost one in 1,000 infants is born deaf while six in 1,000 have some form of **hearing impairment.** This makes **hearing impairment** one of the more common birth defects. Balance disorders can be more difficult to diagnose but are no less debilitating. Considering the interest in understanding the causes of newborn deafness and balance disorders, relatively little is known about ear development, especially at the cellular and molecular levels. The long-term goal of this study is to understand the cellular and molecular processes involved in the early patterning of the developing inner ear, in particular the origin and differentiation of the sensory organs. The experiments proposed will determine from where in the placode sensory organs arise, study a single cell s lineage to determine the timing and location of hair cell differentiation (specialized mechanosensory cells of the sensory organs), and test the role of the genes Notch and Delta in this differentiation. Advances in vital dyes, intravital imaging and gene function assays in the African clawed frog, Xenopus laevis, offer the unique opportunity to address the proposed hypothesis in living embryos and tadpoles. SPECIFIC AIM NUMBER 1. Generated fate maps of inner ear structures from different stages during otic placode development and correlate these maps with gene expression patterns. Labeling small groups of cells within the placode with a fluorescent vital dye and following these cells until most of the inner ear structures have differentiated, will allow us to address our hypothesis directly. SPECIFIC AIM NUMBER 2. Use single cell labeling to assess the lineage relationship between hair and supporting cells. By labeling a single cell with a fluorescent lineage tracer at different and progressively later developmental stages, the time that the resulting progency become restricted to one cell type, such as a hair cell, can be determined. SPECIFIC AIM NUMBER 3. Use gain and loss of function genetic constructs to perturb Notch/Delta signaling and determine the effects on inner ear development. Three transmembrane proteins, the receptor Notch and its ligands Delta and Serrate, are known to be involved in cell-to-cell signaling and cell fate determination in other sensory tissues, but their roles in ear development are still unknown. By injecting either mRNA or plasmid DNA containing one of these three genes into one cell of a 4-cell embryo, expression can be targeted to one inner ear, leaving the other side as a control. Two of the constructs will provide gain-of-function effects by increasing Notch/Delta signaling while the third will provide a loss-of-function effect by decreasing Notch/Delta signaling.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: DOMINANT CONNEXIN MUTATIONS AND HEARING LOSS**

  Principal Investigator & Institution: Yum, Sabrina W.; Pediatrics; Drexel University College of Medicine 245 N 15Th St Philadelphia, Pa 19102

  Timing: Fiscal Year 2004; Project Start 12-APR-2004; Project End 31-MAR-2009

  Summary: (provided by applicant): Three genes (GJB2, GJB3, GJB6) encode for gap junction proteins (connexin 26 (Cx26), (Cx30) and (Cx31) respectively), are found to cause dominant and/or recessive hearing loss. How these mutations cause hearing loss remains unknown. While both recessive and dominant mutants have impaired function, the dominant mutants might have additional dominant negative effects on the wild type

counterparts or even trans-dominant inhibition effects on each other, as Cx26, Cx30 and Cx31 are all expressed in the cochlea. The loss of gap junction coupling in cochlear cells may affect the homeostasis of potassium ions in the inner ear and cause **hearing impairment.** To test these hypotheses, cellular and animal models will be generated to analyze the effects of dominant GJB2/Cx26, GJB6/Cx30, and GJB3/Cx31 mutations, with the following three Specific Aims: 1) to determine the effects of dominant GJB2/Cx26, GJB6/Cx30, and GJB3/Cx31 mutations on the assembly, trafficking and function of their cognate mutant protein in gap junction-deficient HeLa cells; 2) to determine the effects of dominant GJB2/Cx26, GJB6/Cx30, and GJB3/Cx31 mutations on HeLa cells that express wild-type human Cx26, Cx30 and Cx31; 3) to generate and analyze animal models of selected dominant GJB2/Cx26 mutations, by expressing these mutants in the mesenchymal cells of the cochlea. The trafficking and functional results of the cellular and animal models will elucidate the fundamental cellular and molecular mechanism of dominant GJB2/Cx26, GJB6/Cx30, and GJB3/Cx31 mutations, and the animal models of selected mutations will serve as a fundamental resource for further study of the causes and treatments of these inherited causes of deafness. The principle investigator proposed this five year supervised research experience and didactic training to serve as a transitional period from a clinician to a clinician scientist. Dr. Scherer, who has performed similar analyses on the effects of GJB1/Cx32 mutations, will mentor her scientific development, along with Dr. Crenshaw, an established investigator in neurobiology and auditory biology. The work will be supported by the collaboration of Dr. Saunders, an established investigator in the neurobiology and physiology of hearing. An external advisory committee of highly regarded expert in connexin and auditory biology will provide additional support and advice. My goal is to become a well trained independent investigator in biomedicine. The excellent academic environment and the tremendous resource at the University of Pennsylvania, as well as the commitment of her institute will maximize her potential to succeed.

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- **Project Title: EARLAB: A VIRTUAL HEARING LABORATORY**

  Principal Investigator & Institution: Mountain, David C.; Professor; Biomedical Engineering; Boston University Charles River Campus 881 Commonwealth Avenue Boston, Ma 02215

  Timing: Fiscal Year 2002; Project Start 24-SEP-2001; Project End 31-AUG-2006

  Summary: (provided by applicant): The long-range goal of the EarLab project is to create realistic, web-based models capable of predicting human auditory responses to a wide range of acoustic stimuli or environmental insults. Applications range from predicting how acoustic over-stimulation leads to **hearing impairment** to explaining how humans are able to function in complex acoustic environments. To achieve our goal we will synthesize and integrate existing information on mammalian hearing and create tools that will facilitate effective interaction between investigators from different research disciplines. The models will improve our ability to take the knowledge obtained from animal models and apply it to humans. In the process of constructing and integrating the EarLab models and tools, data gaps will be identified that will need to be filled by future animal and/or human studies. The neuroscience objectives are to: 1) develop an integrated model of cochlear function, 2) develop a model of noise-induced hearing loss, and 3) develop integrated models of sound-source localization. The informatics goals are: 1) to create the computational infrastructure for a web-based auditory modeling environment, 2) to create an intelligent virtual laboratory that will allow rapid reconfiguration of simulations and interchange of model modules, as well as reference

information to aid simulation design, and 3) to develop a user interface for model configuration and data visualization.

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- **Project Title: EFFECTIVENESS OF COMPUTER-BASED HEARING TEST & TRAINING**

  Principal Investigator & Institution: Hong, Oi Saeng.; None; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, Mi 481091274

  Timing: Fiscal Year 2002; Project Start 30-SEP-2000; Project End 29-SEP-2005

  Summary: Noise-induced hearing loss (NIHL), the most common occupational disease in the U. S. (NIOSH, 1996a), is an irreversible **hearing impairment,** causing significant monetary and personal costs. Consistent use of hearing protective devices (HPDs) reduces noise exposure and subsequent NIHL. Unfortunately, workers are not consistently wearing HPDs. Attention needs to be directed toward identifying the most effective ways to assist workers in adopting the use of HPDs. The purpose of this project is to prevent NIHL in operating engineers (OEs), construction workers who operate heavy equipment, by testing the effectiveness of an innovative tailored intervention to increase their use of HPDs. Four specific aims will be addressed in this study: (1) design and test the effectiveness of an innovative intervention for OEs to increase their use of HPDs; (2) determine prevalence of hearing loss in OEs; (3) demonstrate the feasibility of providing computer-based self-administrated audiometric screening tests (SAAST) and hearing protection interventions at a construction worker training center; and (4) test and refine the Predictors of Use of Hearing Protection Model (PUHPM), a causal model designed to explain use of HPDs by OEs. To achieve these aims, this proposed project will be conducted in three phases, (I) pre-study development of intervention, (II) intervention study, and (III) post-study evaluation of intervention. In Phase I, qualitative data on OEs' perceptions, opinions, and attitudes on use of HPDs will be obtained through focus groups to guide development and refinement of an intervention. This intervention and the SAAST will be pilot tested and revised as needed. Phase II will test the effectiveness of an individually tailored, interactive, multimedia intervention combined with the SAAST and delivered by computer and contrast it with a control intervention. Phase III will obtain workers' feedback on the SAAST and the experimental intervention to guide revisions in the program in preparation for national distribution. This proposed study will deliver the intervention in an innovative format, building on recent research findings regarding the effectiveness of individually tailored interventions. Further, this proposed project will assess the feasibility of providing computer-based SAAST at a training center. Results from the proposed project will provide a model for future intervention research in occupational safety and health area and aid in reducing a serious preventable impairment, NIHL.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: ELECTRODES AND STIMULATORS FOR STRIAL PRESBYCUSIS**

  Principal Investigator & Institution: Spelman, Francis A.; Prof. & Associate Director; Advanced Cochlear Systems, Inc. 34935 Se Douglas St, Ste 200 Snoqualmie, Wa 980659228

  Timing: Fiscal Year 2004; Project Start 01-MAR-2002; Project End 31-JAN-2006

  Summary: (provided by applicant): The overall objective of this proposal is to develop a novel implanted auditory assist device that will specifically address age related strial hearing loss. As people age, many experience a hearing loss, strial presbycusis, across all

frequencies. The relationship between the rise in hearing thresholds and the corresponding reduction in the endocochlear potential is well documented. Recent research on animals demonstrates that increasing the endocochlear potential back to its normal value results in the decrease of hearing thresholds back towards their normal values. We propose to develop a hearing assist device based on this new research. The implanted device will maintain the endocochlear potential at near normal values in the ears of older people who suffer from strial hearing loss, thereby reversing their **hearing impairment.** In addition, there are early indications that this device will not only reverse hearing loss, but also serve as a therapy for strial presbycusis by preventing further deterioration of the scala media.

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- **Project Title: ELUCIDATION OF DYSMYELINATION IN THE 18Q-SYNDROME**

  Principal Investigator & Institution: Leach, Robin J.; Director of Cytogenetics and Genetics Re; Cellular & Structural Biology; University of Texas Hlth Sci Ctr San Ant 7703 Floyd Curl Dr San Antonio, Tx 78229

  Timing: Fiscal Year 2002; Project Start 01-JUL-2000; Project End 30-JUN-2004

  Summary: (adapted from applicant's abstract): Dysmyelination of the central nervous system is a key feature in individuals with the 18q- syndrome, a syndrome that results from loss of chromosomal material from the long arm of chromosome 18. Other common findings in 18q- patients include mental retardation, developmental delay, and **hearing impairment.** Through the studies of over 40 patients with this syndrome, the investigators have established that the most common feature of this syndrome is dysmyelination. From molecular genetic experiments, they have identified a region on chromosome 18 that is missing in each patient with dysmyelination. This region is therefore the "critical region" for dysmyelination in this syndrome. The gene that codes for myelin basic protein (MBP) maps into this critical region on chromosome 18q. However, mouse models have demonstrated that loss of one copy of the MBP gene is not sufficient to cause dysmyelination in the mouse. Since the 18q- syndrome is a contiguous gene syndrome, they hypothesize that there is more than one gene that must be lost from this region in humans and mice to have dysmyelination. Thus to test this hypothesis, they propose to make a mouse model that is missing the region of the mouse genome that is homologous to the "critical region" they identified in their human studies. To construct this mouse model, they propose three specific aims. The first aim is to map the transcripts they have identified in the human critical region into the mouse genome. The second aim will be to develop a mouse model with a deletion of the "critical region" using the Cre/loxP system. The third aim will be to characterize the myelin in this mouse model using molecular, structural and functional assays. These experiments will help them gain insight into the mechanism of abnormal myelination in patients with 1 8qsyndrome. In addition, this mouse model will be an important tool for future studies that focus on identifying genes that affect patients with 18q- syndrome. The information from these studies could ultimately lead to therapeutic intervention for this disorder.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: FUNCTIONAL HEARING ABILITY WITHIN THE CONTEXT OF DRIVING**

  Principal Investigator & Institution: Baldwin, Carryl L.; Psychology; Old Dominion University Hampton Blvd Norfolk, Va 23529

Timing: Fiscal Year 2004; Project Start 01-JUN-2004; Project End 30-APR-2006

Summary: Age-related changes in hearing and cognition pose considerable challenges to older adults in real world settings. Traditional methods of assessing audiometric functioning fail to consider the attentional processing requirements inherent in everyday listening situations. Concurrently, cognitive aging research has often neglected to adequately measure and account for hearing abilities. **Hearing impairment,** common among older populations, necessitates the expenditure of differentially greater attentional resources for signal extraction thereby compromising performance on concurrent cognitive tasks. New in-vehicle technologies utilizing auditory guidance instructions to assist drivers with navigating through complex and unfamiliar environments have the potential to decrease the attentional demands of difficult ddving situations and thus increase the safety and mobility of older ddvers. However, failure to address the interacting affects of declining hearing abilities and attentional processing capabilities of older adults threatens the effective implementation of these new technologies. Standard methods of assessing **hearing impairment** (i.e., clinical audiometry) neglect the working memory demands involved in everyday auditory processing. At the same time, conventional assessments of cognitive processing often use auditory tasks but frequently do not assess hearing ability adequately. The major goal of the proposed research is to develop and validate a functional hearing assessment methodology with young, young-old and old adults to examine the impact of hearing ability on speech processing and attentional workload during multi-task performance similar to that present in many everyday situations. To achieve this goal, three experiments of multi-task performance are proposed. A speech-processing task will be combined with a simulated driving task. Experiment 1 will facilitate the establishment of a method of assessing functional hearing ability (FHA) and Experiment 2 will examine the impact of realistic environmental noise on FHA. Auditory stimuli will first be presented within a range of presentation levels including standard (60dB), attenuated and amplified presentation levels. By equating functional hearing level between the age groups, a comparison of the attentional requirements of the speech-processing task independent of hearing ability can be achieved. Results of the investigation will be utilized to develop a predictive model of the attentional requirements of auditory processing in real world multi-task situations such as driving. Experiment 3 will incorporate the results of the FHA methodology established in Experiments 1 and 2 in a realistic driving task involving utilizing auditory navigational guidance instructions to complete a wayfinding task.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENES INVOLVED IN EAR DEVELOPMENT**

  Principal Investigator & Institution: Mansour, Suzanne L.; Assistant Professor; Institute of Human Genetics; University of Utah Salt Lake City, Ut 84102

  Timing: Fiscal Year 2004; Project Start 01-JUL-1993; Project End 28-FEB-2007

  Summary: (provided by applicant): The main objective of this research is to determine the identities, interactions and regulation of genes that participate in the development and/or function of the mouse peripheral auditory and vestibular systems. Previously, a gene trap screening strategy was employed to identify and mutate genes expressed in or adjacent to the developing inner ear. One of the genes found in the screen, Dusp6 is expressed in otic mesenchyme and encodes a dual-specificity protein phosphate that inactivates the mitogen-activated protein kinase, ERK, a downstream effectors of Fibroblast Growth Factor (FGF) signaling. FGFs play critical roles in many aspects of otic development and Dusp6 mRNA is not only expressed in many sites of FGF

signaling, including otic sites, its expression also depends on FGF signaling. Furthermore, mice that lacks Dusp6 have partially penetrate postnatal lethality associated with small size and craniosynostosis. Affected animals also have ossicle and otic capsule abnormalities. The size and cranial phenotypes are characteristic to different extents of humans and mice with dominant activating mutations in FGF receptors. **Hearing impairment** is variably associated with the human mutations, but has not been evaluated in the mouse models. Taken together, these data suggest the hypothesis that DUSP6 is a partially redundant negative feedback regulator of FGF signaling during the development of otic and other tissues. Three Specific Aims are proposed to test the hypothesis. First, the ontogeny and cellular basis of the otic phenotypes of Dusp6 null mutants will be characterized and the status of the inner ear will be determined. Next, expression analysis performed during the critical period for development of the Dusp6 phenotypes will be used to identify candidate FGF signaling pathways mediating those phenotypes. The otic phenotypes of mouse models of Pfeiffer (FGFR1), Apert (FGFR2) and Muenke (FGFR3) Syndromes will be compared with those of Dusp6 mutants and genetic interaction studies will be used to determine which of the FGFR signaling pathways are regulated by DUSP6. Finally, expression analysis will be used to evaluate other ERK phosphates for potential redundancy with Dusp6 and their roles in otic development will be defined genetically. As the mouse ear is very similar to that of humans, we expect that our studies will apply to human ear development and shed light on the genetic mechanisms, which perturbs it, leading to hearing and balance disorders.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETIC PREDISPOSITION TO NOISE INDUCED HEARING LOSS**

  Principal Investigator & Institution: Taggart, Robert T.; Associate Professor; Communicative Disorders & Scis; State University of New York at Buffalo Suite 211 Ub Commons Buffalo, Ny 14228

  Timing: Fiscal Year 2002; Project Start 15-SEP-2001; Project End 31-AUG-2004

  Summary: (provided by applicant): Noise induced hearing loss has substantial impact on the productivity and quality of life for as many as 10 million people in the United States. There is increasing evidence from human and animal studies that mutations within genes expressed within the cochlea can render individuals more susceptible to **hearing impairment** caused by exposure to acoustic over- stimulation, trauma or ototoxic agents. We propose to search for NIHL susceptibility gene mutations by examining subjects who routinely receive high levels of noise exposure. A series of 2000 military personnel who are found to have permanent changes in hearing thresholds (PTS) during yearly audiological examination and 1000 control subjects will be screened for sequence variations that either directly or in combination with other factors are associated with NIHL susceptibility. PTS and control subjects will be compared for mutations in candidate genes, history of occupational noise exposure and other epidemiological factors (i.e., smoking, ethnic background, family history of hearing impairment). The gene mutations examined will include sequence variants associated with specific inherited forms of **hearing impairment** and sequence variations identified within candidate genes suspected to have important roles in maintenance of cochlear function. We suspect that an increased frequency of one or more inherited gene mutations will be found in PTS subjects relative to control subjects, perhaps as the result of being carriers for recessively inherited non-syndromic deafness traits (congenital), dominantly inherited **hearing impairment** genes with a later age of onset or one of several mitochondrial DNA mutations. We will identify PTS subjects with a family

history of NIHL to identify families that will be suitable for future linkage and candidate gene localization studies. These studies represent an innovative approach toward identification of cochlear genes that have important roles in the protection and recovery from acoustic trauma caused by chronic acoustic over-stimulation.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETIC TESTING/HEARING IMPAIRMENT IN AFRICAN AMERICANS**

  Principal Investigator & Institution: Robin, Nathaniel H.; Associate Professor; Genetics; University of Alabama at Birmingham Uab Station Birmingham, Al 35294

  Timing: Fiscal Year 2003; Project Start 01-SEP-2003; Project End 31-AUG-2005

  Summary: (provided by applicant) African Americans (AA) as a group distrust the medical establishment. The reasons have been discussed in editorials and opinion papers, and include unfortunate historical events like the Tuskegee syphilis study and the Sickle Cell screening program. One undesirable consequence of this mistrust is that AA as a group have been hesitant to participate in biomedical research studies. Consequently, many medical advances have not had a direct benefit for this population. One example of this is the genetic basis for **hearing impairment** (HI). Over 60 hearing-related genes have been identified in the past decade, and genetic testing is now available for one, GJB2. Studies among populations of Northern European extraction have shown that GJB2 mutations cause about 55% of nonsyndromic HI. No similar discovery has occurred for AA, as in limited studies GJB2 mutations have not been seen in AAs. Therefore, despite the many discoveries, there has been little advance in the genetics of HI in AA. A recent report suggested that mutations in a related gene, GJA1, may be more common in deaf/hard of hearing (D/HOH) AA, but this study was limited, as only 26 D/HOH AA were tested. In this proposal, we will examine the interrelated issues of AA's willingness to participate in research and the genetic basis of HI in AA. We will survey D/HOH AA and their families on their attitudes towards research and genetic testing for HI. Those subjects that complete the survey will then be offered free research-based genetic testing for several HI-related genes, GJB2, GJB6, and GJAI. Dr. Richard Smith at the University of Iowa will do the genetic testing. Offering the research based genetic testing will yield two valuable results. First, we will gain insight into why some AAs are unwilling to participate in research by comparing the results of those that agree to participate and those that decline. Second, by the results of the genetic testing, we will determine the frequency of mutations in GJB2, GJB6, and GJA1 among D/HOH AA. Subjects will be notified of their test results and offered free genetic counseling to have the results explained. From these results we will gain insight into why AA will/will not participate in research studies, and into their attitudes toward genetic testing for HI. Furthermore, these results will determine the role of mutations in GJB2, GJB6, and GJA1 in HI in AA. Together, these results will lead to more efficient genetic testing for HI in this population.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETICS OF A NEW MOUSE MODEL FOR DEAFNESS**

  Principal Investigator & Institution: Zheng, Qing Y.; Jackson Laboratory 600 Main St Bar Harbor, Me 04609

  Timing: Fiscal Year 2002; Project Start 01-AUG-2000; Project End 31-JUL-2003

  Summary: (adapted from applicant's abstract): Genetic impairment of hearing affects about one in every 2,000 children. Identification of genes leading to **hearing impairment**

is essential for understanding factors necessary for normal auditory function and for development of therapeutic strategies. The genetic analysis of mouse deafness mutations has proven instrumental in the identification of several human deafness genes. A new mutation causing hearing and balance defects spontaneously arose in a colony of BALB/cByJ inbred mice at The Jackson Laboratory. The recessive mutation was named 'hypoplasia of the membranous labyrinth' (symbol hml) because it mainly affects inner ear morphology and development. The human homolog of the gene responsible for the hml phenotype in mice may play a role in the etiology and pathogenesis of some cases of human inherited deafness. Currently the pathogenetic mechanism and the identity of hml are not known. A small panel of intercross mice was used to map the hml locus to the middle region of mouse chromosome (Chr) 10. The genetic map position of the mouse hml gene suggests that the homologous human gene may be located on Chr 9pl3, where a particular form of genetic deafness in humans (DFNB15) has been previously mapped. In order to characterize the genetic and developmental dysfunction responsible for this morphogenetic inner ear mutation in mice, and ultimately extend that new found knowledge to improve our understanding of DFNB15 or other deafness traits in humans, the identification and characterization of the hml gene needs to be carried out. Aim 1. Generate a high-resolution genetic map of the region surrounding hml and screen candidate genes for the mutation. Aim 2. Construct a physical contig of YACS and BACS clones across the minimal genetic region. Aim 3. Fully characterize the development and pathology of inner ears from hml/hml mice compared with hml/+ and +/+ controls.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETICS OF HEARING LOSS IN PALESTINIAN KINDREDS**

  Principal Investigator & Institution: King, Mary-Claire; American Cancer Society Professor; Medicine; University of Washington Grant & Contract Services Seattle, Wa 98105

  Timing: Fiscal Year 2002; Project Start 01-MAY-2000; Project End 30-APR-2003

  Summary: Profound **hearing impairment** occurs in approximately one in 1000 children at birth, primarily due to genetic causes. In cultures with a tradition of consanguinity, rates of congenital hereditary **hearing impairment** may be much higher. Palestine is such a culture, and in some locales, more than 10 percent of children are born deaf. Of the many genes likely to be involved in hereditary **hearing impairment,** 62 have been mapped and 15 cloned so far. Normal counterparts of these genes must be critical to normal development of hearing. Therefore, identifying genes for hereditary **hearing impairment** and characterizing their normal functions offers a powerful approach for developing treatments for sensorineural deafness, both in children and among older adults. Extended kindreds with rigorously diagnosed **hearing impairment** and carefully constructed genealogies, who are enthusiastic participants in research studies, are probably the most valuable resource in the world for identifying these genes. Palestinian kindreds K, Y, C, and J are extended families, unrelated to each other, with congenital deafness in multiple generations. The deaf persons and their informative relatives in these families are already participants in this study, with genealogical information, clinical histories, and DNA obtained with informed consent of each person. Dr. Kanaan spent the past 8 months as a Fulbright Visiting Professor in the King lab, where he evaluated these families by current genomic approaches. Using genome-wide linkage analysis, Dr. Kanaan mapped **hearing impairment** in Family K to a 5.4 cM region of chromosome 22q13; the new locus has been named DFNB28. He identified multiple candidate genes in this region, excluded two by sequence analysis of the family, and

showed that this region is not linked to deafness in families Y, C, or J. He excluded all known genes for inherited deafness in these families, demonstrating that these kindreds represent new, previously unknown genes for inherited hearing loss. Our goals for this FIRCA are (1) to complete fine mapping of hereditary **hearing impairment** with additional relatives of Family K, then clone this gene for hereditary **hearing impairment;** (2) to map the different genes responsible for hereditary **hearing impairment** in Families C, Y, and J; and (3) to identify additional extended Palestinian families with hereditary **hearing impairment.** This FIRCA is collaborative with the existing FIRCA between M-C King and Karen Avraham of Tel Aviv University. The ultimate goal of our three-way collaboration is to transfer the technology for identification of genes for important human conditions to Middle Eastern geneticists.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETICS OF MILD HEARING LOSS IN CHILDREN AGED 6-12 YRS**

  Principal Investigator & Institution: Wake, Melissa; Murdoch Children's Research Institute Flemington Rd Melbourne,

  Timing: Fiscal Year 2002; Project Start 25-SEP-2002; Project End 31-AUG-2005

  Summary: (provided by applicant): The Problem: Slight/mild sensorineural **hearing impairment** (HI) affects at least 180,000 US school-aged children. Although rapid advances have been made in the genetics of moderate-profound HI, little is known about the contributions of single gene mutations to slight/mild nonsyndromic Hl, or of the impacts of such HI on child outcomes. BROAD, LONG-TERM OBJECTIVES: This large-scale project, to be carried out in Victoria, Australia, will be the most comprehensive study yet to address the impacts and genetics of mild childhood **hearing impairment.** AIMS: In a large community sample of elementary school-aged children, we aim to (1) Describe relationships between slight/mild HI and Connexin 26 (the two most common "deafness genes") and Pendrin mutations, and impacts of slight/mild HI; (2) Develop and trial informed consent procedures on the use of DNA specimens for genetic testing for elementary school children with slight/mild HI; (3) Describe the impact of genetic testing on elementary school children with slight/mild HI and their families; and (4) Develop and evaluate education and counseling approaches when providing genetic information. RESEARCH DESIGN & METHODS: To establish prevalence, we will screen the hearing of approximately 6,000 elementary school-aged children (Years 1 and 5). From this base cohort approximately 180 children with slight/mild HI ("cases") and a further 360 children with normal hearing ("controls") will undergo assessment to address Aim 1. This will include testing the two "deafness genes" of interest, assessing language, academic, cognitive and social/quality of life outcomes, and self-reporting any problems with hearing. In a small preceding qualitative study, issues related to genetic testing in families of children with and without HI will be explored. We will then develop, trial and evaluate information and informed consent procedures, feedback, and counseling procedures (Aims 3 & 4). SIGNIFICANCE: If Cx26 and/or Pendrin is found to contribute to slight/mild HI, then this might profoundly alter (a) the advice and counseling we currently provide to families identified through a child with homozygous Cx26 or Pendrin deafness and (b) approaches to future population screening.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GENETICS OF PROGRESSIVE SENSORINEURAL HEARING LOSS**

  Principal Investigator & Institution: Street, Valerie A.; Pathology; University of Washington Grant & Contract Services Seattle, Wa 98105

Timing: Fiscal Year 2004; Project Start 01-JUL-2004; Project End 30-JUN-2009

Summary: (provided by applicant): **Hearing impairment** is a common sensory deficit with both genetic and environmental etiologies. Given the complexity of the auditory system, it is not surprising that a broad range of gene products have been implemented in hearing loss. This wealth of genetic heterogeneity provides numerous targets for mutations that may alter auditory abilities and provides an avenue which novel can discover genes or the function of previously cloned genes can be characterized further. However, this heterogeneity also complicates clinical diagnosis. Molecular genetic studies to dissect this complexity will allow clinicians to diagnose precisely the molecular lesion underlying a hearing loss disorder, which should facilitate the most appropriate intervention. Characterization of modifier genes that may rescue or increase the auditory consequences of a particular mutation in a **hearing impaired** family may provide predictive value in counseling patients carrying these mutations and genetic variations. Deficits in auditory function at any age can lead to isolation and withdrawal from the hearing population. Therefore it is imperative for hearing researchers to better understand the auditory system and search for mechanisms to curb or cure **hearing impairment.** A molecular genetic and animal model approach as described in this grant proposal is one path to follow towards accomplishing this task.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: GROWTH AND REGENERATION IN THE INNER EAR**

  Principal Investigator & Institution: Corwin, Jeffrey T.; Professor; Otolaryngology; University of Virginia Charlottesville Box 400195 Charlottesville, Va 22904

  Timing: Fiscal Year 2002; Project Start 01-DEC-1988; Project End 30-NOV-2005

  Summary: It is estimated that 80 percent of significant **hearing impairment** in the U.S. is sensorineural or "nerve" deafness that usually originates from hair cell losses. Deficits in the sensory hair cells that convert sound and balance stimuli into neural signals have been considered irreversible, because the production of hair cells ends before birth in human ears. However, hair cells are produced postembryonically in the ears of cold-blooded animals and birds; in some, millions of hair cells are added to the ear throughout life. During past cycles of this grant it was discovered that hair cells damaged in those animals could be replaced through regenerative proliferation that was triggered by trauma. The machinery for regenerative proliferation also can operate in damaged balance organs from the ears of adult mammals, including 60-year-old humans, but that only occurs at low levels. This request for renewal of a project in its 18th year proposes to continue investigations that focus on identifying and understanding the signaling mechanisms that control the production of cells and the processes that lead to their specialization as sensory hair cells in embryonic and postembryonic ears. Those objectives will be approached in pharmacological tests, in immunohistochemistry and in situ hybridization, in expression screens that are identifying the specific molecules that function in those control mechanisms in the ear, in tests that will utilize cells derived from the ears of mice and humans and in tests of the hypothesized mechanisms in mouse mutants. The information sought is essential for the identification of targets for the development of therapeutic approaches to stimulate and control mechanisms of self-repair in the ears of mammals. The goals of this research directly pertain to possible prevention of and recovery from sensorineural hearing loss and balance dysfunctions that contribute to prevalent communication disorders and to falls by elderly individuals. They also appear likely to lead to improved understanding of the development of normal and abnormal auditory and vestibular function in human ears.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: HEARING AID RESEARCH**

  Principal Investigator & Institution: Braida, Louis D.; Assoc Prof of Elec Engr & Computer Sci; Center for Cancer Research; Massachusetts Institute of Technology Room E19-750 Cambridge, Ma 02139

  Timing: Fiscal Year 2002; Project Start 01-APR-1976; Project End 30-JUN-2004

  Summary: This research is directed toward improved speech reception for users of hearing aids. Attempts to advance basic understanding involve study of limitations imposed by characteristics of the speech signal and of the impairment, and the development of models of speech intelligibility that exploits ideas used in automatic speech recognition. Research on the speech signal focuses on understanding the effects of speaking style, specifically the effects of speaking clearly for the hard of hearing, and the effects of intra-speaker and inter-speaker variability on intelligibility. Research on the effects of hearing impairments focuses on developing and testing of techniques for simulating impairments for listeners with normal hearing. The envisioned models of speech intelligibility includes models of perceptual processing, integration of speech cues across frequency bands, and are addressed at understanding the effects of signal properties, **hearing impairment,** and environmental disturbances (noise and reverberation) on speech reception. Attempts to develop improved signal processing techniques for use in hearing aids involve study of multiban automatic gain control, amplitude compression, and techniques for reducing the effects of feedback in amplification systems.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: HEARING AIDS BASED ON MODELS OF COCHLEAR COMPRESSION**

  Principal Investigator & Institution: Goldstein, Julius L.; Professor; Becs Technology, Inc. 9487 Dielman Rock Island Ind Dr St. Louis, Mo 63132

  Timing: Fiscal Year 2002; Project Start 15-JAN-1999; Project End 31-DEC-2003

  Summary: (Verbatium from the Abstract): **Hearing impairment** is commonly experienced as loss of sensitivity to weak sounds, while intense sounds can remain as loud as in normal hearing. Many current hearing aids treat this phenomenon of loudness recruitment" with sound amplification that decreases with sound intensity, to provide normal loudness. Design of such compressive amplifiers is controversial. In research sponsored by the NIH the PI developed models of nonlinear cochlear sound processing, which suggest compression strategies that prevent overamplification while minimizing distortion and disturbance by background noise. In Phase-I, algorithms were developed for multichannel hearing aids using both rapid and slow compression mechanisms. Benefits of the new design were demonstrated with a computer simulation in pilot tests on normal and impaired hearing subjects for their understanding of speech in iroise. New insights are provided on functions of nonlinear cochlear mechanisms lacking in impaired ears. An advanced real-time implementation was developed in Phase-I. In Phase-II, prototype wearable hearing aids will be developed, fabricated, and formally tested by independent laboratories. Preliminary simulations of custom miniaturization technologies will be conducted in preparation for commercialization. In addition, the design will be developed as a desktop master hearing aid for clinical optimization of individual fittings. PROPOSED COMMERCIAL APPLICATION: Wider acceptibility of hearing aids is potentiated by the superior performance of the new

design, particularly in background noise. The fundamental relationship of the new design to cochlear mechanisms potentiates a professional-instrument market for a full-featured master hearing aid for use in R & D and clinical fitting.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: HEARING IN BELGIAN WATERSLAGER CANARIES**

  Principal Investigator & Institution: Lauer, Amanda M.; Psychology; University of Maryland College Pk Campus College Park, Md 20742

  Timing: Fiscal Year 2002; Project Start 01-SEP-2002; Project End 30-JUN-2005

  Summary: (provided by applicant): The main goal of the proposed research is to provide a more complete assessment of hearing in the Belgian Waterslager canary. This strain of canary has a hereditary hearing loss associated with missing and damaged hair cells. Little is known about how these hair cell abnormalities affect hearing, other than elevating pure tone thresholds, particularly at high frequencies. In the present study, psychoacoustic methods will be used to investigate hearing abilities in Belgian Waterslager and normal hearing canaries. In a series of behavioral experiments, I will assess frequency analysis, temporal processing, and perception of vocalizations. The performance of Belgian Waterslager canaries on these tasks will be compared to the performance of normal hearing canaries. In addition, I will investigate the behavioral effects of hair cell damage and regeneration after noise exposure in these birds, followed by an anatomical study of the basilar papillae. What makes canaries especially interesting subjects for hearing experiments is that they have been used in many behavioral and neurobiological studies of vocal learning and neurogenesis. Thus, the proposed experiments will increase our understanding of the functional consequences of **hearing impairment** in these birds, and of **hearing impairment** in general.

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- **Project Title: ID OF THE MOUSE DEAFNESS (DN) GENE ON CHROMOSOME 19**

  Principal Investigator & Institution: Keats, Bronya J.; Professor; Genetics; Louisiana State Univ Hsc New Orleans New Orleans, La 70112

  Timing: Fiscal Year 2002; Project Start 01-AUG-1999; Project End 31-JUL-2004

  Summary: (Adapted from investigator's abstract) The overall goal is to identify the gene (dn) that is defective in the deafness (dn/dn) mouse. The applicants have mapped the dn gene to mouse chromosome 19 and it is likely to be the ortholog of the human DFNB7/11 gene on chromosome 9q13-q21. The deafness mouse is an autosomal recessive mutant of the curly-tail (CT) stock showing degeneration of the organ of Corti, stria vascularis, and the saccular macula. Ultrastructural abnormalities of the inner hair cells have been shown to be present at birth, and by 15-20 days after birth there are abnormalities of the extracellular spaces of the organ of Corti as well as loss of inner and outer hair cells. By 45 days after birth the inner and outer hair cells have degenerated completely, and the organ of Corti has no distinguishable cell types from base to apex. Interestingly, regeneration of cells other than hair cells occurs in the apical turn between 45 and 90 days after birth. Unlike other mouse models for deafness, the dn/dn mouse does not exhibit circling behavior, indicative of vestibular dysfunction, and therefore may provide insight into the auditory system as distinct from the vestibular system. Preliminary linkage and physical mapping data suggest that the deafness phenotype is associated with a chromosomal rearrangement, probably an inversion. Based on these results, the applicants propose to identify both breakpoints of the inversion, identify and characterize candidate genes, and create a hearing dn/dn mouse using transgenic

technology. The specific aims are to: (1) Isolate and determine the sequence at both inversion breakpoints; (2) Identify candidate genes in the vicinity of the chromosomal rearrangement; (3) Isolate cDNAs and analyze for abnormal expression and gene structure in the dn/dn mouse relative to the +/+ mouse; and (4) Rescue the deafness phenotype via the transfer of BAC DNA directly into dn/dn mouse embryos. The deafness mouse is a model for nonsyndromic profound **hearing impairment,** and identifying the defective gene will be a valuable contribution to our understanding of the genes needed for normal cochlear function.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: IDENTIFICATION AND CHARACTERIZATION OF THE DFNB17 GENE**

  Principal Investigator & Institution: Greinwald, John H.; Children's Hospital Med Ctr (Cincinnati) 3333 Burnet Ave Cincinnati, Oh 452293039

  Timing: Fiscal Year 2002; Project Start 15-MAY-2002; Project End 30-APR-2007

  Summary: (provided by applicant): The primary goal of this proposed research project is to determine the disease-causing mutation of the gene responsible for the seventeenth loci for autosomal recessive non-syndromic hearing loss (DFNB17), and to characterize its expression and function in the inner ear. Hereditary **hearing impairment** (HHI) affects approximately 1 in 1000 children and constitutes one of the most common birth defects. Because of the long-term problems with language acquisition, development and education, a further understanding of the pathophysiology of **hearing impairment** is warranted. Based on preliminary linkage data localizing the gene responsible for DFNB17 to a 3cM region of chromosome 7q31, we hypothesize that the deafness-causing mutation is contained within this interval. We will use a positional cloning strategy to test this hypothesis, identify the mutation responsible for DFNB17 and determine its putative functional and expression c characteristics. This project proposes to: 1) Refine and narrow the DFNB17 interval on chromosome 7q31. 2) Identify candidate cochlear expressed genes in the DFNB17 interval. 3) Identify the DFNB17 gene by determining the disease causing mutation in a family mapping the original locus and in novel families mapping to this interval. 4) Determine the expression pattern and putative function of this novel cochlear expressed gene. Secondarily, this project will serve as an opportunity for the principal investigator to acquire the skills and knowledge base to become an independent clinician-scientist. The immediate goals of the candidate are to establish an active research laboratory and study the DFNB17 gene. The long-term career goal is to be an independent clinician-scientist, focused on the study of the molecular genetics of hereditary deafness. Specifically, to identify novel hearing loss related genes, advance the science of molecular diagnostic testing for patients and provide insight into pathways for potential treatments in **hearing impaired** patients. All of this knowledge can then be directly applied to an otologically based clinical practice at a large pediatric tertiary care referral center to provide the highest quality of care for **hearing impaired** patients and families. The overall development plan to reach these goals will include a combination of dedicated laboratory time, integrating with and receiving direct support from the Division of Human Genetics with an educational plan which will consist of close association with mentor scientists, dedicated reading course, didactic inter- and extra-divisional interactive sessions and classes and prescribed lectures.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: INTENSITY CODING AND DYNAMIC PROCESSES IN HEARING**

  Principal Investigator & Institution: Viemeister, Neal F.; Professor; Psychology; University of Minnesota Twin Cities 200 Oak Street Se Minneapolis, Mn 554552070

  Timing: Fiscal Year 2002; Project Start 30-SEP-1990; Project End 31-MAR-2006

  Summary: The dynamic aspects of sound-- the amplitude and frequency changes that occur over time- are crucial information- bearing elements of auditory perception and communication. The ability of the auditory system to follow and to resolve such changes is the topic of this proposal. The proposed project is a comprehensive behavioral study, using normal-hearing adults, of the ability to extract information from changes in the amplitude and the spectrum of sound. The proposal consists of three related projects that investigate increasingly complex aspects of dynamic auditory processing. The first project addresses basic issues in auditory coding. One focus is on how normal human hearing can operate over a huge intensity range. The proposed experiments address hypotheses based on physiological data that suggest a possible role for suppression, cochlear efferents, and nonlinear spread of excitation. The other focus is on the role of fine-structure information in monaural hearing. The proposed experiments on this basic, long-standing issue will delineate the relative importance of fine-structure and envelope information in detection and discrimination. The second project examines the ability of the auditory system to extract information from dynamic changes in amplitude such as produced by amplitude and frequency modulation. The general aim of this project is to develop a comprehensive empirical and theoretical account of such processing, including delineation of those aspects of the amplitude envelope that are important for detection and discrimination. The third project, on supra-threshold dynamic processing, is concerned with the processing of amplitude changes that are highly detectable and, as such, represents a significant extension of previous research. The hypotheses driving the specific research questions are based upon data and theory from threshold phenomenon. The general aim of this project is to extend our understanding of dynamic processing to more realistic auditory stimuli. Overall, these projects will provide information of fundamental importance for understanding the basic properties of normal human hearing and, eventually, for understanding the perceptual consequences of **hearing impairment.** It will help provide a bridge between auditory physiology and real-world hearing. This is essential for a full understanding of hearing and for the development and evaluation of strategies for alleviating hearing loss.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: ION TRANSPORT MECHANISMS IN TYPE I FIBROCYTES**

  Principal Investigator & Institution: Shen, Zhijun; Assitant Professor; Pathology and Lab Medicine; Medical University of South Carolina P O Box 250854 Charleston, Sc 29425

  Timing: Fiscal Year 2002; Project Start 01-AUG-2001; Project End 31-JUL-2004

  Summary: (provided by applicant): Recent studies have provided considerable support for the concept that type I fibrocytes in the spiral ligament participate actively in cochlear ion homeostasis as part of a pathway for recycling K+ from perilymph to endolymph. If true, then type I fibrocytes should have evolved complex and possibly unique mechanisms for regulating cellular and intercellular K+ flux. Moreover, it is highly probable that these transport processes are under the control of local and systemic modulators. It is planned to test these hypotheses via two Specific Aims. Aim I will identify and characterize specific channels and channel subtypes responsible for regulating the influx and efflux of K+ in cultured and freshly isolated type I fibrocytes with patch clamp recording. Pharmacological tools will be used to identify the specific

channel types. Aim 2 will assess the potential role of vasopressin and ATP as systemic and local modulators for regulating K+ homeostasis in type I fibrocytes under normal physiological conditions. Dose-dependent responses to various agonists and antagonists will be fully characterized by patch clamp techniques. Specific pharmacological tools will be utilized to distinguish the receptor types and possible mechanisms involved. Reverse transcription - polymerase chain reaction analysis will be performed to confirm the expression of genes for ion channels identified in Aim I and receptor subtypes defined in Aim 2. Data from this highly focused study will help to verify a portion of the proposed pathway for K+ recycling in our current model of ion homeostasis in the cochlea and thereby provide new insights into potential treatments for **hearing impairment.**

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: IOWA COCHLEAR IMPLANT CENTER PROJECT IV**

  Principal Investigator & Institution: Gantz, Bruce J.; Professor and Head; Otolaryngology; University of Iowa Iowa City, Ia 52242

  Timing: Fiscal Year 2002; Project Start 09-SEP-1985; Project End 31-MAY-2006

  Summary: provided by applicant): This revised competing renewal application requests continuation of the Iowa Cochlear Implant Clinical Research Center. We have been engaged in clinical outcomes research studying cochlear implant application in children and adults. Speech perception with cochlear implants has improved to the point where selection criteria for implant consideration is poorly defined. Refining the criteria for cochlear implantation is one of the more important issues facing clinicians. The overall goals of the proposed research are to 1) study expansion of selection criteria for implantation to include adults with more hearing and earlier implantation in children, 2) develop a reliable evaluation strategy including accurate assessment of auditory thresholds to determine if a child is a candidate for a cochlear implant by 12 months of age, 3) develop and evaluate novel signal processing for speech perception and music appreciation, 4) evaluate the combination of electrical signal processing and acoustical amplification in adults with more residual hearing using a newly designed short electrode implant, 5) refine and expand the use of electrophysiologic measures to improve fitting of existing and high rate speech processors for young children and adults, 6) assess the communication outcomes (speech production, language, reading, writing, and music appreciation) of children with **hearing impairment** using hearing aids and those with implants to determine if implant selection criteria should be expanded to include children with more hearing, 7) study the benefits of binaural cochlear implants, 8) determine the factors that affect the long-term benefit of cochlear implants in children and adults. The proposed application will test multiple hypotheses by studying 257 previously implanted adults and children, 120 newly recruited postlingually deafened adults and prelingually deafened children, and 20 adults with more residual low frequency hearing. The 120 adults and children will receive new high rate signal processing implants that include telemetry to measure the cochlear EAP (Nucleus and Clarion). The 20 adults with residual hearing will be implanted with a short electrode implant recently developed by the Iowa implant team. 75 **hearing impaired** children using hearing aids and 25 normal hearing infants will be recruited for control studies. Four research projects, Patient Care and Technical Support Core B will address the above goals. The 4 research projects are highly integrated and depend on data from each other to answer the experimental questions proposed.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: LINGUISTIC CONTEXT USE AND HEARING DISABILITY/HANDICAP**

  Principal Investigator & Institution: Hnath-Chisolm, Theresa E.; Professor; Communication Scis & Disorders; University of South Florida 4202 E Fowler Ave Tampa, Fl 33620

  Timing: Fiscal Year 2002; Project Start 01-AUG-2000; Project End 31-JUL-2004

  Summary: This project is conceived as an initial step in the development of efficacious aural rehabilitation strategies for individuals with adult-onset **hearing impairment.** As a result of this impairment individuals experience difficulty communicating, thus there are known reductions on self-perceived hearing-related quality of life. While communication performance and hearing- related quality of life improvements can be obtained through the use of hearing aids, their use is not a panacea. Aural rehabilitation therapy is designed to help individuals for whom hearing aid use alone is not sufficient to overcome the communicative, social, and psychological impact of adult-onset **hearing impairment.** Thus the goals of aural rehabilitation therapy are twofold: 1) alleviate the communication difficulties (i.e., the hearing disability); and, 2) reduce the psycho-social sequelae (i.e., the hearing handicap) that often accompany the impairment. While aural rehabilitation approaches evaluated to date appear efficacious when group performance is examined, individual subject variability is found in response to treatment. This suggests the need to examine how factors that may be amenable to treatment are related to hearing disability and/or hearing handicap. Training on factors which contribute significantly to hearing disability and/or hearing handicap would warrant further investigation. Thus the present study is designed to examine the relationship between one cognitive- linguistic variable that may be amenable to treatment, and the self-perception of hearing disability and/or hearing handicap. This is the ability to use linguistic constraints in the speech recognition process. To examine, in the main experiment, the unique contribution of this factor to hearing disability and/or hearing handicap, the regression model will also include data on known significant audiometric and demographic correlates, as well as data on self-perceived benefit from the use of hearing aids. Prior to initiating the main experiment, however, it is necessary to examine an underlying assumption of the mathematical model, based on probability theory, that will be used to quantify linguistic constraint use. Results will not only have important clinical implications, but will also increase our understanding of the use of probability theory as a model for the speech recognition process.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MECHANOSENSOR DEVELOPMENT, FUNCTION, AND DYSFUNCTION**

  Principal Investigator & Institution: Mueller, Ulrich; Professor; Scripps Research Institute Tpc7 La Jolla, Ca 92037

  Timing: Fiscal Year 2003; Project Start 01-APR-2003; Project End 29-FEB-2008

  Summary: (provided by applicant): Deafness is a major health problem. 1 in 800 children is born with **hearing impairment** and large parts of the aging population are afflicted by age-related hearing loss. Deafness can be caused by defects in hair cells, the mechanosensors for sound waves in the inner ear. The stereocilia of hair cells harbor mechanotransduction channels that open or close upon stereocilia deflection. The transduction channel and the molecules that regulate stereocilia movement are not known. This has prevented to determine the molecular mechanism of mechanotransduction and sound perception. The long term goal of our research is to

understand the mechanisms that regulate mechanotransduction in hair cells, and the defects in this process that cause deafness. We propose here to study the role of cadherin 23 (CDH23) in hair cell function. We hypothesize that CDH23 assembles a transmembrane signalling complex that regulates stereocilia behavior. The hypothesis is based on the fact that mutations in CDH23 cause deafness, that cadherins in other cells assemble signalling complexes, and that stereocilia bundles in CDH23-deficient mice are disrupted. To test our hypothesis, we will: (i) determine the subcellular distribution of CDH23 in hair cells by immunohistochemistry; (ii) define its adhesive properties in cell adhesion assays; (iii) isolate by yeast-two-hybrid assays CDH23-interacting proteins; (iv) generate mouse line that carry defined mutations in CDH23 disrupting interactions with downstream effectors. Our preliminary data validate our hypothesis. The data show that CDH23 is localized to stereocilia, and binds to molecules implicated in signalling. We expect that transmembrane complexes connect stereocilia, their cytoskeleton and ion channels into a functional unit for sound perception. An understanding of this molecular machine will be important to develop rational strategies for therapeutic intervention in deafness.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MODULATION OF HAIR CELL TOXICITY IN ZEBRAFISH**

  Principal Investigator & Institution: Owens, Kelly N.; Otolaryngology/Head and Neck Surgery; University of Washington Grant & Contract Services Seattle, Wa 98105

  Timing: Fiscal Year 2004; Project Start 01-JUN-2004; Project End 31-MAY-2006

  Summary: (provided by applicant): Loss of sensory hair cells is a major cause of **hearing impairment** and can arise from both genetic and environmental causes including noise trauma, aging, and drug exposure. The overall objective of this application is to investigate the mechanism of aminoglycoside drug toxicity in hair cells. This research will test the hypothesis that perturbation of proteins which are direct or indirect targets of aminoglycosides will alter the degree of hair cell death using the zebrafish lateral line as a model system. Two approaches are used to define components modulating aminoglycoside toxicity: physiological alteration of hair cells in wildtype zebrafish and isolation of mutants with altered aminoglycoside response. The specific aims of this application are to: 1) test whether disruption of mitochondrial function alters aminoglycoside response; 2) determine the molecular nature of the zebrafish sentinel mutation that exhibits aminoglycoside resistance; and 3) identify new mutations with sensitivity or resistance to aminoglycoside hair cell loss. The long term goal of this research to identify pathways which may underlie other less experimentally tractable forms of hair cell loss, such as age or noise related hair cell loss, and to suggest targets for intervention during drug treatment.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR BASIS OF MATERNALLY TRANSMITTED DEAFNESS**

  Principal Investigator & Institution: Fischel-Ghodsian, Nathan; Professor of Pediatrics; Cedars-Sinai Medical Center Box 48750, 8700 Beverly Blvd Los Angeles, Ca 900481804

  Timing: Fiscal Year 2002; Project Start 01-MAR-1992; Project End 31-MAR-2006

  Summary: (provided by applicant): The broad long term objectives of this research proposal are to elucidate the molecular basis of maternally inherited deafness, and globally to shed light on the mechanism(s) of phenotypic expression of pathogenic mitochondrial DNA mutations. The specific aims of this proposal mainly revolve around the identification and functional characterization of a nuclear gene that is

responsible for modifying the clinical expression of the A1555G mitochondrial DNA mutation associated with **hearing impairment** in humans. The health-relatedness of these aims is to provide the basis for the rational design of therapeutic interventions to prevent, correct, or circumvent the clinical expression of maternally transmitted **hearing impairment** specifically and mitochondrial DNA diseases more generally. The experimental approach will focus on the identification of a modifier gene on chromosome 8 using genetic mapping and the analysis of candidate genes in the region. In parallel, genetic linkage and candidate gene analysis will be used to identify additional loci and genes that may be modifiers of the clinical phenotype. Once the chromosome 8 modifier gene has been identified, the gene and its functional pathway will be functionally characterized using expression studies, cellular localization, identification of proteins binding to the modifier, and binding assays of both the mutated and non-mutated forms of the modifier protein.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR CLONING OF THE WALTZER DEAFNESS GENE**

  Principal Investigator & Institution: Bryda, Elizabeth C.; Associate Professor; West Virginia University P. O. Box 6845 Morgantown, Wv 265066845

  Timing: Fiscal Year 2002; Project Start 01-SEP-2002; Project End 31-AUG-2003

  Summary: Our long term objective is to understand the underlying molecular mechanisms involved in development of the mammalian auditory system. The specific goal of this application is to use molecular genetic techniques to isolate and characterize the mouse waltzer gene. Waltzer (v) is a recessive mutation characterized by congenital deafness, bi- directional circling behavior, and hyperactivity. The central hypothesis of this application is that waltzer is a mouse model for human hereditary deafness. Based on genetic map position, the v gene is located near and may be the same as two other deafness-related loci on mouse chromosome 10: a deafness modifier locus, mdfw, and a locus implicated in late onset progressive hearing loss, Ahl. Since v maps to a region of mouse Chromosome 10 that shares homology with a region of human chromosome 10 known to contain at least two deafness loci, USH1D and DFNB12, the human homologue of the v gene may be one of these deafness genes. Identification of the v gene will facilitate identification of the human homologue of waltzer. Once the human v gene is identified, its role in human hereditary deafness can be assessed. We will use molecular genetic techniques to accomplish four specific aims: 1) clone the mouse v gene, 2) clone the human v gene, 3) determine if the human v gene is responsible for Usher syndrome Type 1D, and 4) identify modifying loci that alter the waltzer phenotype. cloning of the v gene will identify a new gene that plays a role in auditory development and **hearing impairment** and may provide important insight into understanding human hereditary deafness.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR DEVELOPMENT OF THE ENDOLYMPHATIC DUCT AND SAC**

  Principal Investigator & Institution: Choo, Daniel I.; Assistant Professor; Children's Hospital Med Ctr (Cincinnati) 3333 Burnet Ave Cincinnati, Oh 452293039

  Timing: Fiscal Year 2002; Project Start 02-APR-2001; Project End 31-MAR-2006

  Summary: (from applicant's abstract): Homeostasis of inner ear endolymph is critical to sensory transduction in the inner ear. Failure to maintain endolymph homeostasis is thought to result in deafness, vestibular dysfunction and tinnitus in pathologies such as

Meniere's disease or certain forms of hereditary **hearing impairment.** The endolymphatic duct and sac (ELDS) are key structures in maintaining this fluid homeostasis. Therefore, data on the molecular development of the ELDS are very relevant. By focusing on a mouse mutant (kreisler) with an ELDS phenotype, this application seeks to define the molecular pathways involved in induction and differentiation of the ELDS. To determine early targets of kr signaling, this application will test the hypothesis that expression of early molecular markers of the ELDS anlage is down-regulated in homozygote kr embryos at embryonic day 10-11 compared to controls. The effects of kr mutation on cellular differentiation within the developing ELDS will be studied by testing the hypothesis that expression of a battery of genes specific for cells in the embryonic day 12 to 18 ELDS is down-regulated in kreisler homozygotes compared to controls. To facilitate direct experimental manipulation of the developing ELDS, this application will develop an in vitro model of the developing kreisler otocyst and ELDS. Experiments will first test the hypothesis that cultured kreisler otocysts developmentally mimic the in vivo system morphologically and functionally. This model will then be used to test the hypothesis that virally mediated expression of kr can rescue the ELDS phenotype in vitro. To test the hypothesis that hindbrain sources of kr induce ELDS differentiation, we will culture kreisler otocysts with wild-type hindbrain explants. Such data will provide insights into the molecular pathways involved in kr signaling and in development of the ELDS. The PI's obvious commitment to medicine and science has been demonstrated by his extensive pursuit of training in the clinical and basic science facets of inner ear biology. The success of these efforts are reflected in his publications which also demonstrate his ability to accomplish quality basic science investigation. In combination with the outstanding academic environment at Children's Hospital Research Foundation, the RCA will allow the PI to continue a rigorous scientific training and successfully address the specific aims outlined in the application. The proposed program of study and the science generated will undoubtedly advance the PI toward his goals of successfully competing for a future R01, and in the long term, becoming a successful independent Clinician scientist. Significantly, this proposal includes challenging but achievable goals that will provide important knowledge to the field of inner ear development.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR GENETICS OF A SYNDROME WITH HEARING IMPAIRMENT**

  Principal Investigator & Institution: Post, J Christopher.; Director; Allegheny-Singer Research Institute 320 E North Ave Pittsburgh, Pa 15212

  Timing: Fiscal Year 2002; Project Start 01-JUL-1994; Project End 30-JUN-2005

  Summary: This revised application is a continuation of R29 DC02398, "Genetic Mapping of a Syndrome with **Hearing Impairment.**" Our research has focused on the molecular basis of craniofacial disorders, in particular Crouzon craniofacial dysostosis (CFD), which is characterized by craniosynostosis (premature closure of calvarial sutures) and mapping CFD and delineating the entire structure of the mutated gene, FGFR2. We determined that a single point mutant osteoblasts. Based upon these observations, we now hypothesize that the default pattern of tissue growth, when two like tissues come into proximity, is fusion. The normal development of the calvarium (which requires like tissues not to fuse) would then be dependent on complex genetic systems to override the natural fusion process, perhaps by increasing sutural apoptotic rates. Craniosynostosis would result from a reversion to the default (fusion) pathway of tissue growth. Thus, constitutive signaling from mutated FGF4s causes a dominant gain of function initiating

involved. Newly developed nucleic acid array technologies permit the comprehensive evaluation of the entire set of expressed genes (the expressome) throughout the course of abnormal suture development. Thus, for this new proposal, we devised a chimeric nude rat model, which when implanted with mutant human osteoblasts beneath the calvarium, develops premature synostosis. The differential gene expression patterns between samples from this novel in vivo model, related in vitro cell co- cultures, and controls will be analyzed across time to identify the downstream genes involved in craniosynostosis. Laboratory techniques for analyzing samples will include differential display and robotically gridded nucleic acid arrays. Gene analysis will be prioritized based upon homology to genes known to control multicellular tissue growth, cell contact and adhesion, and osteoblasts processes active in craniosynostosis. Finally, the differentially expressed genes will be related to the biology of cranial development by 1) in situ hybridization for analysis of spatial and temporal patterns; and 2) evaluation of impact on apoptosis for assessment of physiological effect. The delineation of the panoply of genes involved in causing craniosynostosis will enhance our understanding of these diseases and suggest new therapeutic strategies.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR GENETICS OF HEARING IMPAIRMENT**

  Principal Investigator & Institution: Lesperance, Marci M.; Associate Professor; Otolaryngology; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, Mi 481091274

  Timing: Fiscal Year 2002; Project Start 01-MAR-1999; Project End 29-FEB-2004

  Summary: The goal of this research is to identify and characterize genes that, when mutated, cause hereditary **hearing impairment.** Genetic hearing loss accounts for at least half of the cases of hearing loss in the United States. Little is known about the molecular mechanisms of hearing loss. Thus identifying genes and defining how mutations in these genes cause hearing loss will help elucidate the developmental, biological, and physiological processes of hearing. DFNA6 is a gene mapped in a family with dominant, progressive, low- frequency, nonsyndromic sensorineural hearing loss. A second family with similar hearing loss was found to map to a locus (DFNA14) in close proximity to DFNA6. We will narrow the DFNA6 candidate region and determine if it overlaps with the DNA14 region. Novel cDNAs and ESTs will be identified in the candidate region, and candidate genes, including FGFR3, the fibroblast receptor 3 gene, will be tested for mutations. These studies will also include analysis of a second family with dominant nonsyndromic hereditary **hearing impairment.** Affected individuals in this family develop high frequency, delayed-onset progressive sensorineural hearing loss. Clinical data and DNA samples have been collected from 87 family members of this family to date. Linkage to known dominant deafness loci will be tested, and if ruled out, the samples will be submitted to the Mammalian Genotyping Service for a genome search. Analysis of the genotyping data and fine mapping will be completed by the candidate. The candidate is an academic pediatric otolaryngologist with two and one-half years of previous full-time research experience. The long-term goal of these studies is to improve diagnostic and therapeutic methods for patients with hearing loss. Strong institutional support is available at the University of Michigan in terms of core facilities for research, the sponsor and co-sponsor, and collaborators in hearing research, molecular biology, and molecular genetics.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOLECULAR MECHANISM OF AMINOGLYCOSIDE OTOTOXICITY**

  Principal Investigator & Institution: Guan, Min-Xin; Children's Hospital Med Ctr (Cincinnati) 3333 Burnet Ave Cincinnati, Oh 452293039

  Timing: Fiscal Year 2002; Project Start 15-SEP-2002; Project End 31-AUG-2007

  Summary: (provided by applicant):The goal of the proposed research is to elucidate the molecular pathogenetic mechanism of maternally inherited aminoglycoside induced **hearing impairment.** Aminoglycoside ototoxicity is a major clinical problem. In the United States, almost 4 million courses of aminoglycoside antibiotics are administrated annually for infections. It is estimated that between 2 to 5 percent of patients treated with these drugs develop significant hearing loss. In the developing countries, the problem of ototoxic side effects is more acute due to the widespread use of these drugs. Aminoglycoside ototoxicity is a complex multifactorial disorder resulting from interaction between genetic and environmental factors. The aminoglycoside hypersensitivity is often maternally transmitted. Recently, the A1 555G mutation in the mitochondrial 12S rRNA gene has been identified as an inherited mutation that predisposes to amingolycoside ototoxicity. This mutation accounts for a significant portion of patients with aminoglycoside ototoxicity. However, numerous important questions remain unanswered regarding the molecular and biochemical basis for genetic susceptibility to aminoglycoside ototoxicity.We hypothesize that human mitochondrial 12S rRNA, particularly that canying the A1555G mutation, is the main target of aminoglycosides and that these drugs exert their detrimental effects in the cochlea through an alternation of mitochondrial protein synthesis. We also hypothesize that there are additional mtDNA mutations associated with aminoglycoside ototoxicity. To test these hypotheses, we propose the specific aims as follows: 1) Examination of the binding of these drugs to the decoding site of mitochondrial 12S rRNA. 2). Examination of the mitochondrial specificity and dosage effect on these antibiotics by analysis of growth properties and rate of mitochondrial protein synthesis in A1555G mutation disease cell model. 3) Identification and evaluation of additional mtDNA mutations associated with aminoglycoside ototoxicity by a systemic and extended screening of a large Chinese clinical patient population with aminoglycoside ototoxicity.Success of this project will provide new insight into the pathogenic mechanisms of aminglycoside-associated ototoxicity, which in turns provide valuable new information and technology for the diagnosis and prevention of this disorder. The data from this study will help to predict which individuals are at risk for ototoxicity, improve the safety of clinical implications for the aminoglycoside-antibiotc therapy, and decrease the incidence of deafness. The ultimate goal of this study is to develop the aminoglycoside analogs with less toxicity and to provide aminoglycoside treatment strategies that prevent irreversible cochlear damage.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MONAURAL AND BINARUAL SPECTRO/TEMPORAL PROCESSING**

  Principal Investigator & Institution: Eddins, David A.; Associate Professor; Communicative Disorders & Scis; State University of New York at Buffalo Suite 211 Ub Commons Buffalo, Ny 14228

  Timing: Fiscal Year 2002; Project Start 01-JUL-1999; Project End 30-JUN-2004

  Summary: From the proposal) Characterization of normal and impaired auditory perception necessarily requires an understanding of how simple and complex auditory signals are perceived and encoded. A void in this area of research is a global or unifying framework with which to understand such processing as it relates to everyday

communication in listeners with normal and impaired hearing. This proposal requests support for a comprehensive study focusing on the perception of spectral and temporal patterns characteristic of sounds in the natural environment. One long-term goal is to provide a global explanation of spectral and temporal envelope perception. One specific hypothesis to be tested here is that the perception of envelope changes (spectral or temporal) is consistent with a general set of physical constraints mediated by domain-specific envelope channels in the central auditory system. Two sets of channels are proposed, temporal and spectral, which are tuned to domain-specific envelope frequency and which reflect similar properties (e.g., position invariance) throughout the audio spectrum. It is also proposed that temporal envelope channels might exist that receive both monaural and binaural input. Because so many individuals with cochlear **hearing impairment** have difficulty processing complex sounds, but relatively little difficulty on many "local" tasks, it is crucial to understand the nature of these deficits and how (putative) domain-specific envelope channels might be affected. The experiments and analyses will provide a substantial contribution to the fields of hearing science, experimental psychology, and clinical audiology.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: MOUSE GENETICS CORE**

  Principal Investigator & Institution: Tempel, Bruce L.; Professor of Otolaryngology-Hns and Pha; University of Washington Grant & Contract Services Seattle, Wa 98105

  Timing: Fiscal Year 2002

  Summary: Mouse Genetics Core-Hearing loss is the most frequent sensory defect in humans. Congenital, perinatal or early onset hearing loss occurs at approximately 7 out of 1000 neonates in the United States. In approximately half of the children born with severe **hearing impairment,** a genetic contribution is suspected. The powerful molecular and genetic techniques available in mouse combined with the functional similarities between mouse and human audition make mouse a useful model system for studying deafness. In order to support users of mouse models for genes affecting the auditory system function, we will provide technical support in the form of expert husbandry (receiving, setting up crosses, weaning, fostering, background transfers, etc), genotyping, and notification/delivery of requested mice to the users. Per diem charges for mouse care will be the responsibility of the user, provided that they have a funded project that includes support for mouse care. In order to encourage innovative and new collaborative projects, we will provide per diem support for pilot/new studies that are not currently funded for mouse work. To monitor usage and provide equitable access, we will review, periodically, animals to be maintained by the Core. This core will provide a critical function for a variety of users. Efficiency of mouse care will be greatly increased by having centralized, expert mouse husbandry and genotyping. This will allow users not proficient in mouse care to use the vast number of identified gene knockout mice and defined spontaneous mutants to further their research. Experienced mouse users will benefit from the familiarity of the Core personnel with mouse behavior and care, allowing increased health and higher fecundity among their strains. All users will benefit by knowing about the strains, techniques, and projects being pursued by other users of the core.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NEUROGENESIS IN THE AUDITORY SYSTEM**

  Principal Investigator & Institution: Morest, D Kent.; Professor of Anatomy; Anatomy; University of Connecticut Sch of Med/Dnt Bb20, Mc 2806 Farmington, Ct 060302806

Timing: Fiscal Year 2003; Project Start 01-APR-1991; Project End 28-FEB-2006

Summary: (provided by applicant): Deafness and hearing loss due to damage of the inner ear and cochlear nerve remain as major incurable disorders today. Also of much concern are congenital forms of damage, since the resulting **hearing impairment** profoundly disturbs the development of communication skills and learning. These conditions are associated with degeneration and reorganization of the central auditory pathways, To understand better these conditions, we need to acquire some insight into the factors that account for axonal growth and synapse formation in the development of the auditory pathway, since the same genetic factors are likely to be involved in these processes during normal development, congenital malformation, and plastic changes in the mature nervous system. This research aims to elucidate the cellular interactions leading to the assembly of the sensorineural structures of the inner ear and the connections with the central auditory pathway. The approach is to study the role of certain key molecules (growth factors and their receptors) in the differentiation of the cochlear ganglion cells by microscopic observations of their morphogenesis during normal development. Experimental perturbations of their embryonic precursors and their target tissues, i.e., the sensory epithelium and cochlear nucleus, will be carried out to test genetic hypotheses concerning the role of these key molecules. Cell cultures of the precursors of the ear and acoustic nuclei of chicken and mouse embryos and neonates are used to characterize the cellular interactions. Induced genetic mutants with single gene deletions or overexpression models are compared with normal mice. Experiments are designed to reveal key factors involved in these interactions and the loci of their actions at the molecular level. Antibodies and in situ hybridization will be used for localizing such molecules to specific cell types at the critical stages of the developmental process in situ. Experimental perturbations of cultured mouse cochlear ganglion cells, including treatment with growth factors, antibodies, and transfected nucleic acids will be used to evaluate their interactions with the cochlear nucleus and inner ear of embryonic and neonatal animals. Co-cultures of sensory neuronal precursors and otic epithelium from normal and genetically modified mouse embryos will be used to determine how cells with specific genetic alterations are affected. Ultimately these findings should provide a rational basis for developing new therapies.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NEW TEST FOR PREDICTING HEARING AID USE**

  Principal Investigator & Institution: Nabelek, Anna K.; Audiology and Speech Pathology; University of Tennessee Knoxville Knoxville, Tn 37996

  Timing: Fiscal Year 2002; Project Start 10-SEP-2001; Project End 31-AUG-2003

  Summary: adapted from applicant's abstract): Several methods have been employed for assessing hearing aid use, benefit, and satisfaction, however, none of these predict hearing aid outcome with confidence. The long term aim of the proposed study is to develop an objective clinical test for predicting hearing aid use. The test is based on the accepted level of background noise when listening to speech delivered at the most comfortable level. The accepted noise level (ANL) is defined as the difference between the level of speech and the level of the background noise that a person is willing to accept when listening to speech without becoming tense and tired while following the words of the story. The ANL should not be convised with speech to noise ratio (S/N) used in speech perception testing. The ANL has been investigated in four preliminary studies with small groups of subjects. The results indicated that the ANL is reliable and stable over a 3-week period and differentiates subjects who wear hearing aids full time from subjects who seldom wear their hearing aids or who reject their hearing aids. The

full-time hearing aid users are able to accept significantly higher background noise levels than the other subjects. In the proposed study, a Power Analysis specified cohort of 216 individuals with **hearing impairment** will be tested. The specific aims are to compare the ANL with traditionally used measures of hearing aid outcome including speech perception in noise and subjective benefit judgments and to determine for the ANL: (1) the ability to predict hearing aid use, (2) dependence upon conditions with and without hearing aids and amplification circuit type, (3) effect of 3-month experience with hearing aids, and (4) dependence upon subjects' gender, age, audiometric sensitivity, and audiometric slope. If the results obtained are consistent with the preliminary findings, the ANL data should predict the actual hearing aid use and help explain the enigma of hearing aid non-compliance in adults with **hearing impairment.** The prediction of hearing aid use will permit realistic counseling, reduction of false expectations, and possible therapeutic paradigms aimed at increasing acceptance of background noise.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NEWBORN SCREENING FOR HEARING IMPAIRMENT**

  Principal Investigator & Institution: Naylor, Edwin W.; Neo Gen Screening, Inc. Box 219, Abele Business Park Bridgeville, Pa 15017

  Timing: Fiscal Year 2002; Project Start 01-JUL-2001; Project End 31-MAR-2004

  Summary: (Adapted from applicant's abstract): The feasibility of screening borns for hearing impairmflent in an assay paralleling routine metabolic screening will be demonstrated. Hearing loss owing to heredity factors and cytomegalovirus are analyzed. DNA from the universally collected newborn filter paper blood card serves as the source of nucleic acids to perform the assay. Several target sequences in the cytomegalovirus genome will be evaluated for their utility to identify viral DNA in the newborn specimen. The following mutations in connexin 26, Pendrin, and connexin 31 genes serve as model systems for hereditary hearing loss: (1) connexin 26 35 del G, 167 del T,.Usher2A 23l4delG; (2) Pendrin L236S, T416P; Mitochondrial A1555G. Amplicons that are diagnostic for CMV DNA and the described mutations are analyzed using a low-density oligonucleotide inicroarray in a multiplex format. The microarray vjfl clearly distinguish homozygous wild type, heterozygotes, and homozygous mutants for the described mutations. Screening for **hearing impairment** in a laboratory-based program, parallel to auditory screening, will provide an overall superior screening service. The lab assay will identify many newborns that would be missed where auditory screening is not available. PROPOSED COMMERCIAL APPLICATION: NOT AVAILABLE

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NICOTINIC RECEPTORS IN COCHLEAR HAIR CELL PHYSIOLOGY**

  Principal Investigator & Institution: Fuchs, Paul A.; Professor; Otolaryn & Head & Neck Surgery; Johns Hopkins University 3400 N Charles St Baltimore, Md 21218

  Timing: Fiscal Year 2003; Project Start 01-APR-2003; Project End 31-MAR-2006

  Summary: (provided by applicant) Recent years have seen important developments in the study of hearing, especially the emergence of molecular genetics to probe the underlying mechanisms of hearing loss. It is estimated that 1 in every 1,000 newborns is profoundly deaf, while nearly 1 in 20 has a significant **hearing impairment.** In more than half of these cases, the cause is genetic. As of February 2002, twenty-nine specific genes have been associated with different forms of nonsyndromic human deafness. In

addition, many other gene products involved in normal cochlear function have been identified. The foreign collaborator (Elgoyhen) cloned and characterized two novel nicotinic receptor genes (alpha 9 and alpha 10) that are expressed in cochlear hair cells. Alpha 9 and 10 encode receptor proteins that mediate the effect of acetylcholine (ACh) released by efferent neurons onto cochlear hair cells. The Principal Investigator (Fuchs) showed that calcium entry through the ACh receptor leads to hair cell hyperpolarization, reducing transmitter release to cause a loss of tuning and sensitivity in the auditory nerve fibers. This FIRCA proposal brings together the expertise of the Fuchs and Elgoyhen laboratories to conduct a series of electrophysiological and molecular genetic experiments to elucidate the properties and function of these cholinergic receptors in hair cell physiology. The long-term goal of this proposal is to define the physiological role of the hair cell's cholinergic receptor. In addition, it is expected that the results obtained will contribute to our understanding of the role of efferent cholinergic input in the genesis and potential treatment of **hearing impairment** produced by loud sound or ototoxic drugs. The immediate aims of this application are three-fold: first, the pharmacological and physiological comparison of recombinant alpha9/alpha10 receptors expressed in Xenopus laevis oocytes with native cholinergic receptors of inner and outer hair cells in acute cochlear explants; second, the characterization of the ontogeny of cholinergic responses in inner hair cells and third, the physiological analysis of synaptic contacts onto inner and outer hair cells in mice with genetic modifications in the Acra9 gene, namely the alpha9 null mutant mouse and a knock-in mouse bearing a gain of function mutation. This research will be done primarily in Argentina at INGEBI (National Research Council) in collaboration with Ana Belen Elgoyhen as an extension of NIH grant #R01 DC01508.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NORMAL & IMPAIRED TEMPORAL PROCESSING OF COMPLEX SOUNDS**

  Principal Investigator & Institution: Buus, Soren; Professor; Electrical and Computer Engr; Northeastern University 360 Huntington Ave Boston, Ma 02115

  Timing: Fiscal Year 2002; Project Start 01-FEB-1995; Project End 31-JAN-2005

  Summary: (Adapted from the Investigator's Abstract) : The long-term objective of this proposal is to formulate precise, quantitative models for the perception of tones, noise, and speech in both normal and impaired hearing. Such models may aid in providing better diagnostic tools for **hearing impairment** and better rehabilitation of hearing-impaired listeners. The proposed project aims to investigate dynamic processes in the auditory system that affect the perception of loudness and roughness and to continue modeling of these processes. Model predictions will be compared to psychoacoustic data obtained in forced-choice experiments with cochlearly impaired listeners and with normal listeners tested in the quiet and with continuous maskers that are spectrally shaped to produce thresholds equal to those of an impaired listener. The specific aims encompass four areas. Specific aim 1 is to test several hypotheses related to the loudness ratio between equal-SPL long and short sounds. Binaural loudness summation for long and short tones will be measured as a function of level. A novel paradigm will be used to determine how loudness grows with stimulus duration by measuring the difference in duration required to produce equal loudness between equal-SPL monotic and diotic tones and between pure tones and tone and tone complexes. Specific aim 2 tests the hypotheses that intense 'recalibration' tones reduce the slope of normal listeners* loudness function for subsequent test tones at moderate levels and that recalibration is reduced or absent in impaired listeners, because it is mediated by efferent action on the

outer hair cells. Loudness matches between tones at different frequencies will be obtained as a function of level with and without prior presentation of 85-dB-SPL recalibration tones. The effect of recalibration on temporal integration of loudness also will be examined. Specific aim 3 is to test the hypothesis that the form of the loudness function for a tone at low and moderate levels is approximately proportional to the square of the maximal basilar-membrane vibration amplitude. Growth of forward masking with on- and off-frequency maskers will be compared to loudness functions derived from measurements of binaural loudness summation and from measurements of temporal integration of loudness. Specific aim 4 is to test the hypothesis that loudness recalibration reduces roughness at moderate levels. Across-frequency roughness matches will be obtained as a function of level with and without recalibration.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: ONLINE LEARNING FOR OLDER ADULTS**

  Principal Investigator & Institution: Calkins, Margaret P.; Ideas, Inc. 8055 Chardon Rd Kirtland, Oh 44094

  Timing: Fiscal Year 2003; Project Start 15-SEP-2003; Project End 31-AUG-2005

  Summary: (provided by applicant): This project addresses the Program Announcement Innovative Technologies for Enhancing Function for Individuals with Disabilities. Specifically, it addresses the call for training modules on the appropriate use of assistive devices to increase function for persons with disabilities. The purpose of this SBIR grant is to develop and test the efficacy of an online computer course about the availability and use of assistive technology to increase independence in older persons with **hearing impairment.** An experienced team that has worked with older adults with disabilities, as well as designed, produced, and sold educational courses in the past has been assembled. This project will result in one three-hour online computer course that will enable older adults with **hearing impairment** to assess their home environment and effectively choose assistive technology that will enable them to adapt or change their physical environment in order to function more independently. The specific aims of Phase I of the Project include: 1. Create the content for the course about assistive technology for older adults with **hearing impairment;** 2. Structure the course format so that it can easily be taken online by an older adult; 3. Test the efficacy of and satisfaction with the course; 4. Determine desired content of additional courses for Phase II There are three main benefits to this product: 1. Increased independence; 2. Decreased caregiver burden; 3. Increased flexibility in learning opportunities. The number of older adults with disabilities continues to grow; therefore it is imperative to provide valuable education through current learning trends for accessibility by caregiver and any individuals seeking knowledge.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: OTOSCLEROSIS-A MOLECULAR GENETIC STUDY**

  Principal Investigator & Institution: Smith, Richard J.; Professor and Vice Chairman; Otolaryngology; University of Iowa Iowa City, Ia 52242

  Timing: Fiscal Year 2002; Project Start 01-MAY-2002; Project End 30-APR-2007

  Summary: (provided by applicant): Among white adults, otosclerosis is the single most common cause of **hearing impairment.** The disease is caused by abnormal bone homeostasis of the otic capsule, which usually results in a conductive hearing loss due to fixation of the stapes footplate, although sensorineural hearing loss also may occur. The etiology of otosclerosis is unknown, and both genetic and environmental factors

have been implicated. Although the genetics of otosclerosis are controversial, the majority of studies indicate autosomal dominant inheritance with reduced penetrance. Using two large families showing this type of Mendelian inheritance pattern, we have localized two otosclerosis-causing genes, OTSCI and OTSC2. We also have shown that at least one additional locus, OTSC3, exists. Continuing on this initial body of work, we propose to: 1) Clone the OTSCI and OTSC2 genes; 2) Identify novel otosclerosis loci by linkage analysis; 3) Identify novel otosclerosis loci by linkage and linkage disequilibrium analyses in families from Greece; 4) Identify novel otosclerosis loci by non-parametric linkage analysis using affected sib pairs.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: OUTCOMES OF GENETIC TESTING FOR HEARING IMPAIRMENT**

  Principal Investigator & Institution: Krantz, Ian D.; Children's Hospital of Philadelphia 34Th St and Civic Ctr Blvd Philadelphia, Pa 191044399

  Timing: Fiscal Year 2002; Project Start 26-SEP-2002; Project End 31-AUG-2006

  Summary: (provided by applicant): Sensorineural hearing loss (SNHL) is a heterogeneous group of disorders that collectively represent the most common congenital deficit in humans. More than 100 genes have been implicated in SNHL. Our ability to identify the molecular etiologies of hearing loss is rapidly increasing, and coupled with the institution of universal newborn hearing screening programs, both diagnosis and molecular testing are being offered at an earlier age. While these technical advances are being incorporated into clinical management of infants and children with hearing loss little work has been initiated to understand the decision making processes and attitudes of parents who opt for or against genetic testing. Further work is also needed to understand the outcomes of genetic testing in families with hearing loss both to establish genotype-phenotype correlations to improve clinical management and to identify and address issues of concern to affected families. There is little data to guide this intervention and it is not yet clear how the results of the testing and counseling sessions impact the family, subsequent interventions, or the child's eventual outcome. This proposal takes a multidisciplinary approach to study a large cohort of children and their families ascertained with hearing loss on a molecular and clinical level and to evaluate outcomes, parental attitudes towards, and the psychosocial aspects of, genetic testing with the overall goal of improving clinical practice and providing parents with the information and tools they need to make informed decisions. We hypothesize that 1) by identifying the etiology of hearing loss, through genetic evaluation and molecular testing, genotype-phenotype correlations will be established that will lead to improved clinical management of patients and families with hearing loss; 2) assessment of parental understanding, attitudes, beliefs and concerns about genetic testing throughout the testing process (beginning with the time of referral by the audiologist or otolaryngologist and continuing through specific gene testing) will increase our understanding of the needs and concerns of parents of children with hearing loss thus promoting informed and collaborative decision making resulting in improved clinical management; and 3) assessment of parental understanding, beliefs, attitudes, and concerns about genetic testing will lead to the development of educational materials and decision aids to assist families, both hearing and deaf, with their **hearing impaired** children.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PATHOGENESIS OF DISEASE-ASSOCIATED CONNEXIN-31 MUTATIONS**

  Principal Investigator & Institution: Zhang, Zhuohua; Burnham Institute 10901 N Torrey Pines Rd La Jolla, Ca 920371005

  Timing: Fiscal Year 2004; Project Start 01-JUL-2004; Project End 30-JUN-2009

  Summary: (provided by applicant): Gap junctions, assembled by connexins, mediate cell-cell communication and maintain cellular homeostasis. In human, mutations in genes encoding connexins are identified in a number of inherited diseases. Mutations in connexin-31 are associated with **hearing impairment,** erythrokeratodermia variabilis (EKV), and peripheral neuropathy. Little is known about the molecular basis for the distinct pathogenic processes associated with Cx31 mutants. In preliminary study, we have shown the expression of Cx31 in adult organ of corti. We also found that hearing impairment-associated Cx31 mutants show impaired channel function, loss of assembly at cell-cell contacts, and defective intracellular trafficking. Notably, EKV-associated Cx31 mutants promote apoptotic cell death, in addition to the defects found in hearing impairment-associated mutants. Moreover, expression of disease associated Cx31 mutants induces BiP expression. We hypothesize that Cx31 mutant-associated **hearing impairment** and skin disease are consequences of abnormal intracellular trafficking of mutant proteins. The trafficking defect of the mutant proteins results from UPR induced by abnormal conformation of mutant proteins. In this proposal we propose: Specific aim 1. To define the intracellular trafficking defects of disease associated Cx31 mutants. Specific aim 2. To determine the molecular mechanism of cell death caused by expressing EKV-associated Cx31 mutants. Specific aim 3. To define the pathogenic mechanisms of disease-associated Cx31 mutants in vivo using transgenic mouse models. The results will facilitate both the understanding of the pathological mechanisms of Cx31 mutations and the design of potential treatments of these diseases.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PERCEPTION OF SPEECH BY NORMAL AND IMPAIRED LISTENERS**

  Principal Investigator & Institution: Kewley-Port, Diane; Professor; Speech and Hearing Sciences; Indiana University Bloomington P.O. Box 1847 Bloomington, in 47402

  Timing: Fiscal Year 2002; Project Start 01-JAN-1995; Project End 31-DEC-2004

  Summary: (Adapted from the Investigator's Abstract) A thorough understanding of the abilities of normal- hearing and hearing-impaired individuals to process the spectral-temporal properties of speech is needed. In particular, the relation between the basic capabilities of the auditory system to resolve the acoustic details of speech and the perception of speech in normal discourse is poorly understood. Our research program directly addresses this need in three lines of research within a general theory of vowel perception. Listeners are selected to be typical of the population with either normal hearing or mild-to-moderate high-frequency sensorineural **hearing impairment.** The first line of research will determine the weighted contribution of three salient acoustic properties to the classification of American English vowels. This research explores the use of these properties in the identification of natural vowels in optimal conditions and in several conditions of distortion, including vowels presented in noise and vowels spoken with a foreign accent. The second line of research uses psychophysical techniques to determine listeners' thresholds for discriminating acoustic differences between vowels, including modeling of the peripheral auditory processing of these complex sounds. In addition, this research investigates the manner in which

discrimination performance is degraded as experimental tasks change from those used in psychophysical procedures to those that simulate communication with natural sentences. In the third line of research, the relation between discrimination abilities and vowel classification in fluent speech will be determined. These experiments will describe systematically the relation between peripheral capabilities to process vowels and the more central processes of vowel classification in ordinary discourse. Results will also make major advances towards a new theory of vowel perception. The data from these experiments will contribute to the understanding of the impact of cochlear dysfunction on normal conversation processes.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PERIPHERAL INTERACTIONS IN AUDITORY TEMPORAL PROCESSING**

  Principal Investigator & Institution: Oxenham, Andrew J.; Center for Cancer Research; Massachusetts Institute of Technology Room E19-750 Cambridge, Ma 02139

  Timing: Fiscal Year 2002; Project Start 01-FEB-1999; Project End 31-JAN-2004

  Summary: The purpose of this research is to investigate monaural auditory temporal processing new psychophysical data with quantitative model predictions. The project has three main aims: (i) To investigate the influence of peripheral (cochlear) non-linearities on psychophysical measures of temporal resolution; (ii) to examine the consequences of a loss of non-linearity due to sensorineural hearing loss; and (iii) to functionally characterize higher stages of temporal processing. Two experiments will examine the magnitude and the time course of psychophysical suppression to discover the extent of which physiological and psychophysical suppression are reflections of the same underlying process. The results will clarify the role of suppression in certain measures of temporal resolution. Further experiments will test the hypothesis that the non-linear growth of forward masking is a reflection of peripheral non-linearities and that more central processes can be treated as quasi linear. Results from normal-hearing listeners will be compared with those from listeners with moderate-to severe cochlear hearing loss to test whether the differences can be accounted for solely by the expected changes in peripheral compression. The hypothesis, if supported, will have important consequences for the modeling and understanding of temporal resolution in hearing-impaired listeners. The penultimate experiments will seek to elucidate the underlying mechanisms of forward masking comparing predictions of the two most popular theories, namely adaptation of response and persistence (or integration) of response, with experimental data designed to distinguish between the two. The final experiment will examine how information is combined across frequency in a forward-masking situation. An understanding of the changes in temporal resolution due to **hearing impairment** may ultimately assist in selecting appropriate parameters for the design of digital hearing aids.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PRECEDENCE: ITS ROLE IN RECOGNIZING SPEECH IN NOISE**

  Principal Investigator & Institution: Freyman, Richard L.; Professor; Communication Disorders; University of Massachusetts Amherst 408 Goodell Building Amherst, Ma 01003

  Timing: Fiscal Year 2002; Project Start 01-JUL-1992; Project End 31-MAR-2006

  Summary: In a typical room, our ears receive not only the original source of sound, but numerous reflections off of surfaces in the room. Fortunately, through the precedence

effect we are able to fuse a sound source and its reflections into a single image and locate that image near the original source of sound. The overall goal of the proposed research is to achieve a better understanding of the precedence effect and its importance in understanding speech in the presence of interfering noise or other speech. The primary assumption is that there are two types of masking of speech: (1) traditional energetic masking, and (2) informational masking, in which it is difficult for the listener to separate out the pattern of the target speech within a fluctuating pattern of interference. In non-reflective conditions, the horizontal separation of target and masking sources releases energetic masking, mostly because the head shadows the masker at one ear and because the brain compares the differences in inputs to the two ears. Unfortunately, this type of masking release is dramatically reduced by the reflections in a real room. The hypothesis tested in this research is that because the precedence effect preserves the perceived spatial distinctions between target and masker even in reverberation, release from informational masking is not reduced by room reflections. The studies will investigate the nature of informational masking and how the precedence effect and binaural hearing in general contribute to overcoming this type of masking. The study of binaural hearing is particularly important because many people with bilateral **hearing impairment** become effectively monaural listeners when they only wear one hearing aid. The results of these studies may well show how important it is to be able preserve binaural hearing and sound localization when prescribing auditory prostheses. The studies will also investigate the phenomena and mechanisms of the precedence effect on a more basic level, adding to our overall understanding of sound perception in typical reverberant spaces.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PREDICTING SPEECH INTELLIGIBILITY OF DEAF CHILDREN**

  Principal Investigator & Institution: Uchanski, Rosalie M.; Central Institute for the Deaf 4560 Clayton Ave St. Louis, Mo 63110

  Timing: Fiscal Year 2002; Project Start 01-SEP-2001; Project End 31-AUG-2003

  Summary: (provided by applicant): The earlier identification and treatment of **hearing impairment** through universal newborn screening, as well as new developments in sensory aid technology such as cochlear implantation, will enable more children with profound **hearing impairment** (PHI) to produce intelligible speech. Evaluating the effectiveness of these new developments requires accurate, reliable and efficient methods of assessing overall speech intelligibility. The primary goal of this project is to identify a set of parameters that can reliably predict the speech intelligibility of PHI children. This is a necessary first step towards the ultimate goal of developing an automatic means of extracting these measures from a standard speech sample to provide an objective measure for clinical use. This project will take advantage of existing speech samples from a large group of deaf children (N=180), for which some acoustic analyses are nearly complete. These acoustic measures are based on knowledge of segmental and suprasegmental errors made by deaf talkers. Also available, for comparison to any acoustic analysis, are listener intelligibility judgements for these same speech samples. A linear combination of the current acoustic measures provides good, but not clinically acceptable, predictive power. The proposed work will explore two approaches to improving the predictive relation between acoustic measurements and intelligibility. First, the set of acoustic-phonetic measurements will be expanded to include a wider variety of speech characteristics of deaf talkers. Second, from other speech technologies we will adapt measures that reflect gross temporal characteristics (envelope-spectra in the Speech Transmission Index) and spectral characteristics

(cepstral coefficients) of the speech signal. Both linear regression and non- linear (e.g., neural net) approaches to combining these measures for maximum prediction will be explored. The groundwork laid by this project will be the basis for an application to develop automatic speech intelligibility assessment software that can be used to determine the efficacy of instructional methods, sensory aids or speech training programs for PHI children.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PREDOCTORAL FELLOWSHIP PROGRAM (DISABILITY)**

  Principal Investigator & Institution: Reiss, Lina A.; Biomedical Engineering; Johns Hopkins University 3400 N Charles St Baltimore, Md 21218

  Timing: Fiscal Year 2002; Project Start 01-JUL-2002

  Summary: The goal of this thesis proposal is to elucidate the function of auditory neurons in the cochlear nucleus (CN) and central nucleus of the inferior colliculus (CNIC). A first step toward understanding function is to find out what stimuli the neuron responds to, ideally without a priori assumptions. Thus, Aim 1 is to develop a method for estimating the spectrotemporal weighting functions (STWFs) of single auditory neurons with pseudorandom noise stimuli. The STWF, or weights that a neuron assigns to sound energy at certain times and frequencies, can be directly applied to predict linear, or nearly linear, neural responses to arbitrary stimuli. Aim 2 is to estimate the STWFs of neurons in the CN of the decerebrate cat, and use local injection of agents that block inhibitory inputs to determine how these STWFs are shaped by inhibition. Aim 3 is to extend the method to include binaural spectrotemporal interactions when estimating weighting functions in the CNIC of the decerebrate cat. Together, experiments of these aims will increase understanding of circuitry and function in the CN and CNIC, and will in turn suggest how **hearing impairment** and other auditory disorders affect processing of speech and other complex sounds.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PROCESSES OF SPEECH SEGMENTATION IN INFANCY**

  Principal Investigator & Institution: Morgan, James L.; Associate Professor; Cognitive and Linguistic Scis; Brown University Box 1929 Providence, Ri 02912

  Timing: Fiscal Year 2002; Project Start 01-FEB-1996; Project End 31-OCT-2004

  Summary: Learning about words is central to learning about language. To learn about the meanings and properties of words, infants must be able to recover recognizable word shapes from the continuous input speech that they hear. The difficulty of this task is readily apparent to anyone listening to speakers conversing in an unfamiliar language: what one hears is a babble lacking readily identifiable words. The development of word-shape recognition skills is prerequisite to further acquisition of language, for if a language learner cannot break input utterances into their constituent parts, it will be impossible to learn how these parts fit together or what individual parts mean. Despite the fundamental importance of word segmentation and word-shape identification to communicative development, research has only recently begun to explicate the nature and development of requisite cognitive and perceptual capacities. The studies proposed in this application seek to address questions including: How do the perceptual abilities recruited for word segmentation across the second half of the first year interact with developing lexical representations? How and when do infants succeed in disentangling multiple influences- arising from lexical properties, discourse factors, speaker affect, talker variability, and so forth- on prosodic characteristics of

word shapes? To what degree does developing knowledge of language-particular patterns of word structure modulate early word-shape identification? Are individual differences in early word-shape recognition abilities predictive of aspects of later language development? What quantities and qualities of language experience are required for development of word segmentation and word-shape identification skills? How do these skills develop in infants with congenital sensorineural mild-to-severe hearing impairment? To these ends, the research proposed here will primarily use a word recognition extension of the conditioned head turning method to investigate 6- to 14-month-old infants' segmentation of fluent natural speech.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: RECENT ADVANCEES IN OTITIS MEDIA: RESEARCH CONFERENCE**

  Principal Investigator & Institution: Lim, David J.; Executive Vice President, Research; House Ear Institute Los Angeles, Ca 90057

  Timing: Fiscal Year 2003; Project Start 01-MAY-2003; Project End 30-APR-2005

  Summary: (provided by applicant): Following the common cold, otitis media (OM), or inflammation of the middle ear, is the most frequent illness resulting in visits to physicians and the most common cause of **hearing impairment** in children. The annual cost associated with OM exceeds $5 billion. The International Symposium on Recent Advances in Otitis Media and the Post-Symposium Research Conference are held every four years. The Eighth Post-Symposium Research Conference on Recent Advances in Otitis Media is scheduled to be held in June 7-8, 2003. The purpose of the Research Conference is to summarize and critically analyze important research findings by world leaders in the field who are assembled for the Symposium. The aims of this Post-Symposium and Research Conference are: 1) to review new discoveries that have been made in basic and clinical otitis media research since the seventh "Symposium and Research Conference on Otitis Media," held in 1999; 2) to critically review recent discoveries in epidemiology, genetics, microbiology, immunology, vaccinology, cell and molecular biology, pathogenesis, prevention, diagnosis management and sequelae of otitis media; 3) to identify new research opportunities and to delineate future research directions and priorities; 4) to improve and encourage communication and collaboration between researchers in various disciplines; and 5) to widely disseminate information by publication in a scientific journal. To expedite and ensure the timely completion of the panel report, we are proposing a web-based system, accessible to panel members, where the report material can be deposited for review by the other members of the panel. This process will allow panel chairs to monitor the progress being made and will hasten the completion of the final panel report. In order to ensure worldwide dissemination of the information, the Research Conference Report will be published as a supplement to a professional journal, such as the Annals of Otology, Rhinology and Laryngology, as it has been in the past. Additionally, we plan to post the panel reports on HEI's otitis media web page (with permission from the publisher).

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: RECOMBINANT ANTIBODIES AGAINST HAIR-CELL PROTEINS**

  Principal Investigator & Institution: Cyr, Janet L.; Otolaryngology/Head & Neck Surgery; West Virginia University P. O. Box 6845 Morgantown, Wv 265066845

  Timing: Fiscal Year 2002; Project Start 01-SEP-2001; Project End 31-AUG-2004

Summary: (provided by applicant): Damage to the receptor cells of the inner ear, the hair cells, is a common underlying cause of **hearing impairment.** A complete understanding of hair-cell function requires the identification and characterization of the proteins that confer the cell?s unique properties, including proteins present in the hair bundle, the cell?s mechanosensitive organelle. Such a biochemical characterization has been impeded by the scarcity of material available for analysis. The generation of specific labeling reagents, for example monoclonal antibodies, should provide the means to overcome this obstacle: immunological tools will permit us to identify critical hair-cell and hair-bundle proteins, to study their intracellular targeting, and to pinpoint other molecules with which they interact. Recombinant antibodies displayed on the surface of filamentous bacteriophage should allow us to sidestep many of the difficulties inherent in obtaining conventional antibodies against low-abundance proteins. Production of recombinant antibodies does not in principle require immunization, large numbers of antibodies can be isolated, and sophisticated selection schemes for isolation of interesting clones can be devised. Over the past decade, substantial progress has been made in the generation and manipulation of recombinant antibodies, however their application in the study of low-abundance proteins has not been thoroughly tested. Our proposed studies will extend this methodology to the study of rare proteins - in particular, those present in hair cells and hair bundles. To obtain tools for the study of hair-cell and hair-bundle proteins, including components of the transduction apparatus, we will use a bacteriophage-displayed library of recombinant antibodies directed against inner-ear proteins. We will isolate antibody-bearing bacteriophage that recognize subclasses of saccular hair-cell proteins; such antibodies will provide the necessary reagents to characterize hair-cell and hair-bundle constituents and provide a means to further understand the molecular events that result in a functional, extraordinarily sensitive mechanoreceptive cell.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: REGULATION OF HAIR BUNDLE H+ AND ATP**

  Principal Investigator & Institution: Hill, Jennifer K.; Medicine; Oregon Health & Science University Portland, or 972393098

  Timing: Fiscal Year 2002; Project Start 01-MAY-2002

  Summary: (provided by applicant): Nearly 30 million Americans suffer from a hearing deficit, at an annual cost to society of over $50 billion, it is incumbent upon us to understand the underlying causes of **hearing impairment** in order to reduce these significant personal and financial burdens. Whereas age-related hearing loss is the prevailing form of impairment, many other factors, including environmental and pharmacological insults and inherited genetic defects, cause hearing and balance dysfunction. Damage to the sensory cells of the inner ear is a frequent underlying cause. Hair cells, the sensory receptors of the inner ear, detect sound, linear acceleration, and angular velocity. The hair cell has a unique mechanoreceptive organelle, the hair bundle, which sits atop the cell?s apical surface. When a hair bundle is positively deflected, transduction channels open triggering mechanoelectrical transduction. A properly functioning hair-bundle is crucial for the overall function of the hair cell. Mutations in some hair-bundle proteins have already been identified as causative factors of hearing and vestibular defects. One such protein is the plasma-membrane calcium-ATPase (PMCA). This Ca2+/H+ exchanger plays a prominent role in Ca2+ regulation in the hair bundle. However, for every Ca2+ removed, one ATP is hydrolyzed and there is a reciprocal increase in intracellular H+ concentration. Therefore, ATP synthesis and H+ regulation are crucial for PMCA activity. Using

pharmacology, molecular biology, biochemistry, and computational modeling, the goal of this proposal is to identify and characterize the mechanism by which the hair-cell bundle regulates H+ as a consequence of PMCA activity and to determine the source of ATP which fuels not only PMCA but other bundle ATPases.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: RESEARCH PROGRAM ON THE NEURAL BASIS OF HEARING**

  Principal Investigator & Institution: Brugge, John F.; Professor Emeritus; Physiology; University of Wisconsin Madison 750 University Ave Madison, Wi 53706

  Timing: Fiscal Year 2002; Project Start 01-MAR-1999; Project End 29-FEB-2004

  Summary: The long-range goal of the Program is to gain a thorough understanding of the complex sensory and neural bases of hearing and **hearing impairment.** The present proposal addresses complementary sets of questions related to a major theme of the Program: neural processing of the natural and spatial location of complex sound. It represents an integrated series of studies featuring novel experimental approaches conduced by a multi-disciplinary team of established investigators who, collectively, bring to the Program a record of productive interaction and expertise in a wide variety of disciplines including neurophysiology, membrane biophysics, neuroanatomy, electronic and computer engineering, statistical analysis, mathematical modeling, physical acoustics, signal processing, and human and animal behavior and psychoacoustics. Experiments are proposed that span cellular, system and behavioral levels. Specifically, the collaborative efforts includes studies of 1) processing speech and complex sounds by the cochlear nuclei, including structure/function studies at the cellular level and complementary animal psychophysics, 2) brainstem mechanisms involved in spatial localization, with special emphases on the precedence effect, the physiology and connectivity of auditory brainstem nuclei, and the coding of auditory spatial cues, 3) auditory cortical mechanisms of spatial hearing, with emphases on encoding sound motion and directional signals in background noise 4) structure/function relationships underlying auditory cortical processing, dealing with intrinsic and synaptic mechanisms and neural circuitry in auditory cortex and 5) human sound localization with emphases on processing of monaural directional cues and cues involved in moving sounds sources. The Program promotes interaction between and among investigators through such means as collaboration on research projects, sharing of core facilities and technical support staff, sharing of computer programs and databases over a network, and participation in regulated and frequent seminars that emphasize informal sharing of ideas and critical evaluation of research in progress. This work constitutes a series of necessary steps in understanding fundamental structure and function of the normal auditory system, which is essential to understanding mechanisms that underlie **hearing impairment** and to devising new strategies for diagnosis, intervention and treatment of disorders of hearing, speech and language.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: ROLE OF CONVENTIONAL MYOSIN MYH9 IN HEARING**

  Principal Investigator & Institution: Lalwani, Anil K.; Mendik Foundation Professor & Chair; Otolaryngology; University of California San Francisco 500 Parnassus Ave San Francisco, Ca 941222747

  Timing: Fiscal Year 2002; Project Start 05-JUL-2002; Project End 30-JUN-2003

  Summary: (provided by applicant): Through the candidate gene approach, we have identified MYH9 as the causative gene responsible for DFNA17, an autosomal dominant

nonsyndromic form of hereditary **hearing impairment.** MYH9, a conventional nonmuscle myosin, joins the growing list of myosins associated with hearing loss. In the DFNA17 family, a G to A transition at nucleotide 2114 changes codon 705 from an invariant arginine (R) to histidine (H), R705H, within a highly conserved SHI linker region. The co-segregation of the mutant MYH9 with nonsyndromic **hearing impairment** illustrates a biologically significant role for MYH9 in hearing and an organ-specific pathology associated with the mutant allele.The objective of the proposed research is to understand the role of MYH9 and its mutant allele MYH9R7O5H in hearing and its dysfunction. We will test the hypothesis that MYH9 is essential for normal hearing and that the mutant allele MYH9R7O5H leads to myosin dysfunction and auditory impairment. Initially, we will assess the importance of MYH9 to hearing in humans. Individuals with hearing loss of unknown genetic etiology will be screened for alterations in the MYH9 gene to determine the contribution of MYH9 mutations in nonsyndromic **hearing impairment.** The discovery of additional mutations will facilitate genotype-phenotype correlation and determining the contribution of MYH9 to hearing loss in general. Secondly, we will assess the role of MYH9 in inner ear development and hearing. This will be carried out by characterizing the expression pattern of Myh9 in the developing and an adult mouse inner ear and determining the effects of its absence. We will use the XA1 36 ES cell line carrying a marker gene insertion into its Myh9 allele to generate mice transgenic for the Myh9 null allele. Thirdly, we will assess the effect of the MYH9R7O5H mutation on myosin function in vitro and in vivo. MYH9R7O5H will be characterized in vitro for its ATPase activity, actin-dependent motility and the effect of its expression in cultured cell lines in which biological role of MYH9 has been established. Generating a mouse model of DFNA1 7 through targeted or random germline introduction of Myh9R7O5H allele will assess the effect of MYH9R7O5H in vivo. In summary, the proposed research will lead to elucidation of the role of MYH9 in hearing and deafness.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: SCREENING VESTIBULAR FUNCTION USING EVOKED POTENTIALS**

  Principal Investigator & Institution: Jones, Sherri M.; Communication Scis & Disorders; East Carolina University 1000 E 5Th St Greenville, Nc 27858

  Timing: Fiscal Year 2001; Project Start 27-SEP-1999; Project End 31-AUG-2004

  Summary: There are no direct, noninvasive, physiological measures of vestibular function. This is in clear contrast to the wide variety of physiological measures available to directly assess function of the auditory system at all levels from the end organ to the cortex. Many of these auditory measures, most notably, auditory brainstem responses, have been used to screen for, or identify and characterize hearing loss in a large number of genetic mutants. These studies have provided important information about the genetics of **hearing impairment.** The proposed research will develop the techniques to assess the functional status of the vestibular end organs and eighth nerve. Meaurements will be direct, noninvasive and implemented by adapting established techniques for recording linear vestibular evoked potentials. Protocols will be suitable for screening and detailed functional assessment. Two specific aims will be addressed. First, stimulation and recording hardware and software will be developed. Peripheral vestibular and brainstem neural activity will be recorded using far-field evoked potential techniques. Adequate stimuli for activation of macular or ampullar neurons will be used to elicit responses. Stimuli will be applied to the cranium via a mechanical shaker/head mount system. Normal mice and genetic mutants with specific inner ear or

central anomalies will be used to demonstrate test validity. Second, the effectiveness and efficiency of the measurement technique will be evaluated. Vestibular function will be surveyed based on two selection strategies. One strategy will measure mice that display behavioral signs of imbalance or vestibular dysfunction or have measurable hearing loss. The second strategy will measure random samples drawn from multiple genetic strains where vestibular dysfunction may be obscure or hidden. This research will produce a tool for the direct, noninvasive assessment of vestibular function and will generate a database quantifying vestibular function in relation to genetics. The knowledge gained will serve as a basis for future research ultimately leading to a better understanding of vestibular ontogeny, genetics of vestibular impairment and better diagnosis and treatment of dizziness in humans.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: SEARCH FOR NEW GENES CAUSING NON-SYNDROMIC DEAFNESS**

  Principal Investigator & Institution: Liu, Xue Z.; Otolaryngology; University of Miami-Medical Box 248293 Coral Gables, Fl 33124

  Timing: Fiscal Year 2002; Project Start 01-JUN-2000; Project End 31-MAY-2004

  Summary: Hearing loss is the most common sensorineural disorder affecting at least 5 percent of population. Genetic factors are one of the most important causes for profound **hearing impairment.** About 1 in 2000 children are born with hereditary deafness. The bulk (around 80 percent) of genetic deafness is non-syndromic form. Studies on molecular basis of non-syndromic hearing loss (NSHL) are not only important for improving our understanding of normal hearing and hearing loss, but also for developing more precise genetic counseling and specific treatments for both genetic and environment-related **hearing impairment.** Because of genetic heterogeneity, large families usually from isolated communities have been selected for study that are independently capable of yielding evidence for linkage. We have collected more than 130 DNA samples from three large dominantly inherited multigenerational families in China with non-syndromic dominant deafness and have access to four additional pedigrees with NSHL that would be suitable for linkage analysis. The proposed research will exploit this unique source for large multigenerational families. We propose (1) to continue collecting samples from all available members of relevant sibships in these families, (2) to type the samples for polymorphic markers in order to exclude linkage to known loci, (3) to subject the remaining pedigrees to genome wide marker screening for linkage analysis. For the largest family NSHL.O1, linkage has been excluded to any of known loci for dominant NSHL and DNA samples from this family have already been submitted for a genome wide marker screen. We will then seek to identify and ultimately clone the relevant genes by the positional candidate gene approach. The goal of the proposed studies is to map at least one new gene for non-syndromic deafness. The proposal will provide the preliminary data required for further localization and positional cloning of the gene. This strategy has been successfully employed to map 50 loci for NSHL. This knowledge is an essential prerequisite to the development and provision of molecular diagnostic services for families with NSHL, as well as the further delineation of the functional genomics of the cochlea.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: SENSORY IMPAIRMENT, FUNCTIONAL STATUS AND MORTALITY**

  Principal Investigator & Institution: Lee, David J.; Assistant Professor; Epidemiology and Public Health; University of Miami-Medical Box 248293 Coral Gables, Fl 33124

  Timing: Fiscal Year 2003; Project Start 15-AUG-2003; Project End 31-JUL-2004

  Summary: (provided by applicant) Hearing and visual impairments are among the most common forms of impairment in older adults. Despite the importance of these impairments as a public health problem there has been relatively little research on the epidemiology of multiple sensory impairment and its influence on functional status, including risk of mortality. The current proposed study would examine the prevalence and functional health correlates of **hearing impairment** and dual sensory impairment including risk of mortality. The National Health Interview Survey (NHIS) is a household survey of the US civilian population conducted annually by the National Center for Health Statistics (NCHS). In total from 1986-94, demographic, health, visual and **hearing impairment** have been collected on nearly 117,000 US adults. Recently, NCHS conducted a mortality follow-up for all individuals participating in the 1986-94 NHIS surveys. Using this uniquely representative and large database the Investigators will: 1) estimate the prevalence and severity of reported **hearing impairment** and dual sensory impairment (visual impairment and hearing impairment) in US adults by age, gender and race/ethnicity, 2) evaluate the reported health and disability status of US adults with and without **hearing impairment** and dual sensory impairment, 3) estimate and compare the overall and cause-specific mortality rates for adults with and without **hearing impairment** and dual sensory impairment, and 4) develop, test and compare theoretical models such as the one depicted in Figure 1 of this application, in which the interrelationships between risk factors, single and dual sensory impairment, functional status and mortality are assessed. This proposed study will address several research objectives outlined in the NIA Program Announcement #PA-99-123, The Aging Senses: Relationships Among Multiple Sensory Systems, which include the support of: 1) epidemiological studies in which more than one sensory modality is studied in a given population in order to measure the prevalence and extent of decline as well as to elucidate interactions among modalities, and 2) studies of the effects of multiple sensory deficits on functional status and quality of life in elderly humans.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: SPECTRAL TEMPORAL FACTORS IN PERCEPTION OF SPEECH**

  Principal Investigator & Institution: Kluender, Keith R.; Psychology; University of Wisconsin Madison 750 University Ave Madison, Wi 53706

  Timing: Fiscal Year 2004; Project Start 01-APR-2000; Project End 28-FEB-2009

  Summary: (provided by applicant): The overarching goal is to better understand auditory processes underlying perception of speech and other complex sounds. One current goal is to continue development of signal processing algorithms for spectral enhancement. The focus is upon improvement of speech recognition in the face of extreme context-sensitivity resulting from co articulation. This effort is directed toward incorporation in facilitative devices such as hearing aids. The algorithm, currently successful with normal hearing listeners with simulated hearing loss, will be further improved, and testing will be extended to a population of listeners with **hearing impairment.** The second major goal is to describe and model processes by which the auditory system maintains perceptual constancy despite variations commonly encountered across sound sources (such as different talkers) and across different sound

environments. More specifically, reveal auditory mechanisms that serve to compensate for reliable spectral and temporal characteristics of a sound source and of the ambient environment more generally. The primary focus is to further understand perception of speech, and the manner in which these auditory processes explain how listeners understand speech across variations in characteristics of individual talkers, as well as their speaking rate and rhythm. If possible, these new findings will be incorporated into development of the spectral enhancement algorithm for clinical application. Finally, behavioral studies using a nonhuman mammal (chinchilla) will be conducted in order to establish a nonhuman model of auditory perceptual constancy that can be used in efforts to better understand the underlying physiology of spectral and temporal processing of complex sounds.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: TBX1 FUNCTIONS IN EAR DEVELOPMENT**

  Principal Investigator & Institution: Baldini, Antonio; Associate Professor; Pediatrics; Baylor College of Medicine 1 Baylor Plaza Houston, Tx 77030

  Timing: Fiscal Year 2003; Project Start 01-JUL-2003; Project End 30-JUN-2008

  Summary: (provided by applicant): Tbx1 is a highly conserved T-box-encoding transcription factor. Loss of function of Tbxl in mice is associated with severe developmental defects of the external, middle and inner ear, as well as other developmental abnormalities. TBX1 is thought to be a critical gene in the pathogenesis of de122qll/DiGeorge syndrome (DGS). Morphological abnormalities of the external ear and **hearing impairment** (conductive or sensorineural) affect the majority of patients. The external and middle ear defects in the mouse model are consistent with the requirement of Tbxl for the development of the pharyngeal arches but the inner ear defects are of unknown origin. Preliminary data underline the requirement of Tbxl for the growth of the otocyst and for the formation of the cochlear duct and semicircular canals. Because of the fundamental importance of the affected developmental processes, we propose a genetic dissection of the function of Tbxl in the inner ear. The first aim of the project is to establish the mechanism by which Tbxl loss of function blocks otocyst morphogenesis. We hypothesize that this is due to growth failure, death or fate change of a subpopulation of otic epithelial cells. We will use chimera and cell fate analyses to address this hypothesis. The second aim is to understand whether Tbxl expression is required in the otic epithelium, periotic mesenchyme or both. We hypothesize that Tbxl is required cell-autonomously in the otic epithelium and we will dissect this function from a possible non-cell autonomous role in the mesenchyme using tissue-specific mutation of the gene. The third aim is to establish whether quantitative reduction of Tbxl RNA message can cause morphological, molecular and/or functional abnormalities of the inner ear. We hypothesize that the function of Tbxl in inner ear development is dosage-dependent and we will use a hypomorphic Tbxl allele to test this hypothesis. In particular, we would like to understand whether Tbxl dosage reduction could cause **hearing impairment,** a common clinical finding in DGS patients.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: THE EXPERIENCE OF HEARING IMPAIRMENT**

  Principal Investigator & Institution: Wallhagen, Margaret I.; Physiological Nursing; University of California San Francisco 500 Parnassus Ave San Francisco, Ca 941222747

  Timing: Fiscal Year 2003; Project Start 15-SEP-2003; Project End 30-JUN-2007

Summary: (provided by applicant): **Hearing impairment** ranks among the top four chronic conditions experienced by older adults, and rapidly increases with age; 50% of those aged 85 and over report **hearing impairment. Hearing impairment** alters one's ability to communicate with others, and data consistently demonstrate its negative impact on psychosocial and physical functioning. However, although **hearing impairment** can alter long standing relationships and mandate re-negotiation of roles and communication patterns, minimal data are available on the experience of **hearing impairment** in older adults and their communication partners (CPs) (partner/spouse/caregiver). To address this critical gap in our understanding, this longitudinal qualitative study with a naturalistic (non-manipulated) intervention will investigate the experience and consequences (psychosocial, functional, clinical) of **hearing impairment** for community dwelling **hearing impaired** elders (aged 60 and over) and their CPs across one year. One hundred dyads will be recruited from participating audiology clinics when they make a first time appointment for a hearing assessment and evaluation for a hearing aid. Interviews will occur before the hearing assessment (T1), at 3 months post assessment and hearing aid recommendation (T2), and again at 12 months (T3). Through in-depth interviews the meaning of heating impairment, its effects on salient aspects of each partner's life, and its effects on each partner's psychosocial, functional, and clinical status will be explored at each data collection point. In addition, factors that facilitate or hinder adaptation to a hearing aid and processes by which roles and relationships are re-negotiated will also be investigated. Post hearing assessment interviews will explore the processes by which changes (if any) have occurred as a result of a hearing aid. Select quantitative data on the effects of **hearing impairment** will be collected to augment the qualitative data and allow for triangulation of methods. This study will fill a critical gap in our understanding of the experience of hearing impairment: it will inform health professionals regarding this meaning of **hearing impairment** and how older adults and their CPs manage this chronic condition within the context of their on-going lives, and will underpin the development of targeted interventions to facilitate adaptation to **hearing impairment** and thereby enhance quality of life.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: THERAPEUTIC EFFECTS OF STEM CELLS ON HEARING LOSS**

  Principal Investigator & Institution: Parker, Mark A.; Children's Hospital (Boston) Boston, Ma 021155737

  Timing: Fiscal Year 2003; Project Start 01-JAN-2003

  Summary: (provided by applicant): **Hearing impairment** has a profound effect on the American population, with almost thirty million people exhibiting some level of deafness or hearing loss. This disability impairs more people in terms of both numbers and economic impact than epilepsy, multiple sclerosis, spinal injury, stroke, and Huntington's and Parkinson's diseases combined. The goal of this proposal is to investigate the therapeutic potential of stem cells transplanted in the auditory system. To this end, the first aim is to study the cellular signaling between stem cells and cochlear explants in vitro. The upregulation of growth factors and cell migration will be measured from stem cells in co-culture with organ of Corti explants. The second aim is to exploit the developmental potential of stem cells by defining the in vitro conditions in which neural stem cells may transdifferentiate into cochlear cell types. To address this aim, we will attempt to prolong organ of Corti explant viability to optimize conditions for neural stem cell transdifferentiation. The final aim is to utilize the regenerative capacities of stem cells by transplanting them into deafened animal models. To

accomplish this, neural stem cells will be transplanted into the internal auditory meatus of a denervated animal model. Lastly, stem cells will be transplanted into the otic capsule of a deafened animal model. The hypothesis is that the transplanted stem cells will respond to environmental cues and differentiate into cochlear cells. The hope is that transplanted stem cells will prove to be therapeutically beneficial to hearing loss.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: TRAINING IN SPEECH, HEARING AND SENSORY COMMUNICATION**

  Principal Investigator & Institution: Pisoni, David B.; Psychology; Indiana University Bloomington P.O. Box 1847 Bloomington, in 47402

  Timing: Fiscal Year 2004; Project Start 25-SEP-1989; Project End 30-JUN-2009

  Summary: (provided by applicant): This proposal requests support to continue the multidisciplinary training program in Speech, Hearing and Sensory Communication at Indiana University. The program provides specialized research training in the Communications Sciences and Disorders for postdoctoral, predoctoral and medical students. Faculty and laboratory facilities will be drawn from Psychology, Linguistics, Speech & Hearing Sciences, Cognitive Science and Neural Science in Bloomington and Otolaryngology and Radiology in the School of Medicine in Indianapolis. The program has ten core faculty members and an additional twenty-six affiliated and supporting faculty. Trainees will be expected to carry out research in one of the laboratories and gain specialized knowledge in areas such as: speech analysis, synthesis and perception; anatomy and physiology of the auditory system; psychophysics of hearing and complex sound perception; acoustic and articulatory phonetics; experimental and clinical phonology; perceptual development, phonological acquisition and development; tactile psychophysics and perception; clinical audiology, speech-language pathology, **hearing impairment** and cochlear implants; spoken word recognition and lexical access; and spoken language processing. Postdoctoral trainees will be drawn from Speech & Hearing Sciences, Clinical Audiology and Speech-Language Pathology, Linguistics, Computer Science, Electrical Engineering, Cognitive, and Developmental Psychology. Predoctoral trainees will be drawn from the Ph.D. programs in Psychology, Linguistics, Speech & Hearing Sciences, Cognitive and Neural Science. As in the past, training activities will consist of: (1) individual and collaborative research projects; (2) participation in weekly laboratory meetings, research seminars, journal clubs and workshops, and attendance at scientific or professional meetings; and (3) formal coursework as needed in Psychology, Speech & Hearing, Linguistics, Cognitive Science or Neural Science. Access to clinical populations for research is available through the Speech and Hearing Clinic in Bloomington and the ENT Clinics at the IU Medical Center in Indianapolis. Our long-term goal is to provide specialized research training in the Communication Sciences and Disorders in order to increase the number of qualified biomedical and behavioral research scientists working on basic and clinical problems in Speech, Hearing and Sensory Communication.

  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: TRIALS OF PREVENTION OF COGNITIVE DECLINE IN WOMEN**

  Principal Investigator & Institution: Grodstein, Francine; Associate Professor; Brigham and Women's Hospital 75 Francis Street Boston, Ma 02115

  Timing: Fiscal Year 2004; Project Start 30-SEP-1998; Project End 30-JUN-2008

Summary: (provided by investigator): This is a competing renewal of a grant in which we added on cognitive testing to two randomized clinical trials of chronic disease prevention in women: the Women's Health Study (WHS) tests low-dose aspirin and antioxidant supplementation in healthy women and the Women's Antioxidant Cardiovascular Study (WACS) tests antioxidant and folate supplementation in women with existing cardiovascular disease. These agents are also hypothesized to prevent Alzheimer disease (AD); since preventive efforts are often best focused at the earliest stages of disease development, our aim in the original application was to investigate whether these treatments might protect against early cognitive decline, a pre-clinical marker of AD risk, in community dwelling women. We conducted telephone cognitive assessments at 3 points in time over 5 years in 6,387 WHS subjects and 2,836 WACS subjects, aged 65 years and older. Both trials received NIH funding to extend follow-up by 3 years to determine whether an average 10 years on the study agents prevent cardiovascular disease or cancer; compliance and follow-up in the trials remain high after 8 years. Since cognitive decline develops slowly over a long period of time, it is likely that long durations of treatment are also necessary to prevent or delay decline. Thus, the extended follow-up of WHS and WACS provides a truly unique opportunity to extend the cognitive sub-studies too, making these among the largest and longest-term clinical trials of neuroprotection; we propose to conduct a single extra wave of cognitive testing during the final year of each trial. Using blood samples obtained from over 70 percent of participants in both trials, we will also examine interactions between these treatments and apolipoprotein E genotype. Importantly, the cognitive sub-studies have been highly successful to date, and establish: (1) effective randomization of subjects, (2) high participation and follow-up in cognitive testing and (3) that our telephone instrument is reliable, valid, and can detect expected relations with cognitive decline. In this revision, we propose to enhance our instrument by adding a 2nd test of executive function (a strong predictor of AD risk) and a test of **hearing impairment.** WHS has been extended until August 2004 and WACS until February 2006, thus there is a limited window of opportunity for taking advantage of the long-term follow-up.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: WITHIN AND BETWEEN CHANNEL REPRESENTATION**

  Principal Investigator & Institution: Richards, Virginia M.; Professor; Psychology; University of Pennsylvania 3451 Walnut Street Philadelphia, Pa 19104

  Timing: Fiscal Year 2004; Project Start 01-JAN-1994; Project End 30-NOV-2008

  Summary: (provided by applicant): This proposal constitutes a psychophysical experimental program which examines two aspects of auditory processing in the healthy human auditory system: (a) uncertainty-driven integration of information across frequency, and (b) observers' ability to detect and/or segregate target signals embedded in a background of distracters. The proposed experiments examine the integration of information across frequency and the integration of information across time and frequency, respectively. The primary goal of the first sequence of experiments is to compare effects of stimulus uncertainty using tasks in which observers should extract frequency from a single frequency locus vs. compare information across the spectrum. For the former task it has been suggested that observers fail to selectively attend to a single frequency locus, an explanation that is difficult to reconcile with uncertainty effects for the latter task. The second set of studies provides estimates of the relative efficacy of different cues for sound source segregation. The experiments examine the hypothesis that the multiple cues are independently represented and optimally combined. In addition, the experiments estimate frequency selectivity after the

segregation of two sources into "auditory streams." The proposed experiments address these issues by analyzing threshold data and examining relative weights in time and frequency. Processing models associated with signal detection theory form the basis of data analysis. While the experimental observers are undergraduates with normal audiograms, the experimental methods can be adopted to test persons suffering **hearing impairment,** persons for whom the presence of multiple sources leads to substantial masking.

Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

E-Journals: PubMed Central[3]

PubMed Central (PMC) is a digital archive of life sciences journal literature developed and managed by the National Center for Biotechnology Information (NCBI) at the U.S. National Library of Medicine (NLM).[4] Access to this growing archive of e-journals is free and unrestricted.[5] To search, go to **http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Pmc**, and type "hearing impairment" (or synonyms) into the search box. This search gives you access to full-text articles. The following is a sample of items found for hearing impairment in the PubMed Central database:

- **Prevalence of permanent childhood hearing impairment in the United Kingdom and implications for universal neonatal hearing screening: questionnaire based ascertainment study.** by Fortnum HM, Summerfield AQ, Marshall DH, Davis AC, Bamford JM.; 2001 Sep 8;
  http://www.pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=48157
- **Whispered voice test for screening for hearing impairment in adults and children: systematic review.** by Pirozzo S, Papinczak T, Glasziou P.; 2003 Oct 25;
  http://www.pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=259166

The National Library of Medicine: PubMed

One of the quickest and most comprehensive ways to find academic studies in both English and other languages is to use PubMed, maintained by the National Library of Medicine.[6] The advantage of PubMed over previously mentioned sources is that it covers a greater number of domestic and foreign references. It is also free to use. If the publisher has a Web site that offers full text of its journals, PubMed will provide links to that site, as well as to sites offering other related data. User registration, a subscription fee, or some other type of fee may be required to access the full text of articles in some journals.

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[3] Adapted from the National Library of Medicine: **http://www.pubmedcentral.nih.gov/about/intro.html**.

[4] With PubMed Central, NCBI is taking the lead in preservation and maintenance of open access to electronic literature, just as NLM has done for decades with printed biomedical literature. PubMed Central aims to become a world-class library of the digital age.

[5] The value of PubMed Central, in addition to its role as an archive, lies in the availability of data from diverse sources stored in a common format in a single repository. Many journals already have online publishing operations, and there is a growing tendency to publish material online only, to the exclusion of print.

[6] PubMed was developed by the National Center for Biotechnology Information (NCBI) at the National Library of Medicine (NLM) at the National Institutes of Health (NIH). The PubMed database was developed in conjunction with publishers of biomedical literature as a search tool for accessing literature citations and linking to full-text journal articles at Web sites of participating publishers. Publishers that participate in PubMed supply NLM with their citations electronically prior to or at the time of publication.

To generate your own bibliography of studies dealing with hearing impairment, simply go to the PubMed Web site at **http://www.ncbi.nlm.nih.gov/pubmed**. Type "hearing impairment" (or synonyms) into the search box, and click "Go." The following is the type of output you can expect from PubMed for hearing impairment (hyperlinks lead to article summaries):

- **A 3-nucleotide deletion in the polypyrimidine tract of intron 7 of the DFNA5 gene causes nonsyndromic hearing impairment in a Chinese family.**
  Author(s): Yu C, Meng X, Zhang S, Zhao G, Hu L, Kong X.
  Source: Genomics. 2003 November; 82(5): 575-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14559215

- **A 4-bp insertion in the eya-homologous region (eyaHR) of EYA4 causes hearing impairment in a Hungarian family linked to DFNA10.**
  Author(s): Pfister M, Toth T, Thiele H, Haack B, Blin N, Zenner HP, Sziklai I, Nurnberg P, Kupka S.
  Source: Molecular Medicine (Cambridge, Mass.). 2002 October; 8(10): 607-11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12477971

- **A case of megalocornea-mental retardation syndrome complicated with bilateral sensorineural hearing impairment.**
  Author(s): Tominaga N, Kondoh T, Kamimura N, Matsumoto T, Matsuzaka T, Oshima K, Nishimura G, Tsuji Y.
  Source: Pediatrics International : Official Journal of the Japan Pediatric Society. 1999 August; 41(4): 392-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10453191

- **A common frameshift mutation and other variants in GJB4 (connexin 30.3): Analysis of hearing impairment families.**
  Author(s): Lopez-Bigas N, Melchionda S, Gasparini P, Borragan A, Arbones ML, Estivill X.
  Source: Human Mutation. 2002 April; 19(4): 458.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11933201

- **A Dutch family with hearing loss linked to the DFNA20/26 locus: longitudinal analysis of hearing impairment.**
  Author(s): Kemperman MH, De Leenheer EM, Huygen PL, van Wijk E, van Duijnhoven G, Cremers FP, Kremer H, Cremers CW.
  Source: Archives of Otolaryngology--Head & Neck Surgery. 2004 March; 130(3): 281-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15023833

- **A gene for autosomal dominant hearing impairment (DFNA14) maps to a region on chromosome 4p16.3 that does not overlap the DFNA6 locus.**
  Author(s): Van Camp G, Kunst H, Flothmann K, McGuirt W, Wauters J, Marres H, Verstreken M, Bespalova IN, Burmeister M, Van de Heyning PH, Smith RJ, Willems PJ, Cremers CW, Lesperance MM.
  Source: Journal of Medical Genetics. 1999 July; 36(7): 532-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10424813

- **A longitudinal study of the validity of parental reporting in the detection of otitis media and related hearing impairment in infancy.**
  Author(s): Anteunis LJ, Engel JA, Hendriks JJ, Manni JJ.
  Source: Audiology : Official Organ of the International Society of Audiology. 1999 March-April; 38(2): 75-82.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10206516

- **A mutational hot spot in the KCNQ4 gene responsible for autosomal dominant hearing impairment.**
  Author(s): Van Camp G, Coucke PJ, Akita J, Fransen E, Abe S, De Leenheer EM, Huygen PL, Cremers CW, Usami S.
  Source: Human Mutation. 2002 July; 20(1): 15-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12112653

- **A new locus for nonsyndromic hereditary hearing impairment, DFNA17, maps to chromosome 22 and represents a gene for cochleosaccular degeneration.**
  Author(s): Lalwani AK, Luxford WM, Mhatre AN, Attaie A, Wilcox ER, Castelein CM.
  Source: American Journal of Human Genetics. 1999 January; 64(1): 318-23.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9915977

- **A protocol for people with hearing impairment.**
  Author(s): Hayman M.
  Source: Nurs Times. 1998 October 28-November 3; 94(43): 54-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9887842

- **A yeast model for the study of human DFNA5, a gene mutated in nonsyndromic hearing impairment.**
  Author(s): Gregan J, Van Laer L, Lieto LD, Van Camp G, Kearsey SE.
  Source: Biochimica Et Biophysica Acta. 2003 July 14; 1638(2): 179-86.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12853124

- **Absence of hearing impairment in adult onset facioscapulohumeral muscular dystrophy.**
  Author(s): Rogers MT, Zhao F, Harper PS, Stephens D.
  Source: Neuromuscular Disorders : Nmd. 2002 May; 12(4): 358-65.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12062253

- **Achievements of the European Working Group on Genetics of Hearing Impairment.**
  Author(s): Martini A, Mazzoli M.
  Source: International Journal of Pediatric Otorhinolaryngology. 1999 October 5; 49 Suppl 1: S155-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10577796

- **Age-related hearing impairment (ARHI): environmental risk factors and genetic prospects.**
  Author(s): Fransen E, Lemkens N, Van Laer L, Van Camp G.
  Source: Experimental Gerontology. 2003 April; 38(4): 353-9. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12670621

- **Air-bone gap and hearing impairment level predictive value in preoperative assessment of cholesteatoma localization in the tympanic cavity.**
  Author(s): Durko M.
  Source: Otolaryngol Pol. 2004; 58(1): 73-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15101263

- **Anatomic and physiologic discrepancies in perioperative hearing impairment.**
  Author(s): Singh SK.
  Source: Anesthesiology. 2003 September; 99(3): 757-8; Author Reply 758.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12960569

- **Audiology and hearing impairment: improving the quality of care.**
  Author(s): Meecham E.
  Source: Nursing Standard : Official Newspaper of the Royal College of Nursing. 1999 July 14-20; 13(43): 42-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10531983

- **Autosomal dominant low-frequency hearing impairment (DFNA6/14): a clinical and genetic family study.**
  Author(s): Bom SJ, Van Camp G, Cryns K, Admiraal RJ, Huygen PL, Cremers CW.
  Source: Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2002 November; 23(6): 876-84.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12438850

- **Autosomal dominant non-syndromal low-frequency sensorineural hearing impairment linked to chromosome 4p16 (DFNA14): statistical analysis of hearing threshold in relation to age and evaluation of vestibulo-ocular functions.**
  Author(s): Kunst H, Marres H, Huygen P, Van Camp G, Joosten F, Cremers C.
  Source: Audiology : Official Organ of the International Society of Audiology. 1999 May-June; 38(3): 165-73. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10437687

- **Benefit from binaural hearing aids in individuals with a severe hearing impairment.**
  Author(s): Day GA, Browning GG, Gatehouse S.
  Source: British Journal of Audiology. 1988 November; 22(4): 273-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3242717

- **Bibliographic material on the dual handicaps of hearing impairment and MR: a progress report of your AAMD-CEASD Joint Committee on the Deaf Retarded.**
  Author(s): Lloyd LL.
  Source: Mental Retardation. 1972 April; 10(2): 18.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=4553198

- **Birth weight and hearing impairment in norwegians born from 1967 to 1993.**
  Author(s): Nafstad P, Samuelsen SO, Irgens LM, Bjerkedal T.
  Source: Pediatrics. 2002 September; 110(3): E30.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12205280

- **Blood viscosity as a factor in sensorineural hearing impairment.**
  Author(s): Browning GG, Gatehouse S, Lowe GD.
  Source: Lancet. 1986 January 18; 1(8473): 121-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2867347

- **Causes of hearing impairment in deaf pupils with a mental handicap.**
  Author(s): Admiraal RJ, Huygen PL.
  Source: International Journal of Pediatric Otorhinolaryngology. 1999 December 5; 51(2): 101-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10619623

- **Changes in the aetiology of hearing impairment in deaf-blind pupils and deaf infant pupils at an institute for the deaf.**
  Author(s): Admiraal RJ, Huygen PL.
  Source: International Journal of Pediatric Otorhinolaryngology. 2000 September 29; 55(2): 133-42.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11006453

- **Characteristics of children with permanent mild hearing impairment.**
  Author(s): Kiese-Himmel C, Ohlwein S.
  Source: Folia Phoniatrica Et Logopaedica : Official Organ of the International Association of Logopedics and Phoniatrics (Ialp). 2003 March-April; 55(2): 70-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12697980

- **Cigarette smoking and risk for hearing impairment: a longitudinal study in Japanese male office workers.**
  Author(s): Nakanishi N, Okamoto M, Nakamura K, Suzuki K, Tatara K.
  Source: Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine. 2000 November; 42(11): 1045-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11094781

- **Cloning genes for non-syndromal hearing impairment.**
  Author(s): Smith RJ, Van Camp G.
  Source: British Journal of Audiology. 1999 October; 33(5): 271-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10890140

- **Combined functional visual and hearing impairment in a population aged 75 and older in Finland and its influence on activities of daily living.**
  Author(s): Lupsakko TA, Mantyjarvi MI, Sulkava RO, Kautiainen HJ.
  Source: Journal of the American Geriatrics Society. 2002 October; 50(10): 1748-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12366637

- **Computed tomography evaluation of the inner ear as a diagnostic, counselling and management strategy in patients with congenital sensorineural hearing impairment.**
  Author(s): Cross NC, Stephens SD, Francis M, Hourihan MD, Reardon W.
  Source: Clinical Otolaryngology and Allied Sciences. 1999 June; 24(3): 235-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10384853

- **Congenital hearing impairment associated with rubella: lessons from Bangladesh.**
  Author(s): Rahman MM, Khan AM, Hafiz MM, Ronny FM, Ara S, Chowdhury SK, Nazir SS, Khan WI.
  Source: Southeast Asian J Trop Med Public Health. 2002 December; 33(4): 811-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12757231

- **Congenital non-syndromal sensorineural hearing impairment due to connexin 26 gene mutations--molecular and audiological findings.**
  Author(s): Mueller RF, Nehammer A, Middleton A, Houseman M, Taylor GR, Bitner-Glindzciz M, Van Camp G, Parker M, Young ID, Davis A, Newton VE, Lench NJ.
  Source: International Journal of Pediatric Otorhinolaryngology. 1999 October 15; 50(1): 3-13.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10596881

- **Connexin 26 mutations and nonsyndromic hearing impairment in northern Finland.**
  Author(s): Lopponen T, Vaisanen ML, Luotonen M, Allinen M, Uusimaa J, Lindholm P, Maki-Torkko E, Vayrynen M, Lopponen H, Leisti J.
  Source: The Laryngoscope. 2003 October; 113(10): 1758-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14520102

- **Connexin 26 preverbal hearing impairment: mutation prevalence and heterozygosity in a selected population.**
  Author(s): Orzan E, Murgia A, Polli R, Martella M, Mazza A, Zacchello F, Babighian G.
  Source: International Journal of Audiology. 2002 March; 41(2): 120-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12212857

- **Connexin 31 (GJB3) is expressed in the peripheral and auditory nerves and causes neuropathy and hearing impairment.**
  Author(s): Lopez-Bigas N, Olive M, Rabionet R, Ben-David O, Martinez-Matos JA, Bravo O, Banchs I, Volpini V, Gasparini P, Avraham KB, Ferrer I, Arbones ML, Estivill X.
  Source: Human Molecular Genetics. 2001 April 15; 10(9): 947-52.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11309368

- **Consanguinity and hearing impairment in developing countries: a custom to be discouraged.**
  Author(s): Zakzouk S.
  Source: The Journal of Laryngology and Otology. 2002 October; 116(10): 811-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12437836

- **Controlled trial of universal neonatal screening for early identification of permanent childhood hearing impairment: coverage, positive predictive value, effect on mothers and incremental yield. Wessex Universal Neonatal Screening Trial Group.**
  Author(s): Kennedy CR.
  Source: Acta Paediatrica (Oslo, Norway : 1992). Supplement. 1999 December; 88(432): 73-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10626585

- **Controlled trial of universal neonate screening for early identification of permanent childhood hearing impairment.**
  Author(s): Moyer VA.
  Source: The Journal of Pediatrics. 1999 July; 135(1): 129-30.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10428653

- **Coping with post-lingual severe-profound hearing impairment: a grounded theory study.**
  Author(s): Hallberg LR, Passe U, Ringdahl A.
  Source: British Journal of Audiology. 2000 February; 34(1): 1-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10759073

- **Correlations between risk factors for hearing impairment and TEOAE screening test outcome in neonates at risk for hearing loss.**
  Author(s): Ratynska J, Grzanka A, Mueller-Malesinska M, Skarzynski H, Hatzopoulos S.
  Source: Scand Audiol Suppl. 2001; (52): 15-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11318451

- **Cracking the auditory genetic code: nonsyndromic hereditary hearing impairment.**
  Author(s): Lalwani AK, Castelein CM.
  Source: The American Journal of Otology. 1999 January; 20(1): 115-32. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9918184

- **Cracking the auditory genetic code: part II. Syndromic hereditary hearing impairment.**
  Author(s): Tseng CJ, Lalwani AK.
  Source: The American Journal of Otology. 2000 May; 21(3): 437-51. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10821562

- **Critical learning period for speech acquisition and screening techniques in early detection of hearing impairment.**
  Author(s): Serbetcioglu MB.
  Source: Turk J Pediatr. 2001 April-June; 43(2): 128-32.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11432491

- **Definition of hearing impairment and its effect on prevalence figures. A survey among senior citizens.**
  Author(s): Duijvestijn JA, Anteunis LJ, Hendriks JJ, Manni JJ.
  Source: Acta Oto-Laryngologica. 1999; 119(4): 420-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10445055

- **Delayed evoked otoacoustic emissions--an ideal screening test for excluding hearing impairment in infants.**
  Author(s): Zwicker E, Schorn K.
  Source: Audiology : Official Organ of the International Society of Audiology. 1990; 29(5): 241-51.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2275639

- **Deletion mapping of split hand/split foot malformation with hearing impairment: a case report.**
  Author(s): Fukushima K, Nagai K, Tsukada H, Sugata A, Sugata K, Kasai N, Kibayashi N, Maeda Y, Gunduz M, Nishizaki K.
  Source: International Journal of Pediatric Otorhinolaryngology. 2003 October; 67(10): 1127-32.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14550969

- **Demographics of meningitis-induced hearing impairment: implications for immunization of children against Hemophilus influenzae type B.**
  Author(s): Wolff AB, Brown SC.
  Source: Am Ann Deaf. 1987 March; 132(1): 26-30. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3498351

- **Dental care for children and young people who have a hearing impairment.**
  Author(s): Champion J, Holt R.
  Source: British Dental Journal. 2000 August 12; 189(3): 155-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11021033

- **Deriving criteria for hearing impairment in the elderly: a functional approach.**
  Author(s): Lichtenstein MJ, Bess FH, Logan SA, Burger MC.
  Source: Journal of the American Academy of Audiology. 1990 January; 1(1): 11-22.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2132577

- **Detection of hearing impairment in early childhood.**
  Author(s): Hovind H, Parving A.
  Source: Scandinavian Audiology. 1987; 16(4): 187-93.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3438700

- **Detection of hearing impairment with the acoustic stapedius reflex.**
  Author(s): Margolis RH.
  Source: Ear and Hearing. 1993 February; 14(1): 3-10. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8444335

- **DFN4: non-syndromic autosomal dominant X-linked sensorineural hearing impairment.**
  Author(s): Pfister M, Lalwani AK.
  Source: Advances in Oto-Rhino-Laryngology. 2000; 56: 196-9. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10868235

- **DFNA25, a novel locus for dominant nonsyndromic hereditary hearing impairment, maps to 12q21-24.**
  Author(s): Greene CC, McMillan PM, Barker SE, Kurnool P, Lomax MI, Burmeister M, Lesperance MM.
  Source: American Journal of Human Genetics. 2001 January; 68(1): 254-60. Epub 2000 December 11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11115382

- **DFNB39, a recessive form of sensorineural hearing impairment, maps to chromosome 7q11.22-q21.12.**
  Author(s): Wajid M, Abbasi AA, Ansar M, Pham TL, Yan K, Haque S, Ahmad W, Leal SM.
  Source: European Journal of Human Genetics : Ejhg. 2003 October; 11(10): 812-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14512973

- **Diabetes and hearing impairment in Mexican American adults: a population-based study.**
  Author(s): Ma F, Gomez-Marin O, Lee DJ, Balkany T.
  Source: The Journal of Laryngology and Otology. 1998 September; 112(9): 835-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9876372

- **Diagnosis and management strategies in congenital atresia of the external auditory canal. Study Group on Otological Malformations and Hearing Impairment.**
  Author(s): Declau F, Cremers C, Van de Heyning P.
  Source: British Journal of Audiology. 1999 October; 33(5): 313-27. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10890146

- **Diagnosis of hearing impairment in childhood.**
  Author(s): Kustel M, Komora V.
  Source: Acta Chir Hung. 1992-93; 33(1-2): 45-53.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1343465

- **Discrimination of slight changes in tone frequency applied in audiological diagnosis of noise-induced hearing impairment.**
  Author(s): Gryczynski M, Sulkowski W.
  Source: Pol J Occup Med. 1990; 3(1): 129-45.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2132933

- **Dispositional optimism, dysphoria, health, and coping with hearing impairment in elderly adults.**
  Author(s): Andersson G, Melin L, Lindberg P, Scott B.
  Source: Audiology : Official Organ of the International Society of Audiology. 1995 March-April; 34(2): 76-84.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8561685

- **Does having a job improve the quality of life among post-lingually deafened Swedish adults with severe-profound hearing impairment?**
  Author(s): Grimby A, Ringdahl A.
  Source: British Journal of Audiology. 2000 June; 34(3): 187-95.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10905452

- **DPOAE-patterns in different types of autosomal-dominant nonsyndromal hearing impairment.**
  Author(s): Oeken J, Stumpf R.
  Source: Scand Audiol Suppl. 2001; (52): 119-20.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11318440

- **DPOAEs and vestibular function in different types of autosomal-dominant non-syndromal hearing impairment.**
  Author(s): Oeken J, Stumpf R, Bootz F.
  Source: Auris, Nasus, Larynx. 2002 January; 29(1): 29-34.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11772487

- **Dutch consensus on diagnosis and treatment of hearing impairment in children and adults with intellectual disability. The Consensus Committee.**
  Author(s): Evenhuis HM.
  Source: Journal of Intellectual Disability Research : Jidr. 1996 October; 40 (Pt 5): 451-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8906532

- **Early detection of hearing impairment in a developing country: what options?**
  Author(s): Olusanya B.
  Source: Audiology : Official Organ of the International Society of Audiology. 2001 May-June; 40(3): 141-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11465296

- **Early identification and management of hearing impairment.**
  Author(s): Buttross SL, Gearhart JG, Peck JE.
  Source: American Family Physician. 1995 May 1; 51(6): 1437-46, 1451-2.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7732946

- **Early identification of hearing impairment in patients with type 1 diabetes mellitus.**
  Author(s): Lisowska G, Namyslowski G, Morawski K, Strojek K.
  Source: Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2001 May; 22(3): 316-20.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11347633

- **Early intervention for hearing impairment: differences in the timing of communicative and linguistic development.**
  Author(s): Robinshaw HM.
  Source: British Journal of Audiology. 1995 December; 29(6): 315-34.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8861408

- **Effect of hearing impairment on educational outcomes and employment up to the age of 25 years in northern Finland.**
  Author(s): Jarvelin MR, Maki-Torkko E, Sorri MJ, Rantakallio PT.
  Source: British Journal of Audiology. 1997 June; 31(3): 165-75.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9276099

- **Effects of hearing impairment and presentation level on masking period patterns for Schroeder-phase harmonic complexes.**
  Author(s): Summers V.
  Source: The Journal of the Acoustical Society of America. 2000 November; 108(5 Pt 1): 2307-17.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11108371

- **Effects of hearing impairment on the patient's family and friends.**
  Author(s): Stephens D, France L, Lormore K.
  Source: Acta Oto-Laryngologica. 1995 March; 115(2): 165-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7610796

- **Effects of hearing impairment on use of health services among the elderly.**
  Author(s): Green CA, Pope CR.
  Source: Journal of Aging and Health. 2001 August; 13(3): 315-28.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11813729

- **Effects on sound localization of configuration and type of hearing impairment.**
  Author(s): Noble W, Byrne D, Lepage B.
  Source: The Journal of the Acoustical Society of America. 1994 February; 95(2): 992-1005.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8132913

- **Electrical status epilepticus in slow wave sleep: prospective case study of a cortical hearing impairment.**
  Author(s): Fowler CG, Kile JE, Hecox KE.
  Source: Journal of the American Academy of Audiology. 2001 April; 12(4): 174-82.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11332517

- **Electrophysiological and behavioral methods in early detection of hearing impairment.**
  Author(s): Poblano A, Chayo I, Ibarra J, Rueda E.
  Source: Archives of Medical Research. 2000 January-February; 31(1): 75-80.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10767484

- **Epidemiological studies on hearing impairment with reference to genetic factors in Sichuan, China.**
  Author(s): Liu XZ, Xu LR, Hu Y, Nance WE, Sismanis A, Zhang SL, Xu Y.
  Source: The Annals of Otology, Rhinology, and Laryngology. 2001 April; 110(4): 356-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11307913

- **Epidemiology of hearing impairment at three Flemish Institutes for Deaf and Speech Defective Children.**
  Author(s): Deben K, Janssens de Varebeke S, Cox T, Van de Heyning P.
  Source: International Journal of Pediatric Otorhinolaryngology. 2003 September; 67(9): 969-75.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12907052

- **Epidemiology of permanent childhood hearing impairment in Estonia, 1985-1990.**
  Author(s): Uus K, Davis AC.
  Source: Audiology : Official Organ of the International Society of Audiology. 2000 July-August; 39(4): 192-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10963439

- **Epidemiology of permanent childhood hearing impairment in the Tyrol, 1980-94.**
  Author(s): Nekahm D, Weichbold V, Welzl-Muller K.
  Source: Scandinavian Audiology. 2001; 30(3): 197-202.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11683458

- **Epidemiology of permanent childhood hearing impairment in Trent Region, 1985-1993.**
  Author(s): Fortnum H, Davis A.
  Source: British Journal of Audiology. 1997 December; 31(6): 409-46. Erratum In: Br J Audiol 1998 February; 32(1): 63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9478287

- **Epidemiology of permanent hearing impairment in children in relation to costs of a hearing health surveillance program.**
  Author(s): Parving A, Christensen B.
  Source: International Journal of Pediatric Otorhinolaryngology. 1996 January; 34(1-2): 9-23.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8770669

- **Erratum: Identification of five new mutations of PDS/SLC26A4 in Mediterranean families with hearing impairment.**
  Author(s): Lopez-Bigas N, Melchionda S, de Cid R, Grifa A, Zelante L, Govea N, Arbones ML, Gasparini P, Estivill X.
  Source: Human Mutation. 2002 July; 20(1): 77-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12112665

- **Evaluation of hearing impairment.**
  Author(s): Zadeh MH, Selesnick SH.
  Source: Compr Ther. 2001 Winter; 27(4): 302-10. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11765688

- **Factors causing hearing impairment: some perspectives from Europe.**
  Author(s): Parving A.
  Source: Journal of the American Academy of Audiology. 1995 September; 6(5): 387-95. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8547702

- **False positives in universal neonatal screening for permanent childhood hearing impairment.**
  Author(s): Kennedy C, Kimm L, Thornton R, Davis A.
  Source: Lancet. 2000 December 2; 356(9245): 1903-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11130392

- **Familial early-onset progressive vestibulopathy without hearing impairment.**
  Author(s): Brantberg K.
  Source: Acta Oto-Laryngologica. 2003 August; 123(6): 713-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12953770

- **Familial factors and hearing impairment modulate the neuromotor phenotype in Turner syndrome.**
  Author(s): Haverkamp F, Keuker T, Woelfle J, Kaiser G, Zerres K, Rietz C, Ruenger M.
  Source: European Journal of Pediatrics. 2003 January; 162(1): 30-5. Epub 2002 November 22.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12486504

- **Feasibility of otoacoustic emission detection followed by ABR as a universal neonatal screening test for hearing impairment.**
  Author(s): Hunter MF, Kimm L, Cafarlli Dees D, Kennedy CR, Thornton AR.
  Source: British Journal of Audiology. 1994 February; 28(1): 47-51.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7987271

- **Fetal heart rate response to acoustic stimulation in relation to fetal development and hearing impairment.**
  Author(s): Johansson B, Wedenberg E, Westin B.
  Source: Acta Obstetricia Et Gynecologica Scandinavica. 1992 December; 71(8): 610-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1336920

- **Follow-up study in a family with dominant progressive hereditary sensorineural hearing impairment. I. Analysis of hearing deterioration.**
  Author(s): van den Wijngaart WS, Verschuure J, Brocaar MP, Huizing EH.
  Source: Audiology : Official Organ of the International Society of Audiology. 1985; 24(4): 233-40.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=4051873

- **Follow-up study in a family with dominant progressive hereditary sensorineural hearing impairment. II. Clinical aspects.**
  Author(s): van den Wijngaart WS, Huizing EH, Niermeijer MF, Verschuure J, Brocaar MP, Blom W.
  Source: Audiology : Official Organ of the International Society of Audiology. 1985; 24(5): 336-42.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=4051882

- **Frequencies of GJB2 mutations in German control individuals and patients showing sporadic non-syndromic hearing impairment.**
  Author(s): Kupka S, Braun S, Aberle S, Haack B, Ebauer M, Zeissler U, Zenner HP, Blin N, Pfister M.
  Source: Human Mutation. 2002 July; 20(1): 77-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12112666

- **Frequency of mitochondrial DNA point mutations among patients with familial sensorineural hearing impairment.**
  Author(s): Lehtonen MS, Uimonen S, Hassinen IE, Majamaa K.
  Source: European Journal of Human Genetics : Ejhg. 2000 April; 8(4): 315-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10854117

- **Frequency of the recessive 30delG mutation in the GJB2 gene in Northeast-Hungarian individuals and patients with hearing impairment.**
  Author(s): Toth T, Kupka S, Esmer H, Zeissler U, Sziklai I, Zenner HP, Blin N, Pfister M.
  Source: International Journal of Molecular Medicine. 2001 August; 8(2): 189-92.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11445873

- **Further evidence for linkage of low-mid frequency hearing impairment to the candidate region on chromosome 4p16.3.**
  Author(s): Brodwolf S, Boddeker IR, Ziegler A, Rausch P, Kunz J.
  Source: Clinical Genetics. 2001 August; 60(2): 155-60.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11553051

- **Genetic epidemiology of hearing impairment.**
  Author(s): Morton NE.
  Source: Annals of the New York Academy of Sciences. 1991; 630: 16-31. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1952587

- **Genetics of hearing impairment.**
  Author(s): Hone SW, Smith RJ.
  Source: Seminars in Neonatology : Sn. 2001 December; 6(6): 531-41. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12014894

- **Genomics and hearing impairment.**
  Author(s): Keats BJ, Berlin CI.
  Source: Genome Research. 1999 January; 9(1): 7-16. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9927480

- **Genotypic and phenotypic correlations of DFNB1-related hearing impairment in the Midwestern United States.**
  Author(s): Lim LH, Bradshaw JK, Guo Y, Pilipenko V, Madden C, Ingala D, Keddache M, Choo DI, Wenstrup R, Greinwald JH Jr.
  Source: Archives of Otolaryngology--Head & Neck Surgery. 2003 August; 129(8): 836-40.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12925341

- **Geriatric grand rounds: hearing impairment and functional independence.**
  Author(s): Swagerty DL Jr.
  Source: Kans Med. 1995 Fall; 96(3): 147-8, 151.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8583743

- **Global action against hearing impairment.**
  Author(s): Wilson J.
  Source: Scand Audiol Suppl. 1988; 28: 33-5. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3187386

- **Glossary for hereditary hearing impairment.**
  Author(s): Pfister MH, Rehm HL.
  Source: Ear and Hearing. 2003 August; 24(4): 260-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12923416

- **Hearing impairment among adults--extent of the problem and scientific evidence on the outcome of hearing aid rehabilitation.**
  Author(s): Maki-Torkko EM, Brorsson B, Davis A, Mair LWS, Myhre KL, Roine RP, Rosenhall U, Sorri MJ, Stilven S.
  Source: Scand Audiol Suppl. 2001; (54): 8-15. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11688602

- **Hearing impairment among aging persons in the health care facility: their diagnosis and rehabilitation.**
  Author(s): Hull RH, Traynor RM.
  Source: J Am Health Care Assoc. 1977 January; 3(1): 14-8. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10621664

- **Hearing impairment among young Chinese in an urban area.**
  Author(s): Kaewboonchoo O, Morioka I, Miyashita K, Takeda S, Wang YX, Li SC.
  Source: Public Health. 1998 May; 112(3): 143-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9629019

- **Hearing impairment and ear diseases among children of school entry age in rural South India.**
  Author(s): Rao RS, Subramanyam MA, Nair NS, Rajashekhar B.
  Source: International Journal of Pediatric Otorhinolaryngology. 2002 June 17; 64(2): 105-10.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12049823

- **Hearing impairment and neurological dysfunction associated with a mutation in the mitochondrial tRNASer(UCN) gene.**
  Author(s): Verhoeven K, Ensink RJ, Tiranti V, Huygen PL, Johnson DF, Schatteman I, Van Laer L, Verstreken M, Van de Heyning P, Fischel-Ghodsian N, Zeviani M, Cremers CW, Willems PJ, Van Camp G.
  Source: European Journal of Human Genetics : Ejhg. 1999 January; 7(1): 45-51.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10094190

- **Hearing impairment and tinnitus pitch in patients with unilateral tinnitus: comparison of sudden hearing loss and chronic tinnitus.**
  Author(s): Ochi K, Ohashi T, Kenmochi M.
  Source: The Laryngoscope. 2003 March; 113(3): 427-31.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12616191

- **Hearing impairment data.**
  Author(s): Battey JF Jr.
  Source: Public Health Reports (Washington, D.C. : 1974). 1999 September-October; 114(5): 393.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10590758

- **Hearing impairment in a patient with unilateral narrowing of the internal auditory canal--a case report.**
  Author(s): Shiomi Y, Shiomi Y, Oda N.
  Source: Auris, Nasus, Larynx. 2001 November; 28(4): 353-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11694382

- **Hearing impairment in children with impacted cerumen.**
  Author(s): Olusanya BO.
  Source: Annals of Tropical Paediatrics. 2003 June; 23(2): 121-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12803741

- **Hearing impairment in low birth weight children.**
  Author(s): Daghistani KJ, Jamal TS, Zakzouk SM.
  Source: Saudi Med J. 2002 March; 23(3): 311-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11938423

- **Hearing impairment in patients with acoustic neuroma--analysis by electrocochleography.**
  Author(s): Yokoyama K, Nishida H, Noguchi Y, Komatsuzaki A.
  Source: Auris, Nasus, Larynx. 1999 October; 26(4): 401-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10530735

- **Hearing impairment in preterm very low birthweight babies detected at term by brainstem auditory evoked responses.**
  Author(s): Jiang ZD, Brosi DM, Wilkinson AR.
  Source: Acta Paediatrica (Oslo, Norway : 1992). 2001 December; 90(12): 1411-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11853339

- **Hearing impairment in Stickler syndrome.**
  Author(s): Admiraal RJ, Szymko YM, Griffith AJ, Brunner HG, Huygen PL.
  Source: Advances in Oto-Rhino-Laryngology. 2002; 61: 216-23. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12408087

- **Hearing impairment in Thais due to sport shooting: a preliminary report.**
  Author(s): Charakorn C, Amatyakul P.
  Source: J Med Assoc Thai. 1998 May; 81(5): 344-51.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9623034

- **Hearing impairment in Usher syndrome type II.**
  Author(s): Pennings RJ, Huygen PL, Cremers WR.
  Source: The Annals of Otology, Rhinology, and Laryngology. 2003 September; 112(9 Pt 1): 825.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14535570

- **Hearing impairment in Usher's syndrome.**
  Author(s): Pennings RJ, Wagenaar M, van Aarem A, Huygen PL, Kimberling WJ, Cremers CW.
  Source: Advances in Oto-Rhino-Laryngology. 2002; 61: 184-91.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12408083

- **Hearing impairment is common in various phenotypes of the mitochondrial DNA A3243G mutation.**
  Author(s): Hum Mutat. 2002 Jul;20(1):77-8
  Source: Archives of Neurology. 2001 November; 58(11): 1885-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12112665

- **Hearing impairment related to age in Usher syndrome types 1B and 2A.**
  Author(s): Wagenaar M, van Aarem A, Huygen P, Pieke-Dahl S, Kimberling W, Cremers C.
  Source: Archives of Otolaryngology--Head & Neck Surgery. 1999 April; 125(4): 441-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10208682

- **Hearing impairment, emotions and audiological rehabilitation: a sociological perspective.**
  Author(s): Danermark BD.
  Source: Scand Audiol Suppl. 1998; 49: 125-31. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10209787

- **Hearing impairment.**
  Author(s): Wallhagen MI.
  Source: Annu Rev Nurs Res. 2002; 20: 341-68. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12092516

- **Identification of a novel mutation in WFS1 in a family affected by low-frequency hearing impairment.**
  Author(s): Kunz J, Marquez-Klaka B, Uebe S, Volz-Peters A, Berger R, Rausch P.
  Source: Mutation Research. 2003 April 9; 525(1-2): 121-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12650912

- **Identification of five new mutations of PDS/SLC26A4 in Mediterranean families with hearing impairment.**
  Author(s): Lopez-Bigas N, Melchionda S, de Cid R, Grifa A, Zelante L, Govea N, Arbones ML, Gasparini P, Estivill X.
  Source: Human Mutation. 2001 December; 18(6): 548. Corrected and Republished In:
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11748854

- **Identification of neonatal hearing impairment: a cornerstone for newborn hearing screening.**
  Author(s): Prieve BA.
  Source: Ear and Hearing. 2000 October; 21(5): 345.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059696

- **Identification of neonatal hearing impairment: a multicenter investigation.**
  Author(s): Norton SJ, Gorga MP, Widen JE, Folsom RC, Sininger Y, Cone-Wesson B, Vohr BR, Fletcher KA.
  Source: Ear and Hearing. 2000 October; 21(5): 348-56.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059697

- **Identification of neonatal hearing impairment: auditory brain stem responses in the perinatal period.**
  Author(s): Sininger YS, Cone-Wesson B, Folsom RC, Gorga MP, Vohr BR, Widen JE, Ekelid M, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 383-99.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059700

- **Identification of neonatal hearing impairment: characteristics of infants in the neonatal intensive care unit and well-baby nursery.**
  Author(s): Vohr BR, Widen JE, Cone-Wesson B, Sininger YS, Gorga MP, Folsom RC, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 373-82.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059699

- **Identification of neonatal hearing impairment: ear-canal measurements of acoustic admittance and reflectance in neonates.**
  Author(s): Keefe DH, Folsom RC, Gorga MP, Vohr BR, Bulen JC, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 443-61.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059703

- **Identification of neonatal hearing impairment: hearing status at 8 to 12 months corrected age using a visual reinforcement audiometry protocol.**
  Author(s): Widen JE, Folsom RC, Cone-Wesson B, Carty L, Dunnell JJ, Koebsell K, Levi A, Mancl L, Ohlrich B, Trouba S, Gorga MP, Sininger YS, Vohr BR, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 471-87.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059705

- **Identification of neonatal hearing impairment: infants with hearing loss.**
  Author(s): Cone-Wesson B, Vohr BR, Sininger YS, Widen JE, Folsom RC, Gorga MP, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 488-507.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059706

- **Identification of neonatal hearing impairment: recruitment and follow-up.**
  Author(s): Folsom RC, Widen JE, Vohr BR, Cone-Wesson B, Gorga MP, Sininger YS, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 462-70.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059704

- **Identification of neonatal hearing impairment: summary and recommendations.**
  Author(s): Norton SJ, Gorga MP, Widen JE, Folsom RC, Sininger Y, Cone-Wesson B, Vohr BR, Fletcher KA.
  Source: Ear and Hearing. 2000 October; 21(5): 529-35.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059708

- **Improvement in early detection of congenital hearing impairment due to universal newborn hearing screening.**
  Author(s): Nekahm D, Weichbold V, Welzl-Mueller K, Hirst-Stadlmann A.
  Source: International Journal of Pediatric Otorhinolaryngology. 2001 May 31; 59(1): 23-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11376815

- **Incidence/prevalence of sensorineural hearing impairment in Thailand and Southeast Asia.**
  Author(s): Prasansuk S.
  Source: Audiology : Official Organ of the International Society of Audiology. 2000 July-August; 39(4): 207-11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10963442

- **Increased variation in mtDNA in patients with familial sensorineural hearing impairment.**
  Author(s): Lehtonen MS, Moilanen JS, Majamaa K.
  Source: Human Genetics. 2003 August; 113(3): 220-7. Epub 2003 June 12.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12802679

- **Is deafness a disease of poverty? The association between socio-economic deprivation and congenital hearing impairment.**
  Author(s): Kubba H, MacAndie C, Ritchie K, MacFarlane M.
  Source: International Journal of Audiology. 2004 March; 43(3): 123-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15198375

- **Is DFNA5 a susceptibility gene for age-related hearing impairment?**
  Author(s): Van Laer L, DeStefano AL, Myers RH, Flothmann K, Thys S, Fransen E, Gates GA, Van Camp G, Baldwin CT.
  Source: European Journal of Human Genetics : Ejhg. 2002 December; 10(12): 883-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12461698

- **Kabuki make-up syndrome and hearing impairment.**
  Author(s): Say B, McCutcheon L, Todd C, Hough JV.
  Source: Clinical Dysmorphology. 1993 January; 2(1): 68-70.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8298741

- **Language delay in infants associated with middle ear disease and mild, fluctuating hearing impairment.**
  Author(s): Friel-Patti S, Finitzo-Hieber T, Conti G, Brown KC.
  Source: Pediatr Infect Dis. 1982 March-April; 1(2): 104-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7177899

- **Late diagnosis of congenital hearing impairment in children: the parents' experiences and opinions.**
  Author(s): Magnuson M, Hergils L.
  Source: Patient Education and Counseling. 2000 October-November; 41(3): 285-94.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11042431

- **Late diagnosis of congenital sensorineural hearing impairment: why are detection methods failing?**
  Author(s): Robertson C, Aldridge S, Jarman F, Saunders K, Poulakis Z, Oberklaid F.
  Source: Archives of Disease in Childhood. 1995 January; 72(1): 11-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7717729

- **Late-onset auditory inactivity (deprivation) in persons with bilateral essentially symmetric and conductive hearing impairment.**
  Author(s): Dieroff HG.
  Source: Journal of the American Academy of Audiology. 1993 September; 4(5): 347-50.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8219302

- **Lead and minor hearing impairment.**
  Author(s): Schwartz J, Otto D.
  Source: Archives of Environmental Health. 1991 September-October; 46(5): 300-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1953038

- **Linguistic influences on the auditory processing of speech by children with normal hearing or hearing impairment.**
  Author(s): Jerger S, Elizondo R, Dinh T, Sanchez P, Chavira E.
  Source: Ear and Hearing. 1994 April; 15(2): 138-60.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8020647

- **Living with a hearing impairment - a case study.**
  Author(s): Cowl B.
  Source: N Z Nurs J. 1983 August; 76(8): 3-5. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=6578467

- **Localization of a novel autosomal recessive non-syndromic hearing impairment locus (DFNB38) to 6q26-q27 in a consanguineous kindred from Pakistan.**
  Author(s): Ansar M, Ramzan M, Pham TL, Yan K, Jamal SM, Haque S, Ahmad W, Leal SM.
  Source: Human Heredity. 2003; 55(1): 71-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12890929

- **Localization of the gene (or genes) for a syndrome with X-linked mental retardation, ataxia, weakness, hearing impairment, loss of vision and a fatal course in early childhood.**
  Author(s): Kremer H, Hamel BC, van den Helm B, Arts WF, de Wijs IJ, Sistermans EA, Ropers HH, Mariman EC.
  Source: Human Genetics. 1996 November; 98(5): 513-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8882866

- **Longitudinal Study of hearing loss in childhood. Relationship between hearing impairment, poor learning and family background.**
  Author(s): Kaaijk CK.
  Source: Audiology : Official Organ of the International Society of Audiology. 1977 March-April; 16(2): 132-45.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=849208

- **Long-term sequelae of hearing impairment in congenital hypothyroidism.**
  Author(s): Rovet J, Walker W, Bliss B, Buchanan L, Ehrlich R.
  Source: The Journal of Pediatrics. 1996 June; 128(6): 776-83.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8648536

- **Loudness recruitment in abrupt drop sensorineural hearing impairment.**
  Author(s): Young IM, Lowry LD.
  Source: J Aud Res. 1982 October; 22(4): 249-58.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7188206

- **Maternally inherited hearing impairment in a family with the mitochondrial DNA A7445G mutation.**
  Author(s): Hutchin TP, Lench NJ, Arbuzova S, Markham AF, Mueller RF.
  Source: European Journal of Human Genetics : Ejhg. 2001 January; 9(1): 56-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11175301

- **Maternally inherited hearing impairment.**
  Author(s): Van Camp G, Smith RJ.
  Source: Clinical Genetics. 2000 June; 57(6): 409-14. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10905659

- **Maternally inherited non-syndromic hearing impairment in a Spanish family with the 7510T>C mutation in the mitochondrial tRNA(Ser(UCN)) gene.**
  Author(s): del Castillo FJ, Villamar M, Moreno-Pelayo MA, Almela JJ, Morera C, Adiego I, Moreno F, del Castillo I.
  Source: Journal of Medical Genetics. 2002 December; 39(12): E82.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12471220

- **Measuring the prevalence of permanent childhood hearing impairment.**
  Author(s): Russ S.
  Source: Bmj (Clinical Research Ed.). 2001 September 8; 323(7312): 525-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11546682

- **Medical and surgical perspectives: issues in treatment and management of severe and profound hearing impairment.**
  Author(s): Cohen NL.
  Source: Ann Otol Rhinol Laryngol Suppl. 1995 September; 166: 149-50. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7668611

- **Medical aspects of ageing in a population with intellectual disability: II. Hearing impairment.**
  Author(s): Evenhuis HM.
  Source: Journal of Intellectual Disability Research : Jidr. 1995 February; 39 (Pt 1): 27-33.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7719058

- **Middle ear disease and hearing impairment in northern Tanzania. A prevalence study of schoolchildren in the Moshi and Monduli districts.**
  Author(s): Bastos I, Mallya J, Ingvarsson L, Reimer A, Andreasson L.
  Source: International Journal of Pediatric Otorhinolaryngology. 1995 April; 32(1): 1-12.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7607816

- **Mild hearing impairment can reduce verbal memory performance in a healthy adult population.**
  Author(s): van Boxtel MP, van Beijsterveldt CE, Houx PJ, Anteunis LJ, Metsemakers JF, Jolles J.
  Source: J Clin Exp Neuropsychol. 2000 February; 22(1): 147-54.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10649553

- **Mismatch between aspects of hearing impairment and hearing disability/handicap in adult/elderly Cantonese speakers: some hypotheses concerning cultural and linguistic influences.**
  Author(s): Doyle J, Wong LL.
  Source: Journal of the American Academy of Audiology. 1996 December; 7(6): 442-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8972445

- **Molecular diagnosis of hereditary hearing impairment.**
  Author(s): Kremer H, Hoefsloot LH.
  Source: Advances in Oto-Rhino-Laryngology. 2002; 61: 11-27. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12408058

- **Molecular genetics applied to clinical practice: the Cx26 hearing impairment.**
  Author(s): Orzan E, Polli R, Martella M, Vinanzi C, Leonardi M, Murgia A.
  Source: British Journal of Audiology. 1999 October; 33(5): 291-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10890143

- **Molecular genetics of hearing impairment due to mutations in gap junction genes encoding beta connexins.**
  Author(s): Rabionet R, Gasparini P, Estivill X.
  Source: Human Mutation. 2000 September; 16(3): 190-202. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10980526

- **Morphological changes of stria vascularis in congenital hearing impairment due to membranous labyrinth underdevelopment.**
  Author(s): Subotic R, Handzccuk J, Cuk V.
  Source: Acta Oto-Laryngologica. 1997 July; 117(4): 513-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9288205

- **Multicenter audiometric results with the Vibrant Soundbridge, a semi-implantable hearing device for sensorineural hearing impairment.**
  Author(s): Snik AF, Mylanus EA, Cremers CW, Dillier N, Fisch U, Gnadeberg D, Lenarz T, Mazolli M, Babighian G, Uziel AS, Cooper HR, O'Connor AF, Fraysse B, Charachon R, Shehata-Dieler WE.
  Source: Otolaryngologic Clinics of North America. 2001 April; 34(2): 373-88.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11382576

- **Multiplicative effect of smoking and age on hearing impairment.**
  Author(s): Noorhassim I, Rampal KG.
  Source: American Journal of Otolaryngology. 1998 July-August; 19(4): 240-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9692632

- **Multiresolutional modification of speech signals for listeners with hearing impairment.**
  Author(s): Erogul O, Karagoz I.
  Source: Journal of Rehabilitation Research and Development. 1999 July; 36(3): 230-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10659806

- **Mutation analysis of Connexin 31 (GJB3) in sporadic non-syndromic hearing impairment.**
  Author(s): Mhatre AN, Weld E, Lalwani AK.
  Source: Clinical Genetics. 2003 February; 63(2): 154-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12630965

- **Mutational spectrum of the WFS1 gene in Wolfram syndrome, nonsyndromic hearing impairment, diabetes mellitus, and psychiatric disease.**
  Author(s): Cryns K, Sivakumaran TA, Van den Ouweland JM, Pennings RJ, Cremers CW, Flothmann K, Young TL, Smith RJ, Lesperance MM, Van Camp G.
  Source: Human Mutation. 2003 October; 22(4): 275-87. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12955714

- **Mutations in the gene encoding gap junction protein beta-3 associated with autosomal dominant hearing impairment.**
  Author(s): Xia JH, Liu CY, Tang BS, Pan Q, Huang L, Dai HP, Zhang BR, Xie W, Hu DX, Zheng D, Shi XL, Wang DA, Xia K, Yu KP, Liao XD, Feng Y, Yang YF, Xiao JY, Xie DH, Huang JZ.
  Source: Nature Genetics. 1998 December; 20(4): 370-3. Erratum In: Nat Genet 1999 February; 21(2): 241.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9843210

- **Mutations in the human alpha-tectorin gene cause autosomal dominant non-syndromic hearing impairment.**
  Author(s): Verhoeven K, Van Laer L, Kirschhofer K, Legan PK, Hughes DC, Schatteman I, Verstreken M, Van Hauwe P, Coucke P, Chen A, Smith RJ, Somers T, Offeciers FE, Van de Heyning P, Richardson GP, Wachtler F, Kimberling WJ, Willems PJ, Govaerts PJ, Van Camp G.
  Source: Nature Genetics. 1998 May; 19(1): 60-2. Erratum In: Nat Genet 1999 April; 21(4): 449.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9590290

- **Nasal and hearing impairment: are they linked?**
  Author(s): Salvinelli F, Casale M, Trivelli M, Greco F.
  Source: Medical Hypotheses. 2002 February; 58(2): 141-3. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11812191

- **Negative consequences of hearing impairment in old age: a longitudinal analysis.**
  Author(s): Strawbridge WJ, Wallhagen MI, Shema SJ, Kaplan GA.
  Source: The Gerontologist. 2000 June; 40(3): 320-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10853526

- **Neonatal hearing impairment complicated by neonatal pneumonia. Application of auditory evoked potentials in neonatology.**
  Author(s): Wu CY, Qi YS, Zhang SS, Lu JZ.
  Source: Chinese Medical Journal. 1993 April; 106(4): 292-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8325157

- **Neonatal screening for hearing impairment.**
  Author(s): Grote JJ.
  Source: Lancet. 2000 February 12; 355(9203): 513-4. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10682997

- **Neonatal screening for hearing impairment.**
  Author(s): Watkin PM.
  Source: Seminars in Neonatology : Sn. 2001 December; 6(6): 501-9. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12014891

- **Neonatal screening for hearing impairment.**
  Author(s): Kennedy CR.
  Source: Archives of Disease in Childhood. 2000 November; 83(5): 377-83. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11040140

- **Nerve growth factor serum level is reduced in patients with sensorineural hearing impairment: possible clinical implications.**
  Author(s): Salvinelli F, Casale M, Greco F, Trivelli M, Di Peco V, Amendola T, Antonelli A, Stampachiacchiere B, Aloe L.
  Source: J Biol Regul Homeost Agents. 2002 July-September; 16(3): 176-80.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12456015

- **Neuro-otologic findings in a case of superficial siderosis with bilateral hearing impairment.**
  Author(s): Yamana T, Suzuki M, Kitano H.
  Source: The Journal of Otolaryngology. 2001 June; 30(3): 187-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11771051

- **New mental retardation syndrome with hearing impairment, distinct facial appearance, and skeletal anomalies.**
  Author(s): Finucane B, Kurtz MB, Scott CI Jr.
  Source: American Journal of Medical Genetics. 1992 July 15; 43(5): 844-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1642273

- **New speech-in-noise test in different types of hearing impairment.**
  Author(s): Holma T, Laitakari K, Sorri M, Winblad I.
  Source: Acta Otolaryngol Suppl. 1997; 529: 71-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9288273

- **Noise and occupational hearing impairment.**
  Author(s): Lipscomb DM.
  Source: Ear, Nose, & Throat Journal. 1980 June; 59(6): 243-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7398541

- **Noise exposure and hearing impairment in the shipbuilding industry.**
  Author(s): Nilsson R, Liden G, Sanden A.
  Source: Scandinavian Audiology. 1977; 6(2): 59-68.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=929079

- **Noise-induced hearing impairment and health problems of the industrial workers.**
  Author(s): Lucita M.
  Source: The Nursing Journal of India. 1991 January; 82(1): 23-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1749718

- **Nonmuscle myosin heavy-chain gene MYH14 is expressed in cochlea and mutated in patients affected by autosomal dominant hearing impairment (DFNA4).**
  Author(s): Donaudy F, Snoeckx R, Pfister M, Zenner HP, Blin N, Di Stazio M, Ferrara A, Lanzara C, Ficarella R, Declau F, Pusch CM, Nurnberg P, Melchionda S, Zelante L, Ballana E, Estivill X, Van Camp G, Gasparini P, Savoia A.
  Source: American Journal of Human Genetics. 2004 April; 74(4): 770-6. Epub 2004 March 10.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15015131

- **Non-syndromal autosomal dominant hearing impairment: ongoing phenotypical characterization of genotypes.**
  Author(s): Bom SJ, Kunst HP, Huygen PL, Cremers FP, Cremers CW.
  Source: British Journal of Audiology. 1999 October; 33(5): 335-48.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10890148

- **Non-syndromic autosomal dominant progressive non-specific mid-frequency sensorineural hearing impairment with childhood to late adolescence onset (DFNA21).**
  Author(s): Kunst H, Marres H, Huygen P, van Duijnhoven G, Krebsova A, van der Velde S, Reis A, Cremers F, Cremers C.
  Source: Clinical Otolaryngology and Allied Sciences. 2000 February; 25(1): 45-54.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10764236

- **Nonsyndromic hearing impairment is associated with a mutation in DFNA5.**
  Author(s): Van Laer L, Huizing EH, Verstreken M, van Zuijlen D, Wauters JG, Bossuyt PJ, Van de Heyning P, McGuirt WT, Smith RJ, Willems PJ, Legan PK, Richardson GP, Van Camp G.
  Source: Nature Genetics. 1998 October; 20(2): 194-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9771715

- **Non-syndromic hearing impairment: gene linkage and cloning.**
  Author(s): Smith RJ, Van Camp G.
  Source: International Journal of Pediatric Otorhinolaryngology. 1999 October 5; 49 Suppl 1: S159-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10577797

- **Nonsyndromic hearing impairment: unparalleled heterogeneity.**
  Author(s): Van Camp G, Willems PJ, Smith RJ.
  Source: American Journal of Human Genetics. 1997 April; 60(4): 758-64. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9106521

- **Novel word learning in children with hearing impairment.**
  Author(s): Gilbertson M, Kamhi AG.
  Source: Journal of Speech and Hearing Research. 1995 June; 38(3): 630-42.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7674656

- **Occupational hearing impairment in pig breeders.**
  Author(s): Kristensen S, Gimsing S.
  Source: Scandinavian Audiology. 1988; 17(3): 191-2.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3206186

- **Offenders in a silent world: hearing impairment and deafness in relation to criminality, incompetence, and insanity.**
  Author(s): Harry B, Dietz PE.
  Source: Bull Am Acad Psychiatry Law. 1985; 13(1): 85-96. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3995191

- **Office aid to diagnosis of severe hearing impairment: parent interview valuable in early detection.**
  Author(s): Jones MC.
  Source: Clinical Pediatrics. 1970 June; 9(6): 338-41.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=5419443

- **Old theme and new reflections: hearing impairment associated with endolymphatic hydrops.**
  Author(s): Horner KC.
  Source: Hearing Research. 1991 March; 52(1): 147-56. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2061203

- **On criteria for hearing impairment in children.**
  Author(s): Parving A, Christensen B.
  Source: International Journal of Pediatric Otorhinolaryngology. 1992 July; 24(1): 1-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1399298

- **On objective criteria for hearing impairment and hearing disability.**
  Author(s): Parving A, Ostri B.
  Source: Scandinavian Audiology. 1983; 12(3): 165-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=6648314

- **One simple solution to hearing impairment.**
  Author(s): Mahoney DF.
  Source: Geriatric Nursing (New York, N.Y.). 1987 September-October; 8(5): 242-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3666567

- **One-channel and multichannel digitally programmable hearing aids in children with hearing impairment.**
  Author(s): Zorowka PG, Lippert KL.
  Source: Ann Otol Rhinol Laryngol Suppl. 1995 September; 166: 159-62.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7668615

- **One-third of term babies after perinatal hypoxia-ischaemia have transient hearing impairment: dynamic change in hearing threshold during the neonatal period.**
  Author(s): Jiang ZD, Wang J, Brosi DM, Shao XM, Wilkinson AR.
  Source: Acta Paediatrica (Oslo, Norway : 1992). 2004 January; 93(1): 82-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14989445

- **Onset overmasking of a brief amplitude increment in a pure tone and sensorineural hearing impairment.**
  Author(s): Cazals Y, Chays A, Magnan J.
  Source: Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2001 May; 22(3): 356-62.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11347639

- **Open-set word identification by an adult with profound hearing impairment: integration of touch, aided hearing, and speechreading.**
  Author(s): Lynch MP, Eilers RE, Pero PJ.
  Source: Journal of Speech and Hearing Research. 1992 April; 35(2): 443-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1533432

- **Otitis media with effusion in children with congenital or early-onset hearing impairment.**
  Author(s): Vartiainen E.
  Source: The Journal of Otolaryngology. 2000 August; 29(4): 221-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11003073

- **Otoacoustic emissions as a screening test for hearing impairment in children recovering from acute bacterial meningitis.**
  Author(s): Richardson MP, Williamson TJ, Reid A, Tarlow MJ, Rudd PT.
  Source: Pediatrics. 1998 December; 102(6): 1364-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9832570

- **Otoacoustic emissions as a screening test for hearing impairment in children.**
  Author(s): Richardson MP, Williamson TJ, Lenton SW, Tarlow MJ, Rudd PT.
  Source: Archives of Disease in Childhood. 1995 April; 72(4): 294-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7763058

- **Otoacoustic emissions: a new method to diagnose hearing impairment in children.**
  Author(s): Zorowka PG.
  Source: European Journal of Pediatrics. 1993 August; 152(8): 626-34. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8404964

- **Otolaryngological prophylaxis of the newborn through the early identification of hearing impairment and its longitudinal follow-up.**
  Author(s): Simonovic M.
  Source: International Journal of Pediatric Otorhinolaryngology. 1980 February; 1(4): 285-99.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7451030

- **Perioperative hearing impairment.**
  Author(s): Sprung J, Bourke DL, Contreras MG, Warner ME, Findlay J.
  Source: Anesthesiology. 2003 January; 98(1): 241-57. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12503003

- **Phenotypic and molecular assessment of seven patients with 6p25 deletion syndrome: relevance to ocular dysgenesis and hearing impairment.**
  Author(s): Gould DB, Jaafar MS, Addison MK, Munier F, Ritch R, MacDonald IM, Walter MA.
  Source: Bmc Medical Genetics [electronic Resource]. 2004 June 25; 5(1): 17. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15219231

- **Phenotypic characterization of hereditary hearing impairment linked to DFNA25.**
  Author(s): Thirlwall AS, Brown DJ, McMillan PM, Barker SE, Lesperance MM.
  Source: Archives of Otolaryngology--Head & Neck Surgery. 2003 August; 129(8): 830-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12925340

- **Phonological deterioration in adults with an acquired severe hearing impairment.**
  Author(s): Andersson U, Lyxell B.
  Source: Scand Audiol Suppl. 1998; 49: 93-100.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10209783

- **Phonological deterioration in adults with an acquired severe hearing impairment: a deterioration in long-term memory or working memory?**
  Author(s): Andersson U, Lyxell B.
  Source: Scandinavian Audiology. 1999; 28(4): 241-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10572969

- **Physical and mental correlates of hearing impairment in the elderly in Japan.**
  Author(s): Naramura H, Nakanishi N, Tatara K, Ishiyama M, Shiraishi H, Yamamoto A.
  Source: Audiology : Official Organ of the International Society of Audiology. 1999 January-February; 38(1): 24-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10052833

- **Pineal region tumor manifesting initially as hearing impairment.**
  Author(s): Islam MS, Asano K, Tabata H, Ohkuma H, Suzuki S.
  Source: Neurol Med Chir (Tokyo). 2002 July; 42(7): 301-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12160310

- **Prevalence and characteristics of children with serious hearing impairment in metropolitan Atlanta, 1991-1993.**
  Author(s): Van Naarden K, Decoufle P, Caldwell K.
  Source: Pediatrics. 1999 March; 103(3): 570-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10049958

- **Prevalence and etiology of unilateral sensorineural hearing impairment in a Finnish childhood population.**
  Author(s): Vartiainen E, Karjalainen S.
  Source: International Journal of Pediatric Otorhinolaryngology. 1998 May 15; 43(3): 253-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9663947

- **Prevalence of hearing impairment and subjective hearing problems in a rural Danish population aged 31-50 years.**
  Author(s): Karlsmose B, Lauritzen T, Parving A.
  Source: British Journal of Audiology. 1999 December; 33(6): 395-402.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10656600

- **Prevalence of hearing impairment in a population in Sweden.**
  Author(s): Johansson MS, Arlinger SD.
  Source: International Journal of Audiology. 2003 January; 42(1): 18-28.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12564512

- **Prevalence of hearing impairment in siblings of deaf children.**
  Author(s): O'Hara J, Khan SW, Inam N, Chugtai F, Tariq MA, Quraishi MS.
  Source: J Pak Med Assoc. 2002 February; 52(2): 73-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12073715

- **Prevalence of hereditary hearing impairment in adults.**
  Author(s): Sakihara Y, Christensen B, Parving A.
  Source: Scandinavian Audiology. 1999; 28(1): 39-46.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10207955

- **Prevalence of permanent childhood hearing impairment. Family friendly hearing services are needed in the United Kingdom.**
  Author(s): Amis S, Byrne D.
  Source: Bmj (Clinical Research Ed.). 2002 January 19; 324(7330): 172.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11822343

- **Prevalence of permanent childhood hearing impairment. Pilot programme in Australia shows promising results.**
  Author(s): Bailey HD, Bower C, Gifkins K, Coates HL.
  Source: Bmj (Clinical Research Ed.). 2002 January 19; 324(7330): 172.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11822344

- **Prevalence of visual and hearing impairment in a Dutch institutionalized population with intellectual disability.**
  Author(s): Evenhuis HM, Theunissen M, Denkers I, Verschuure H, Kemme H.
  Source: Journal of Intellectual Disability Research : Jidr. 2001 October; 45(Pt 5): 457-64.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11679051

- **Prevalence rates of hearing impairment and comorbid conditions in older people: the Veneto Study.**
  Author(s): Maggi S, Minicuci N, Martini A, Langlois J, Siviero P, Pavan M, Enzi G.
  Source: Journal of the American Geriatrics Society. 1998 September; 46(9): 1069-74.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9736097

- **Progressive sensorineural hearing impairment in professional fishery divers.**
  Author(s): Haraguchi H, Ohgaki T, Okubo J, Noguchi Y, Sugimoto T, Komatsuzaki A.
  Source: The Annals of Otology, Rhinology, and Laryngology. 1999 December; 108(12): 1165-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10605922

- **Progressive sensorineural hearing impairment in systemic vasculitides.**
  Author(s): Berrettini S, Ferri C, Ravecca F, LaCivita L, Bruschini L, Riente L, Mosca M, Sellari-Franceschini S.
  Source: Seminars in Arthritis and Rheumatism. 1998 April; 27(5): 301-18.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9572712

- **Progressive unilateral sensorineural hearing impairment, unilateral large vestibular aqueduct, and mid frequency peaked audiometric configuration.**
  Author(s): Arjmand EM, Webber A.
  Source: Otolaryngology and Head and Neck Surgery. 2003 September; 129(3): 284-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12958582

- **Quality-of-life changes and hearing impairment. A randomized trial.**
  Author(s): Mulrow CD, Aguilar C, Endicott JE, Tuley MR, Velez R, Charlip WS, Rhodes MC, Hill JA, DeNino LA.
  Source: Annals of Internal Medicine. 1990 August 1; 113(3): 188-94.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2197909

- **Radiation-induced hearing impairment in patients treated for malignant parotid tumor.**
  Author(s): Chen WC, Liao CT, Tsai HC, Yeh JY, Wang CC, Tang SG, Hong JH.
  Source: The Annals of Otology, Rhinology, and Laryngology. 1999 December; 108(12): 1159-64.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10605921

- **Radiation-induced hearing impairment--a pilot study in patients treated for malignant parotid tumours.**
  Author(s): Kirkbride P, Liu FF, Wax MK.
  Source: The British Journal of Radiology. 1992 September; 65(777): 833-5.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1393428

- **Re: Special articles: sensory aids for hearing impairment.**
  Author(s): Hecox KE.
  Source: Journal of Rehabilitation Research and Development. 1988 Fall; 25(4): 83.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3193374

- **Recognizing delayed language development in children with hidden hearing impairment.**
  Author(s): Hixson PH.
  Source: Pediatric Annals. 1980 January; 9(1): 55-60.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7367051

- **Refined localization and two additional linked families for the DFNA10 locus for nonsyndromic hearing impairment.**
  Author(s): Verhoeven K, Fagerheim T, Prasad S, Wayne S, De Clau F, Balemans W, Verstreken M, Schatteman I, Solem B, Van de Heyning P, Tranebjarg L, Smith RJ, Van Camp G.
  Source: Human Genetics. 2000 July; 107(1): 7-11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10982027

- **Rehabilitation for high-frequency sensorineural hearing impairment in adults with the symphonix vibrant soundbridge: a comparative study.**
  Author(s): Uziel A, Mondain M, Hagen P, Dejean F, Doucet G.
  Source: Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology. 2003 September; 24(5): 775-83.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14501456

- **Rehabilitation of children and adults with hearing impairments. Therapy for hearing-impaired adults.**
  Author(s): Damen M.
  Source: Can Nurse. 1966 August; 62(8): 40-1. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=5939166

- **Rehabilitation of children and adults with hearing impairments. Therapy for hearing-impaired children.**
  Author(s): Vines T.
  Source: Can Nurse. 1966 August; 62(8): 42-4. No Abstract Available.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=5939168

- **Relationship of hearing impairment to dementia and cognitive dysfunction in older adults.**
  Author(s): Uhlmann RF, Larson EB, Rees TS, Koepsell TD, Duckert LG.
  Source: Jama : the Journal of the American Medical Association. 1989 April 7; 261(13): 1916-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2926927

- **Relationship of serum bilirubin levels and hearing impairment in newborn infants.**
  Author(s): De Vries LS, Lary S, Whitelaw AG, Dubowitz LM.
  Source: Early Human Development. 1987 September; 15(5): 269-77.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3678119

- **Relative and attributable risks for moderate to profound bilateral sensorineural hearing impairment associated with lower birth weight in children 3 to 10 years old.**
  Author(s): Van Naarden K, Decoufle P.
  Source: Pediatrics. 1999 October; 104(4 Pt 1): 905-10.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10506233

- **Relevant demographic factors and hearing impairment in Saudi children: epidemiological study.**
  Author(s): Bafaqeeh SA, Zakzouk SM, al Muhaimeid H, Essa A.
  Source: The Journal of Laryngology and Otology. 1994 April; 108(4): 294-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8182312

- **Reversible sensorineural hearing impairment induced by a carotid body tumor.**
  Author(s): Temmel AF, Kierner AC, Muhm M, Gstoettner W.
  Source: European Archives of Oto-Rhino-Laryngology : Official Journal of the European Federation of Oto-Rhino-Laryngological Societies (Eufos) : Affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery. 1999; 256(9): 466-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10552228

- **Risk factors related to hearing impairment and screening with the Crib-O-Gram.**
  Author(s): Fujita M, Koike Y.
  Source: Auris, Nasus, Larynx. 1986; 13(3): 129-38.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3593126

- **Risk management of asymmetrical hearing impairment in an armed forces population.**
  Author(s): Caldera SR, Pearson CR.
  Source: The Journal of Laryngology and Otology. 2000 May; 114(5): 345-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10912262

- **Risk of hearing impairment in pediatric liver transplant recipients: a single center study.**
  Author(s): Bucuvalas JC, O'Connor A, Buschle K, Krug S, Ryckman FC, Atherton H, Alonso MP, Balistreri WF.
  Source: Pediatric Transplantation. 2003 August; 7(4): 265-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12890003

- **Role of free oxygen radicals in noise-related hearing impairment.**
  Author(s): Kaygusuz I, Ozturk A, Ustundag B, Yalcin S.
  Source: Hearing Research. 2001 December; 162(1-2): 43-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11707350

- **Science, medicine, and the future: New interventions in hearing impairment.**
  Author(s): Steel KP.
  Source: Bmj (Clinical Research Ed.). 2000 March 4; 320(7235): 622-5. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10698884

- **Screening for and assessment of infant hearing impairment.**
  Author(s): Hall JW 3rd.
  Source: Journal of Perinatology : Official Journal of the California Perinatal Association. 2000 December; 20(8 Pt 2): S113-21.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11190690

- **Screening for congenital hearing impairment: time for a change.**
  Author(s): Bamford J, Davis A, Stevens J.
  Source: Archives of Disease in Childhood. Fetal and Neonatal Edition. 1998 July; 79(1): F73-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9797632

- **Screening for hearing impairment in a cohort of elderly patients attending a hospital geriatric medicine service.**
  Author(s): Wu HY, Chin JJ, Tong HM.
  Source: Singapore Med J. 2004 February; 45(2): 79-84.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14985847

- **Screening for hearing impairment in hospitalised elderly.**
  Author(s): Lim JK, Yap KB.
  Source: Ann Acad Med Singapore. 2000 March; 29(2): 237-41.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10895346

- **Screening of families with autosomal recessive non-syndromic hearing impairment (ARNSHI) for mutations in GJB2 gene: Indian scenario.**
  Author(s): Maheshwari M, Vijaya R, Ghosh M, Shastri S, Kabra M, Menon PS.
  Source: American Journal of Medical Genetics. 2003 July 15; 120A(2): 180-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12833397

- **Screening of mitochondrial DNA mutations in subjects with non-syndromic familial hearing impairment in Taiwan.**
  Author(s): Chu SY, Chiang SC, Chien YH, Hwu WL.
  Source: Acta Paediatr Taiwan. 2002 November-December; 43(6): 330-3.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12632786

- **Second family with hearing impairment linked to 19q13 and refined DFNA4 localisation.**
  Author(s): Mirghomizadeh F, Bardtke B, Devoto M, Pfister M, Oeken J, Konig E, Vitale E, Riccio A, De Rienzo A, Zenner HP, Blin N.
  Source: European Journal of Human Genetics : Ejhg. 2002 February; 10(2): 95-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11938438

- **Selected resources for hereditary hearing impairment on the world wide web.**
  Author(s): Pfister M.
  Source: Ear and Hearing. 2003 August; 24(4): 349-50.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12923426

- **Self-reported hearing difficulty and hearing impairment in Japanese people living in a community.**
  Author(s): Okamoto M, Nakanishi N, Tatara K.
  Source: International Journal of Audiology. 2004 January; 43(1): 54-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14974628

- **Sensorineural hearing impairment non-syndromic, dominant DFNA11.**
  Author(s): Tamagawa Y, Kitamura K, Ishida T, Nishizawa M, Liu XZ, Walsh J, Steel KP, Brown SD.
  Source: Advances in Oto-Rhino-Laryngology. 2000; 56: 103-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10868221

- **Sensorineural hearing impairment, non-syndromic: DFNB5, 6, 7. Homozygosity mapping to localize genes causing autosomal recessive non-syndromic hearing loss.**
  Author(s): Fukushima K, Ueki Y, Smith RJ.
  Source: Advances in Oto-Rhino-Laryngology. 2000; 56: 152-7. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10868227

- **Sensorineural hearing impairment: non-syndromic, recessive DFNB2.**
  Author(s): Liu XZ, Brown SD.
  Source: Advances in Oto-Rhino-Laryngology. 2000; 56: 124-30. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10868224

- **Severe-profound hearing impairment and health-related quality of life among post-lingual deafened Swedish adults.**
  Author(s): Ringdahl A, Grimby A.
  Source: Scandinavian Audiology. 2000; 29(4): 266-75.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11195947

- **Sex-related hearing impairment in Wolfram syndrome patients identified by inactivating WFS1 mutations.**
  Author(s): Pennings RJ, Huygen PL, van den Ouweland JM, Cryns K, Dikkeschei LD, Van Camp G, Cremers CW.
  Source: Audiology & Neuro-Otology. 2004 January-February; 9(1): 51-62.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14676474

- **Skull base factors in relation to hearing impairment in cleft palate children.**
  Author(s): Carrie S, Sprigg A, Parker AJ.
  Source: The Cleft Palate-Craniofacial Journal : Official Publication of the American Cleft Palate-Craniofacial Association. 2000 March; 37(2): 166-71.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10749057

- **Social competence and behavioural problems in children with hearing impairment.**
  Author(s): Anderson G, Olsson E, Rydell AM, Larsen HC.
  Source: Audiology : Official Organ of the International Society of Audiology. 2000 March-April; 39(2): 88-92.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10882047

- **Spanish hearing impairment inventory for the elderly.**
  Author(s): Lopez-Vazquez M, Orozco JA, Jimenez G, Berruecos P.
  Source: International Journal of Audiology. 2002 June; 41(4): 221-30.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12154812

- **Speech recognition scores related to age and degree of hearing impairment in DFNA2/KCNQ4 and DFNA9/COCH.**
  Author(s): Bom SJ, De Leenheer EM, Lemaire FX, Kemperman MH, Verhagen WI, Marres HA, Kunst HP, Ensink RJ, Bosman AJ, Van Camp G, Cremers FP, Huygen PL, Cremers CW.
  Source: Archives of Otolaryngology--Head & Neck Surgery. 2001 September; 127(9): 1045-8.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11556850

- **Stimulus variability and spoken word recognition. II. The effects of age and hearing impairment.**
  Author(s): Sommers MS.
  Source: The Journal of the Acoustical Society of America. 1997 April; 101(4): 2278-88.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9104029

- **Temporary hearing impairment after general anesthesia--a case report.**
  Author(s): Chan YF, Hsing CH, Chen JY, Hsu CS, Yeh FC.
  Source: Acta Anaesthesiol Sin. 2000 March; 38(1): 37-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11000662

- **The association of hearing impairment and chronic diseases with psychosocial health status in older age.**
  Author(s): Kramer SE, Kapteyn TS, Kuik DJ, Deeg DJ.
  Source: Journal of Aging and Health. 2002 February; 14(1): 122-37.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11892756

- **The COCH gene: a frequent cause of hearing impairment and vestibular dysfunction?**
  Author(s): Fransen E, Van Camp G.
  Source: British Journal of Audiology. 1999 October; 33(5): 297-302.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10890144

- **The effect of mild hearing impairment on auditory processing tests.**
  Author(s): Neijenhuis K, Tschur H, Snik A.
  Source: Journal of the American Academy of Audiology. 2004 January; 15(1): 6-16.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15030098

- **The efficacy of early identification and intervention for children with hearing impairment.**
  Author(s): Downs MP, Yoshinaga-Itano C.
  Source: Pediatric Clinics of North America. 1999 February; 46(1): 79-87. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10079791

- **The epidemiology of hearing impairment in an Australian adult population.**
  Author(s): Wilson DH, Walsh PG, Sanchez L, Davis AC, Taylor AW, Tucker G, Meagher I.
  Source: International Journal of Epidemiology. 1999 April; 28(2): 247-52.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10342686

- **The impact of hearing impairment: a global health problem.**
  Author(s): Davis A, Hind S.
  Source: International Journal of Pediatric Otorhinolaryngology. 1999 October 5; 49 Suppl 1: S51-4.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10577775

- **The incidence of hearing impairment after successful treatment of neuroblastoma.**
  Author(s): Simon T, Hero B, Dupuis W, Selle B, Berthold F.
  Source: Klinische Padiatrie. 2002 July-August; 214(4): 149-52.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12165893

- **The influence of hearing impairment on preverbal emotional vocalizations of infants.**
  Author(s): Scheiner E, Hammerschmidt K, Jurgens U, Zwirner P.
  Source: Folia Phoniatrica Et Logopaedica : Official Organ of the International Association of Logopedics and Phoniatrics (Ialp). 2004 January-February; 56(1): 27-40.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14767158

- **The role of consonant-vowel amplitude ratio in the recognition of voiceless stop consonants by listeners with hearing impairment.**
  Author(s): Sammeth CA, Dorman MF, Stearns CJ.
  Source: Journal of Speech, Language, and Hearing Research : Jslhr. 1999 February; 42(1): 42-55.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10025542

- **The two faces of presbyacusis: hearing impairment and psychosocial consequences.**
  Author(s): Espmark AK, Rosenhall U, Erlandsson S, Steen B.
  Source: International Journal of Audiology. 2002 March; 41(2): 125-35.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12212858

- **The use of non-specialist personnel in providing a service for children disabled by hearing impairment.**
  Author(s): Wirz SL, Lichtig I.
  Source: Disability and Rehabilitation. 1998 May; 20(5): 189-94.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9622264

- **Two families with phenotypically different hereditary low frequency hearing impairment: longitudinal data and linkage analysis.**
  Author(s): Bille M, Munk-Nielsen L, Tranebjaerg L, Parving A.
  Source: Scandinavian Audiology. 2001; 30(4): 246-54.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11845993

- **Unilateral sensorineural hearing impairment in childhood: analysis of 31 consecutive cases.**
  Author(s): Kiese-Himmel C.
  Source: International Journal of Audiology. 2002 January; 41(1): 57-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12467371

- **Uniparental disomy of chromosome 13q causing homozygosity for the 35delG mutation in the gene encoding connexin26 (GJB2) results in prelingual hearing impairment in two unrelated Spanish patients.**
  Author(s): Alvarez A, del Castillo I, Pera A, Villamar M, Moreno-Pelayo MA, Rivera T, Solanellas J, Moreno F.
  Source: Journal of Medical Genetics. 2003 August; 40(8): 636-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12920081

- **Universal screening for infant hearing impairment.**
  Author(s): Gravel JS, Diefendorf AO, Matkin ND.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 957-9; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971030

- **Universal screening for infant hearing impairment.**
  Author(s): Stewart DL, Davis-Freeman S.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 956; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971028

- **Universal screening for infant hearing impairment.**
  Author(s): Northern JL.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 955; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971027

- **Universal screening for infant hearing impairment.**
  Author(s): Hayes D.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 954-5; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971026

- **Universal screening for infant hearing impairment.**
  Author(s): Dennis JM, Hall JW 3rd, Jacobson JT, Kileny PR, Ruth RA.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 954; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971025

- **Universal screening for infant hearing impairment. Executive Board of the Educational Audiology Association.**
  Author(s): Von Almen P, Allen L, Adkins T, Anderson K, Blake-Rahter T, English K, Johnson CD.
  Source: Pediatrics. 1994 December; 94(6 Pt 1): 957; Author Reply 959-63.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7971029

- **Universal screening for infant hearing impairment: simple, beneficial, and presently justified.**
  Author(s): White KR, Maxon AB.
  Source: International Journal of Pediatric Otorhinolaryngology. 1995 July; 32(3): 201-11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7665267

- **Use of assistive devices to address hearing impairment by older persons with disabilities.**
  Author(s): Tomita M, Mann WC, Welch TR.
  Source: International Journal of Rehabilitation Research. Internationale Zeitschrift Fur Rehabilitationsforschung. Revue Internationale De Recherches De Readaptation. 2001 December; 24(4): 279-89.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11775032

- **Vestibular findings associated with chronic noise induced hearing impairment.**
  Author(s): Shupak A, Bar-El E, Podoshin L, Spitzer O, Gordon CR, Ben-David J.
  Source: Acta Oto-Laryngologica. 1994 November; 114(6): 579-85.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=7879613

- **Whispered voice test for screening for hearing impairment in adults and children: systematic review.**
  Author(s): Pirozzo S, Papinczak T, Glasziou P.
  Source: Bmj (Clinical Research Ed.). 2003 October 25; 327(7421): 967. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14576249

- **WHO activities for prevention of deafness and hearing impairment in children.**
  Author(s): Smith AW.
  Source: Scand Audiol Suppl. 2001; (53): 93-100.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11409786

- **WHO and its role in the prevention of deafness and hearing impairment.**
  Author(s): Hinchcliffe R.
  Source: The Journal of Laryngology and Otology. 1997 August; 111(8): 699-701. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9327003

- **Whole blood viscosity and red cell filterability as factors in sensorineural hearing impairment in the elderly.**
  Author(s): Gatehouse S, Lowe GD.
  Source: Acta Otolaryngol Suppl. 1990; 476: 37-43.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=2087978

- **Working-memory capacity and phonological processing in deafened adults and individuals with a severe hearing impairment.**
  Author(s): Lyxell B, Andersson U, Borg E, Ohlsson IS.
  Source: International Journal of Audiology. 2003 July; 42 Suppl 1: S86-9. Review.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12918614

CHAPTER 2. NUTRITION AND HEARING IMPAIRMENT

Overview

In this chapter, we will show you how to find studies dedicated specifically to nutrition and hearing impairment.

Finding Nutrition Studies on Hearing Impairment

The National Institutes of Health's Office of Dietary Supplements (ODS) offers a searchable bibliographic database called the IBIDS (International Bibliographic Information on Dietary Supplements; National Institutes of Health, Building 31, Room 1B29, 31 Center Drive, MSC 2086, Bethesda, Maryland 20892-2086, Tel: 301-435-2920, Fax: 301-480-1845, E-mail: ods@nih.gov). The IBIDS contains over 460,000 scientific citations and summaries about dietary supplements and nutrition as well as references to published international, scientific literature on dietary supplements such as vitamins, minerals, and botanicals.[7] The IBIDS includes references and citations to both human and animal research studies.

As a service of the ODS, access to the IBIDS database is available free of charge at the following Web address: **http://ods.od.nih.gov/databases/ibids.html**. After entering the search area, you have three choices: (1) IBIDS Consumer Database, (2) Full IBIDS Database, or (3) Peer Reviewed Citations Only.

Now that you have selected a database, click on the "Advanced" tab. An advanced search allows you to retrieve up to 100 fully explained references in a comprehensive format. Type "hearing impairment" (or synonyms) into the search box, and click "Go." To narrow the search, you can also select the "Title" field.

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[7] Adapted from **http://ods.od.nih.gov**. IBIDS is produced by the Office of Dietary Supplements (ODS) at the National Institutes of Health to assist the public, healthcare providers, educators, and researchers in locating credible, scientific information on dietary supplements. IBIDS was developed and will be maintained through an interagency partnership with the Food and Nutrition Information Center of the National Agricultural Library, U.S. Department of Agriculture.

The following information is typical of that found when using the "Full IBIDS Database" to search for "hearing impairment" (or a synonym):

- **Age-related hearing impairment and B vitamin status.**
  Author(s): Department of Audiology, Bispebjerg Hospital H:S, Copenhagen, Denmark.
  Source: Berner, B Odum, L Parving, A Acta-Otolaryngol. 2000 August; 120(5): 633-7 0001-6489
- **Reversible hearing impairment induced by lithium in the guinea pig.**
  Author(s): INSERM Laboratoire d'Audiologie Experimentale, Bordeaux, France.
  Source: Horner, K C Huang, Z W Higuerie, D Cazals, Y Neuroreport. 1997 April 14; 8(6): 1341-5 0959-4965

Federal Resources on Nutrition

In addition to the IBIDS, the United States Department of Health and Human Services (HHS) and the United States Department of Agriculture (USDA) provide many sources of information on general nutrition and health. Recommended resources include:

- healthfinder®, HHS's gateway to health information, including diet and nutrition: **http://www.healthfinder.gov/scripts/SearchContext.asp?topic=238&page=0**
- The United States Department of Agriculture's Web site dedicated to nutrition information: **www.nutrition.gov**
- The Food and Drug Administration's Web site for federal food safety information: **www.foodsafety.gov**
- The National Action Plan on Overweight and Obesity sponsored by the United States Surgeon General: **http://www.surgeongeneral.gov/topics/obesity/**
- The Center for Food Safety and Applied Nutrition has an Internet site sponsored by the Food and Drug Administration and the Department of Health and Human Services: **http://vm.cfsan.fda.gov/**
- Center for Nutrition Policy and Promotion sponsored by the United States Department of Agriculture: **http://www.usda.gov/cnpp/**
- Food and Nutrition Information Center, National Agricultural Library sponsored by the United States Department of Agriculture: **http://www.nal.usda.gov/fnic/**
- Food and Nutrition Service sponsored by the United States Department of Agriculture: **http://www.fns.usda.gov/fns/**

Additional Web Resources

A number of additional Web sites offer encyclopedic information covering food and nutrition. The following is a representative sample:

- AOL: **http://search.aol.com/cat.adp?id=174&layer=&from=subcats**
- Family Village: **http://www.familyvillage.wisc.edu/med_nutrition.html**
- Google: **http://directory.google.com/Top/Health/Nutrition/**
- Healthnotes: **http://www.healthnotes.com/**

- Open Directory Project: **http://dmoz.org/Health/Nutrition/**
- Yahoo.com: **http://dir.yahoo.com/Health/Nutrition/**
- WebMD®Health: **http://my.webmd.com/nutrition**
- WholeHealthMD.com: **http://www.wholehealthmd.com/reflib/0,1529,00.html**

CHAPTER 3. ALTERNATIVE MEDICINE AND HEARING IMPAIRMENT

Overview

In this chapter, we will begin by introducing you to official information sources on complementary and alternative medicine (CAM) relating to hearing impairment. At the conclusion of this chapter, we will provide additional sources.

National Center for Complementary and Alternative Medicine

The National Center for Complementary and Alternative Medicine (NCCAM) of the National Institutes of Health (**http://nccam.nih.gov/**) has created a link to the National Library of Medicine's databases to facilitate research for articles that specifically relate to hearing impairment and complementary medicine. To search the database, go to the following Web site: **http://www.nlm.nih.gov/nccam/camonpubmed.html**. Select "CAM on PubMed." Enter "hearing impairment" (or synonyms) into the search box. Click "Go." The following references provide information on particular aspects of complementary and alternative medicine that are related to hearing impairment:

- **"Deaf hearing": unacknowledged detection of auditory stimuli in a patient with cerebral deafness.**
  Author(s): Garde MM, Cowey A.
  Source: Cortex. 2000 February; 36(1): 71-80.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10728898

- **A bone-anchored hearing aid for patients with pure sensorineural hearing impairment: a pilot study.**
  Author(s): Stenfelt S, Hakansson B, Jonsson R, Granstrom G.
  Source: Scandinavian Audiology. 2000; 29(3): 175-85.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10990016

- **A comparison of Tactaid II+ and Tactaid 7 use by adults with a profound hearing impairment.**
  Author(s): Galvin KL, Mavrias G, Moore A, Cowan RS, Blamey PJ, Clark GM.
  Source: Ear and Hearing. 1999 December; 20(6): 471-82.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10613385

- **Auditory filter nonlinearity in mild/moderate hearing impairment.**
  Author(s): Baker RJ, Rosen S.
  Source: The Journal of the Acoustical Society of America. 2002 March; 111(3): 1330-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11931310

- **Conductive hearing loss produces a reversible binaural hearing impairment.**
  Author(s): Moore DR, Hine JE, Jiang ZD, Matsuda H, Parsons CH, King AJ.
  Source: The Journal of Neuroscience : the Official Journal of the Society for Neuroscience. 1999 October 1; 19(19): 8704-11.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10493771

- **Enhanced activation of the auditory cortex in patients with inner-ear hearing impairment: a magnetoencephalographic study.**
  Author(s): Morita T, Naito Y, Nagamine T, Fujiki N, Shibasaki H, Ito J.
  Source: Clinical Neurophysiology : Official Journal of the International Federation of Clinical Neurophysiology. 2003 May; 114(5): 851-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12738430

- **HI-SIMv1.0--towards the virtual reality of hearing impairments.**
  Author(s): Korkko P, Huttunen K, Sorri M.
  Source: Scand Audiol Suppl. 2001; (52): 209-10.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11318471

- **Identification of neonatal hearing impairment: distortion product otoacoustic emissions during the perinatal period.**
  Author(s): Gorga MP, Norton SJ, Sininger YS, Cone-Wesson B, Folsom RC, Vohr BR, Widen JE, Neely ST.
  Source: Ear and Hearing. 2000 October; 21(5): 400-24.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059701

- **Identification of neonatal hearing impairment: evaluation of transient evoked otoacoustic emission, distortion product otoacoustic emission, and auditory brain stem response test performance.**
  Author(s): Norton SJ, Gorga MP, Widen JE, Folsom RC, Sininger Y, Cone-Wesson B, Vohr BR, Mascher K, Fletcher K.

Source: Ear and Hearing. 2000 October; 21(5): 508-28.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059707

- **Identification of neonatal hearing impairment: experimental protocol and database management.**
  Author(s): Harrison WA, Dunnell JJ, Mascher K, Fletcher K, Vohr BR, Gorga MP, Widen JE, Cone-Wesson B, Folsom RC, Sininger YS, Norton SJ.
  Source: Ear and Hearing. 2000 October; 21(5): 357-72.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059698

- **Identification of neonatal hearing impairment: transient evoked otoacoustic emissions during the perinatal period.**
  Author(s): Norton SJ, Gorga MP, Widen JE, Vohr BR, Folsom RC, Sininger YS, Cone-Wesson B, Fletcher KA.
  Source: Ear and Hearing. 2000 October; 21(5): 425-42.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11059702

- **Loss of Kv3.1 tonotopicity and alterations in cAMP response element-binding protein signaling in central auditory neurons of hearing impaired mice.**
  Author(s): von Hehn CA, Bhattacharjee A, Kaczmarek LK.
  Source: The Journal of Neuroscience : the Official Journal of the Society for Neuroscience. 2004 February 25; 24(8): 1936-40.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=14985434

- **Overshoot effects using Schroeder-phase harmonic maskers in listeners with normal hearing and with hearing impairment.**
  Author(s): Summers V.
  Source: Hearing Research. 2001 December; 162(1-2): 1-9.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11707346

- **Problems of hearing impaired children and suggested solutions.**
  Author(s): Prasad B.
  Source: Iccw News Bull. 1992 April-June; 40(2): 11-7.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12286292

- **The pattern of hearing impairment among schoolboys in an Institute for deaf subjects.**
  Author(s): Abolfotouh MA, Al-Ghamdi SA.
  Source: Saudi Med J. 2000 September; 21(9): 873-6.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11376367

- **The precedence effect for lateralization for the mild sensory neural hearing impaired.**
  Author(s): Theo Goverts S, Houtgast T, van Beek HH.

Source: Hearing Research. 2002 January; 163(1-2): 82-92.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11788202

- **The role of hearing aids in providing environmental feedback for the profoundly hearing impaired.**
  Author(s): Bhat G, Kakrani VA, Pratinnidhi AK.
  Source: Indian J Public Health. 2002 April-June; 46(2): 46-50.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12653001

- **Urocortin-deficient mice show hearing impairment and increased anxiety-like behavior.**
  Author(s): Vetter DE, Li C, Zhao L, Contarino A, Liberman MC, Smith GW, Marchuk Y, Koob GF, Heinemann SF, Vale W, Lee KF.
  Source: Nature Genetics. 2002 August; 31(4): 363-9. Epub 2002 July 01.
  http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=12091910

Additional Web Resources

A number of additional Web sites offer encyclopedic information covering CAM and related topics. The following is a representative sample:

- Alternative Medicine Foundation, Inc.: **http://www.herbmed.org/**
- AOL: **http://search.aol.com/cat.adp?id=169&layer=&from=subcats**
- Chinese Medicine: **http://www.newcenturynutrition.com/**
- drkoop.com®: **http://www.drkoop.com/InteractiveMedicine/IndexC.html**
- Family Village: **http://www.familyvillage.wisc.edu/med_altn.htm**
- Google: **http://directory.google.com/Top/Health/Alternative/**
- Healthnotes: **http://www.healthnotes.com/**
- MedWebPlus: **http://medwebplus.com/subject/Alternative_and_Complementary_Medicine**
- Open Directory Project: **http://dmoz.org/Health/Alternative/**
- HealthGate: **http://www.tnp.com/**
- WebMD®Health: **http://my.webmd.com/drugs_and_herbs**
- WholeHealthMD.com: **http://www.wholehealthmd.com/reflib/0,1529,00.html**
- Yahoo.com: **http://dir.yahoo.com/Health/Alternative_Medicine/**

The following is a specific Web list relating to hearing impairment; please note that any particular subject below may indicate either a therapeutic use, or a contraindication (potential danger), and does not reflect an official recommendation:

- **General Overview**

  Ménière's Disease
  Source: Healthnotes, Inc.; www.healthnotes.com

  Recurrent Ear Infections
  Source: Healthnotes, Inc.; www.healthnotes.com

  Rubella
  Source: Integrative Medicine Communications; www.drkoop.com

- **Alternative Therapy**

  Dance Therapy
  Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
  Hyperlink:
  http://www.wholehealthmd.com/refshelf/substances_view/0,1525,687,00.html

General References

A good place to find general background information on CAM is the National Library of Medicine. It has prepared within the MEDLINEplus system an information topic page dedicated to complementary and alternative medicine. To access this page, go to the MEDLINEplus site at **http://www.nlm.nih.gov/medlineplus/alternativemedicine.html**. This Web site provides a general overview of various topics and can lead to a number of general sources.

CHAPTER 4. DISSERTATIONS ON HEARING IMPAIRMENT

Overview

In this chapter, we will give you a bibliography on recent dissertations relating to hearing impairment. We will also provide you with information on how to use the Internet to stay current on dissertations. **IMPORTANT NOTE:** When following the search strategy described below, you may discover non-medical dissertations that use the generic term "hearing impairment" (or a synonym) in their titles. To accurately reflect the results that you might find while conducting research on hearing impairment, we have not necessarily excluded non-medical dissertations in this bibliography.

Dissertations on Hearing Impairment

ProQuest Digital Dissertations, the largest archive of academic dissertations available, is located at the following Web address: **http://wwwlib.umi.com/dissertations**. From this archive, we have compiled the following list covering dissertations devoted to hearing impairment. You will see that the information provided includes the dissertation's title, its author, and the institution with which the author is associated. The following covers recent dissertations found when using this search procedure:

- **A COMPARATIVE EVALUATIVE STUDY OF TWO MODELS FOR REHABILITATION OF THE HEARING IMPAIRED PERSONS IN EGYPT** by MOHAMED, MOHAMED MAHROUS, PHD from MICHIGAN STATE UNIVERSITY, 1982, 270 pages
  http://wwwlib.umi.com/dissertations/fullcit/8216571
- **A COMPARATIVE STUDY OF THE SIGNIFICANCE OF MINIMAL HEARING IMPAIRMENT AMONG THE 'LEARNING DISABLED'** by HUGHES, LARRY CALVIN, PHD from UNIVERSITY OF COLORADO AT BOULDER, 1980, 116 pages
  http://wwwlib.umi.com/dissertations/fullcit/8103103
- **A DESCRIPTION OF A SCHOOL CULTURE BY TEACHERS OF HEARING IMPAIRED CHILDREN** by UPCHURCH, JAMES ROY, JR., EDD from INDIANA UNIVERSITY, 1980, 151 pages
  http://wwwlib.umi.com/dissertations/fullcit/8016688

- **A STUDY OF THE RELATIONSHIP BETWEEN UNILATERAL HEARING IMPAIRMENT AND ACADEMIC ACHIEVEMENT** by BERNERO, RAYMOND JOSEPH, PHD from GALLAUDET UNIVERSITY, 1982, 189 pages
  http://wwwlib.umi.com/dissertations/fullcit/8226713
- **Acquired hearing impairment among older females with psychopathology** by Stein, Lindsay Marjorie, PhD from UNIVERSITY OF CINCINNATI, 1989, 231 pages
  http://wwwlib.umi.com/dissertations/fullcit/9003227
- **Acquired hearing impairment in older couple relationships: An exploration of couple resilience processes** by Yorgason, Jeremy Brenton, PhD from VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY, 2003, 158 pages
  http://wwwlib.umi.com/dissertations/fullcit/3082611
- **ACTIVITY PATTERNS OF HEARING IMPAIRED ELDERLY WOMEN** by MANZELLA, DIANE S., EDD from UNIVERSITY OF CALIFORNIA, LOS ANGELES, 1982, 123 pages
  http://wwwlib.umi.com/dissertations/fullcit/8306087
- **Association between perceptual learning modalities and high-frequency sensorineural hearing impairment in adult males** by Myers, Paula Joan, PhD from UNIVERSITY OF SOUTH FLORIDA, 2000, 261 pages
  http://wwwlib.umi.com/dissertations/fullcit/9968824
- **CIVIL TECHNOLOGY WORK SAMPLES FOR HEARING IMPAIRED STUDENTS** by ZWIERS, DUANE MARLO, EDD from UNIVERSITY OF MINNESOTA, 1986, 143 pages
  http://wwwlib.umi.com/dissertations/fullcit/8625866
- **EFFECTS OF MAINSTREAMING OF HEARING IMPAIRED HIGH SCHOOL STUDENTS' SELF-CONCEPT AND THEIR PERCEPTION OF HEARING PEOPLE** by NDURUMO, MICHAEL M., PHD from PEABODY COLLEGE FOR TEACHERS OF VANDERBILT UNIVERSITY, 1980, 158 pages
  http://wwwlib.umi.com/dissertations/fullcit/8105464
- **Impact of hearing impairment on caregiver-child interactions among Chinese families** by Yeh, Yu-Ling, PhD from THE UNIVERSITY OF TEXAS AT AUSTIN, 1997, 173 pages
  http://wwwlib.umi.com/dissertations/fullcit/9803072
- **INCREASING PEER INFORMATION ABOUT PROBLEMS RELATED TO SEVERE HEARING IMPAIRMENT (MAINSTREAMING, DEAFNESS)** by YOUDELMAN, KAREN SCHNEIER, EDD from COLUMBIA UNIVERSITY TEACHERS COLLEGE, 1984, 199 pages
  http://wwwlib.umi.com/dissertations/fullcit/8505408
- **TEACHERS' KNOWLEDGE OF THE RELATIONSHIP OF AUDITORY ACUITY AND HEARING IMPAIRMENT TO READING** by MARSHALL, EVELYN MYRTLE, PHD from THE UNIVERSITY OF MICHIGAN, 1982, 199 pages
  http://wwwlib.umi.com/dissertations/fullcit/8225003
- **THE EFFECTS OF VERBAL LANGUAGE DEFICIT ASSOCIATED WITH PROFOUND PRELINGUAL HEARING IMPAIRMENT ON CHILDREN'S REPRESENTATION OF SPACE** by SIMMONS, MARY PATRICIA, PHD from UNIVERSITY OF CALIFORNIA, LOS ANGELES, 1971, 110 pages
  http://wwwlib.umi.com/dissertations/fullcit/7213651

- **The emotional well-being of older siblings of children with a hearing impairment and older siblings of nondisabled children** by Sundaram, Renuka, PhD from UNIVERSITY OF CALIFORNIA, LOS ANGELES, 1997, 66 pages
  http://wwwlib.umi.com/dissertations/fullcit/9737345
- **THE INFLUENCE OF MILD TO MODERATE HEARING IMPAIRMENT AND DECREASED SOCIAL INTERACTION ON THE VERBAL COMMUNICATION BEHAVIOR OF ELDERLY WOMEN** by DOWNS, MARY BOSTON, PHD from UNIVERSITY OF MARYLAND COLLEGE PARK, 1979, 90 pages
  http://wwwlib.umi.com/dissertations/fullcit/8006758
- **The relation of hearing impairment to loneliness in an elderly population** by Forbes, Brian C; PhD from QUEEN'S UNIVERSITY AT KINGSTON (CANADA), 1984
  http://wwwlib.umi.com/dissertations/fullcit/NK65905
- **THE RELATIONSHIP BETWEEN HEARING IMPAIRMENT AND MOTOR PROFICIENCY IN SELECTED SCHOOL AGE CHILDREN** by SCHMIDT, SHARON JO, PHD from OREGON STATE UNIVERSITY, 1982, 118 pages
  http://wwwlib.umi.com/dissertations/fullcit/8201186

Keeping Current

Ask the medical librarian at your library if it has full and unlimited access to the *ProQuest Digital Dissertations* database. From the library, you should be able to do more complete searches via **http://wwwlib.umi.com/dissertations**.

CHAPTER 5. PATENTS ON HEARING IMPAIRMENT

Overview

Patents can be physical innovations (e.g. chemicals, pharmaceuticals, medical equipment) or processes (e.g. treatments or diagnostic procedures). The United States Patent and Trademark Office defines a patent as a grant of a property right to the inventor, issued by the Patent and Trademark Office.[8] Patents, therefore, are intellectual property. For the United States, the term of a new patent is 20 years from the date when the patent application was filed. If the inventor wishes to receive economic benefits, it is likely that the invention will become commercially available within 20 years of the initial filing. It is important to understand, therefore, that an inventor's patent does not indicate that a product or service is or will be commercially available. The patent implies only that the inventor has "the right to exclude others from making, using, offering for sale, or selling" the invention in the United States. While this relates to U.S. patents, similar rules govern foreign patents.

In this chapter, we show you how to locate information on patents and their inventors. If you find a patent that is particularly interesting to you, contact the inventor or the assignee for further information. **IMPORTANT NOTE:** When following the search strategy described below, you may discover non-medical patents that use the generic term "hearing impairment" (or a synonym) in their titles. To accurately reflect the results that you might find while conducting research on hearing impairment, we have not necessarily excluded non-medical patents in this bibliography.

Patents on Hearing Impairment

By performing a patent search focusing on hearing impairment, you can obtain information such as the title of the invention, the names of the inventor(s), the assignee(s) or the company that owns or controls the patent, a short abstract that summarizes the patent, and a few excerpts from the description of the patent. The abstract of a patent tends to be more technical in nature, while the description is often written for the public. Full patent descriptions contain much more information than is presented here (e.g. claims, references, figures, diagrams, etc.). We will tell you how to obtain this information later in the chapter.

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[8]Adapted from the United States Patent and Trademark Office:
http://www.uspto.gov/web/offices/pac/doc/general/whatis.htm.

The following is an example of the type of information that you can expect to obtain from a patent search on hearing impairment:

- **Alarm system for the hearing impaired**

  Inventor(s): Clayton; Jack A. (7444 Dexter Town Hall, Dexter, MI 48130)

  Assignee(s): none reported

  Patent Number: 4,777,474

  Date filed: March 26, 1987

  Abstract: The present invention is an alarm for the **hearing impaired.** A base station includes alarm receiving circuits for receipt of alarm signals. These alarm signals could be a telephone ringing signal, a smoke/fire alarm, a doorbell signal or the like. Upon detection of one of these alarms, a radio transmitter transmits a signal to a portable unit. The portable unit includes all parts of an ordinary hearing aid together with a radio receiver to receive the signal transmitted by the base station. In a first embodiment, the base station includes a tone generator or voice signal generator which generates a unique signal dependent upon the alarm received for modulation of the transmitted signal. The portable unit includes a demodulator for recovery of the original signal. Thus the unse can determine the type of alarm from the audio signal received. In a second embodiment, a tone generator in the portable unit is enabled by the transmitted signal from the base station.

  Excerpt(s): The field of the present invention is that of alarm systems and in particular alarm systems adapted for use by the **hearing impaired.** In a normal home environment a number of systems rely upon the use of audible alarms. Examples of such systems are the telephone, the doorbell and smoke or fire alarms. Such audible alarms are difficult to detect by **hearing impaired** persons, even when using an ordinary hearing aid. It has heretofore been proposed to provide visual signals for such alarm conditions. For example, a special device can be attached to the telephone in order to illuminate a lamp when the telephone rings. Such visual alarms are detectable by **hearing impaired** persons but do involve problems. The **hearing impaired** person is not always in an area where the visual alarm can be observed. In addition, even if the **hearing impaired** person is within the area where the visual alarm can be observed, momentary diversion of visual attention can prevent the **hearing impaired** person from detecting the alarm.

  Web site: http://www.delphion.com/details?pn=US04777474__

- **Alert system for hearing impaired persons**

  Inventor(s): Chutuk; Mitchell C. (1200 Harbor Dr. N. U15C, Oceanside, CA 92054)

  Assignee(s): none reported

  Patent Number: 5,251,253

  Date filed: November 1, 1991

  Abstract: An alert system and apparatus interrupts operation of sound producing entertainment devices and initiates an alerting device in connection with attracting the attention of **hearing impaired** persons. The present invention includes an input circuit connected to external actuators such as a doorbell, telephone, auxiliary alerting switches, etc., that externally and temporarily control the continuing operation of devices such as a radio, television, stereo, and actuates alert devices such as an audible

device or light. Operably disposed between the input actuators and the external alerting devices is an electronic system consisting of interruption networks, consisting of isolated input processors, isolated time delays, and electronic gated controller with amplification, and a switching network to control the external alerting devices. When applicable, circuit isolation and rectifier networks intercouple between the external actuator inputs and time delays.

Excerpt(s): The present invention relates to alerting devices and systems and more particularly to a novel electronic aid for attracting the attention of **hearing impaired** persons, permitting interruption of operation of external sound producing entertainment devices, as well as initiating operation of visual and aural alerts, wherein such interruption and initiation of circuit operations is actuated by external input devices. It has been the conventional practice for residents and occupants of a dwelling to enjoy a variety of sound producing entertainment devices such as television, stereo, radios and the like, which involves listening to such devices at a raised audio level. Usually, the level is such that the residents or occupants with normal hearing enjoying the entertainment will still detect or sense overriding sounds such as the ringing of the telephone or a doorbell. However, problems and difficulties are encountered when persons have impaired hearing such that during the enjoyment of the entertainment, such persons are at a high risk of missing incoming telephone calls or visitors ringing the doorbell. Also, when **hearing impaired** persons are at a location some distance from the ringing, such as in the backyard, or the entertainment devices are not in operation, they may be unable to hear either the doorbell or the telephone should one be actuated. Such persons are severely restricted in their enjoyment of such entertainment and outdoor activities, as well as indoors if the entertainment device is not in operation.

Web site: http://www.delphion.com/details?pn=US05251253__

- **Audio listening device for the hearing impaired**

  Inventor(s): Kang; Kyeong Ok (Daejeon, KR), Kang; Seong Hoon (Daejeon, KR)

  Assignee(s): Electronics and Telecommunications Research Institute (Daejeon, KR)

  Patent Number: 5,757,935

  Date filed: July 17, 1997

  Abstract: An audio listening device includes a circuit for amplifying sound source signals and a mechanism including a bone conduction vibrator transforming an output signal of the amplifying circuit into a vibration. A vibration source transforms the output of the amplifying circuit into a first magnetic field and vibration. A vibration generating unit generates a second magnetic field for the vibration source to vibrate upwards and downwards due to attraction and repulsion processes of the first and second magnetic fields. A damper is connected to the vibration source to arouse air conduction hearing due to the vibration of the vibration source. A vibration plate is connected to the vibration source to arouse a bone conduction hearing due to the vibration of the vibration source. A vibration transmission unit transmits the bone conduction hearing and air conduction hearing to the **hearing impaired.**

  Excerpt(s): The present invention relates to an audio listening device which enables the **hearing impaired** to appreciate music signals by transforming soundwaves into vibration, and more particularly to an audio listening device for the **hearing impaired** having a serious obstacle to the path of the air conduction lying between the outer ear and the middle ear, with which the **hearing impaired** can receive stereo sonic high

frequency signals above 200 Hz through bone conduction headphones using bone conduction hearing, and stereo sonic low frequency signals below 200 Hz through an existing spine vibration sheet using bone conduction hearing. An existing spine vibration device, composed of a vibration sheet, is devised for the non-impaired to receive low frequency signals by using the vibration of their spines transmitted from the spine vibration device, while they appreciate music signals by using air conduction hearing with the help of loudspeakers or headphones in their houses or cars. However, the **hearing impaired,** having a serious obstacle to the path of the air conduction lying between the outer ear and the middle ear, have only been able to appreciate a low frequency component of music signals by using the vibration of their spines because the soundwaves from loudspeakers or headphones rarely reach their sensorineural system.

Web site: http://www.delphion.com/details?pn=US05757935__

- **Audiometric testing, analyzing, and recording apparatus and method**

  Inventor(s): Besserman; Richard (4824 E. Crystal La., Scottsdale, AZ 85253)

  Assignee(s): none reported

  Patent Number: 4,284,847

  Date filed: February 8, 1980

  Abstract: An audiometric testing system containing a processor and programmable analog circuitry for controlling frequency and intensity of audiometric test tones communicates with a remote data processing system via a communications link. The remote data processing system stores prior audiometric records for a large number of subjects. Each day, the audiometric records of a number of selected persons are transmitted from the remote data processing system to a memory of the audiometric testing system in response to identification numbers entered by an operator. The audiometric responses of each person to patterns of sounds of varying frequencies and intensities are determined. The varying frequencies and intensities are determined by a bracketing subroutine of an algorithm stored in and executed by a processor of the audiometric testing system. A person's responses to such test tones are utilized by the bracketing subroutine to determine his threshold levels at the respective frequencies for each ear. The algorithm automatically computes the pure tone averages for each ear from the threshold levels at a plurality of predetermined frequencies. The algorithm also automatically computes the binaural **hearing impairment** based on test results from prior testing of the person. Any significant shift in threshold is determined by comparison with the prior test results. The audiometric testing system includes a printer which prints the persons' complete hearing test record, including relevant identifying information, present test results, pure tone averages, binaural **hearing impairment,** significant threshold shifts, and a recommended time for the next testing. After all persons have been tested for the day, their updated audiometric records are transmitted via the communications link to the remote data processing system.

  Excerpt(s): The invention relates to audiometric testing systems and methods. Manufacturing organizations are frequently confronted by problems relating to the harmful effects of industrial noise on hearing of employees. Such companies are subject to liability for hearing damage which can be shown to have been caused by industrial noise levels. Well-being of employees requires that the effects of industrial noise on individual employees be periodically monitored to identify employees who experience hearing threshold shifts. It is further necessary to identify manufacturing areas which produce a sufficiently high noise level to induce hearing threshold shifts in employees.

It is also important for manufacturing organizations to be able to provide legally admissible evidence to demonstrate that hearing threshold shifts may have occurred for reasons other than presence of industrial noise. Various audiometric testing techniques are well known. Some known audiometric testing techniques are described in "Audiometry: Principles and Practices", by Aaron Glorig, M.D., Williams & Wilkons Co., Baltimore, Maryland, 1965. Various threshold bracketing techniques are commonly utilized to determine a person's (hereinafter referred to as a test subject, or simply subject) hearing threshold (hereinafter referred to simply as "threshold" or "threshold level") at various frequencies by incrementing or decrementing the intensity of a test tone applied to one of the subject's ears until he or she satisfactorily indicates that he or she has heard the test tone. A quantity known as the "pure tone average" is commonly computed by averaging the subject's threshold at three frequencies, such as 500, 1,000, and 2,000 cycles per second. Another standard calculation is the percent binaural impairment, which indicates deviation from average or standard hearing levels.

Web site: http://www.delphion.com/details?pn=US04284847__

- **Call center for handling video calls from the hearing impaired**

  Inventor(s): Ludwick; Paul W. (Olathe, KS), Watson; Thomas Michael (Raymore, MO)

  Assignee(s): Sprint Communications Company L.P. (Overland Park, KS)

  Patent Number: 6,683,937

  Date filed: August 29, 2002

  Abstract: A call center for handling calls for speech and **hearing impaired** subscribers. The call center includes a plurality of terminals connected to a switching system to handle calls. Each of said plurality of terminals includes a computer system that handles video calls from the speech and **hearing impaired** subscribers and a telephone station that handles voice calls to parties communicating with the speech and **hearing impaired** subscribers. A call controller connected to the switching system and the plurality of terminals determines which of the plurality of terminals handles an incoming call.

  Excerpt(s): The invention is related to the provision of telecommunication services to the deaf and **hearing impaired.** More particularly, the invention is related to providing functionally equivalent services to the speech and **hearing impaired.** Still more particularly, this invention is related to providing a call center which allows the impaired to use sign language to speak to an interpreter that then translates the sign language to a voice call. Title IV of the Americans with Disabilities Act of 1990 requires the Federal Communications Commission (FCC) to ensure that telecommunication services are provided to the hearing and speech impaired. Telecommunication Relay Services (TRS) are used to provide the functional equivalent of telecommunication services to the hearing and speech impaired. TRS have been available on a nationwide basis since 1983. It is a problem that type written messages are not the "functional equivalent" of telecommunications for hearing people. Most of the speech and **hearing impaired** use sign language to communicate and English is a second language to the speech and **hearing impaired.** Communication using typed out messages is difficult for the speech and **hearing impaired.** Therefore, a system is needed that allows the speech and **hearing impaired** to communicate via a telephone connection using sign language.

  Web site: http://www.delphion.com/details?pn=US06683937__

- **Communication system including a hearing aid and a language translation system**

  Inventor(s): Rueda; Valentin Chapero (Erlangen, DE)

  Assignee(s): Siemens Audiologische Technik GmbH (Erlangen, DE)

  Patent Number: 6,157,727

  Date filed: May 22, 1998

  Abstract: A communication system includes a hearing aid and a translation system connected by a communication path. The hearing aid has an input transducer and an output transducer with signal processing circuitry connected therebetween for acting on a signal emitted by the input transducer so as to provide a corrected signal to the output transducer, dependent on the **hearing impairment** of the hearing aid user. The translation system is in communication with the hearing aid via the communication path, and signals received by the input transducer in a first language can be supplied to the translation system wherein those signals are converted into speech signals in a second language, and are re-supplied to the hearing aid and are emitted at the hearing aid earphone in the second language.

  Excerpt(s): The present invention relates to a communication system for users of portable hearing aids of the type having at least a microphone and/or a telephone coil as an input transducer, an amplifier for amplifying the electrical signals of the input transducer, a signal processing circuit with memory, and an earpiece as an output transducer. Hearing aids of this type are equipped with digital or analog signal processing circuitry. In digital hearing aids, there is a digital signal processor in which the signal processing takes place, using a digital signal processing program whose contents are loaded into the hearing aid. As a result, in a digital hearing aid, the details of the acoustical processing can be modified by modifying the program stored in the memory, and thus it is simple to perform an adjustment to optimize the speech intelligibility for an individual patient. Specifically for telephone use, besides the microphone, hearing aids are equipped with a telephone coil or induction coil, as well as a change-over switch which must be operated to change from microphone mode to telephone coil mode. Because users of hearing aids have problems using mobile telephones, German Utility Model 29 608 340 teaches a communication system for hearing aid users for use in connection with a mobile telephone.

  Web site: http://www.delphion.com/details?pn=US06157727__

- **Conference microphone for use with hearing impaired amplification system**

  Inventor(s): Southern; Robert R. (205 Rockland Ave., River Vale, NJ 07675), Treni; Michael R. (248 N. Central Ave., Ramsey, NJ 07446)

  Assignee(s): none reported

  Patent Number: 4,831,656

  Date filed: September 9, 1987

  Abstract: This invention comprises a device for transducing the speech of a conference group gathered about a table. It is capable of wireless operation for use with **hearing impaired** amplification systems and remote conference recording. The device combines an acoustically controlled microphone and antenna system in a single unit with no visible wires, antenna, or electronics. Specifically, a single condenser microphone is mounted at the end of the frustoconical member which is suspended above and

perpendicular to a horizontal reflector plate. The diaphragm of the microphone is parallel to the table top. The reflector plate also functions as an antenna in radio versions of the device. An opening at a predetermined specific angle between the cone and reflector plate deflects the sound waves eminating from any conversations about the table directly into the microphone causing it to produce a higher electrical output for those frequencies produced by the human voice. The opening to the microphone is the same from any side of the device producing uniform directional characteristics so that all conference participants can be heard equally well.

Excerpt(s): Hearing impaired individuals who attend conference-type meetings generally have difficulty hearing everyone at the table. Even people with only moderately impaired hearing, and who do not wear hearing aids, are often in need of amplification. Sound reinforcement, if available, requires setting up microphones and cables, often creating an uncomfortable meeting environment. The arrangement is rarely effective for the **hearing impaired** person and may even create adverse acoustics for the normal hearing participants. People who wear hearing aids also have a difficult time hearing, even though they have personal amplification. This is because of the placement of the hearing aid which most people wear behind the ear. In a conference situation, the micropone of the hearing aid is behind the listener and facing away from the table. Since the microphone is not in the direct path of the sound waves produced by the meeting participants it picks them up after they have been reflected off another surface such as a wall. These reflected waves, arriving at different times, are out of phase causing distortion.

Web site: http://www.delphion.com/details?pn=US04831656__

- **Customizing audio output to a user's hearing in a digital telephone**

  Inventor(s): Campbell; Lowell (Carlsbad, CA), Robertson; Daniel (Encinitas, CA)

  Assignee(s): Denso Corporation, Ltd. (JP)

  Patent Number: 6,212,496

  Date filed: October 13, 1998

  Abstract: Methods and apparatus implementing a technique for producing an audio output customized to a listener's **hearing impairment** through a digital telephone. A user initially sets user parameters to represent the user's hearing spectrum. In receiving a call, the digital telephone receives an input signal. The digital telephone adjusts the input signal according to the user parameters and generates an output signal based upon the adjusted input signal.

  Excerpt(s): The present disclosure relates to digital telephones, and more specifically to digital telephones with audio output that is customized to compensate for a user's individual hearing spectrum. Conventional cellular phones provide an audio output which can be difficult to hear for a listener whose hearing is impaired. Increasing the output volume of the cellular phone is usually only partially effective when the listener's hearing is impaired. Typical **hearing impairment** occurs at select frequency bands. The **hearing impairment** may be complete or partial at any band. Uniform increasing of the output volume only addresses those bands which are partially impaired and so a uniform increase only partially aids the listener. In certain bands, which are completely impaired, the user still does not hear. The listener can also experience discomfort at the loudness of the output in bands which are not impaired in order to be able hear the

other bands. Conventional hearing aids typically provide selective amplification of sound to compensate for a user's specific **hearing impairment.**

Web site: http://www.delphion.com/details?pn=US06212496__

- **Device for the adaptation of programmable hearing aids**

  Inventor(s): Weinfurtner; Oliver (Erlangen, DE)

  Assignee(s): Siemens Audiologische Technik GmbH (Erlangen, DE)

  Patent Number: 5,606,620

  Date filed: February 24, 1995

  Abstract: An adaptation device employing a fuzzy logic system enables an optimum adaptation of programmable hearing aids according to the individual, audiometric data of the **hearing impairment** with a meaningfully adapted setting of the hearing aid parameters taking rules predetermined and tested by the hearing aid manufacturer into consideration, while also considering the characteristic data associated with the hearing aid. The adaptation device is a data processing unit with a fuzzy logic module whose arithmetic unit processes the **hearing impairment** data and the characteristic data, which can be entered and/or retrieved from a storage unit, according to the principles of fuzzy logic, and using processing rules from at least one rule storage unit.

  Excerpt(s): The present invention is directed to a device for communicating with a programmable hearing aid for adapting the programmable hearing aid by providing operating parameters to the programmable hearing aid to set the hearing aid for operation matched to the **hearing impairment** of the user and/or various auditory situations. It is known for manufacturers to provide characteristic data to a hearing acoustician to enable the acoustician to enter operating parameters into the hearing aid for setting the hearing aid, so that the hearing aid operates in a manner which is intended to be matched to the particular impairment of the user, and/or to particular auditory situations, such as a loud or noisy environment, use with a telephone, etc. Programmable hearing aids of this type offer a number of adjustable parameters which are intended to enable the optimum matching of the electro-acoustic behavior of the hearing aid to the **hearing impairment** to be compensated. At the same time, however, the adaptation becomes increasingly difficult for the hearing aid acoustician because of the number of parameters and the multitude of possible setting combinations arising therefrom. This can lead to a faulty adaptation of the hearing aid or to a non-optimum utilization of all adaptation possibilities.

  Web site: http://www.delphion.com/details?pn=US05606620__

- **Digital hearing impairment simulation method and hearing aid evaluation method using the same**

  Inventor(s): Kim; Dong-wook (Sungnam, KR), Park; Young-cheol (Seoul, KR)

  Assignee(s): Samsung Electronics Co., Ltd. (Kyungki-do, KR)

  Patent Number: 5,944,672

  Date filed: April 15, 1998

  Abstract: A digital **hearing impairment** simulation method and a hearing aid evaluation method using the same are disclosed. According to the digital **hearing impairment**

simulation method, a hearing characteristic table of a **hearing impaired** person is input and the input table is stored in a memory, in order to sample the hearing characteristics of the **hearing impaired** person (S1). A hearing loss table is calculated and stored in the memory (S2). An audio signal input via an audio input portion is converted to a digital signal and the converted digital signal is stored in the memory (S3). The converted digital signal is converted to the frequency domain signal using a fast Fourier transform algorithm (S4). The average power by critical band is calculated (S5). A hearing loss gain for each critical band is calculated using the hearing loss table and the average powers of the critical bands (S6). Coefficients for a digital filter corresponding to the hearing loss gains of the critical bands is calculated (S7). The input signal converted to a digital signal and stored in the memory in the step (S3) is digitally filtered using the digital filter coefficients (S8). The digitally filtered signal is converted to an analog signal and the converted analog signal is output to an audio output portion (S9). Thus, the performance of a hearing aid can be easily evaluated and hearing characteristics of a **hearing impaired** person can be easily sampled.

Excerpt(s): The present invention relates to a digital **hearing impairment** simulation method and a hearing aid evaluation method, and more particularly, to a digital **hearing impairment** simulation method and a hearing aid evaluation method using the same according to which a clinical test performed on actual **hearing impaired** persons can be replaced by one performed on normal persons, and also the performance of a hearing aid can be easily evaluated since the result of the clinical test is predictable. Generally, in a study of **hearing impairment,** or evaluation and comparison of hearing aids, a hearing test is directly performed on **hearing impaired** persons and a clinical test of wearing a hearing aid is performed. That is, in the clinical test, impaired persons are allowed to listen to diverse sounds or voice in a soundproof chamber or a hearing test room, and their responses to the sound or voice are checked and evaluated. However, since there are many types of **hearing impairment,** and the type of **hearing impairment** and characteristics of the individual vary greatly, experiments on **hearing impairment** must be performed based on an individual or the type of **hearing impairment,** which requires enormous time and effort. One method for evaluating the capability of a hearing aid is to evaluate the capability of the hearing aid itself, and another is to evaluate the hearing aid in use by directly applying the hearing aid to impaired persons. The method for evaluating a hearing aid in use has disadvantages in that: 1) a long-term test is not easy since most impaired persons are aged, 2) communication between **hearing impaired** persons and testers is not easy, 3) due to diverse **hearing impairment** types and the difference of individual hearing characteristics, it is difficult to group similar hearing impairments, and 4) impaired persons may respond uncertainly to the test due to symptoms of **hearing impairment.** To solve the above problems, it is an objective of the present invention to provide a digital **hearing impairment** simulation method by which a clinical test performed on actual **hearing impaired** persons can be replaced by one performed on normal persons, and which makes it easy to evaluate the capability of a hearing aid since the result of the clinical test is predictable.

Web site: http://www.delphion.com/details?pn=US05944672__

- **Hearing aid which allows non-computerized individual adjustment of signal processing stages**

  Inventor(s): Martin; Raimund (Eggolsheim, DE)

  Assignee(s): Siemans Augiologische Technik GmbH (Erlangen, DE)

  Patent Number: 6,130,950

  Date filed: June 13, 1997

  Abstract: A hearing aid has a microphone, a signal processing chain having a series of signal processing levels, a signal output transducer, a memory in which at least one set of parameters allocated to a hearing situation is stored that enables matching of the parameters of the signal processing stages to the **hearing impairment** of the wearer. Adjustment elements independent of the signal processing stage are provided, and the allocation of the adjustment elements 9 to the individual signal processing stages can be selectively determined. Adjustment of the respective signal processing stages can be accomplished in a non-computerized manner using the adjustment elements, thereby allowing the hearing aid to be used in countries and regions wherein personal computers are not readily available or accessible.

  Excerpt(s): The present invention is directed to a hearing aid of the type having at least one microphone, a signal processing unit with a series of signal processing stages, a signal output transducer, a memory in which at least one set of parameters allocated to a hearing situation can be stored, which, when the hearing situation is present, enables matching of the parameters of the signal processing stages to the wearer's **hearing impairment,** and adjustment means for individually matching the respective signal processing stages. From German OS 43 32 250, a programmable hearing aid is known that can be switched to two different environmental acoustic situations. For this purpose, two circuits are connected via switching means. This connection enables switching of predetermined matching parameters to the different environmental situation. The adjustment means, however, remain dependent on the signal processing stages; exchange takes place only between predetermined matching parameters. The hearing aid requires programming for the individual matching, and in addition is of expensive construction. German OS 36 42 828 discloses a remotely controllable programmable hearing aid in which a first memory contains a number of programs for parameters representing different transmission characteristics of the hearing aid, as well as a control panel for the selective construction of each set of parameters. This hearing aid also has to be programmed individually upon being issued to the hearing-impaired person.

  Web site: http://www.delphion.com/details?pn=US06130950__

- **Interactive telephone communication system for hearing-impaired person**

  Inventor(s): Alheim; Curtis C. (14 Anne Dr., Schenectady, NY 12303)

  Assignee(s): none reported

  Patent Number: 5,121,421

  Date filed: December 13, 1990

  Abstract: A novel interactive telephone communication system and method are provided which allow a hearing-impaired person, using a TDD, to send and receive information over a conventional two-way telephone subscriber network without

communicating directly with another person. The **hearing impaired** person communicates over the subscriber network with a TDD coupled directly or indirectly to the network. The automated processing system includes a receiving circuit coupled to the network to receive communication signals from the hearing-impaired caller and processing means for processing a received communication signal according to a predefined control matrix. The processing means includes retrieval means for selectively retrieving one of a plurality of separately addressed TDD displayable messages stored in an associated computer database. Transmitting means are also provided for sending a retrieved TDD displayable message to the callers TDD for display. Depending upon the embodiment, the communication signal received by the system can comprise either a conventional touch-tone type telephone signal, a rotary type telephone signal or a TDD (e.g., Baudot) coded signal. A related processing method is also disclosed.

Excerpt(s): The present invention relates to telephone communications and, more particularly, to a novel interactive telephone communication system and method which allow a hearing-impaired person, using a TDD, to send and receive information over a two-way telephone subscriber network without communicating directly with another person. Two-way telephone systems, which allow national and worldwide communication between individuals, normally provide for reception and output of sound energy. Because of this, a hearing-impaired person was for a long period prevented from communication over this network. In relatively recent years, however, technology has evolved which allows a deaf individual to communicate over the telephone subscriber network. Specifically, teletype/telecommunication devices for the deaf (TDDs) are now readily available, and many public and private organizations have special telephone numbers for hearing-impaired individuals to call which are devoted exclusively to telecommunications using TDD equipment, such as a relay service. A TDD unit conventionally communicates with another TDD unit using specially coded tone signals, e.g., Baudot and like codes. When a Baudot signal is received, the TDD equipment converts the signal into a visual format for display to the hearing-impaired person. In this manner, two hearing-impaired individuals are able to communicate directly using an existing telephone subscriber network as the carrier. Increasingly, there is a trend in both the public and private sector towards streamlining the handling of incoming telephone calls by the use of pre-recorded interactive voice systems. Verbal interrogation systems, or verbal multiple choice response systems are well known, such as exemplified by the system described in U.S. Pat. No. 4,320,256 and the patents cited therein. However, such interactive voice systems obviously terminate communication for a hearing-impaired person. For example, since the deaf person is unable to hear the verbal instructions he cannot route his own call to an appropriate electronic mailbox or extension.

Web site: http://www.delphion.com/details?pn=US05121421__

- **Mass production auditory canal hearing aid**

  Inventor(s): Oberlander; Dennis A. (5622 Large Ave., Albertville, MN 55301), Voroba; Barry (5509 Vinehill Rd., Minnetonka, MN 55345)

  Assignee(s): none reported

  Patent Number: 4,870,688

  Date filed: May 27, 1986

  Abstract: The in-the-canal hearing aid has patient selected physical components and patient selected electronic components. The construction of the hearing aid and the

method of providing a hearing aid for a particular patient's **hearing impairment** are such that a patient may personally select the best suited hearing aid during the testing process and walk away with the hearing aid he or she has personally selected. This is accomplished by allowing the patient to select a form fitting shell with a malleable covering having a hook and twist which precisely conforms to the patient's own ear. The patient then listens to sounds with or without background noise and from various directions using electronic components which conform to the specifications of the hearing aid and personally chooses those electronics which best aid or assist the patient's hearing loss. These electronics are then quickly inserted into the same shell that the patient has chosen for testing purposes and the patient may leave with the hearing aid that he or she has personally selected during the testing process. Repair or replacement is as easily accomplished by replacing the personalized shell if physical discomfort occurs or by replacing the electronics if a sound environment exists which was not anticipated during testing. The result is a truly personalized and personally chosen prothesis which is capable of on the spot delivery.

Excerpt(s): This application is related to U.S. patent application Ser. No. 867,487 filed May 27, 1986, now U.S. Pat. No. 4,759,070, entitled PATIENT CONTROLLED MASTER HEARING AID which disclosed a test apparatus for patient selection of the electronics to be incorporated into the hearing aid of this invention. The disclosure of that application is incorporated herein by reference. This invention relates to the field of hearing aids, and more particularly to an in-the-canal miniaturized hearing aid which has all of its electrical and mechanical components, including a replaceable battery, contained within a prefabricated earshell assembly composed of a hollow rigid body with a soft, resilient covering fixed to the exterior. Numerous types and designs of hearing aids for assisting persons with hearing deficiencies are known in the prior art. Typically, hearing aids incorporate a microphone for converting sound waves to electrical signals. These signals are then amplified by an amplifier circuit and sent to a receiver. The receiver converts the electrical signals into amplified sound waves and directs the sound waves toward the eardrum.

Web site: http://www.delphion.com/details?pn=US04870688__

- **Method and apparatus for customizing a device based on a frequency response for a hearing-impaired user**

  Inventor(s): Bell; Robert T. (Bountiful, UT), Shaffer; Shmuel (Palo Alto, CA)

  Assignee(s): Cisco Technology, Inc. (San Jose, CA)

  Patent Number: 6,724,862

  Date filed: January 15, 2002

  Abstract: A method and apparatus for customizing a device based on a frequency response for a hearing-impaired user are disclosed. The device receives an identifier associated with a hearing-impaired user and retrieves a frequency filter associated with the hearing-impaired user from a database by providing the identifier. The device applies the frequency filter to audio signals in a call session conducted over a network for presentation to the hearing-impaired user at the device.

  Excerpt(s): This invention relates in general to communications, and more particularly to a method and apparatus for customizing a device based on a frequency response for a hearing-impaired user. People with hearing impairments generally have trouble understanding conversations conducted over a telephone. Many telephones have

volume controls that can compensate for a mild hearing loss by allowing a user to increase the volume of audio signals being broadcast to the user from the speaker in the handset. The volume controls, however, amplify the entire audio signal and do not compensate for particular frequencies that are located outside of the particular user's hearing range. The volume controls must also be manually adjusted every time a person with a **hearing impairment** uses the telephone. When a person with normal hearing wishes to use the same telephone, the volume levels must be adjusted back to a normal level. Furthermore, increasing the local gain in the telephone handset may decrease the hearing-impaired user's ability to distinguish speech from the amplified background noise. In accordance with the present invention, the disadvantages and problems associated with customizing a device based on a frequency response for a hearing-impaired user have been substantially reduced or eliminated. In a particular embodiment, a method for customizing a device based on a frequency response for a hearing-impaired user is disclosed that retrieves a frequency filter associated with a hearing-impaired user from a database and applies the frequency filter to audio signals in a call session conducted at a device.

Web site: http://www.delphion.com/details?pn=US06724862__

- **Method and device for the processing of sounds for auditory correction for hearing impaired individuals**

  Inventor(s): Chartier; Frederic (Paris, FR), Gournay; Philippe (Asnieres, FR), Guilmin; Gwenael (Suresnes, FR), Quagliaro; Gilles (Cormeilles en Parisis, FR)

  Assignee(s): Thomson-CSF (Paris, FR)

  Patent Number: 6,408,273

  Date filed: December 2, 1999

  Abstract: A method for providing auditory correction for a hearing-impaired individual, including extracting pitch, voicing, energy and spectrum characteristics of an input speech signal. The method also includes modifying the extracted pitch characteristic by multiplying a pitch factor times the extracted pitch characteristic, modifying the extracted voicing characteristic by multiplying a voicing factor times the extracted voicing characteristic, modifying the extracted energy characteristic by applying a compression function to the extracted energy characteristic, and modifying the extracted spectrum characteristic by applying a homothetical compression function to the extracted spectrum characteristic. Further, a speech signal is reconstituted perceptible to the hearing-impaired individual based on the modified pitch, voicing, energy and spectrum characteristics.

  Excerpt(s): The present invention relates to a method and device for the correction of sounds for hearing-impaired individuals. It can be applied equally well to the making of auditory prosthetic devices as well as to software that can be executed on personal computers or telephone answering machines and more generally to any device designed to improve hearing comfort and the understanding of speech by persons affected by deafness. The problem of deaf people essentially arises out of the specific and degraded nature of their auditory perception. In his need to communicate, man since the dawn of time has constructed a mode of oral communication, namely speech, based on the mean characteristics of the production of sound signals (in the form of voice) and their perception (by the ear). Everyday language therefore is the language of the greatest number. By contrast, the hearing of the hearing-impaired person is far removed from the mean and everyday language hardly or even not at all accessible to him.

Web site: http://www.delphion.com/details?pn=US06408273__

- **Method for adapting the transmission characteristic of a hearing aid to the hearing impairment of the wearer**

  Inventor(s): Haubold; Jorg (Dortmund, DE), Kachler; Manfred (Nuernberg, DE), Kaiser; Eduard (Forchheim, DE), Weidner; Roland (Zapfendorf, DE)

  Assignee(s): Siemens Audiologische Technik GmbH (Erlangen, DE)

  Patent Number: 5,835,611

  Date filed: June 2, 1997

  Abstract: In a method for the adaptation of the transmission characteristic of a hearing aid to the hearing aid impairment of a hearing aid wearer using a personal computer having a pointer device such as a mouse, the acoustician selects segments of the graphic presentation of the hearing aid parameters with the mouse, modifies the graphics point-by-point or segment-by-segment by displacement of the mouse and thereby correspondingly co-modifies appertaining, displayable parameters. The hearing aid can be adapted to reach a target characteristic by means of one adaptation procedure, followed if necessary by further analogous fine adaptation procedures.

  Excerpt(s): The present invention is directed to a method for the adaptation of the transmission characteristic of a hearing aid to the **hearing impairment** of the wearer using a data processing system having a display, whereby graphics can be displayed at the display. The adaptation of hearing aids to the respective **hearing impairment** of the subject confronts the hearing aid acoustician with a large number of different programming possibilities. These arise due to the various hearing aid manufacturers, the number of available apparatus types and the many hearing aid parameters that can be varied by control elements or by programming such as frequency response (for example, edge shift/edge steepness in the bass and treble range), gain, cut-off point of the AGC, peak clipping, etc. The number of programming possibilities has become so large that it can no longer be justified even in terms of time expenditure to run through all these possibilities in order to arrive at an optimum adaptation. Moreover, such a tiresome adaptation procedure cannot be imposed on the subject. Automated adaptation methods have therefore been proposed, as in U.S. Pat. No. 4,953,112. Nonetheless, the hearing aid acoustician continues to be confronted with a significant number of different setting possibilities, given programmable hearing aids, that influence the acoustic behavior of the hearing aid. European application 0 537 026 discloses a hand-held programmer for programming programmable hearing aids. This programmer is equipped with a microcontroller and has a display, a keyboard as well as a communication interface to the hearing aid programming unit. This known programmer is connected to the hearing aid via a hardwired connection and displays the setting of the hearing aid control elements at the display. For programming, the control displays can be modified at the display via the keyboard and the setting of the hearing aid control elements corresponding to a predetermined control display can be transferred to the hearing aid. The modified setting of the hearing aid control elements can be read from the display in the form of a bar diagram.

  Web site: http://www.delphion.com/details?pn=US05835611__

- **Method for hearing loss compensation in telephony systems based on telephone number resolution**

  Inventor(s): Knappe; Michael E. (San Jose, CA), Oran; David R. (Acton, MA)

  Assignee(s): Cisco Technology, Inc. (San Jose, CA)

  Patent Number: 6,061,431

  Date filed: October 9, 1998

  Abstract: Different **hearing impairment** compensation parameters are stored in a searchable attribute database indexed by the telephone numbers of **hearing impaired** users. Calls made to or from the stored telephone numbers have incoming voice samples redirected to signal processing resources that perform customized hearing compensation. The compensation parameters are downloaded from the attribute database to the chosen signal processing resource at call setup time. The signal processing resource then compensates the audio signals of the telephone call for specific user **hearing impairment** using the downloaded compensation parameters.

  Excerpt(s): The invention relates to compensating audio signals for the **hearing impaired** and more particularly to hearing loss compensation for telephony systems. Persons with hearing impairments have particular trouble understanding conversations conducted over telephones. Some hearing aids include a special magnetic coupling device that magnetically couples audio signals from a telephone handset to the hearing aid. However, not all telephones can be used with magnetic coupling devices. Many public and home telephones have volume controls that compensate for mild hearing loss by simply increasing the volume of the audio signals coming out of the telephone handset. However, volume controls amplify the entire audio signal and do not compensate for the particular frequencies associated with a particular user's dependent hearing impediment. Telephone volume controls generally must be manually adjusted every time someone with a hearing impediment uses the telephone. A person with normal hearing, who wishes to use the same telephone, must then readjust the telephone back to a normal volume level. Increasing local gain in the telephone handset also increases noise reflected back to the telephone receiver from the listener's local. This decreases the ability to distinguish speech from the amplified background noise.

  Web site: http://www.delphion.com/details?pn=US06061431__

- **Method for treating hearing deficiencies**

  Inventor(s): Carlson; Jason L. (Portola Valley, CA), Perkins; Rodney C. (Woodside, CA)

  Assignee(s): Resound Corporation (Palo Alto, CA)

  Patent Number: 4,817,609

  Date filed: September 11, 1987

  Abstract: A method and apparatus are described for treating **hearing impairment** in a human. The external auditory canal is substantially enlarged surgically in region proximate the ear drum. An electronic hearing aid is placed in this region. The hearing aid has a external housing molded to conform with the shape of the surgically enlarged region.

  Excerpt(s): This invention relates to the treatment of **hearing impairment** in humans. More particularly, the invention relates to an improved method and an improved electronic hearing aid for effecting such treatment. Two common types of hearing aids

are the so-called bone conduction devices and devices which directly stimulate the tympanic membrane or ear drum. A third type of device, utilized for direct neural stimulation, is also sometimes employed. All three devices have their strengths and weaknesses insofar as their effectiveness in the treatment of **hearing impairment.** Probably the most commonly used of these devices is the air conduction type of device, which uses a speaker to vibrate the air in the ear canal adjacent the tympanic membrane. The air conduction type of hearing aid generally employs suitable electronics for amplifying incoming sound waves, perhaps also with some processing of the sound waves to change the shape of the response curve. Reproduction of such sound waves by the speaker stimulates the tympanic membrane.

Web site: http://www.delphion.com/details?pn=US04817609__

- **Multi-channel synchronous companding system**

  Inventor(s): Armstrong; Stephen W. (Burlington, CA), Csermak; Ronald J. D. (Hamilton, CA), Sykes; Frederick E. (Burlington, CA)

  Assignee(s): Gennum Corporation (Burlington, CA)

  Patent Number: 5,832,097

  Date filed: September 19, 1995

  Abstract: A multi-channel synchronous compander for hearing aids, in which the input signal from an input transducer is directed through a 2:1 front compressor, then through a band splitting filter to divide it into a desired number of frequency bands, then through expander/compressors to provide selected expansion/compression of each frequency band depending on the user's **hearing impairment.** The outputs of the expander/compressors are summed, amplified and directed to the hearing aid output transducer. The compressor and each expander/compressor are all controlled by control signals derived from the compressed signal level at the output of the front compressor. The use of common control signals for both the front end compression and the expansion removes the need for close matching of temporal performance and improves the output signal fidelity. The front compressor allows the filter capacitors to be reduced in size so that they can be integrated. Sounds above a high level threshold do not change the gain applied to input signal, even when changes are made in the expansion/compression ratios of the expander/compressors.

  Excerpt(s): This invention relates to a synchronous companding system for audio amplifiers. The companding system of the invention is particularly suitable for use in hearing aids. Hearing impairment is often characterized by a loss of sensitivity to quiet or low level sounds. The loss of sensitivity can either be frequency dependent or it can be across the entire frequency spectrum of the affected individual's hearing. It is more common for the threshold of hearing to display a frequency dependence, whereby the ear is not equally sensitive to sound pressure at various frequencies. This characteristic is observable for individuals with normal hearing as well as for those with a **hearing impairment.** Another observed phenomenon in individuals with hearing loss is loudness growth. This means that although the threshold of hearing is elevated, there is not usually an equal elevation in the upper comfort level. Most **hearing impaired** individuals subjectively rate sounds as being loud at a sound pressure similar to that which their normal counterparts would also consider to be loud. Measurement of the subjective responses to gradually increasing sound levels between the two extremes of hearing threshold and hearing discomfort reveal that **hearing impaired** persons have an initially faster rise in perceived loudness growth for sounds above threshold. At

elevated sound pressures, the rate of growth tends to match that of persons with normal hearing.

Web site: http://www.delphion.com/details?pn=US05832097__

- **Omnidirectional hearing aid**

  Inventor(s): Zelikovitz; Joseph (P.O. Box 2499, Grove, OK 74344)

  Assignee(s): none reported

  Patent Number: 5,680,466

  Date filed: October 6, 1994

  Abstract: A hearing aid device is disclosed providing omnidirectional listening assistance for the **hearing impaired** individual. The person with the **hearing impairment** may have greater hearing sensitivity in one ear than the other. Sounds emanating on the opposite side of a person than the more sensitive ear may be lost because the more sensitive ear is not directionally situated to receive the sound most effectively. The invention is directed toward detecting sounds in the auditory field associated with the less sensitive ear and transmitting those detected sounds to the more sensitive ear for amplification therein. Where the dominant ear is also partially impaired, a second sound transducer may be added to detect the sound emanating in a second auditory range associated with the more sensitive, albeit partially impaired, ear. The detected signals from the first and second auditory ranges may be combined in this embodiment for amplification in the more sensitive ear. Thus, this invention provides for more efficient detection of sounds and a more effective sound delivery to the most sensitive ear. Effectively, both embodiments of this invention provide for sound detection in a three hundred and sixty degree (360.degree.) range regardless of head movement or position.

  Excerpt(s): The present invention relates to a hearing aid system and, more particularly, to an omnidirectional hearing aid. The loss of hearing is a very large and growing problem for our society, particularly among the older segment of the population. Hearing aid devices are well-known in the art for enhancing an impaired person's hearing. Hearing aid devices operate by amplifying detected sound to a level the impaired individual can comprehend. Current hearing aid devices, however, do not effectively and efficiently detect and deliver sounds in a three hundred and sixty degree (360.degree.) reception range. Further, current hearing aids do not deliver sounds to the most sensitive ear when the sounds emanate from an auditory field away from the hearing aid device. Under normal circumstances, sound waves enter the outer ear and modify the shape of the tympanic membrane, commonly known as the ear drum. This change in shape of the tympanic membrane corresponds to pressure changes in the sound wave. The pressure on the tympanic membrane is applied directly to three ossicles located in the middle ear. The three ossicles, namely the malleus (the mallet), the incus (the anvil) and the stapes (the stirrup) vibrate in response to the pressure changes and ultimately apply pressure to the cochlea via the last of these ossicles, the stapes.

  Web site: http://www.delphion.com/details?pn=US05680466__

- **Packet telephony gateway for hearing impaired relay services**

  Inventor(s): Swardstrom; Paul D. (Naperville, IL), Hollatz; Michael C. (Huntley, IL)

  Assignee(s): Rockwell Electronic Commerce Corp. (Wood Dale, IL)

  Patent Number: 6,625,259

  Date filed: March 29, 2000

  Abstract: A method and apparatus are provided for relaying text between a **hearing impaired** person and a third party through the public switched telephone network. The method includes the steps of converting the text between a multifrequency textual format on the public switched telephone network and a packet format on a local area network and exchanging the text with the **hearing impaired** person through the local area network.

  Excerpt(s): The field of the invention relates to telephony and more particularly to communication devices for the **hearing impaired.** Telecommunication devices for **hearing impaired** people are generally known. Such devices are typically structured as computer terminals, which may be coupled electrically or acoustically to a telephone line. Telecommunication devices for the **hearing impaired** are typically used in conjunction with relaying services that may be offered to the **hearing impaired** by a local public switched telephone network free of charge. Typically, an agent of the relaying service sits at a terminal and relays messages from a **hearing impaired** client to the non-hearing impaired.

  Web site: http://www.delphion.com/details?pn=US06625259__

- **Portable telephone communication device for the hearing impaired**

  Inventor(s): Fylstra; David J. (Palo Alto, CA), Nielson; Donald L. (Palo Alto, CA), Stehle; Roy H. (Palo Alto, CA)

  Assignee(s): SRI International (Menlo Park, CA)

  Patent Number: 4,268,721

  Date filed: May 2, 1977

  Abstract: A portable telephone communications device for the **hearing impaired** can be carried in the pocket of the user and attaches directly to the telephone handset without intrusion. It includes a keyboard and a readout which enables the user to transmit data by means of the keyboard and receive data which is presented on either an electronic display or a printer or both.

  Excerpt(s): This invention relates to telephone communication systems and more particularly to systems including a keyboard and a display device which can communicate by way of a telephone line. Devices whereby the individuals having **hearing impairment** can use voice grade telephone lines are in existence. The teletypewriter is one such system. Another such system is described in a U.S. Pat. No. 3,746,793 wherein a keyboard entry terminal generates character codes which are transmitted to voice grade telephone lines through an acoustic coupler with the telephone receiver cradled thereon. An ordinary television receiver is connected to the terminal to display the operator's message as it is typed. At the receiving terminal, an acoustic coupler is used and the signals received are decoded and displayed on a television receiver. In another U.S. Pat. No. 3,896,267, there is described a system similar

to the one in U.S. Pat. No. 3,746,793 wherein a switch is used for determining whether the diode matrix will encode keyboard entrys in BAUDOT or ASCII codes.

Web site: http://www.delphion.com/details?pn=US04268721__

- **Programmable hearing aid operable in a mode for tinnitus therapy**

  Inventor(s): Holube; Inga (Anton Bruckner Str. 43, 91052, Erlangen, DE), Martin; Raimund (Klingenweg 3, 91330, Eggolsheim, DE), Sigwanz; Ullrich (Buckenhofer Weg 39, 91058, Erlangen, DE), Zoels; Fred (Lettenfeldstr. 37, 90592, Altenhann, DE)

  Assignee(s): none reported

  Patent Number: 6,047,074

  Date filed: June 17, 1997

  Abstract: A digital hearing aid is employable for tinnitus therapy, as well as for retraining tinnitus therapy, in combination with correction of other hearing impairments of a user of the hearing aid. For this purpose, the hearing aid contains a signal processing chain, between a hearing aid input and a hearing aid output, which is responsible for producing a useful signal by acting on the input signal in a manner to correct the **hearing impairment** of a user of the hearing aid. The signal processing chain also includes an arrangement for generating a tinnitus therapy signal, which is combined in the signal processing chain with the useful signal, dependent on a mode of operation which has been selected or set.

  Excerpt(s): The present invention is directed to a programmable hearing aid of the type having at least one acoustoelectrical input transducer, a signal processing chain including a signal converter, an amplifier, a digital signal processor and a memory, and an electroacoustical output transducer. A hearing aid of this type is disclosed in German Auslegeschrift 27 16 336, corresponding to U.S. Pat. No. 4,187,413. In this hearing aid, a microphone is provided as an input signal source that is connected to an amplifier followed by an analog-to-digital converter that is connected to a digital computer stag. A digital-to-analog converter is connected to the output of the computer stage and supplies an analog signal to an output amplifier to which an earphone is connected as an output transducer. The computer stage of this programmable hearing aid can be a microprocessor with a memory and can be implemented as an integrated module. A number of input signals, for example from a microphone and a pick-up induction coil, can thus be correlated with one another in the processor. Tinnitus is a condition wherein a person perceives noises in the ear or head for which no external causes exist. This can be extremely uncomfortable and can lead to mental and physical disturbance in serious cases. The possibility of alleviating the tinnitus condition by drowning out the tinnitus noise with a sound signal supplied to the ear has been investigated for many years in the scientific literature.

  Web site: http://www.delphion.com/details?pn=US06047074__

- **Signalling apparatus for hearing impaired persons**

  Inventor(s): Kiss; Michael Z. (1116-A 8th St., Suite 245, Manhattan Beach, CA 90266)

  Assignee(s): none reported

  Patent Number: 4,853,674

  Date filed: June 18, 1987

  Abstract: A system for **hearing impaired** persons for nonaudibly signalling the occurrence of monitored events such as an audible event (e.g. a baby crying), a telephone line signal, a switch closure, or a transducer output. The system includes a receiver module for producing a nonaudible signal responsive to an RF signal command, modulated by both a common and an identification frequency tone, received from one or more transmitter modules, each monitoring a predetermined set of events. The receiver and transmitter modules are configured to consume sufficiently low electric power to enable them to be battery energized. Battery energization permits the receiver module to be packaged in a pocket sized portable unit which the **hearing impaired** person can carry with him in his normal daytime activities.

  Excerpt(s): The present invention is directed to a system for **hearing impaired** persons for nonaudibly signalling the oocurrence of monitored events. Such monitored events would typically comprise an audible event (e.g. the sounding of a fire alarm), a telephone line signal, a switch closure, or a transducer output. The present invention is directed to an improved signalling system including a receiver module for producing a nonaudible signal responsive to an RF signal command received from one or more transmitter modules, each transmitter module monitoring a predetermined set of events. The receiver module includes one or more signal lamps for producing a nonaudible visual signal. The lamps are illuminated in response to an RF signal command and identify the particular transmitter module which has detected the occurrence of the monitored event. The receiver module additionally includes an internal vibrator which is activated in response to the RF signal command to produce a nonaudible tactile signal to alert the user that one of the transmitter modules has alarmed.

  Web site: http://www.delphion.com/details?pn=US04853674__

- **Speaker device for the hearing impaired**

  Inventor(s): Petersen; Jack N. (103 Lake Sears Dr., Winter Haven, FL 33880)

  Assignee(s): none reported

  Patent Number: 5,282,251

  Date filed: August 3, 1992

  Abstract: A portable speaker system for the **hearing impaired,** comprising at least two speakers mounted on a framework which can be moved easily around a room, and specifically moved to allow one speaker to be directed at the left ear, and the other speaker directed to the right ear. As the speakers are adjustable in their direction, and volume, a person with impaired hearing can position the speakers at the side of their chair, adjust the volume as required, and hear the audio sound at their level of volume, while persons with normal hearing are allowed to hear the same audio sound at normal levels. In another embodiment of this invention, each speaker can be connected to a separate sound source, to produce a stereo effect.

Excerpt(s): This invention relates to an apparatus and method of aiding the **hearing impaired** to listen to Television, or, Music, in the same room with other persons having normal hearing, without requiring the sound to be turned up to a higher level, in order to hear the sounds. It has been customary for the **hearing impaired** to be seated closer to the source of the audio sound than persons with normal hearing, or, to have the audio sound turned to a higher level than ordinary, in order for the **hearing impaired** to enjoy the same sounds as the persons with the normal hearing. This situation causes much frustration to either the **hearing impaired,** or the persons with normal hearing, because, either the **hearing impaired** cannot hear the sounds, or, the persons with normal hearing are required to listen to the audio sounds at a much higher level than they can enjoy, or, a seating arrangement must be used, which can be a problem in most rooms. Several approaches have been provided for aiding these persons with impaired hearing. Chairs have been designed with speakers implanted in the backs of the chairs, and, these devices do aid the **hearing impaired,** however, the chair assignment in the room must be decided in advance, and, cleaning the room becomes a frustration to the cleaner, due to the required wires on the floor being a nuisance to the vacuum cleaner, sweeper, or general cleaning.

Web site: http://www.delphion.com/details?pn=US05282251__

- **Symbol means for identifying hearing impaired people**

  Inventor(s): Babbitt; Norman F. (225 Eramo Ter., Hamden, CT 06518)

  Assignee(s): none reported

  Patent Number: 4,773,171

  Date filed: March 2, 1987

  Abstract: Symbols are provided for identifying a person as having a **hearing impairment.** The symbols ar affixed to an item associated with the person in such manner that the symbols are displayed to be viewed by other people. The symbol includes a pictorial representation of an ear, a designation indicating the ear(s) subject to **hearing impairment,** and a color coding applied to the pictorial representation indicates the degree of hearing loss. Examples of items to which the symbols may be attached include, among other items, a storm door, a screen door, an outside wall adjacent a doorbell, a house window, an eyeglass frame, an article of clothing, a cane, a walking stick, a dog harness, a dog collar, an identification card and a drivers license. The material, size and manner of attachment of the symbol to the item are dependent upon the item.

  Excerpt(s): The present invention relates to a system of symbols for **hearing impaired** people, and to the use of such symbols, the symbols serving to identify people with impaired hearing, and to indicate which ear is affected, or both, and to give the degree of hearing loss. Hearing impairment is the most prevalent physical disability in the United States of America, yet **hearing impairment** receives far less attention than seems justified. According to the latest statistics compiled by the American Hearing Research Foundation of Chicago, Ill., there are an estimated 13.4 million **hearing impaired** people in this country, and the number increases steadily every year. A higher percentage of men than women is prevocationally deaf, a long standing fact which has repeated in every decennial census since 1830. Beck discloses a sign for use by a blind person at street intersections, to indicate that handicap to motorists. The sign has opposite faces that are identical and has a hole whereby the upright position of the sign can be determined by the sense of touch.

Web site: http://www.delphion.com/details?pn=US04773171__

- **Telecommunications device for the hearing impaired with telephone, text communication and answering, and automated voice carryover**

  Inventor(s): Cheung; George (La Mirada, CA), Lee; Peter (Huntington Beach, CA), Pham; Phuong Le (Huntington Beach, CA)

  Assignee(s): Ameri Phone, Inc. (Garden Grove, CA)

  Patent Number: 5,710,806

  Date filed: September 22, 1994

  Abstract: A telecommunication device for the **hearing impaired** having the capability of sending text communications via a telephone-style keypad and receiving text communications for display on an LCD display in addition to providing standard telephone voice communications. The telecommunications device automates voice carryover (VCO) calls and for provides automatic answering and recording capability for text messages on the same telephone line as a voice answering machine and or a facsimile machine. The telecommunications device further includes means for selectively adjusting the amplification of received voice messages and sent voice messages to provide maximum amplification of said received voice messages without producing feedback oscillation or to provide maximum amplification of sent voice messages without producing feedback oscillation. The telecommunications device further including means for minimizing effect of the reflected impedance of the telephone line on signal transmission and optimizing the coupling of signals to the telephone line.

  Excerpt(s): The present invention relates in general to telecommunication devices for the **hearing impaired** and in particular to a telecommunications device for the **hearing impaired** having the capability of sending text communications via a telephone-style twelve-key keypad and receiving text communications for display on an LCD display in addition to providing standard telephone voice communications. The invention relates especially to such a telecommunication device specifically adapted for voice carryover (VCO) calls and for providing answering machine capability for text messages. Hearing-impaired persons use teletypewriters (TTYs) to communicate over telephone lines. These teletypewriters, called TDDs when specifically for the hearing-impaired person, communicate over the telephone lines in Baudot code, although some machines have the capability of communicating in ASCII code, in addition to Baudot code. A TDD typically has a typewriter style keyboard for entry of information and a display for presenting information entered by the TDD user or transmitted by the TDD or received from other TDDs. Although TDDs facilitate text communication over telephone lines, they are limited in fulfilling the wide range of telecommunication needs of hearing-impaired persons and the households of hearing-impaired persons. Hearing-impaired individuals have differing degrees of **hearing impairment** and often are part of households that include persons having normal hearing capabilities. A **hearing impaired** individual may be able to communicate clearly by speaking but may not hear well enough to comprehend voice transmissions or may comprehend voice transmissions only partially.

  Web site: http://www.delphion.com/details?pn=US05710806__

- **Telephone headset for the hearing impaired**

  Inventor(s): Groppe; Alvin F. (Germantown, TN)

  Assignee(s): Artic Elements, Inc. (Germantown, TN)

  Patent Number: 5,086,464

  Date filed: March 5, 1990

  Abstract: An adjustable telephone headset for the **hearing impaired** comprising a left and a right ear piece, a speaker within each ear piece, an input device, such as a microphone or magnetic induction pickup within one of the ear pieces, and an amplifier connected between the input device and the speaker. Optionally, a switch may select between either a microphone or a magnetic induction pickup as the choice of input device. A wearer of the headset may place a telephone receiver against the microphone or magnetic induction pickup, allowing an amplified telephone conversation to be heard by both ears. Independent volume controls for each speaker allow individual adjustment to compensate for variations in hearing loss, and optional tone controls for each speaker similarly allow optimum compensation for differences in tonal response in the wearer's ears. An optional remote microphone allows use as a conventional hearing aid when not engaged in telephone conversation.

  Excerpt(s): The present invention relates, in general, to hearing aids for the **hearing impaired,** and particularly to hearing aids of the class adapted to be utilized in connection with a telephone receiver. A preliminary patentability search in class 379, subclass 52 produced the following patents: Lavery, U.S. Pat. No. 2,554,834, issued May 29, 1951; McGee, U.S. Pat. No. 2,837,607, issued June 3, 1958; and Flygstad, U.S. Pat. No. 3,396,245, issued Aug. 6, 1968. While each of the above patents disclose various hearing aid apparatus for use with telephone receivers, none disclose or suggest the present invention. More specifically, none of the above patents disclose or suggest a telephone headset for the **hearing impaired** with a single input means against which the telephone receiver may be placed, with separate volume controls for each ear, which permits the user to hear the conversation from a telephone receiver with both ears. Lavery, U.S. Pat. No. 2,554,834, describes a coupling for a telephone receiver in which a hearing aid device, inductively coupled to the telephone receiver, amplifies the conversation for receipt by an ear of the user. Lavery has no headset, as does the present invention, and does not allow the conversation to be heard by the user through both ears. Additionally, Lavery teaches against the use of acoustic pickup means, such as a microphone, which may be used in accordance with the present invention.

  Web site: http://www.delphion.com/details?pn=US05086464__

- **Visual aid for the hearing impaired**

  Inventor(s): Jhabvala; Murzban D. (Clarksville, MD), Lin; Hung C. (Silver Spring, MD)

  Assignee(s): The United States of America as represented by the Administrator of the (Washington, DC)

  Patent Number: 5,029,216

  Date filed: June 9, 1989

  Abstract: A multi-channel electronic visual aid device which is able to signal to the user whether sound is coming from the left or right, front or back, or both. For the plurality of channels, which may operate in pairs, the sound is picked up by a respective

microphone and amplified and rectified into a DC voltage. The DC voltage is next fed to an analog to digital converter and then to a digital encoder. The binary code from the encoder is coupled into a logic circuit where the binary code is decoded to provide a plurality of output levels which are used to drive an indicator which, in turn, provides a visual indication of the sound level received. The binary codes for each pair of channels are also fed into a digital comparator. The output of the comparator is used to enable the logic circuits of the two channels such that if, for example, the signal coming from the right is louder than that coming from the left, the output of the logic unit of the right channel will be enabled and the corresponding indicator activated, indicating the sound source on the right. An indication of the loudness is also provided. One embodiment of the invention may be carried by the **hearing impaired** or deaf, as a system, for example, which is embedded into eye glasses or a cap. Another embodiment of the invention may be integrated with a vehicle to give a **hearing impaired** or deaf driver a warning, with a directional indication, that an emergency vehicle is in the vicinity. In this second embodiment, the emergency vehicle transmits an RF signal which would be used as an enabling signal for the visual aid device to avoid false alarms from traffic and other sound sources in the vicinity of the dirver's vehicle.

Excerpt(s): The invention described herein was made in the performance of work under a NASA contract and by an employee of the United States Government and is subject to Public Law 96-517 (35 U.S.C.sctn.200 et seq.). The contractor has not elected to retain title to the invention. The invention relates generally to hearing aid apparatus and more particularly to a multi-channel electronic device for the **hearing impaired** or deaf providing a visual indication as to directivity and loudness of the sounds received. This invention has particular utility in providing **hearing impaired** persons with an indication not only of specific sounds, but the direction from which they emanate. A common but very difficult problem exists among individuals who are totally deaf in one ear. While these individuals are able to hear adequately with hearing aid devices, they are unable to quickly discern the direction from which the sound originates. Normally this is not a life threatening problem. Situations, however, do exist where such individuals must be made immediately aware of the origin of the sound, particularly a loud sound. Typical examples include general automobile traffic, fire alarms, loading dock traffic, sirens and variety of less common audibles, but of equal warning power. Recent contact with such individuals having this type of hearing disability has dramatically emphasized the severity of the problem. In addition, people who are totally deaf or **hearing impaired** encounter difficulties while operating a motor vehicle with respect to hearing and locating an emergency vehicle in the vicinity.

Web site: http://www.delphion.com/details?pn=US05029216__

Patent Applications on Hearing Impairment

As of December 2000, U.S. patent applications are open to public viewing.[9] Applications are patent requests which have yet to be granted. (The process to achieve a patent can take several years.) The following patent applications have been filed since December 2000 relating to hearing impairment:

[9] This has been a common practice outside the United States prior to December 2000.

- **Acoustic signal processor**

  Inventor(s): Narusawa, Hitoshi; (Tokyo, JP)

  Correspondence: Staas & Halsey Llp; 700 11th Street, NW; Suite 500; Washington; DC; 20001; US

  Patent Application Number: 20020118846

  Date filed: February 22, 2002

  Abstract: The present invention relates to an acoustic signal processor, and provides a device which allows processing of acoustic signals such that acoustic information can be easily heard and accurately understood by individuals with or without **hearing impairment.** The acoustic signal processor comprises a peak detection circuit group 4 for determining a frequency band having the highest energy level out of the frequency bands constituting the inputted acoustic signals, and a variable equalizer 7 which maintains the energy level roughly at a constant level for the frequency bands lower than the frequency band determined by peak detection circuit group 4, and increases the amplification degree of the energy level as the frequency increases for the frequency bands higher than the frequency band determined by the peak detection circuit group 4.

  Excerpt(s): The present invention relates to an acoustic signal processor which can process acoustic signals so as to be clear and easy to hear acoustic signals regardless of whether an individual has a **hearing impairment** or not. Generally when individuals understand acoustic signals by auditory senses, the acoustic signals are detected by the auditory nerve and are transferred to the brain, where these signals are processed with reference to memory acquired from past experiences, but the functions of the auditory nerve path are little understood since the auditory nerve path is extremely large and complicated compared with the visual nerve path. Recent advancements in electronic engineering have enabled many new endeavors in the field of acoustic processing, but some endeavors have appeared which involve processing to provide a new image of sounds by confusing the human auditory senses, and have raise concerns as to whether humanity is lost as a result.

  Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Automatically switched hearing aid communications earpiece**

  Inventor(s): Dobras, David Q.; (San Francisco, CA), Puthuff, Steven H.; (Saratoga, CA), Taenzer, Jon C.; (Los Altos, CA)

  Correspondence: David G. Beck; Mccutchen, Doyle, Brown & Enersen, Llp; Three Embarcadero Center; San Francisco; CA; 94111; US

  Patent Application Number: 20020076073

  Date filed: December 19, 2000

  Abstract: The present invention is directed to a hearing aid apparatus which can function in a hearing aid state and a communications state, by automatically switching between the hearing aid state and the communications state. Exemplary embodiments combine the functions of headset operation and hearing aid operation into an apparatus which can connect with communication devices and which can automatically reconfigure itself to function as a hearing aid for addressing a **hearing impairment** of the user. Exemplary embodiments can be configured small and comfortable to permit wear over extended periods of time.

Excerpt(s): The present invention relates generally to hearing aid devices, and more particularly, to hearing aid devices which can alternately function as two-way communication devices. Hearing aid devices are well known, and are used to improve the quality of an individual's hearing by amplifying portions of sound that are particular to the individual's **hearing impairment.** Known hearing aids typically include a sound pick-up device, such as a microphone, located in a vicinity of the individual's ear, some processing circuitry for modifying the sound, and an output device such as a speaker for providing the modified sound to the ear canal of the individual. An exemplary hearing aid device is described in U.S. Pat. No. 4,396,806, entitled "Hearing Aid Amplifier". This patent describes a programmable hearing aid amplifier having a multiple band amplification with controllable gain and compression signal processing characteristics. The processed signal is fed to a power amplifier to drive a hearing aid transducer, such as a speaker. The hearing aid amplifier includes various bandpass restricted channels for individually shaping the gain, attack and decay characteristics of the selected channel. Signals are supplied to the channels via a high pass filter connected to a microphone input. Although devices as described in U.S. Pat. No. 4,396,806 are typically used exclusively for addressing hearing impairments, it is also known to use similar devices as communication devices for unimpaired users as well. For example, communication devices are known which use headsets for conveying sound from any of a variety of sources including, but not limited to, telephone networks, portable radios or CD players, or from any other sound transmitting system such that sound can be delivered with relatively high quality to the ear of the user without disturbing others in a vicinity of the user. Such systems have also found widespread use in communication devices used by police, firefighters, secret service agents and the like to receive sound transmissions from remote locations and to transmit sound to the remote locations.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Hearing enhancement communication link**

  Inventor(s): Smith, Richard C.; (Costa Mesa, CA)

  Correspondence: Morland C Fischer; 2030 Main ST; Suite 1050; Irvine; CA; 92614

  Patent Application Number: 20020181729

  Date filed: June 1, 2001

  Abstract: A hearing enhancement communication link within which a hearing aid speaker is connected, whereby to supply loud and clear audio messages over a full range of frequencies from a receiver/transmitter (e.g., a 2-way radio) directly to the ear of the user in order to overcome the adverse effects of loud background noises and/or a **hearing impairment** of the user. The hearing aid speaker is electrically connected to an electrical receptacle by an electrical cable having a pair of conductors running between the hearing aid speaker and the receptacle. The hearing aid speaker is acoustically coupled to an ear piece to be received in the user's ear by way of acoustic tubing. The electric cable has a coiled section to be stretched and provide strain relief to the conductors running through the cable. The acoustic tubing has a gentle bend to run behind and over the top of the user's ear to better hold the ear piece therein.

  Excerpt(s): This invention relates to a hearing enhancement communication link within which a hearing aid speaker (e.g., a balanced armature micro-speaker) is connected whereby to supply loud and clear audio messages from a receiver/transmitter (e.g., a 2-way radio, cell phone or a Walkman type stereo player) directly to the ear of the user in order to overcome the adverse effects of loud background noises and/or a **hearing**

impairment of the user. It is frequently necessary to transmit detailed audio messages directly to a recipient who is separated by a great distance from the source (e.g., a remote radio transmitter) of the messages. For example, law enforcement and security personnel working in the field are usually required to stay in constant contact with a central command station. Because of loud background noise in the vicinity of the user or where the user has a **hearing impairment,** he may not be able to understand vital communications that require immediate action. For example, police and military personnel often sustain partial hearing loss as a consequence of the nature of their work. In cases where individuals are engaged in covert operations, they are often required to carry on their bodies a 2-way radio, or the like. In this regard, a relatively heavy and bulky button diaphragm speaker is typically coupled between an audio source and an ear piece. Not only does a diaphragm speaker increase the total weight of the communication path to be supported from the user's ear, but the diaphragm speaker is also characterized by a narrow and low frequency response range. This low frequency response range is further degraded, inasmuch as the diaphragm speaker is acoustically coupled to a coiled, collapsed acoustic tube that is known to inhibit the transmission of certain sounds (by as much as 15 decibels). Because of its relatively large size and weight, clips and other retaining means are often used to hold a diaphragm speaker against the user's clothing, such as at his collar. Notwithstanding these clips, it is still somewhat difficult to hold a diaphragm speaker in place, especially when the user is running or his head undergoes violent turns.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **INTERGRATED HEARING AID FOR TELECOMMUNICATIONS DEVICES**

  Inventor(s): BERGER, H. STEPHEN; (GEOGETOWN, TX), CHOJAR, SUNIL; (LEBANON, NJ), FAZIO, JOSEPH D.; (RINGOES, NJ), GILMORE, DILLARD; (AUSTIN, TX)

  Correspondence: Siemens Corp; Intellectual Property Department; 186 Wood Ave South; Iselin; NJ; 08830

  Patent Application Number: 20010041602

  Date filed: May 2, 1997

  Abstract: A system integrates a hearing aid with devices such as wireless telephones, advantageously avoiding radio frequency (RF) interference. In one embodiment, a processor transforms an electrical signal to compensate for a **hearing impairment.** The function used for signal transformation can be accessed via a processor memory enhancement such as a smart card. A digital-to-analog converter (DAC) converts the transformed signal to an analog signal, which then goes to an amplifier and speaker. In other embodiments, an analog amplifier transforms the electrical signal.

  Excerpt(s): The present invention relates to telecommunications and telephonic devices, and more specifically to the use of telecommunications devices by wearers of hearing aids. Millions of Americans suffer from hearing loss. Most commonly, hearing loss is of one of four types. In slope loss, the ability to hear high frequencies is lost while the ability to hear sounds in the low frequencies is retained. In reverse slope loss, the ability to hear low frequencies is lost while the ability to hear sounds in the high frequencies is retained. Less frequently, the hearer loses the ability to hear sounds in all normally audible frequencies. Finally, some people lose the ability to hear in only a small range of frequencies. Typically, someone who suffers from hearing loss wears a hearing aid. Hearing aids are electroacoustical devices worn to compensate for a **hearing**

impairment by amplifying sound. They include aids placed behind the ear, aids placed in the ear, and aids placed in the external auditory canal. Hearing aids generally consist of a microphone, an amplifier, and a speaker, but are increasingly sophisticated instruments. Many have automatic gain control and digital signal processing; they can often be programmed to remedy a specific pattern of frequency loss specified by a user's prescription. Hearing aids utilize analog or digital circuitry. Most hearing aids in use today are analog.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Method and apparatus for automatic non-cooperative frequency specific assessment of hearing impairment and fitting of hearing aids**

  Inventor(s): Janssen, Thomas; (Tuntenhausen, DE), Zoth, Peter; (Gilching, DE)

  Correspondence: Marcus G Theodore, PC; 466 South 500 East; Salt Lake City; UT; 84102; US

  Patent Application Number: 20030144603

  Date filed: January 29, 2003

  Abstract: A method and device for automatically assessing loss of hearing sensitivity and compression (recruitment) with user defined frequency resolution by means of extrapolated DPOAE I/O functions and ABRs as well as for automatically fitting hearing aids without any cooperation of the subject tested using a device having a display screen attached to a handheld device generating and collecting otoacoustic emission signals and brain stem response signals into a programmed with a clinical audiogram with fitting parameters for hearing aids calculated on the basis of assessed hearing threshold and compression and identifying the type of hearing required for the individual.

  Excerpt(s): This application is a continuation-in-part application of the provisional patent application Serial No. 60/352,966 entitled "Method and Apparatus for Automatic Non-Cooperative Frequency Specific Assessment of **Hearing Impairment** and Fitting of Hearing Aids" filed Jan. 30, 2002. This invention pertains to hearing testing and hearing aid fitting devices. In particular it pertains to a hearing testing device employing means of extrapolated distortion product otoacoustic emission input/output functions (DPOAE I/O-functions) and/or auditory brain stem responses (ABRs) as well as for automatically fitting hearing aids without any cooperation of the subject tested using a device having a display screen attached to a handheld device generating and collecting otoacoustic emission signals and/or brain stem response signals into a programmed computer with a clinical audiogram providing fitting parameters for hearing aids calculated on the basis of assessed hearing threshold and compression. In addition tympanometry and ABR-Inter-Peak-Latency assessment (ABR-IPL) for differentiating middle-ear, cochlear and neural disorders can be optionally performed. Psychoacoustical tests are commonly used for assessing hearing threshold. These tests are not successful with patients that cannot communicate responses, such as neonates, and require skilled testers who can interpret the responses. Furthermore, psychoacoustical tests need a lot of time to assess disturbances of sound processing. As a result, objective measurements for assessing hearing loss have been developed. Conventionally, behavioral hearing threshold is represented as hearing loss in a clinical audiogram form at different frequencies, usually at 125, 250, 500, 1000, 2000, 4000, and 8000 Hz. In principal, also ABRs and OAEs are potential measures for assessing hearing loss. The advantage of these measures over behavioral hearing testing is that they are

"objective" in the sense that no cooperation of the patient is needed, and therefore can be used in infants and young children. Furthermore, objective measurements allow more precise identification of **hearing impairment** in a shorter time. Thus, they are also suited for hearing testing in adults. Behavioral threshold and the latency and amplitude of ABRs and the distortion product otoacoustic emission (DPOAE) sound pressure level and the slope of the DPOAE I/O-function, respectively, are reported to be closely related (Jacobson 1985, Janssen et al. 1998, Kummer et al. 1998). Various measurements devices have been employed to measure these responses. However, they also require trained testers, and elaborate equipment. The device and method described below provides an easy to use handheld hearing testing device, which also provides hearing aid fitting parameters which are calculated on the basis of the assessed loss of hearing and compression. The fitting of the hearing aid is performed automatically after identifying the type of the hearing aid and loading the respective software for adjusting the hearing aid.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Method for customizing audio systems for hearing impaired**

  Inventor(s): Hou, Zezhang; (Cupertino, CA)

  Correspondence: Beyer Weaver & Thomas Llp; P.O. Box 778; Berkeley; CA; 94704-0778; US

  Patent Application Number: 20020183648

  Date filed: April 24, 2002

  Abstract: Improved approaches to assist those having hearing loss are disclosed. One approach pertains to providing customization of personal audio systems for a **hearing impaired** individual. Another approach pertains to designing and producing an audio product that includes components or software that can be customized for **hearing impaired** individuals. The customization provided by either approach can be performed on-line or off-line.

  Excerpt(s): This application claims priority of U.S. Provisional Application Ser. No. 60/288,130, filed May 3, 2001, and entitled "METHOD FOR CUSTOMIZING AUDIO SYSTEMS FOR **HEARING IMPAIRED,**" the content of which is hereby incorporated by reference. This application is related to U.S. application Ser. No. 09/541,366, filed Mar. 31, 2000, and entitled "METHOD AND SYSTEM FOR ON-LINE HEARING EXAMINATION AND CORRECTION," now U.S. Pat. No. 6,322,521, the content of which is hereby incorporated by reference. This application is also related to U.S. application Ser. No. 09/540,577, filed Mar. 30, 2000, and entitled "METHOD AND SYSTEM FOR ON-LINE HEARING EXAMINATION USING CALIBRATED LOCAL MACHINE," the content of which is hereby incorporated by reference. The present invention relates to audio systems and, more particularly, to customizing personal audio systems for **hearing impaired** individuals.

  Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Pathophysiology associated with a single gene (MASS 1) mutation underlying the robust audiogenic seizure phenotype in frings mice**

  Inventor(s): Klein, Brian; (Salt Lake City, UT), Ptacek, Louis; (Salt Lake City, UT), White, H. Steve; (Salt Lake City, UT)

  Correspondence: Madson & Metcalf; Gateway Tower West; Suite 900; 15 West South Temple; Salt Lake City; UT; 84101

  Patent Application Number: 20030226154

  Date filed: April 25, 2003

  Abstract: The present invention relates to a novel gene which is associated with audiogenic seizures in mice. The gene is known as the Monogenic Audiogenic Seizure-susceptible gene or mass1. The product of the mass1 gene is designated MASS1. Nucleic acid molecules that encode for MASS I have been identified and purified. The sequence of murine mass1 can be found at SEQ ID NO: 1, and the sequence of human mass1 can be found at SEQ ID NO: 3. Mammalian genes encoding a MASS1 protein are also provided. The invention also provides recombinant vectors comprising nucleic acid molecules that code for a MASS1 protein. These vectors can be plasmids. In certain embodiments, the vectors are prokaryotic or eukaryotic expression vectors. The nucleic acid coding for MASS1 can be linked to a heterologous promoter. The invention also relates to transgenic animals in which one or both alleles of the endogenous mass1 gene is mutated. The invention further relates to a **hearing impairment** associated with the Frings MASS1 mutation. More specifically, the invention characterizes a moderate and non-progressive **hearing impairment** which leads to the development of audiogenic seizures.

  Excerpt(s): This application is a continuation in part application related to U.S. patent application Ser. No. 10/220,587, which is a United States nationalization of International Patent Application No. PCT/US01/06962, entitled "MASS1 Gene, A Target for Anticonvulsant Drug Development," which is related to and claims the benefit of U.S. Provisional Application Serial No. 60/222,898 of Louis J. Ptacek, H. Steve White, Ying-Hui Fu, and Shana Skradski filed Aug. 3, 2000 and entitled "Human mass1 Gene," and U.S. Provisional Application Serial No. 60/187,209 of Louis J. Ptacek, H. Steve White and Ying-Hui Fu, filed Mar. 3, 2000 and entitled "Novel Epilepsy Gene Is a Target for Anticonvulsant Drug Development," which are each incorporated herein by this reference. The present invention relates to the isolation and characterization of a novel gene relating to epilepsy. More specifically, the invention relates to the isolation and characterization of the Monogenic Audiogenic Seizure-susceptible gene, hereinafter mass1 gene, and the characterization of a **hearing impairment** associated with the MASS1 mutation found in Frings mice. Epilepsy is a common neurological disorder that affects nearly 2.5 million people in the United States. Epilepsy is characterized by recurrent seizures resulting from a sudden burst of electrical energy in the brain. The electrical discharge of brain cells causes a change in a person's consciousness, movement, and/or sensations. The intensity and frequency of the epileptic seizures varies from person to person.

  Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **System and method of teleconferencing with the deaf or hearing-impaired**

  Inventor(s): Basson, Sara H.; (White Plains, NY), Epstein, Edward Adam; (Putnam Valley, NY), Fairweather, Peter G.; (Yorktown Heights, NY), Kanevsky, Dimitri; (Ossining, NY)

  Correspondence: Paul J. Farrell; Dilworth & Barrese, Llp; 333 Earle Ovington Boulevard; Uniondale; NY; 11553; US

  Patent Application Number: 20020069069

  Date filed: December 1, 2000

  Abstract: A system and method is provided for real time teleconferencing, where one of the participants is deaf or hearing-impaired. In one aspect of the system and method, each participant has an Automatic Speech Recognition (ASR) system and a chat service system, such as AOL Instant Messenger.TM. Each participant may have a different type of ASR system, as well as a different type of chat service system. It is not necessary that the deaf or hearing-impaired participant have an ASR system. For each participant, the participant's ASR system transcribes the speech of the participant and provides it to the participant's chat service system, which translates the transcribed text into the chat service message in the format of the participant's chat service system. An Integration Server receives all the participant's chat messages, which have various formats, and translates them into the format used by the chat service system of the deaf or hearing-impaired participant, thus allowing her to see the transcribed text of the conversation between the other participants. In addition, the deaf or hearing-impaired participant inputs text to her chat service system, which creates a formatted message text. The Integration Server receives this formatted chat message and translates it into the formats of the remaining participant's chat service systems, so that the remaining participants see the comments of the deaf or hearing-impaired participant. In other aspects, the teleconferencing system and method is used to connect disparate chat service systems, without necessarily including a deaf or hearing-impaired participant.

  Excerpt(s): This invention relates to a system and method for providing the deaf or **hearing impaired** to participate in a teleconference in general, and, in particular, to a system and method that provides a platform which allows various Automatic Speech Recognition (ASR) systems to communicate over various chat messenger systems so that a deaf or hearing-impaired person may receive a transcribed text of the teleconference. Presently, there are several methods for the deaf and hearing-impaired to interpret those speaking to them. One method is having a live interpreter, who listens to the conversation and translates the spoken words into sign language, and vice-versa. Another method is having a live stenographer, who listens to the conversation and types the spoken words so that they may be viewed in real-time and responded to. Yet another method is a stenographic, or Automatic Speech Recognition (ASR), program, which transcribes the spoken words in the same manner as a live transcriber. However, teleconferencing presents particular problems to the deaf and **hearing impaired.** The logistics of providing one or more live interpreters or translators would be both complex and expensive. Although using a computer program, i.e. ASR, is cheaper than an interpreter/stenographer, ASR has its own problems. If the ASR program is speaker-dependent, it requires a certain amount of time to be trained to the intonations of each individual speaker. This would require multiple speaker profiles to be stored in order that the ASR program could deal with the audio input from the multiple participants in a teleconference. These profiles would use up more and more storage space. The ASR system itself would need to be more complex, because it would need to deal with several different audio streams being received simultaneously.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **SYSTEMS AND METHODS FOR PROVIDING A USER-FRIENDLY COMPUTING ENVIRONMENT FOR THE HEARING IMPAIRED**

  Inventor(s): Crosson, David; (Kissimmee, FL), Vermilyea, Mike; (Orlando, FL)

  Correspondence: Cingular Wireless; 5565 Glenridge Connector, 9th Floor MC 920; C/o Linda Giles, System Analyst; Atlanta; GA; 30342; US

  Patent Application Number: 20040066914

  Date filed: October 3, 2002

  Abstract: A program enhancer system and method for embedding hearing-impaired friendly information into an existing computer program is provided. The existing computer program contains program information that is translated into a format usable by a hearing-impaired user. The systems and methods retrieves desired program information and translates the information into any of animation, digital movie and still image formats to be displayed to the user on a display device. A hyperlink is associated with the translated data and is stored in a memory device. The user can access the translated information using any type of input including hyperlink based inputs or natural language inputs.

  Excerpt(s): 1. Field of Invention This invention generally relates to systems and methods for providing a video enhancement to computer programs to benefit the **hearing impaired.** With the advent of computing and web surfing, the fundamental way of existence today requires basic knowledge and use of a computer. With the increase in use of computers and a computer's services, the complexities of computer programs have also increased. Thus, even the most experienced users must occasionally resort to using the Help Menu of a program to find answers to computing problems or information regarding a computer program in use. For most users, the format of current help menus is sufficient for use and navigation. However, it is sometimes difficult to read a help menu task on a display device while attempting to simultaneously navigate through the instructed tasks. As an added feature to many Help Menu programs, "voiced" instructions are provided that allow a user to navigate through tasks without having to visually concentrate on the help menu display. However, in the United States alone more than 28 million people have hearing impairments. Thus, a system using such a method would have no advantage for a **hearing impaired** user. Admittedly, there has been little technological advancement related to the improvement of computer programs and help menus to assist the **hearing impaired.**

  Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

- **Systems and methods for visually communicating the meaning of information to the hearing impaired**

  Inventor(s): August, Katherine G.; (Matawan, NJ), Lee, Daniel D.; (Leonia, NJ), Potmesil, Michael; (Aberdeen, NJ)

  Correspondence: John E. Curtin, ESQ.; Troutman Sanders Llp; Suite 1600; 1660 International Drive; Mclean; VA; 22102; US

  Patent Application Number: 20040012643

  Date filed: July 18, 2002

Abstract: The present invention provides systems and methods for visually communicating the meaning of information to the **hearing impaired** by associating written or spoken language to sign language animations. Such systems comprise associating textual or audio symbols with known sign language symbols. New sign language symbols can also be generated in response to information which does not have a known sign language symbol. The information can be treated as elements which can be weighted according to each element's contribution to the overall meaning of the information sought to be communicated. Such systems can graphically display representations of both known and new sign language symbols to a **hearing impaired** person.

Excerpt(s): This invention relates to systems and methods for visually communicating the meaning of information to the **hearing impaired.** Hearing impaired individuals who communicate using sign language, such as American Sign Language (ASL), Signed English (SE), or another conventional language must often rely on reading subtitles or other representations of spoken language during the performance of plays, while watching television, in theater productions, lectures, and during telephone conversations with hearing people. Conversely, hearing people, in general, are not familiar with sign language. When it comes to communicating using a telephone, there exists technology to assist **hearing impaired** persons make telephone calls. For example, telecommunication devices for the deaf (TDD), text telephone (TT) or teletype (TTY) are just a few that come to mind. Modern TDDs permit the user to type characters into a keyboard. The character strings are then encoded and transmitted over a telephone line to a display of a remote TDD device.

Web site: http://appft1.uspto.gov/netahtml/PTO/search-bool.html

Keeping Current

In order to stay informed about patents and patent applications dealing with hearing impairment, you can access the U.S. Patent Office archive via the Internet at the following Web address: **http://www.uspto.gov/patft/index.html**. You will see two broad options: (1) Issued Patent, and (2) Published Applications. To see a list of issued patents, perform the following steps: Under "Issued Patents," click "Quick Search." Then, type "hearing impairment" (or synonyms) into the "Term 1" box. After clicking on the search button, scroll down to see the various patents which have been granted to date on hearing impairment.

You can also use this procedure to view pending patent applications concerning hearing impairment. Simply go back to **http://www.uspto.gov/patft/index.html**. Select "Quick Search" under "Published Applications." Then proceed with the steps listed above.

CHAPTER 6. BOOKS ON HEARING IMPAIRMENT

Overview

This chapter provides bibliographic book references relating to hearing impairment. In addition to online booksellers such as **www.amazon.com** and **www.bn.com**, excellent sources for book titles on hearing impairment include the Combined Health Information Database and the National Library of Medicine. Your local medical library also may have these titles available for loan.

Book Summaries: Federal Agencies

The Combined Health Information Database collects various book abstracts from a variety of healthcare institutions and federal agencies. To access these summaries, go directly to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. You will need to use the "Detailed Search" option. To find book summaries, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer. For the format option, select "Monograph/Book." Now type "hearing impairment" (or synonyms) into the "For these words:" box. You should check back periodically with this database which is updated every three months. The following is a typical result when searching for books on hearing impairment:

- **When the Hearing Gets Hard: Winning the Battle Against Hearing Impairment**

  Source: New York, NY: Insight Books, Plenum Publishing Corporation. January 1994. 307 p.

  Contact: Available from Insight Books. Plenum Publishing Corporation, 233 Spring Street, New York, NY 10013. (800) 221-9369 or (212) 620-8000. PRICE: $24.50 plus shipping and handling.

  Summary: This book is a guide for people with hearing impairments and their families and friends. The author, a journalist, novelist and poet with a **hearing impairment,** encourages people with hearing loss to cultivate a rewarding life by learning how to cope with telephones, doorbells, driving, shopping, and participation in other public activities. She presents strategies for interacting with family members, children, co-workers, medical personnel, shopkeepers, and others. The author also recounts the

experiences of people with hearing impairments: actors, sports personalities, and business executives. She describes the obstacles they overcame to succeed in the hearing world. Additional sections cover assistive devices, dietary management, and ototoxic medications. In the latter section, extensive lists of ototoxic materials are presented. The book also includes a selected list of resource organizations and a subject index. 35 references.

- **Genetics and Hearing Impairment**

  Source: San Diego, CA: Singular Publishing Group, Inc. 1996. 348 p.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $54.00 plus shipping and handling. ISBN: 1565937929.

  Summary: This book offers an overview of genetic hearing loss for audiologists, otolaryngologists, and clinical geneticists. Thirty chapters are presented in five sections. The first gives a background, covering auditory function, basic genetics, and genetic techniques relevant to this field. This is followed by a section providing an introduction to the audiological aspects of genetic hearing loss. The third section covers many of the most common syndromes associated with hearing loss, including genetic disorders of the skeleton, Usher syndrome, Pendred syndrome, Waardenburg syndrome, Alport syndrome, neurofibromatosis type II, branchio-oto-renal syndrome, and Treacher Collins syndrome. The fourth section concerns nonsyndromal hearing losses with different modes of inheritance, including otosclerosis, x-linked hearing loss, and mitochondrially determined **hearing impairment.** The final section deals with approaches to the management of individuals with genetic hearing loss, and encompasses genetic counseling, rehabilitation and surgery. The text concludes with a glossary, a list of references, and a subject index. 840 references.

- **Children with Hearing Impairment: Contemporary Trends**

  Source: Nashville, TN: Vanderbilt Bill Wilkerson Center Press. 1998. 413 p.

  Contact: Available from Vanderbilt Bill Wilkerson Center Press. 1114 19th Avenue, South, Nashville, TN 37212-2197. (877) 844-3840 or (615) 936-5023. Fax (615) 936-5013. PRICE: $60.00 plus shipping and handling. ISBN: 0963143980.

  Summary: This book offers chapter versions of papers presented at the Fourth International Symposium on Childhood Deafness (Kiawah Island, South Carolina, 1996). Rather than couch the topic areas within the themes of causation, assessment, and management (as in the previous symposia), the steering committee elected to identify what they believed to be the ten most salient issues confronting professionals concerned with hearing loss in children. Thus, the book addresses issues associated with early identification of hearing loss, assessment, auditory processing, otitis media, amplification, intervention, and health care change. A special section on families was developed to celebrate the life time contributions of Noel D. Matkin, a renowned pediatric audiologist. The Afterword is written by Laura Knox, a long time employee, colleague and friend of the Bill Wilkerson Center and Vanderbilt. The text concludes with author and subject indices.

- **Clinical Rehabilitation Assessment and Hearing Impairment: A Guide to Quality Assurance**

  Source: Silver Spring, MD: National Association of the Deaf (NAD). 1986. 149 p.

  Contact: Available from National Association of the Deaf (NAD). 814 Thayer Avenue, Silver Spring, MD 20910. Voice (301) 587-6282; TTY (301) 587-6283; Fax (301) 587-4873. PRICE: $4.95 (paperback) plus shipping and handling. ISBN: 0913072699.

  Summary: This handbook, written for rehabilitation, education, and other service providers, covers assessment procedures, techniques, and issues in the psychological, psychiatric, neuropsychological, vocational, and related areas of evaluation of people who have **hearing impairment.** Topics covered include the psychometric assessment of people who are deaf, conducting a psychological assessment in this population, the characteristics and assessment of students in transition, the neuropsychological assessment and its application with a person who is deaf, forensic psychological evaluations, vocational assessments and special considerations for persons who are deaf, research studies on the use of vocational evaluation recommendations in actual service settings, and the problem of testing individuals who are deaf and whose native language is American Sign Language. Each chapter provides numerous references and the book concludes with author and subject indices.

- **Diagnosis and Treatment of Hearing Impairment in Children. 2nd ed**

  Source: San Diego, CA: Singular Publishing Group, Inc. 1998. 279 p.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545. Fax (800) 774-8398. E-mail: singpub@mail.cerfnet.com. Website: www.singpub.com. PRICE: $55.00 plus shipping and handling. ISBN: 1565938658.

  Summary: This text discusses the prevention, diagnosis, and treatment of **hearing impairment** in children. The first chapter in the book focuses on the anatomy of the hearing mechanism, with an emphasis on otologic, audiologic background understanding of the diseases and conditions that cause congenital and acquired hearing loss early childhood. The remaining eight chapters cover the diagnosis of the causes of hearing disorders, fundamentals of inheritance, hearing loss associated with perinatal infections, acquired hearing loss due to other infections and causes, sensorineural hearing loss associated with trauma, the basic audiologic evaluation of congenital hearing loss, strategies for habilitation, and cochlear implants. Each chapter concludes with references and the text concludes with a subject index.

- **Assistive Devices for Persons with Hearing Impairment**

  Source: Needham Heights, MA: Allyn and Bacon. 1995. 301 p.

  Contact: Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $69.95 plus shipping and handling. ISBN: 0205137784.

  Summary: This textbook offers general information about assistive devices for people with hearing impairments. Fourteen chapters cover the impact of the Americans with Disabilities Act (ADA) on audiologists, the Food and Drug Administration's (FDA) medical device amendments, interfacing with the telephone system, clinical procedures for evaluating telephone use and the need for related assistive devices, the use of alerting and assistive systems by people with cochlear implants, television viewing for

people with hearing loss, the importance of room acoustics, frequency modulated (FM) systems, induction loop systems, alerting devices for the **hearing impaired,** integrating assistive devices into the hospital setting, selecting appropriate technology for individual users, increasing consumer acceptance of assistive devices, and assistive device research needs. Each chapter includes references, tables, and black and white photographs where appropriate. A subject index concludes the textbook. (AA-M).

Book Summaries: Online Booksellers

Commercial Internet-based booksellers, such as Amazon.com and Barnes&Noble.com, offer summaries which have been supplied by each title's publisher. Some summaries also include customer reviews. Your local bookseller may have access to in-house and commercial databases that index all published books (e.g. Books in Print®). **IMPORTANT NOTE:** Online booksellers typically produce search results for medical and non-medical books. When searching for "hearing impairment" at online booksellers' Web sites, you may discover non-medical books that use the generic term "hearing impairment" (or a synonym) in their titles. The following is indicative of the results you might find when searching for "hearing impairment" (sorted alphabetically by title; follow the hyperlink to view more details at Amazon.com):

- **Acquired hearing impairment in the adult: Report of a task force convened by the Health Services Directorate, Health Services and Promotion Branch**; ISBN: 0662161297; http://www.amazon.com/exec/obidos/ASIN/0662161297/icongroupinterna
- **Comprehensive training of personnel and technical assistance in establishment of home intervention programs for families of infants, toddlers and preschool aged children with hearing impairment (SuDoc ED 1.310/2:398715)** by U.S. Dept of Education; ISBN: B00010TUUU; http://www.amazon.com/exec/obidos/ASIN/B00010TUUU/icongroupinterna
- **Early identification of hearing impairment in infants and young children : January 1988 through December 1992 : 861 citations (SuDoc HE 20.3615/2:92-10)** by Lori Klein; ISBN: B00010CYPI; http://www.amazon.com/exec/obidos/ASIN/B00010CYPI/icongroupinterna
- **Genetics of hearing impairment (Annals of the New York Academy of Sciences)**; ISBN: 0897666828; http://www.amazon.com/exec/obidos/ASIN/0897666828/icongroupinterna
- **Genetics of Hearing Impairment (Annals of the New York Academy of Sciences, Vol 630)** by Robert J. Ruben, et al; ISBN: 089766681X; http://www.amazon.com/exec/obidos/ASIN/089766681X/icongroupinterna
- **Guidelines for Libraries Serving Persons With a Hearing Impairment or a Visual Impairment** by New York Library; ISBN: 0931658217; http://www.amazon.com/exec/obidos/ASIN/0931658217/icongroupinterna
- **National strategic research plan for hearing and hearing impairment and voice and voice disorders (SuDoc HE 20.3002:ST 8/4)** by U.S. Dept of Health and Human Services; ISBN: B00010F37Y; http://www.amazon.com/exec/obidos/ASIN/B00010F37Y/icongroupinterna

- **Screening for Hearing Impairment in Young Children** by Barry McCormick; ISBN: 1897635664; http://www.amazon.com/exec/obidos/ASIN/1897635664/icongroupinterna
- **Tables for the Estimation of Hearing Impairment Due to Noise for Otologically Normal and Typical Uns (Hse Contract Research Report)** by D. W. Robinson; ISBN: 0118859978; http://www.amazon.com/exec/obidos/ASIN/0118859978/icongroupinterna
- **Tables for the Estimation of Hearing Impairment Due to Noise for Otologically Normal Persons and for a Typical Unscreened Population, as a Function of Age and Duration of Exposure (HSE Contract Research Report)** by D.W. Robinson; ISBN: 0118859218; http://www.amazon.com/exec/obidos/ASIN/0118859218/icongroupinterna
- **Taking Hearing Impairment to School** by Elaine Ernst Schneider, Tom Dineen; ISBN: 189138323X; http://www.amazon.com/exec/obidos/ASIN/189138323X/icongroupinterna
- **The Education of Pupils with Severe Hearing Impairment in Special Schools and Units in Scotland: A Report by HM Inspectors of Schools: a Report by HM Inspectors of Schools**; ISBN: 0114933995; http://www.amazon.com/exec/obidos/ASIN/0114933995/icongroupinterna

Chapters on Hearing Impairment

In order to find chapters that specifically relate to hearing impairment, an excellent source of abstracts is the Combined Health Information Database. You will need to limit your search to book chapters and hearing impairment using the "Detailed Search" option. Go to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. To find book chapters, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer, and the format option "Book Chapter." Type "hearing impairment" (or synonyms) into the "For these words:" box. The following is a typical result when searching for book chapters on hearing impairment:

- **Causes of Hearing Impairment**

  Source: in Stokes, J., ed. Hearing Impaired Infants: Support in the First Eighteen Months. London, England: Whurr Publishers Ltd. 1999. p. 39-54.

  Contact: Available from Paul H. Brookes Publishing Co. P.O. Box 10624, Baltimore, MD 21285. (800) 638-3775. Fax (410) 337-8539. Website: www.brookespublishing.com. PRICE: $38.00 plus shipping and handling. ISBN: 1861561067.

  Summary: Determining the cause of a **hearing impairment** in a child is important for parents. This chapter on the causes of **hearing impairment** is from a book that provides information for professionals and parents who wish to work effectively together to provide the optimal support for children who are **hearing impaired.** The book is designed to give parents enough information to make effective choices, and to build their confidence so that they can secure the most appropriate support and encouragement for their infant. This chapter describes the main causes of permanent childhood **hearing impairment** and outlines the main routes for investigating the causes. The authors discuss the different types of **hearing impairment** (notably sensorineural versus conductive hearing losses); prenatal causes, including genetic

causes and congenital disorders; and postnatal causes, such as infections, ototoxic drugs, and trauma. The authors note that most of the hearing losses in childhood are due to prenatal causes, and they are mainly genetic in origin. Genetic counseling has improved in recent years as a result of research that has successfully detected causative genes. The authors stress that genetic counseling should be freely available to families who require it. 4 figures. 5 references.

- **Hearing Impairment and Deafness**

  Source: in Gething, L. Person to Person: A Guide for Professionals Working with People with Disabilities. 3rd ed. Baltimore, MD: Paul H. Brookes Publishing Company. 1997. p. 139-170.

  Contact: Available from Paul H. Brookes Publishing Company. P.O. Box 10624, Baltimore, MD 21285-0624. (800) 638-3775. Fax (410) 337-8539. E-mail: custserv@pbrookes.com. Website: www.brookespublishing.com. PRICE: $39.00 plus shipping and handling. ISBN: 1557663203.

  Summary: Hearing loss is a generic term used to describe impairment that may range from mild to profound. Hearing loss can occur in high or low frequencies and can affect one or both ears, to the same or different extents. This chapter on hearing loss and deafness is from a manual for professionals working with people with disabilities. The author stresses that it is important to make distinctions between deafness, **hearing impairment,** and being hard of hearing; definitions for each category are provided. The author then discusses issues that affect living with hearing loss, including the extent of the loss, prelingual versus postlingual hearing loss, and associated consequences such as difficulty in locating sound, problems with tinnitus (ringing or buzzing in the ears), and dizziness or balance problems. The author considers the presence of other disabilities with hearing loss and the options for communicating with people who have hearing loss, including oral communication, manual communication, and written communication. Other topics covered are the Deaf community, personal adjustment to a hearing loss, sexuality, parenting, family, community living, access to community activities and services, education, employment, appropriate interpersonal language and behavior, strategies for interaction, anatomy of the ear, the mechanism of hearing, the causes of hearing loss, incidence and prevalence, diagnostic considerations, support services, hearing aids and other assistive devices, and additional costs that may be incurred by someone with a hearing loss. The chapter concludes with a list of resource organizations in Australia, Canada, New Zealand, the United Kingdom, and the United States. 7 figures. 6 tables. 27 references.

- **Classroom Intervention Strategies and Resource Materials for Children with Hearing Impairment**

  Source: in Auditory Disorders in School Children, Fourth Edition. Roeser, R.J.; Downs, M.P., ed. York, PA. Thieme 2004. 394-413.

  Contact: Available from Thieme New York. 333 Seventh Avenue, New York, NY 10001. Toll-free: (800) 782-3488. Fax: (212) 947-1112. E-mail: customerservice@thieme.com. Web site: http://www.thieme.com. ISBN: 1-58890-228-5. PRICE: $59.00 plus shipping and handling.

  Summary: In this chapter of the fourth edition of Auditory Disorders in School Children the author provides tools for educators to successfully manage a child with **hearing impairment** in the classroom. The author hopes to illustrate that strategies for the child

with **hearing impairment** are no more overwhelming than those basic strategies that support a good educational setting in general.

- **Audiological Rehabilitation Intervention Services for Adults with Acquired Hearing Impairment**

  Source: in Valente, M.; Hosford-Dunn, H.; Roeser, R.J., eds. Audiology: Treatment. New York, NY: Thieme. 2000. p. 547-579.

  Contact: Available from Thieme. 333 Seventh Avenue, New York, NY 10001. (800) 782-3488. Fax (212) 947-0108. E-mail: custserv@thieme.com. PRICE: $69.00 plus shipping and handling. ISBN: 0865778590.

  Summary: Many adults and elderly persons with acquired hearing loss could benefit from the expertise of rehabilitation audiologists to help facilitate the process of adaptation to their hearing loss and any assistive devices they may use. This chapter on audiological rehabilitation intervention services for adults with acquired **hearing impairment** is from a textbook that provides a comprehensive overview of the numerous treatment options available to help patients relieve the clinical symptoms seen in an audiology practice. Topics include an overview of audiological rehabilitation, including the origins and development of audiological rehabilitation services, and services related to amplification and other technological devices; speech perception training, including analytic versus synthetic speech perception training, sensory modalities, group versus individual speech perception training, and telephone training; communication management training, including communication strategies, conversational fluency, assertiveness training, stress management, personal adjustment, individual versus group intervention programs, and communication partners; and the foundations of audiological rehabilitation, including definitions, models of rehabilitative audiology, the WHO classification system, the influence of a person's predicament and the environment in defining situations of handicap, rehabilitation as a process, and rehabilitation as a solution centered intervention process. The authors offer a case presentation that includes background information, a description of the situation of handicap, the negotiated objective and structure of the intervention program, the intervention program itself, and outcome, impacts, and consequences of the intervention program. The chapter includes an outline of the topic covered, a list of references, a summary outline of the related preferred practice guidelines, and various 'pearls and pitfalls' offering practical advice to the reader. 3 figures. 16 tables. 142 references.

- **Speech Technology and Speech Training for the Hearing Impaired**

  Source: in Gagne, J.P.; Tye-Murray, N., eds. Research in Audiological Rehabilitation: Current Trends and Future Directions. Minneapolis, MN: American Academy of Rehabilitative Audiology. 1994. p. 251-265.

  Contact: Available from Academy of Rehabilitative Audiology. Circulation Manager, P.O. Box 26532, Minneapolis, MN 55426. (612) 885-0095. PRICE: Free for members; $17.50 for non-members; plus shipping and handling.

  Summary: Speech technology is being implemented in a variety of digital devices to improve communication by persons with **hearing impairment.** This chapter on speech technology and speech training for people with **hearing impairment** is from an audiological rehabilitation monograph from the Academy of Rehabilitative Audiology. Recent advances in digital signal processing algorithms for speech permit development of powerful features that are implemented in the microprocessors of wearable sensory aids. Computer-based trainers for both speech perception and speech production

incorporate many kinds of speech processing algorithms as the basis of feedback. The primary focus of the chapter is on speech-production training aids, in particular on research to validate feedback to demonstrate the clinical efficacy of these systems. The author concludes that future research on human judgements of disordered speech is essential for the development of computer-based trainers that can either enhance speech training or substitute for humans in the clinical process. 1 figure. 50 references. (AA-M).

- **Hearing Impairment and Literacy Skills**

  Source: in Bench, R.J. Communication Skills in Hearing-Impaired Children. San Diego, CA: Singular Publishing Group, Inc. 1992. p. 129-159.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $50.00 plus shipping and handling. ISBN: 1565930754.

  Summary: There is extensive literature on the reading achievement of hearing-impaired children, which shows a plateau in attainment at around 8 to 10 years of age. This chapter, from a book about the communication skills in children with **hearing impairment,** outlines some of the studies documenting this effect. The author then considers work that seeks to explain the processes underlying the reading performance of children with **hearing impairment,** and that promote intervention for the teaching of reading. The chapter also gives an account of the writing abilities of children who have hearing impairments, and the reciprocal relationship between their reading and writing is discussed. (AA-M).

- **Evaluating the Efficacy of Hearing Aids and Cochlear Implants in Children with Hearing Impairment**

  Source: in Bess, F.H. Children with Hearing Impairment: Contemporary Trends. Nashville, TN: Vanderbilt Bill Wilkerson Center Press. 1998. p. 249-260.

  Contact: Available from Vanderbilt Bill Wilkerson Center Press. 1114 19th Avenue, South, Nashville, TN 37212-2197. (877) 844-3840 or (615) 936-5023. Fax (615) 936-5013. PRICE: $60.00 plus shipping and handling. ISBN: 0963143980.

  Summary: This chapter from a section on amplification for infants is from a book of papers presented at the Fourth International Symposium on Childhood Deafness (Kiawah Island, South Carolina, 1996). This chapter discusses the evaluation of the efficacy of hearing aids and cochlear implants in children with **hearing impairment.** The first part of the chapter is a discussion of the goals of sensory assistance and methods of measuring success in meeting these goals. The author argues that the immediate benefits of a sensory aid should be evaluated in terms of the sensory capacity it provides to the user. In contrast, the long term value of that sensory capacity should be evaluated in terms of language development and other measures of attainment. The second part of the chapter provides data on the sensory capacities of aided and implanted children as assessed with an imitative test of phonetic contrast perception (IMSPAC). The author shows that the primary predictor of IMSPAC performance for aided subjects is degree of hearing loss, with little or no influence of age and communication mode. The primary predictors for Nucleus cochlear implant users, however, are communication mode and duration of use. The author discusses the implications of these findings for the management of childhood deafness and the evaluation of sensory aid efficacy. 7 figures. 29 references.

- **Acquired Hearing Impairment**

  Source: in Mencher, G.T.; Gerber, S.E.; McCombe, A. Audiology and Auditory Dysfunction. Needham Heights, MA: Allyn and Bacon. 1997. p. 143-165.

  Contact: Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $46.95 plus shipping and handling. ISBN: 0205161014.

  Summary: This chapter on acquired **hearing impairment** is from an audiology textbook on auditory dysfunction. The author notes that, from a clinical perspective, the auditory behavior of an acquired loss is not very different from that of a congenital loss, and the audiological treatment thus may be similar. The overt results of systemic disturbances, diseases, and hereditary degenerative disorders, all acquired, are often quite similar and difficult to tell apart, and therefore lend themselves to combined study. On the other hand, ototoxicity, noise trauma, and presbycusis (hearing loss due to aging) each has its own special effect on hearing and thus are discussed in separate chapters. This chapter covers tinnitus and recruitment; acquired disease, including cytomegalovirus, mumps, AIDS, herpes, meningitis, and syphilis; sudden onset and degenerative disorders; trauma; and hearing loss associated with systemic disease, including thyroid disease, diabetes mellitus, kidney disease, multiple sclerosis, connective tissue disease, and Meniere's disease. **Hearing impairment** after viral or bacterial disease is usually unchanging, that is, the hearing loss should not get worse. Metabolic disorders often display fluctuating hearing losses. Except for Meniere's disease, there is little that can be done surgically specifically for acquired sensory hearing impairments. They are not subject to surgical intervention, nor are they usually amenable to medical otologic treatment. Of course, the underlying disease is a medical problem that needs to be treated, and that treatment may have a beneficial effect on the **hearing impairment.** 6 figures. 1 table.

- **Assistive Devices for Students with Hearing Impairments**

  Source: in Roeser, R.J.; Downs, M.P., eds. Auditory Disorders in School Children: The Law, Identification, Remediation. New York, NY: Thieme Medical Publishers, Inc. 1995. p. 261-270.

  Contact: Available from Thieme Medical Publishers, Inc. 333 Seventh Avenue, New York, NY 10001. (800) 782-3488 or (212) 760-0888; Fax (212) 947-1112; E-mail: custserv@thieme.com; http://www.thieme.com. PRICE: $45.00 plus shipping and handling. ISBN: 0865775508.

  Summary: This chapter on assistive devices for students with hearing impairments is from a textbook that brings together experts from all disciplines to present ideas on how to provide help for school children with auditory disorders. An assistive device is defined as any device, other than a personal hearing aid, designed to improve the ability of those who do not hear well to communicate or to be aware of auditory signals in the environment. An assistive device may be used alone or may supplement hearing aid use in specific situations. The author describes the different types of assistive devices. Some assistive devices are used to transmit speech efficiently when large distances exist between the speaker and the listener or when the presence of ambient noise in the setting hinders communication. Other devices make it easier to use the telephone or television. Finally, there are devices that alert a person to environmental events by transforming an auditory signal into a visual or tactile stimulus. The author focuses on how the student with **hearing impairment** can be helped through the use of assistive

devices and considers the role of the school with regard to these devices. Sidebars present two brief case histories. 5 figures. 32 references.

- **Assistive Technologies for the Hearing Impaired**

  Source: in Sandlin, R.E., ed. Textbook of Hearing Aid Amplification: Technical and Clinical Considerations. 2nd ed. San Diego, CA: Singular Publishing Group. 2000. p. 643-672.

  Contact: Available from Singular-Thomson Learning. P.O. Box 6904, Florence, KY 41022. (800) 477-3692. Fax (606) 647-5963. Website: www.singpub.com. PRICE: $77.95 plus shipping and handling. ISBN: 1565939972.

  Summary: This chapter on assistive technologies for individuals with **hearing impairment** is from a textbook that offers information for academic and clinical professionals on the selection and fitting of hearing aid devices for people with hearing loss. The authors examine various rehabilitative technologies for improving communication efficiency within commonly used noisy and reverberant listening environments. Topics include the effects of reverberation, noise, and distance on speech recognition; hearing assistive devices, including hard wired systems, personal frequency modulation (FM) amplification, sound field FM amplification, infrared light wave systems, and large area electromagnetic induction loop systems; improving telephone communication with rehabilitative technologies, including hearing aid telecoils and telephone use, rehabilitative technologies and telephone use, acoustic couplers, telephone amplifiers, telecommunication devices for the deaf (TTYs), communication via computers, communication via facsimile (FAX) transmission, and communication via video telephones; improving reception of broadcast media with rehabilitative technologies, i.e., closed captioning; alerting systems; selecting rehabilitative technologies for individuals with hearing loss and 'normal hearing;' measuring efficacy for rehabilitative technologies; increasing consumer utilization of assistive technologies; and legislation for assistive technology. The chapter concludes with a series of illustrative case studies and a list of questions for self study and review. 13 figures. 11 tables. 82 references.

- **Cochlear Implants and Options for Persons with Profound Hearing Impairment**

  Source: in Tobin, H. Practical Hearing Aid Selection and Fitting. Washington, DC: Department of Veterans Affairs, Veterans Health Administration, Rehabilitation Research and Development Service, Scientific and Technical Publications Section. 1997. p. 121-132.

  Contact: Available from Rehabilitation and Development Service. Scientific and Technical Publications Section, 103 South Gay Street, Baltimore, MD 21202-4051. PRICE: Single copy free. Also available for free from www.vard.org/mono/ear/contear.htm.

  Summary: This chapter on cochlear implants and other options for persons with profound **hearing impairment** is from a monograph that offers a solid foundation for audiology clinicians to assess information on the current thinking and approaches to hearing aid selection and fitting to each individual. Topics include patient selection and candidacy for specialized rehabilitative efforts (including age factors); processing strategies that can be used to provide sensory stimulation; the risks, costs, and benefits of these alternatives; the steps of rehabilitative planning in this population, from initial counseling and evaluation, through psychoacoustic and electrophysiologic examinations and consultation with other specialists; and alternative devices that can be used when a cochlear implant is not feasible or as supplements, including assistive listening devices,

FM units, TTYs, and vibrotactile devices. The author concludes that implant devices and other assistive listening devices (ALDs) have improved greatly, as evidenced by the fact that people with cochlear implants now frequently achieve open set speech recognition and conversational ability over the telephone. The rehabilitation program should address areas of assessed deficits in knowledge and performance, and strive to assist the individual with **hearing impairment** to achieve his or her full potential. 2 tables. 66 references.

- **Congenital Hearing Impairment**

  Source: in Mencher, G.T.; Gerber, S.E.; McCombe, A. Audiology and Auditory Dysfunction. Needham Heights, MA: Allyn and Bacon. 1997. p. 117-142.

  Contact: Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $46.95 plus shipping and handling. ISBN: 0205161014.

  Summary: This chapter on congenital **hearing impairment** is from an audiology textbook on auditory dysfunction. After a brief discussion delineating the differences between congenital and genetic, the author discusses the etiology and pathology of congenital genetic deafness, forms of pathology, and associated anomalies, including integumentary, skeletal, ocular, and other anomalies. The second section of the chapter addresses congenital nongenetic deafness, including viral deafness due to rubella or cytomegalovirus, protozoal infections, and the remaining causes of the TORCHS (Toxoplasmosis, Rubella, Cytomegalovirus, Herpes, and Syphilis) syndrome, i.e., congenital syphilis and herpes simplex virus. The chapter concludes with a discussion of the medical and audiological considerations for patients with congenital **hearing impairment.** The author notes that audiometric data should not lead to the assumption that a profoundly **hearing impaired** patient should not be provided with amplification. When examining and when providing rehabilitative programming, the audiologist must consider all the special problems of someone who has never had any hearing or never had sufficient hearing to communicate aurally. 2 tables. 11 figures.

- **Genetic Counselling for Hearing Impairment**

  Source: in Martini, A.; Read, A.; Stephens, D., eds. Genetics and Hearing Impairment. San Diego, CA: Singular Publishing Group, Inc. 1996. p. 255-264.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $54.00 plus shipping and handling. ISBN: 1565937929.

  Summary: This chapter on genetic counseling for **hearing impairment** is from a book that offers an overview of genetic hearing loss for audiologists, otolaryngologists, and clinical geneticists. For most parents who have a child born with a **hearing impairment,** it occurs unexpectedly, in the absence of a family history of the disorder. Gene counseling is the process which addresses the common questions of why the child has a **hearing impairment** and what are the chances of another child to be born similarly affected. Genetic counseling requires consideration of the family history, the medical and obstetric history of the mother of the person with a **hearing impairment,** along with a detailed assessment of the physical findings in the affected individual and specialist investigations and examinations. The author begins with a brief outline of the epidemiology of **hearing impairment,** then discusses etiology (causes), assessment, the genetic counseling session itself, and the importance of counseling adults with **hearing**

impairment. Diagnostic tools discussed include audiometry, ophthalmological examination, electrocardiogram, urinalysis, serology, cochlear computerized tomography (CT scan), and chromosomal analysis. 2 tables.

- **Television Viewing for Persons with Hearing Impairment**

  Source: in Tyler, R.S.; Schum, D.J., eds. Assistive Devices for Persons with Hearing Impairment. Needham Heights, MA: Allyn and Bacon. 1995. p. 123-141.

  Contact: Available from Allyn and Bacon. 160 Gould Street, Needham Heights, MA 02194-2310. (800) 278-3525; Fax (617) 455-7024; E-mail: AandBpub@aol.com; http://www.abacon.com. PRICE: $69.95 plus shipping and handling. ISBN: 0205137784.

  Summary: This chapter on television viewing is from a textbook about assistive devices for people with hearing impairments. The authors review the technology and issues relevant to improving access to television programming. Included in their review are technologies designed to augment the auditory signal (FM, infrared, etc.) and also technologies designed to substitute for the auditory signal (open and closed captioning). The authors also discuss a variety of specific client variables that need to be considered when evaluating the usefulness of each of the available technologies. The audiologist can provide counseling on the advantages and disadvantages for the different technology options. For example, the audiologist must carefully question the client to decide if a hearing aid for general listening use is truly necessary or if the client's primary concerns could be addressed simply by obtaining an adequate assistive listening system for the television. The chapter includes numerous black and white photographs of various devices. 7 figures. 1 table. 25 references. (AA-M).

- **Audiological Approach to Genetic Hearing Impairment in Children**

  Source: in Martini, A.; Read, A.; Stephens, D., eds. Genetics and Hearing Impairment. San Diego, CA: Singular Publishing Group, Inc. 1996. p. 82-91.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $54.00 plus shipping and handling. ISBN: 1565937929.

  Summary: This chapter on the audiological approach to genetic **hearing impairment** in children is from a book that offers an overview of genetic hearing loss for audiologists, otolaryngologists, and clinical geneticists. The authors of this chapter stress the importance of considering a genetic etiology in all cases of pediatric hearing loss, then discuss the pediatric audiological examination. While the audiogram is not the only, or even the best, predictor of outcome, an early and accurate auditory assessment of an infant's hearing allows intervention plans to be formulated and initiated. The assessment should comprise a quick definition of the auditory response, a prompt and optimal correction of the sensory deficit across the speech frequency range, the constant use of the amplification device together with frequent monitoring of the effects of the intervention strategy. Topics include the measurement of auditory sensitivity, techniques for definition of the nature of the hearing loss, new techniques (including otoacoustic emissions or OAEs), and the progression of hearing loss, particularly in situations of genetic etiology. The chapter concludes with a brief appendix that defines current instrumental procedures available in pediatric audiology, including behavioral hearing tests, auditory brainstem response (ABR), electrocochleography, otoadmittance, and OAEs. 1 figure. 3 tables.

- **Epidemiology of Genetic Hearing Impairment**

  Source: in Martini, A.; Read, A.; Stephens, D., eds. Genetics and Hearing Impairment. San Diego, CA: Singular Publishing Group, Inc. 1996. p. 73-81.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $54.00 plus shipping and handling. ISBN: 1565937929.

  Summary: This chapter on the epidemiology of genetic **hearing impairment** is from a book that offers an overview of genetic hearing loss for audiologists, otolaryngologists, and clinical geneticists. This chapter concentrates mainly on figures in childhood and describes some of the difficulties in obtaining appropriate epidemiological data, arising from lack of uniform clinical terminology and criteria for inherited **hearing impairment.** In adult populations, information on the prevalence of genetic **hearing impairment** is scarce, mainly due to the lack of large scale epidemiological studies within the framework of medical services; thus the section on inherited **hearing impairment** in adults is brief. Topics covered include permanent **hearing impairment** in childhood, genetic factors causing permanent **hearing impairment,** the mode of transmission, nonsyndromal and syndromal genetic **hearing impairment,** social and longitudinal aspects of genetic **hearing impairment,** the epidemiology of genetic **hearing impairment** (including the concept that valid epidemiological data are virtually nonexistent in this area), and genetic **hearing impairment** in adults. The author concludes that, in order to collect data on the epidemiology of genetic **hearing impairment** throughout life, protocols based on uniform terminology, description and criteria for the diagnosis of genetic **hearing impairment** should be implemented, and the specificity and sensitivity of current and new audiometric methods for the recognition of a genetic carrier state should be evaluated. 3 tables.

- **Nature of Language Disorders Among Children with Hearing Impairment**

  Source: in Ratner, V.; Harris, L. Understanding Language Disorders: The Impact on Learning. Eau Claire, WI: Thinking Publications. 1994. p. 293-344.

  Contact: Available from Thinking Publications. 424 Galloway Street, Eau Claire, WI 54703. (800) 225-GROW or (715) 832-2488; Fax (800) 828-8885 or (715) 832-9082; E-mail: custserv@thinkingpublications.com. PRICE: $47.00 plus shipping and handling. ISBN: 093059990X.

  Summary: This chapter on the nature of language disorders among children with **hearing impairment** is from a textbook written for teachers, parents, and other professionals who are concerned with children who do not acquire language at the stages that their peers acquire language. The authors note that, unless a **hearing impairment** is diagnosed early in infancy and children receive appropriate habilitation, it can be predicted that their concept development, their spoken language comprehension, and their speech production will be deleteriously affected. The authors define **hearing impairment** and the global impact of hearing loss, describe the factors affecting language acquisition in terms of rate and quality, present alternative modes of communication used to teach language when spoken language is not naturally acquired, contrast the language development of children who are **hearing impaired** in families with deaf parents versus hearing parents, examine the impact of concomitant auditory and visual perceptual disabilities and multilingual and multicultural issues, propose ideal educational environments, and suggest teaching strategies for students who use various communication modes in classroom settings. (AA-M).

- **Psycho-Educational Assessment of Children with Hearing Impairment**

  Source: in Roeser, R.J.; Downs, M.P., eds. Auditory Disorders in School Children: The Law, Identification, Remediation. New York, NY: Thieme Medical Publishers, Inc. 1995. p. 117-148.

  Contact: Available from Thieme Medical Publishers, Inc. 333 Seventh Avenue, New York, NY 10001. (800) 782-3488 or (212) 760-0888; Fax (212) 947-1112; E-mail: custserv@thieme.com; http://www.thieme.com. PRICE: $45.00 plus shipping and handling. ISBN: 0865775508.

  Summary: This chapter on the psychoeducational assessment of children with **hearing impairment** is from a textbook that brings together experts from all disciplines to present ideas on how to provide help for school children with auditory disorders. The author defines terms connected with the notions of evaluation and the diagnostic process and discusses topics related to the assumptions and prerequisites of conducting any evaluation, especially that of a student with **hearing impairment.** Issues related to identifying and applying various evaluation materials and results to the programming of individual children are also addressed. Specific topics include cognition (intelligence), interplay of language and academic achievement, psychomotor functioning, social maturity and adaptive behavior, and emotional adjustment. The author emphasizes that the assessment process should be considered a movement through the educational placement and programming system, not the more limited conclusion that any given professional makes regarding the functional status of a particular child. 7 tables. 180 references.

- **Psychology of Individuals with Hearing Impairment**

  Source: in Sandlin, R.E., ed. Textbook of Hearing Aid Amplification: Technical and Clinical Considerations. 2nd ed. San Diego, CA: Singular Publishing Group. 2000. p. 557-570.

  Contact: Available from Singular-Thomson Learning. P.O. Box 6904, Florence, KY 41022. (800) 477-3692. Fax (606) 647-5963. Website: www.singpub.com. PRICE: $77.95 plus shipping and handling. ISBN: 1565939972.

  Summary: This chapter on the psychology of individuals with **hearing impairment** is from a textbook that offers information for academic and clinical professionals on the selection and fitting of hearing aid devices for people with hearing loss. The author analyzes the psychology of listeners with **hearing impairment,** how their behaviors and thoughts are shaped and developed by both internal and external factors and events, and how the hearing health care professional must utilize this knowledge in order to serve this population. Topics include terminology; the psychological levels of hearing, including primitive level of hearing, the signs and warning level of hearing, and the symbolic level of hearing; hearing loss characteristics, including degree of hearing, time of onset, and handicap produced by the disability; psychological adjustment to hearing loss, including awareness, acceptance, and adjustment; the effects of hearing loss on personality, including emotions, behaviors, and relationships; the cultural influences of age, disability, and hearing loss; and the clinician's psychological influences on rehabilitation. The chapter concludes with a list of questions for self study and review. 23 references.

- **Hearing Impairment and Manual Communication**

  Source: in Bench, R.J. Communication Skills in Hearing-Impaired Children: An Overview. San Diego, CA: Singular Publishing Group, Inc. 1992. p. 96-128.

  Contact: Available from Singular Publishing Group, Inc. 401 West 'A' Street, Suite 325, San Diego, CA 92101-7904. (800) 521-8545 or (619) 238-6777. Fax (800) 774-8398 or (619) 238-6789. E-mail: singpub@singpub.com. Website: www.singpub.com. PRICE: $50.00 plus shipping and handling. ISBN: 1565930754.

  Summary: This chapter, from a book about communication skills in children with **hearing impairment,** discusses **hearing impairment** and manual communication. Following an account of manual systems other than sign language, the author considers the characteristics of sign language as a language. The author comments also on the neuropsychology of sign and the ways in which sign language is learned or acquired. The chapter concludes with a review of total communication, included here because its dominant mode is usually manual. (AA-M).

- **Career Development of Young People with Hearing Impairments**

  Source: in Kluwin, T.N.; Moores, D.F.; Gaustad, M.G., eds. Toward Effective Public School Programs for Deaf Students: Context, Process, and Outcomes. New York, NY: Teachers College Press. 1992. p. 217-237.

  Contact: Available from Teachers College Press. Columbia University, 1334 Amsterdam Avenue, New York, NY 10027. (800) 575-6566 or (212) 678-3929; Fax (212) 678-4149. PRICE: $22.95 plus shipping and handling. ISBN: 0807731595 (paper).

  Summary: This chapter, from a book on mainstreaming deaf students in public school programs, introduces the reader to the career development literature, summarizes theories about career development, presents the career development research relevant to the deaf, and discusses the implications for educators. Specific topics covered include career development during adolescence, career maturity, communication, self-concept, family dynamics, comparisons of deaf with hearing peers, the antecedents of career maturity in the individual with **hearing impairment,** and locus of control and career maturity. The authors conclude that career education in a language deaf adolescents can understand, in conjunction with a supportive and nondirective family willing to explore the full range of vocational possibilities in a culturally stimulating environment, is the best bet in the struggle against the national hardship of unemployment and under-employment. 2 figures. 49 references.

- **Hearing Impairment**

  Source: in Blackman, J.A. Medical Aspects of Developmental Disabilities in Children, Birth to Three. Frederick, MD: Aspen Publishers, Inc. 1997. p. 157-164.

  Contact: Available from Aspen Publishers, Inc. 7201 McKinney Circle, Frederick, MD 21704. (800) 638-8437; Fax (301) 417-7650. PRICE: $40.00 plus shipping and handling. ISBN: 0834207591.

  Summary: This chapter, from a early childhood textbook on the medical aspects of developmental disabilities in young children (birth to age three), outlines concerns related to **hearing impairment.** The author begins with a description of **hearing impairment,** including the different types of hearing loss and the importance of early identification of hearing loss in infants and children. The author goes on to discuss etiology (cause), risk factors for hearing loss in newborns, the incidence of hearing loss,

diagnostic considerations, and management strategies. The chapter concludes with a brief section on the implications for early intervention. The author notes that the primary goal of all management techniques for sensorineural hearing loss is to foster language development. An audiologist can offer valuable assistance, not only in evaluation, but also in the management of hearing aids and other assistive listening devices and in developing appropriate communication techniques that will help maximize a child's learning. The author also considers the impact of hearing loss in a child with multiple disabilities, such as mental retardation. 2 figures. 1 table. 1 reference. (AA-M).

- **Hereditary Hearing Impairment**

  Source: in Ballenger, J.J.; Snow, J.B., Jr., eds. Otorhinolaryngology: Head and Neck Surgery. 15th ed. Baltimore, MD: Williams and Wilkins. 1996. p. 1075-1086.

  Contact: Available from Williams and Wilkins. P.O. Box 64686, Baltimore, MD 21264-4786. (800) 638-0672; Fax (800) 447-8438. PRICE: $179.00 plus shipping and handling. ISBN: 0683003151.

  Summary: This chapter, from a medical textbook on otorhinolaryngology, provides otolaryngologists with information necessary to diagnose many different types of hereditary deafness and to be able to offer prognostic, therapeutic, and habilitative options on that basis. Topics covered include the types of inheritance; the clinical evaluation of hereditary **hearing impairment;** syndromic deafness with craniofacial or cervical malformations, with ocular abnormalities, with integument abnormalities, with cardiac defects, with renal dysfunction, with endocrine dysfunction, with metabolic disorders, with skeletal dysplasia, and with chromosomal abnormalities; other types of syndromic deafness; mitochondrial inheritance; nonsyndromic deafness; and genetic counseling. 1 figure. 3 tables. 75 references.

- **Cochlear Implants and Tactile Aids for Children with Profound Hearing Impairment**

  Source: in Bess, F.H.; Gravel, J.S.; Tharpe, A.M., eds. Amplification for Children with Auditory Deficits. Nashville, TN: Bill Wilkerson Center Press. 1996. p. 283-308.

  Contact: Available from Bill Wilkerson Center Press. 1114 19th Avenue South, Nashville, TN 37212-2197. (615) 936-5023. Fax (615) 936-5013. PRICE: $55.00 plus shipping and handling. ISBN: 096314393X.

  Summary: This chapter, from a textbook on amplification for children with auditory deficits, discusses cochlear implants and tactile aids for children with profound **hearing impairment.** A series of longitudinal studies have been conducted that compare the speech perception performance of children who use cochlear implants, tactile aids, or hearing aids. The authors of this chapter summarize these studies and highlight future research directions. Information is presented on the speech perception materials used to evaluate device effectiveness, the description of experimental and control groups, comparisons of single versus dual channel and multichannel devices, comparisons of multichannel devices and hearing aids, and additional studies with multichannel implant users. 4 figures. 8 tables. 38 references. (AA-M).

- **Aural Rehabilitation for Individuals With Severe and Profound Hearing Impairment: Hearing Aids, Cochlear Implants, Counseling, and Training**

  Source: in Valente, M., ed. Strategies for Selecting and Verifying Hearing Aid Fittings. New York, NY: Thieme Medical Publishers, Inc. 1994. p. 267-299.

Contact: Available from Thieme Medical Publishers, Inc. 381 Park Avenue South, New York, NY 10016. (800) 782-3488 or (212) 683-5088. PRICE: $45.00 plus shipping and handling. ISBN: 0865775001.

Summary: This chapter, from a textbook on selecting and verifying hearing aid fittings, discusses aural rehabilitation, including hearing aids and cochlear implants for individuals with severe and profound **hearing impairment.** The authors focus on the rehabilitative services required for the maximal use and benefit from these devices. They note that the fitting goal for any aid is to match incoming sound with each person's residual hearing so that the range of conversational speech and environmental sounds are comfortably loud, speech is as clear as possible, and loud sounds are not too loud. The authors also focus on determining candidacy for cochlear implant surgery. 5 figures. 9 tables. 58 references.

- **Genetic Hearing Impairment in Children**

Source: in Canalis, R.F. and Lambert, P.R., eds. Ear: Comprehensive Otology. Philadelphia, PA: Lippincott Williams and Wilkins. 2000. p. 511-522.

Contact: Available from Lippincott Williams and Wilkins. P.O. Box 1600, Hagerstown, MD 21741. (800) 638-3030. Fax (301) 223-2300. Website: www.lww.com. PRICE: $179.00 plus shipping and handling. ISBN: 078171558X.

Summary: Two thirds of cases of genetic hearing loss are nonsyndromic; one third of cases have recognizable characteristic findings and are considered part of a syndrome. This chapter on genetic **hearing impairment** in children is from a textbook that offers complete coverage of the field of clinical otology (study of the ear). The book is oriented to serve both the otolaryngology resident as a practical learning tool and the practicing otolaryngologist as an updated reference source of clinical and basic information. Topics include recognizing hereditary causes of hearing loss, including gene penetrance versus gene expression, finding the genes that cause hearing loss, genes that have been located, and applying gene identification to patient care; historical perspective; incidence and prevalence; inheritance patterns, including autosomal dominant, autosomal recessive, and X linked patterns; patient evaluation, including history and physical examination; types of hereditary hearing loss, including Goldenhar syndrome, Apert syndrome, Crouzon syndrome, Treacher Collins syndrome, Usher syndrome, Pendred syndrome, Jervell and Lange Nielsen syndrome, Stickler syndrome, Alport syndrome, Waardenburg syndrome, Branchiootorenal syndrome, X linked recessive mixed deafness with perilymphatic gusher, autosomal dominant delayed onset progressive sensorineural hearing loss, and Pierre Robin sequence; and the role of genetic counseling. Genetic counseling offers multiple opportunities and support mechanisms, from information about childbearing to community activities that cater to people who are deaf. 5 figures. 12 tables. 41 references.

Directories

In addition to the references and resources discussed earlier in this chapter, a number of directories relating to hearing impairment have been published that consolidate information across various sources. The Combined Health Information Database lists the following, which you may wish to consult in your local medical library:[10]

[10] You will need to limit your search to “Directory” and “hearing impairment” using the "Detailed Search" option. Go directly to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. To find directories, use the drop

- **HEATH Resource Directory on Postsecondary Education and Disability: 1996**

  Source: Washington, DC: HEATH Resource Center, American Council on Education. 1996. 69 p.

  Contact: Available from HEATH Resource Center. American Council on Education. One Dupont Circle, N.W., Suite 800, Washington, DC 20036-1193. Voice/TTY (800) 544-3284 or (202) 939-9320. PRICE: Single copy free.

  Summary: This directory on postsecondary education and disability is produced by the HEATH Resource Center, a clearinghouse that collects and disseminates information nationally about disability issues in postsecondary education. The directory lists agencies in six categories: advocacy, access, and awareness; community integration; disability-specific organizations, including attention deficit disorder, learning disabilities, speech and **hearing impairment,** and mobility impairment; funding; legal assistance, including information on the Americans with Disabilities Act; and technology. The directory includes an organization name index, as well as a list of toll-free telephone numbers.

- **Self-Help Sourcebook: Finding and Forming Mutual Aid Self-Help Groups. 4th ed**

  Source: Denville, NJ: American Self-Help Clearinghouse. 1992. 226 p.

  Contact: Available from American Self-Help Clearinghouse. Attn: Sourcebook, St. Clares-Riverside Medical Center, 25 Pocono Road, Denville, NJ 07834. Voice (201) 625-7101; TTY (201) 625-9053. PRICE: $9.00 book rate; $10.00 first class mail. ISBN: 0963432206.

  Summary: This sourcebook lists self-help groups in a wide variety of topic areas, including addictions and dependencies, bereavement, disabilities, health, mental health, parenting and family, physical and/or emotional abuse, and miscellaneous categories. Topics relevant to deafness and communication disorders include acoustic neuroma, alternative/augmentative communication, autism, cleft palate and cleft lip, cochlear implants, developmental disabilities, developmentally delayed children, Down syndrome, dystonia, ear anomalies, elective mutism, **hearing impairment,** inner ear problems, laryngectomy, late-deafened adults, learning disabilities, Meniere's disease, neck-head-oral cancer, parents of children with **hearing impairment,** speech dysfunction, speech impairments, stuttering, tinnitus, Tourette syndrome, and Usher's syndrome. In addition to basic information about the self-help groups, the sourcebook lists self-help clearinghouses, toll-free helplines, resources for rare disorders, resources for genetic disorders, housing and neighborhood resources and resources for the homeless, how-to ideas for developing self-help groups, and using a home computer for mutual help. The book includes a bibliography and key word index.

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boxes at the bottom of the search page where "You may refine your search by." For publication date, select "All Years." Select your preferred language and the format option "Directory." Type "hearing impairment" (or synonyms) into the "For these words:" box. You should check back periodically with this database as it is updated every three months.

CHAPTER 7. MULTIMEDIA ON HEARING IMPAIRMENT

Overview

In this chapter, we show you how to keep current on multimedia sources of information on hearing impairment. We start with sources that have been summarized by federal agencies, and then show you how to find bibliographic information catalogued by the National Library of Medicine.

Video Recordings

An excellent source of multimedia information on hearing impairment is the Combined Health Information Database. You will need to limit your search to "Videorecording" and "hearing impairment" using the "Detailed Search" option. Go directly to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. To find video productions, use the drop boxes at the bottom of the search page where "You may refine your search by." Select the dates and language you prefer, and the format option "Videorecording (videotape, videocassette, etc.)." Type "hearing impairment" (or synonyms) into the "For these words:" box. The following is a typical result when searching for video recordings on hearing impairment:

- **Jody Says 'Love Your Teeth': A Dental Health Teaching Module for Hearing Impaired Preschoolers**

  Source: Phoenix, AZ: Arizona Department of Health Services, Office of Oral Health. 1992. (instructional package).

  Contact: Available from Arizona Department of Health Services, Office of Oral Health. 1740 West Adams, Room 010, Phoenix, AZ 85007-2698. (602) 542-1866. PRICE: Free loan of single copy; two depositories per state; contact above address for listing of National Depositories.

  Summary: This instructional program is an introduction to dental health for preschoolers who have hearing impairments. The module is designed so that a week of dental health activities can be presented in the classroom. A suggested set of lessons and activities is included in the module. Components of the program include a 15-minute videotape featuring Jody the Dental Health Coyote communicating in speech and sign

language; a 45-page teacher's workbook containing background information for designing lesson plans for a specific class; and several manipulatives and visual aids, including a Jody puppet; four storybooks with signed English illustrations; and three wooden puzzles depicting the parts of the mouth, healthy and unhealthy foods, and the experience of a first visit to the dentist.

CHAPTER 8. PERIODICALS AND NEWS ON HEARING IMPAIRMENT

Overview

In this chapter, we suggest a number of news sources and present various periodicals that cover hearing impairment.

News Services and Press Releases

One of the simplest ways of tracking press releases on hearing impairment is to search the news wires. In the following sample of sources, we will briefly describe how to access each service. These services only post recent news intended for public viewing.

PR Newswire

To access the PR Newswire archive, simply go to **http://www.prnewswire.com/**. Select your country. Type "hearing impairment" (or synonyms) into the search box. You will automatically receive information on relevant news releases posted within the last 30 days. The search results are shown by order of relevance.

Reuters Health

The Reuters' Medical News and Health eLine databases can be very useful in exploring news archives relating to hearing impairment. While some of the listed articles are free to view, others are available for purchase for a nominal fee. To access this archive, go to **http://www.reutershealth.com/en/index.html** and search by "hearing impairment" (or synonyms). The following was recently listed in this archive for hearing impairment:

- **NHS Finds Universal Neonatal Screening For Hearing Impairment Effective**
  Source: Reuters Medical News
  Date: May 05, 1998

- **Bilateral Hearing Impairment Needs To Be Diagnosed At Early Age**
  Source: Reuters Medical News
  Date: November 14, 1997
- **Childhood hearing impairment in UK more common than previously thought**
  Source: Reuters Medical News
  Date: September 07, 2001

The NIH

Within MEDLINEplus, the NIH has made an agreement with the New York Times Syndicate, the AP News Service, and Reuters to deliver news that can be browsed by the public. Search news releases at **http://www.nlm.nih.gov/medlineplus/alphanews_a.html**. MEDLINEplus allows you to browse across an alphabetical index. Or you can search by date at the following Web page: **http://www.nlm.nih.gov/medlineplus/newsbydate.html**. Often, news items are indexed by MEDLINEplus within its search engine.

Business Wire

Business Wire is similar to PR Newswire. To access this archive, simply go to **http://www.businesswire.com/**. You can scan the news by industry category or company name.

Market Wire

Market Wire is more focused on technology than the other wires. To browse the latest press releases by topic, such as alternative medicine, biotechnology, fitness, healthcare, legal, nutrition, and pharmaceuticals, access Market Wire's Medical/Health channel at **http://www.marketwire.com/mw/release_index?channel=MedicalHealth**. Or simply go to Market Wire's home page at **http://www.marketwire.com/mw/home**, type "hearing impairment" (or synonyms) into the search box, and click on "Search News." As this service is technology oriented, you may wish to use it when searching for press releases covering diagnostic procedures or tests.

Search Engines

Medical news is also available in the news sections of commercial Internet search engines. See the health news page at Yahoo (**http://dir.yahoo.com/Health/News_and_Media/**), or you can use this Web site's general news search page at **http://news.yahoo.com/**. Type in "hearing impairment" (or synonyms). If you know the name of a company that is relevant to hearing impairment, you can go to any stock trading Web site (such as **http://www.etrade.com/**) and search for the company name there. News items across various news sources are reported on indicated hyperlinks. Google offers a similar service at **http://news.google.com/**.

BBC

Covering news from a more European perspective, the British Broadcasting Corporation (BBC) allows the public free access to their news archive located at **http://www.bbc.co.uk/**. Search by "hearing impairment" (or synonyms).

Newsletters on Hearing Impairment

Find newsletters on hearing impairment using the Combined Health Information Database (CHID). You will need to use the "Detailed Search" option. To access CHID, go to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. Limit your search to "Newsletter" and "hearing impairment." Go to the bottom of the search page where "You may refine your search by." Select the dates and language that you prefer. For the format option, select "Newsletter." Type "hearing impairment" (or synonyms) into the "For these words:" box. The following list was generated using the options described above:

- **Advances in the Genetics of Deafness**

  Source: Advances in the Genetics of Deafness: A Bulletin of the HHIRR. 1(1): 1-8. Spring 1994.

  Contact: Available from National Research Register for Hereditary Hearing Loss, Boys Town National Research Hospital (BTNRH). 555 North 30th Street, Omaha, NE 68131. (800) 320-1171. PRICE: $2.00 for each back issue.

  Summary: This document is the premier issue of a newsletter on the genetics of deafness, a bulletin of the Hereditary **Hearing Impairment** Resource Registry (HHIRR). The bulletin is designed to inform researchers in the genetics of the human auditory system about advances and opportunities for research in this area. The main article discusses the HHIRR, focusing on its purpose, information collection activities, data management concerns, and research collaboration activities. The newsletter also includes a literature review, with materials grouped under five major categories: reviews, clinical reports, genetic epidemiology, gene localization, and molecular genetics. Other segments include a calendar of related meetings; a questions, comments, and feedback section; and a call for readers to join the mailing list of the HHIRR.

- **Educational Audiology Review**

  Source: Educational Audiology Review. 16(4): 1-44. Fall 1999.

  Contact: Available from Educational Audiology Association. 4319 Ehrlich Road, Tampa, FL 33624. (800) 460-7322. Website: www.edaud.org.

  Summary: This newsletter is a quarterly publication of the Educational Audiology Association; this issue focuses on genetic and syndrome related hearing loss. The newsletter includes articles reporting on recent research efforts, conferences, and clinical procedures. This particular issue includes articles on the ten syndromes most commonly associated with **hearing impairment,** a summary of worldwide research in genetics and hearing loss, genetic evaluation and counseling for hearing loss, and a 'report card' article on efforts to incorporate audiology into the educational setting; a litigation issues survey, a report of the 1999 EAA summer conference. Columns offer practical information (primarily about equipment and products), EAA news, a section of brief

reports from different states (and Canada), and a list of EAA materials and publications for sale.

Newsletter Articles

Use the Combined Health Information Database, and limit your search criteria to "newsletter articles." Again, you will need to use the "Detailed Search" option. Go directly to the following hyperlink: **http://chid.nih.gov/detail/detail.html**. Go to the bottom of the search page where "You may refine your search by." Select the dates and language that you prefer. For the format option, select "Newsletter Article." Type "hearing impairment" (or synonyms) into the "For these words:" box. You should check back periodically with this database as it is updated every three months. The following is a typical result when searching for newsletter articles on hearing impairment:

- **Spotlight on: Current Progress in Finding Genes Involved in Hearing Impairment**

  Source: Advances in the Genetics of Deafness. 1(2): 1-4. Spring 1995.

  Contact: Available from Boys Town National Research Hospital (BTNRH). 555 North 30th Street, Omaha, NE 68131. (800) 320-1171.

  Summary: This article discusses recent progress in research investigating the genes involved in **hearing impairment.** The author notes that despite rather daunting obstacles, research into the different types of genetic **hearing impairment** has progressed significantly. Several genes have been localized to specific chromosomes and in some cases, the actual gene responsible has been identified, cloned, and its function determined. Types of **hearing impairment** discussed include that associated with Usher syndrome; Waardenburg syndrome; Alport syndrome; branchio-oto-renal syndrome; Stickler syndrome; osteogenesis imperfecta; Crouzon syndrome; Treacher-Collins syndrome; Norries syndrome; X-linked **hearing impairment;** neurofibromatosis II (NF2); and non-syndromic **hearing impairment.** The author concludes with a brief discussion of the present and future impact of information coming from genetic research in this area. 1 table. 24 references.

Academic Periodicals covering Hearing Impairment

Numerous periodicals are currently indexed within the National Library of Medicine's PubMed database that are known to publish articles relating to hearing impairment. In addition to these sources, you can search for articles covering hearing impairment that have been published by any of the periodicals listed in previous chapters. To find the latest studies published, go to **http://www.ncbi.nlm.nih.gov/pubmed**, type the name of the periodical into the search box, and click "Go."

If you want complete details about the historical contents of a journal, you can also visit the following Web site: **http://www.ncbi.nlm.nih.gov/entrez/jrbrowser.cgi**. Here, type in the name of the journal or its abbreviation, and you will receive an index of published articles. At **http://locatorplus.gov/**, you can retrieve more indexing information on medical periodicals (e.g. the name of the publisher). Select the button "Search LOCATORplus." Then type in the name of the journal and select the advanced search option "Journal Title Search."

APPENDICES

APPENDIX A. PHYSICIAN RESOURCES

Overview

In this chapter, we focus on databases and Internet-based guidelines and information resources created or written for a professional audience.

NIH Guidelines

Commonly referred to as "clinical" or "professional" guidelines, the National Institutes of Health publish physician guidelines for the most common diseases. Publications are available at the following by relevant Institute[11]:

- Office of the Director (OD); guidelines consolidated across agencies available at **http://www.nih.gov/health/consumer/conkey.htm**
- National Institute of General Medical Sciences (NIGMS); fact sheets available at **http://www.nigms.nih.gov/news/facts/**
- National Library of Medicine (NLM); extensive encyclopedia (A.D.A.M., Inc.) with guidelines: **http://www.nlm.nih.gov/medlineplus/healthtopics.html**
- National Cancer Institute (NCI); guidelines available at **http://www.cancer.gov/cancerinfo/list.aspx?viewid=5f35036e-5497-4d86-8c2c-714a9f7c8d25**
- National Eye Institute (NEI); guidelines available at **http://www.nei.nih.gov/order/index.htm**
- National Heart, Lung, and Blood Institute (NHLBI); guidelines available at **http://www.nhlbi.nih.gov/guidelines/index.htm**
- National Human Genome Research Institute (NHGRI); research available at **http://www.genome.gov/page.cfm?pageID=10000375**
- National Institute on Aging (NIA); guidelines available at **http://www.nia.nih.gov/health/**

[11] These publications are typically written by one or more of the various NIH Institutes.

- National Institute on Alcohol Abuse and Alcoholism (NIAAA); guidelines available at **http://www.niaaa.nih.gov/publications/publications.htm**
- National Institute of Allergy and Infectious Diseases (NIAID); guidelines available at **http://www.niaid.nih.gov/publications/**
- National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS); fact sheets and guidelines available at **http://www.niams.nih.gov/hi/index.htm**
- National Institute of Child Health and Human Development (NICHD); guidelines available at **http://www.nichd.nih.gov/publications/pubskey.cfm**
- National Institute on Deafness and Other Communication Disorders (NIDCD); fact sheets and guidelines at **http://www.nidcd.nih.gov/health/**
- National Institute of Dental and Craniofacial Research (NIDCR); guidelines available at **http://www.nidr.nih.gov/health/**
- National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK); guidelines available at **http://www.niddk.nih.gov/health/health.htm**
- National Institute on Drug Abuse (NIDA); guidelines available at **http://www.nida.nih.gov/DrugAbuse.html**
- National Institute of Environmental Health Sciences (NIEHS); environmental health information available at **http://www.niehs.nih.gov/external/facts.htm**
- National Institute of Mental Health (NIMH); guidelines available at **http://www.nimh.nih.gov/practitioners/index.cfm**
- National Institute of Neurological Disorders and Stroke (NINDS); neurological disorder information pages available at **http://www.ninds.nih.gov/health_and_medical/disorder_index.htm**
- National Institute of Nursing Research (NINR); publications on selected illnesses at **http://www.nih.gov/ninr/news-info/publications.html**
- National Institute of Biomedical Imaging and Bioengineering; general information at **http://grants.nih.gov/grants/becon/becon_info.htm**
- Center for Information Technology (CIT); referrals to other agencies based on keyword searches available at **http://kb.nih.gov/www_query_main.asp**
- National Center for Complementary and Alternative Medicine (NCCAM); health information available at **http://nccam.nih.gov/health/**
- National Center for Research Resources (NCRR); various information directories available at **http://www.ncrr.nih.gov/publications.asp**
- Office of Rare Diseases; various fact sheets available at **http://rarediseases.info.nih.gov/html/resources/rep_pubs.html**
- Centers for Disease Control and Prevention; various fact sheets on infectious diseases available at **http://www.cdc.gov/publications.htm**

NIH Databases

In addition to the various Institutes of Health that publish professional guidelines, the NIH has designed a number of databases for professionals.[12] Physician-oriented resources provide a wide variety of information related to the biomedical and health sciences, both past and present. The format of these resources varies. Searchable databases, bibliographic citations, full-text articles (when available), archival collections, and images are all available. The following are referenced by the National Library of Medicine:[13]

- **Bioethics:** Access to published literature on the ethical, legal, and public policy issues surrounding healthcare and biomedical research. This information is provided in conjunction with the Kennedy Institute of Ethics located at Georgetown University, Washington, D.C.: **http://www.nlm.nih.gov/databases/databases_bioethics.html**
- **HIV/AIDS Resources:** Describes various links and databases dedicated to HIV/AIDS research: **http://www.nlm.nih.gov/pubs/factsheets/aidsinfs.html**
- **NLM Online Exhibitions:** Describes "Exhibitions in the History of Medicine": **http://www.nlm.nih.gov/exhibition/exhibition.html**. Additional resources for historical scholarship in medicine: **http://www.nlm.nih.gov/hmd/hmd.html**
- **Biotechnology Information:** Access to public databases. The National Center for Biotechnology Information conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information for the better understanding of molecular processes affecting human health and disease: **http://www.ncbi.nlm.nih.gov/**
- **Population Information:** The National Library of Medicine provides access to worldwide coverage of population, family planning, and related health issues, including family planning technology and programs, fertility, and population law and policy: **http://www.nlm.nih.gov/databases/databases_population.html**
- **Cancer Information:** Access to cancer-oriented databases: **http://www.nlm.nih.gov/databases/databases_cancer.html**
- **Profiles in Science:** Offering the archival collections of prominent twentieth-century biomedical scientists to the public through modern digital technology: **http://www.profiles.nlm.nih.gov/**
- **Chemical Information:** Provides links to various chemical databases and references: **http://sis.nlm.nih.gov/Chem/ChemMain.html**
- **Clinical Alerts:** Reports the release of findings from the NIH-funded clinical trials where such release could significantly affect morbidity and mortality: **http://www.nlm.nih.gov/databases/alerts/clinical_alerts.html**
- **Space Life Sciences:** Provides links and information to space-based research (including NASA): **http://www.nlm.nih.gov/databases/databases_space.html**
- **MEDLINE:** Bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, the healthcare system, and the pre-clinical sciences: **http://www.nlm.nih.gov/databases/databases_medline.html**

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[12] Remember, for the general public, the National Library of Medicine recommends the databases referenced in MEDLINE*plus* (**http://medlineplus.gov/** or **http://www.nlm.nih.gov/medlineplus/databases.html**).

[13] See **http://www.nlm.nih.gov/databases/databases.html**.

- **Toxicology and Environmental Health Information (TOXNET):** Databases covering toxicology and environmental health: **http://sis.nlm.nih.gov/Tox/ToxMain.html**
- **Visible Human Interface:** Anatomically detailed, three-dimensional representations of normal male and female human bodies: **http://www.nlm.nih.gov/research/visible/visible_human.html**

The NLM Gateway[14]

The NLM (National Library of Medicine) Gateway is a Web-based system that lets users search simultaneously in multiple retrieval systems at the U.S. National Library of Medicine (NLM). It allows users of NLM services to initiate searches from one Web interface, providing one-stop searching for many of NLM's information resources or databases.[15] To use the NLM Gateway, simply go to the search site at **http://gateway.nlm.nih.gov/gw/Cmd**. Type "hearing impairment" (or synonyms) into the search box and click "Search." The results will be presented in a tabular form, indicating the number of references in each database category.

Results Summary

Category	Items Found
Journal Articles	34170
Books / Periodicals / Audio Visual	331
Consumer Health	983
Meeting Abstracts	32
Other Collections	191
Total	35707

HSTAT[16]

HSTAT is a free, Web-based resource that provides access to full-text documents used in healthcare decision-making.[17] These documents include clinical practice guidelines, quick-reference guides for clinicians, consumer health brochures, evidence reports and technology assessments from the Agency for Healthcare Research and Quality (AHRQ), as well as AHRQ's Put Prevention Into Practice.[18] Simply search by "hearing impairment" (or synonyms) at the following Web site: **http://text.nlm.nih.gov**.

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[14] Adapted from NLM: **http://gateway.nlm.nih.gov/gw/Cmd?Overview.x**.

[15] The NLM Gateway is currently being developed by the Lister Hill National Center for Biomedical Communications (LHNCBC) at the National Library of Medicine (NLM) of the National Institutes of Health (NIH).

[16] Adapted from HSTAT: **http://www.nlm.nih.gov/pubs/factsheets/hstat.html**.

[17] The HSTAT URL is **http://hstat.nlm.nih.gov/**.

[18] Other important documents in HSTAT include: the National Institutes of Health (NIH) Consensus Conference Reports and Technology Assessment Reports; the HIV/AIDS Treatment Information Service (ATIS) resource documents; the Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Treatment (SAMHSA/CSAT) Treatment Improvement Protocols (TIP) and Center for Substance Abuse Prevention (SAMHSA/CSAP) Prevention Enhancement Protocols System (PEPS); the Public Health Service (PHS) Preventive Services Task Force's *Guide to Clinical Preventive Services*; the independent, nonfederal Task Force on Community Services' *Guide to Community Preventive Services*; and the Health Technology Advisory Committee (HTAC) of the Minnesota Health Care Commission (MHCC) health technology evaluations.

Coffee Break: Tutorials for Biologists[19]

Coffee Break is a general healthcare site that takes a scientific view of the news and covers recent breakthroughs in biology that may one day assist physicians in developing treatments. Here you will find a collection of short reports on recent biological discoveries. Each report incorporates interactive tutorials that demonstrate how bioinformatics tools are used as a part of the research process. Currently, all Coffee Breaks are written by NCBI staff.[20] Each report is about 400 words and is usually based on a discovery reported in one or more articles from recently published, peer-reviewed literature.[21] This site has new articles every few weeks, so it can be considered an online magazine of sorts. It is intended for general background information. You can access the Coffee Break Web site at the following hyperlink: **http://www.ncbi.nlm.nih.gov/Coffeebreak/**.

Other Commercial Databases

In addition to resources maintained by official agencies, other databases exist that are commercial ventures addressing medical professionals. Here are some examples that may interest you:

- **CliniWeb International:** Index and table of contents to selected clinical information on the Internet; see **http://www.ohsu.edu/cliniweb/**.
- **Medical World Search:** Searches full text from thousands of selected medical sites on the Internet; see **http://www.mwsearch.com/**.

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[19] Adapted from **http://www.ncbi.nlm.nih.gov/Coffeebreak/Archive/FAQ.html**.

[20] The figure that accompanies each article is frequently supplied by an expert external to NCBI, in which case the source of the figure is cited. The result is an interactive tutorial that tells a biological story.

[21] After a brief introduction that sets the work described into a broader context, the report focuses on how a molecular understanding can provide explanations of observed biology and lead to therapies for diseases. Each vignette is accompanied by a figure and hypertext links that lead to a series of pages that interactively show how NCBI tools and resources are used in the research process.

APPENDIX B. PATIENT RESOURCES

Overview

Official agencies, as well as federally funded institutions supported by national grants, frequently publish a variety of guidelines written with the patient in mind. These are typically called "Fact Sheets" or "Guidelines." They can take the form of a brochure, information kit, pamphlet, or flyer. Often they are only a few pages in length. Since new guidelines on hearing impairment can appear at any moment and be published by a number of sources, the best approach to finding guidelines is to systematically scan the Internet-based services that post them.

Patient Guideline Sources

The remainder of this chapter directs you to sources which either publish or can help you find additional guidelines on topics related to hearing impairment. Due to space limitations, these sources are listed in a concise manner. Do not hesitate to consult the following sources by either using the Internet hyperlink provided, or, in cases where the contact information is provided, contacting the publisher or author directly.

The National Institutes of Health

The NIH gateway to patients is located at **http://health.nih.gov/**. From this site, you can search across various sources and institutes, a number of which are summarized below.

Topic Pages: MEDLINEplus

The National Library of Medicine has created a vast and patient-oriented healthcare information portal called MEDLINEplus. Within this Internet-based system are "health topic pages" which list links to available materials relevant to hearing impairment. To access this system, log on to **http://www.nlm.nih.gov/medlineplus/healthtopics.html**. From there you can either search using the alphabetical index or browse by broad topic areas. Recently, MEDLINEplus listed the following when searched for "hearing impairment":

Ear Disorders
http://www.nlm.nih.gov/medlineplus/eardisorders.html

Hearing Disorders and Deafness
http://www.nlm.nih.gov/medlineplus/hearingdisordersanddeafness.html

Hearing Problems in Children
http://www.nlm.nih.gov/medlineplus/hearingproblemsinchildren.html

You may also choose to use the search utility provided by MEDLINEplus at the following Web address: **http://www.nlm.nih.gov/medlineplus/**. Simply type a keyword into the search box and click "Search." This utility is similar to the NIH search utility, with the exception that it only includes materials that are linked within the MEDLINEplus system (mostly patient-oriented information). It also has the disadvantage of generating unstructured results. We recommend, therefore, that you use this method only if you have a very targeted search.

The Combined Health Information Database (CHID)

CHID Online is a reference tool that maintains a database directory of thousands of journal articles and patient education guidelines on hearing impairment. CHID offers summaries that describe the guidelines available, including contact information and pricing. CHID's general Web site is **http://chid.nih.gov/**. To search this database, go to **http://chid.nih.gov/detail/detail.html**. In particular, you can use the advanced search options to look up pamphlets, reports, brochures, and information kits. The following was recently posted in this archive:

- **Genetics and Deafness - Ten Syndromes Most Commonly Associated With Hearing Impairment**

  Source: The Research Registry for Hereditary Hearing Loss. Omaha, NE. 7p.

  Contact: Available from Research Registry for Hereditary Hearing Loss. 555 N. 30th Street, Omaha, NE 68131. 800-320-1171 (V/TDD); 404-498-6331 (Fax). Web site: http://www.boystownhospital.org/. PRICE: Available for download online at: http://www.boystownhospital.org/parents/info/genetics/ten.asp.

  Summary: In this article, the author familiarizes readers with ten syndromes most commonly associated with **hearing impairment.** The author has chosen to look at all patients in a national registry who carry the diagnosis of hearing loss, and who also have another associated clinical congenital anomaly or genetic feature, and look at the most common recurring diagnoses. The syndromes discussed are: hemifacial microsomia; Stickler syndrome; congenital cytomegalovirus; Usher syndrome; branchio-oto-renal syndrome; Pendred syndrome; CHARGE association; neurofibromatosis type II; mitochondrial disorders; and Waardenburg syndrome. For each syndrome, the author discusses the incidence and prevalence, common features, and hearing loss, and provides comments.

- **Hearing Impairment: Enriching but Challenging**

  Source: in DeFeo, A.B., ed. Parent Articles 2. San Antonio, TX: Communication Skill Builders. 1995. p. 171-172.

Contact: Available from Communication Skill Builders. Customer Service, 555 Academic Court, San Antonio, TX 78204-2498. (800) 211-8378; Fax (800) 232-1223. PRICE: $55.00 plus shipping and handling. Order Number 076-163-0732.

Summary: In this fact sheet, from a communication skills book for parents, a parent of a child with a **hearing impairment** discusses the emotions and psychological factors that may affect the parents of children with hearing impairments. The author discusses factors that are enriching, that are challenging, and that can be overwhelming. Topics covered include sign language, the role of support groups, educating oneself about deafness, becoming an educational advocate, vocabulary development, and social skills. The author provides detailed suggestions for parents to incorporate into their daily activities with a child who is deaf.

- **Hearing Impairment: Practical Suggestions for the Patient and Family**

  Source: Los Angeles, CA: House Ear Institute. 1994. 35 p.

  Contact: Available from House Ear Institute. 2100 West Third Street, Fifth Floor, Los Angeles, CA 90057. Voice (800) 552-HEAR; (213) 483-4431; TTY (213) 484-2642; Fax (213) 483-8789. PRICE: $1.00 per booklet. Order Number BR-10.

  Summary: This brochure describes various types of hearing loss and outlines practical suggestions for communicating with a person who has hearing loss. The booklet begins with a discussion of the anatomy and function of the normal ear, and then describes conductive, sensorineural, and mixed types of **hearing impairment.** Additional topics include **hearing impairment** in only one ear, rehabilitative measures, hints for friends and relatives of persons with hearing loss, speechreading, communication assistive devices, listening in group situations, hearing-ear dog programs, and hearing aids and their use. The brochure focuses on practical, positive suggestions for everyday activities. In each section, the booklet provides checklists and boxes to individualize the information provided to a specific patient. The appendix lists the addresses of numerous hearing-ear dog programs. 1 figure. 15 references.

- **Incidence and Prevalence of Hearing Impairment in the United States**

  Source: Rockville, MD: American Speech-Language-Hearing Association (ASHA). 1999. [3 p.].

  Contact: Available from American Speech-Language-Hearing Association (ASHA). Product Sales, 10801 Rockville Pike, Rockville, MD 20852. (888) 498-6699. TTY (301) 897-0157. Website: www.asha.org. PRICE: Single copy free.

  Summary: This fact sheet offers statistics on the incidence and prevalence of **hearing impairment** in the U.S. The first section reviews the demographics of **hearing impairment,** including gender, race, and the implementation of the Individuals with Disabilities Education Act (1997). The second section discusses the incidence and prevalence of auditory disorders, including acoustic neuroma and vestibular schwannomas, hyperacusis, Meniere's disease, neurofibromatosis, noise induced hearing loss, otitis media, otosclerosis, presbycusis, sensorineural hearing loss, tinnitus, Waardenburg syndrome, and deafness. The final section briefly reviews current research efforts in the areas of otitis media (middle ear infection), hearing aids, children and hearing loss, tinnitus, and deafness genetics. 21 references.

- **Hearing Impairment or Loss (Deafness)**

  Source: in Griffith, H.W. Instructions for Patients. 5th ed. Orlando, FL: W.B. Saunders Company. 1994. p. 202.

  Contact: Available from W.B. Saunders Company. Order Fulfillment, 6277 Sea Harbor Drive, Orlando, FL 32887. (800) 545-2522; Fax (800) 874-6418. PRICE: $47.50 plus shipping and handling. ISBN: 0721649300.

  Summary: This fact sheet on **hearing impairment** or loss is from a compilation of instructions for patients, published in book format. The fact sheet provides information in three sections: basic information, including a description of the condition, frequent signs and symptoms, causes, risk factors, preventive measures, expected outcome, and possible complications; treatment, including general measures, medication, activity guidelines, and diet; and when to contact one's health care provider. The fact sheet is designed to be photocopied and distributed to patients as a reinforcement of oral instructions and as a teaching tool.

- **Your Hearing Impaired Child**

  Source: Port Huron, MI: Unitron Industries Ltd. 199x. 2 p.

  Contact: Available from Unitron Industries Inc. 3555 Walnut Street, P.O. Box 5010, Port Huron, MI 48061-5010. (800) 521-5400 or (810) 982-0166; Fax (810) 987-2011. PRICE: Single copy free; bulk orders available.

  Summary: This simple brochure provides basic information for the parents of a child with **hearing impairment.** The brochure outlines the basic needs and concerns of all children, including those with hearing loss. Topics covered include the role of affection, daily routine, consistent expectations, language training, fears and concerns, handling new experiences, emotions, social development, and parents' time-out. In each section, the brochure provides hints for parents, including some suggestions particularly relevant to children with hearing loss.

Healthfinder™

Healthfinder™ is sponsored by the U.S. Department of Health and Human Services and offers links to hundreds of other sites that contain healthcare information. This Web site is located at **http://www.healthfinder.gov**. Again, keyword searches can be used to find guidelines. The following was recently found in this database:

- **FAQ - About Tinnitus**

  Summary: Answers to consumers' most commonly asked questions about this hearing impairment characterized by ringing in the ears and/or head noises. These noises can appear in a variety of forms.

  Source: American Tinnitus Association

  http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2676

- **Hearing Aids**

  Summary: This page presents general information about hearing aids for adults, parents and caregivers along with related hearing impairment information.

  Source: American Speech-Language-Hearing Association

  http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2893

- **Usher Syndrome**

  Summary: This online document provides a clinical description and treatment options for this genetic inherited disorder that is characterized by moderate to profound hearing impairment and progressive vision

  Source: Foundation Fighting Blindness, National Headquarters

  http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2334

The NIH Search Utility

The NIH search utility allows you to search for documents on over 100 selected Web sites that comprise the NIH-WEB-SPACE. Each of these servers is "crawled" and indexed on an ongoing basis. Your search will produce a list of various documents, all of which will relate in some way to hearing impairment. The drawbacks of this approach are that the information is not organized by theme and that the references are often a mix of information for professionals and patients. Nevertheless, a large number of the listed Web sites provide useful background information. We can only recommend this route, therefore, for relatively rare or specific disorders, or when using highly targeted searches. To use the NIH search utility, visit the following Web page: **http://search.nih.gov/index.html**.

Additional Web Sources

A number of Web sites are available to the public that often link to government sites. These can also point you in the direction of essential information. The following is a representative sample:

- AOL: **http://search.aol.com/cat.adp?id=168&layer=&from=subcats**
- Family Village: **http://www.familyvillage.wisc.edu/specific.htm**
- Google: **http://directory.google.com/Top/Health/Conditions_and_Diseases/**
- Med Help International: **http://www.medhelp.org/HealthTopics/A.html**
- Open Directory Project: **http://dmoz.org/Health/Conditions_and_Diseases/**
- Yahoo.com: **http://dir.yahoo.com/Health/Diseases_and_Conditions/**
- WebMD®Health: **http://my.webmd.com/health_topics**

Finding Associations

There are several Internet directories that provide lists of medical associations with information on or resources relating to hearing impairment. By consulting all of associations

listed in this chapter, you will have nearly exhausted all sources for patient associations concerned with hearing impairment.

The National Health Information Center (NHIC)

The National Health Information Center (NHIC) offers a free referral service to help people find organizations that provide information about hearing impairment. For more information, see the NHIC's Web site at **http://www.health.gov/NHIC/** or contact an information specialist by calling 1-800-336-4797.

Directory of Health Organizations

The Directory of Health Organizations, provided by the National Library of Medicine Specialized Information Services, is a comprehensive source of information on associations. The Directory of Health Organizations database can be accessed via the Internet at **http://www.sis.nlm.nih.gov/Dir/DirMain.html**. It is composed of two parts: DIRLINE and Health Hotlines.

The DIRLINE database comprises some 10,000 records of organizations, research centers, and government institutes and associations that primarily focus on health and biomedicine. To access DIRLINE directly, go to the following Web site: **http://dirline.nlm.nih.gov/**. Simply type in "hearing impairment" (or a synonym), and you will receive information on all relevant organizations listed in the database.

Health Hotlines directs you to toll-free numbers to over 300 organizations. You can access this database directly at **http://www.sis.nlm.nih.gov/hotlines/**. On this page, you are given the option to search by keyword or by browsing the subject list. When you have received your search results, click on the name of the organization for its description and contact information.

The Combined Health Information Database

Another comprehensive source of information on healthcare associations is the Combined Health Information Database. Using the "Detailed Search" option, you will need to limit your search to "Organizations" and "hearing impairment". Type the following hyperlink into your Web browser: **http://chid.nih.gov/detail/detail.html**. To find associations, use the drop boxes at the bottom of the search page where "You may refine your search by." For publication date, select "All Years." Then, select your preferred language and the format option "Organization Resource Sheet." Type "hearing impairment" (or synonyms) into the "For these words:" box. You should check back periodically with this database since it is updated every three months.

The National Organization for Rare Disorders, Inc.

The National Organization for Rare Disorders, Inc. has prepared a Web site that provides, at no charge, lists of associations organized by health topic. You can access this database at the following Web site: **http://www.rarediseases.org/search/orgsearch.html**. Type "hearing impairment" (or a synonym) into the search box, and click "Submit Query."

APPENDIX C. FINDING MEDICAL LIBRARIES

Overview

In this Appendix, we show you how to quickly find a medical library in your area.

Preparation

Your local public library and medical libraries have interlibrary loan programs with the National Library of Medicine (NLM), one of the largest medical collections in the world. According to the NLM, most of the literature in the general and historical collections of the National Library of Medicine is available on interlibrary loan to any library. If you would like to access NLM medical literature, then visit a library in your area that can request the publications for you.[22]

Finding a Local Medical Library

The quickest method to locate medical libraries is to use the Internet-based directory published by the National Network of Libraries of Medicine (NN/LM). This network includes 4626 members and affiliates that provide many services to librarians, health professionals, and the public. To find a library in your area, simply visit **http://nnlm.gov/members/adv.html** or call 1-800-338-7657.

Medical Libraries in the U.S. and Canada

In addition to the NN/LM, the National Library of Medicine (NLM) lists a number of libraries with reference facilities that are open to the public. The following is the NLM's list and includes hyperlinks to each library's Web site. These Web pages can provide information on hours of operation and other restrictions. The list below is a small sample of

[22] Adapted from the NLM: **http://www.nlm.nih.gov/psd/cas/interlibrary.html**.

libraries recommended by the National Library of Medicine (sorted alphabetically by name of the U.S. state or Canadian province where the library is located)[23]:

- **Alabama:** Health InfoNet of Jefferson County (Jefferson County Library Cooperative, Lister Hill Library of the Health Sciences), **http://www.uab.edu/infonet/**
- **Alabama:** Richard M. Scrushy Library (American Sports Medicine Institute)
- **Arizona:** Samaritan Regional Medical Center: The Learning Center (Samaritan Health System, Phoenix, Arizona), **http://www.samaritan.edu/library/bannerlibs.htm**
- **California:** Kris Kelly Health Information Center (St. Joseph Health System, Humboldt), **http://www.humboldt1.com/~kkhic/index.html**
- **California:** Community Health Library of Los Gatos, **http://www.healthlib.org/orgresources.html**
- **California:** Consumer Health Program and Services (CHIPS) (County of Los Angeles Public Library, Los Angeles County Harbor-UCLA Medical Center Library) - Carson, CA, **http://www.colapublib.org/services/chips.html**
- **California:** Gateway Health Library (Sutter Gould Medical Foundation)
- **California:** Health Library (Stanford University Medical Center), **http://www-med.stanford.edu/healthlibrary/**
- **California:** Patient Education Resource Center - Health Information and Resources (University of California, San Francisco), **http://sfghdean.ucsf.edu/barnett/PERC/default.asp**
- **California:** Redwood Health Library (Petaluma Health Care District), **http://www.phcd.org/rdwdlib.html**
- **California:** Los Gatos PlaneTree Health Library, **http://planetreesanjose.org/**
- **California:** Sutter Resource Library (Sutter Hospitals Foundation, Sacramento), **http://suttermedicalcenter.org/library/**
- **California:** Health Sciences Libraries (University of California, Davis), **http://www.lib.ucdavis.edu/healthsci/**
- **California:** ValleyCare Health Library & Ryan Comer Cancer Resource Center (ValleyCare Health System, Pleasanton), **http://gaelnet.stmarys-ca.edu/other.libs/gbal/east/vchl.html**
- **California:** Washington Community Health Resource Library (Fremont), **http://www.healthlibrary.org/**
- **Colorado:** William V. Gervasini Memorial Library (Exempla Healthcare), **http://www.saintjosephdenver.org/yourhealth/libraries/**
- **Connecticut:** Hartford Hospital Health Science Libraries (Hartford Hospital), **http://www.harthosp.org/library/**
- **Connecticut:** Healthnet: Connecticut Consumer Health Information Center (University of Connecticut Health Center, Lyman Maynard Stowe Library), **http://library.uchc.edu/departm/hnet/**

[23] Abstracted from **http://www.nlm.nih.gov/medlineplus/libraries.html**.

- **Connecticut:** Waterbury Hospital Health Center Library (Waterbury Hospital, Waterbury), **http://www.waterburyhospital.com/library/consumer.shtml**
- **Delaware:** Consumer Health Library (Christiana Care Health System, Eugene du Pont Preventive Medicine & Rehabilitation Institute, Wilmington), **http://www.christianacare.org/health_guide/health_guide_pmri_health_info.cfm**
- **Delaware:** Lewis B. Flinn Library (Delaware Academy of Medicine, Wilmington), **http://www.delamed.org/chls.html**
- **Georgia:** Family Resource Library (Medical College of Georgia, Augusta), **http://cmc.mcg.edu/kids_families/fam_resources/fam_res_lib/frl.htm**
- **Georgia:** Health Resource Center (Medical Center of Central Georgia, Macon), **http://www.mccg.org/hrc/hrchome.asp**
- **Hawaii:** Hawaii Medical Library: Consumer Health Information Service (Hawaii Medical Library, Honolulu), **http://hml.org/CHIS/**
- **Idaho:** DeArmond Consumer Health Library (Kootenai Medical Center, Coeur d'Alene), **http://www.nicon.org/DeArmond/index.htm**
- **Illinois:** Health Learning Center of Northwestern Memorial Hospital (Chicago), **http://www.nmh.org/health_info/hlc.html**
- **Illinois:** Medical Library (OSF Saint Francis Medical Center, Peoria), **http://www.osfsaintfrancis.org/general/library/**
- **Kentucky:** Medical Library - Services for Patients, Families, Students & the Public (Central Baptist Hospital, Lexington), **http://www.centralbap.com/education/community/library.cfm**
- **Kentucky:** University of Kentucky - Health Information Library (Chandler Medical Center, Lexington), **http://www.mc.uky.edu/PatientEd/**
- **Louisiana:** Alton Ochsner Medical Foundation Library (Alton Ochsner Medical Foundation, New Orleans), **http://www.ochsner.org/library/**
- **Louisiana:** Louisiana State University Health Sciences Center Medical Library-Shreveport, **http://lib-sh.lsuhsc.edu/**
- **Maine:** Franklin Memorial Hospital Medical Library (Franklin Memorial Hospital, Farmington), **http://www.fchn.org/fmh/lib.htm**
- **Maine:** Gerrish-True Health Sciences Library (Central Maine Medical Center, Lewiston), **http://www.cmmc.org/library/library.html**
- **Maine:** Hadley Parrot Health Science Library (Eastern Maine Healthcare, Bangor), **http://www.emh.org/hll/hpl/guide.htm**
- **Maine:** Maine Medical Center Library (Maine Medical Center, Portland), **http://www.mmc.org/library/**
- **Maine:** Parkview Hospital (Brunswick), **http://www.parkviewhospital.org/**
- **Maine:** Southern Maine Medical Center Health Sciences Library (Southern Maine Medical Center, Biddeford), **http://www.smmc.org/services/service.php3?choice=10**
- **Maine:** Stephens Memorial Hospital's Health Information Library (Western Maine Health, Norway), **http://www.wmhcc.org/Library/**

- **Manitoba, Canada:** Consumer & Patient Health Information Service (University of Manitoba Libraries), **http://www.umanitoba.ca/libraries/units/health/reference/chis.html**
- **Manitoba, Canada:** J.W. Crane Memorial Library (Deer Lodge Centre, Winnipeg), **http://www.deerlodge.mb.ca/crane_library/about.asp**
- **Maryland:** Health Information Center at the Wheaton Regional Library (Montgomery County, Dept. of Public Libraries, Wheaton Regional Library), **http://www.mont.lib.md.us/healthinfo/hic.asp**
- **Massachusetts:** Baystate Medical Center Library (Baystate Health System), **http://www.baystatehealth.com/1024/**
- **Massachusetts:** Boston University Medical Center Alumni Medical Library (Boston University Medical Center), **http://med-libwww.bu.edu/library/lib.html**
- **Massachusetts:** Lowell General Hospital Health Sciences Library (Lowell General Hospital, Lowell), **http://www.lowellgeneral.org/library/HomePageLinks/WWW.htm**
- **Massachusetts:** Paul E. Woodard Health Sciences Library (New England Baptist Hospital, Boston), **http://www.nebh.org/health_lib.asp**
- **Massachusetts:** St. Luke's Hospital Health Sciences Library (St. Luke's Hospital, Southcoast Health System, New Bedford), **http://www.southcoast.org/library/**
- **Massachusetts:** Treadwell Library Consumer Health Reference Center (Massachusetts General Hospital), **http://www.mgh.harvard.edu/library/chrcindex.html**
- **Massachusetts:** UMass HealthNet (University of Massachusetts Medical School, Worchester), **http://healthnet.umassmed.edu/**
- **Michigan:** Botsford General Hospital Library - Consumer Health (Botsford General Hospital, Library & Internet Services), **http://www.botsfordlibrary.org/consumer.htm**
- **Michigan:** Helen DeRoy Medical Library (Providence Hospital and Medical Centers), **http://www.providence-hospital.org/library/**
- **Michigan:** Marquette General Hospital - Consumer Health Library (Marquette General Hospital, Health Information Center), **http://www.mgh.org/center.html**
- **Michigan:** Patient Education Resouce Center - University of Michigan Cancer Center (University of Michigan Comprehensive Cancer Center, Ann Arbor), **http://www.cancer.med.umich.edu/learn/leares.htm**
- **Michigan:** Sladen Library & Center for Health Information Resources - Consumer Health Information (Detroit), **http://www.henryford.com/body.cfm?id=39330**
- **Montana:** Center for Health Information (St. Patrick Hospital and Health Sciences Center, Missoula)
- **National:** Consumer Health Library Directory (Medical Library Association, Consumer and Patient Health Information Section), **http://caphis.mlanet.org/directory/index.html**
- **National:** National Network of Libraries of Medicine (National Library of Medicine) - provides library services for health professionals in the United States who do not have access to a medical library, **http://nnlm.gov/**
- **National:** NN/LM List of Libraries Serving the Public (National Network of Libraries of Medicine), **http://nnlm.gov/members/**

- **Nevada:** Health Science Library, West Charleston Library (Las Vegas-Clark County Library District, Las Vegas), **http://www.lvccld.org/special_collections/medical/index.htm**
- **New Hampshire:** Dartmouth Biomedical Libraries (Dartmouth College Library, Hanover), **http://www.dartmouth.edu/~biomed/resources.htmld/conshealth.htmld/**
- **New Jersey:** Consumer Health Library (Rahway Hospital, Rahway), **http://www.rahwayhospital.com/library.htm**
- **New Jersey:** Dr. Walter Phillips Health Sciences Library (Englewood Hospital and Medical Center, Englewood), **http://www.englewoodhospital.com/links/index.htm**
- **New Jersey:** Meland Foundation (Englewood Hospital and Medical Center, Englewood), **http://www.geocities.com/ResearchTriangle/9360/**
- **New York:** Choices in Health Information (New York Public Library) - NLM Consumer Pilot Project participant, **http://www.nypl.org/branch/health/links.html**
- **New York:** Health Information Center (Upstate Medical University, State University of New York, Syracuse), **http://www.upstate.edu/library/hic/**
- **New York:** Health Sciences Library (Long Island Jewish Medical Center, New Hyde Park), **http://www.lij.edu/library/library.html**
- **New York:** ViaHealth Medical Library (Rochester General Hospital), **http://www.nyam.org/library/**
- **Ohio:** Consumer Health Library (Akron General Medical Center, Medical & Consumer Health Library), **http://www.akrongeneral.org/hwlibrary.htm**
- **Oklahoma:** The Health Information Center at Saint Francis Hospital (Saint Francis Health System, Tulsa), **http://www.sfh-tulsa.com/services/healthinfo.asp**
- **Oregon:** Planetree Health Resource Center (Mid-Columbia Medical Center, The Dalles), **http://www.mcmc.net/phrc/**
- **Pennsylvania:** Community Health Information Library (Milton S. Hershey Medical Center, Hershey), **http://www.hmc.psu.edu/commhealth/**
- **Pennsylvania:** Community Health Resource Library (Geisinger Medical Center, Danville), **http://www.geisinger.edu/education/commlib.shtml**
- **Pennsylvania:** HealthInfo Library (Moses Taylor Hospital, Scranton), **http://www.mth.org/healthwellness.html**
- **Pennsylvania:** Hopwood Library (University of Pittsburgh, Health Sciences Library System, Pittsburgh), **http://www.hsls.pitt.edu/guides/chi/hopwood/index_html**
- **Pennsylvania:** Koop Community Health Information Center (College of Physicians of Philadelphia), **http://www.collphyphil.org/kooppg1.shtml**
- **Pennsylvania:** Learning Resources Center - Medical Library (Susquehanna Health System, Williamsport), **http://www.shscares.org/services/lrc/index.asp**
- **Pennsylvania:** Medical Library (UPMC Health System, Pittsburgh), **http://www.upmc.edu/passavant/library.htm**
- **Quebec, Canada:** Medical Library (Montreal General Hospital), **http://www.mghlib.mcgill.ca/**

- **South Dakota:** Rapid City Regional Hospital Medical Library (Rapid City Regional Hospital), **http://www.rcrh.org/Services/Library/Default.asp**
- **Texas:** Houston HealthWays (Houston Academy of Medicine-Texas Medical Center Library), **http://hhw.library.tmc.edu/**
- **Washington:** Community Health Library (Kittitas Valley Community Hospital), **http://www.kvch.com/**
- **Washington:** Southwest Washington Medical Center Library (Southwest Washington Medical Center, Vancouver), **http://www.swmedicalcenter.com/body.cfm?id=72**

ONLINE GLOSSARIES

The Internet provides access to a number of free-to-use medical dictionaries. The National Library of Medicine has compiled the following list of online dictionaries:

- ADAM Medical Encyclopedia (A.D.A.M., Inc.), comprehensive medical reference: **http://www.nlm.nih.gov/medlineplus/encyclopedia.html**
- MedicineNet.com Medical Dictionary (MedicineNet, Inc.): **http://www.medterms.com/Script/Main/hp.asp**
- Merriam-Webster Medical Dictionary (Inteli-Health, Inc.): **http://www.intelihealth.com/IH/**
- Multilingual Glossary of Technical and Popular Medical Terms in Eight European Languages (European Commission) - Danish, Dutch, English, French, German, Italian, Portuguese, and Spanish: **http://allserv.rug.ac.be/~rvdstich/eugloss/welcome.html**
- On-line Medical Dictionary (CancerWEB): **http://cancerweb.ncl.ac.uk/omd/**
- Rare Diseases Terms (Office of Rare Diseases): **http://ord.aspensys.com/asp/diseases/diseases.asp**
- Technology Glossary (National Library of Medicine) - Health Care Technology: **http://www.nlm.nih.gov/nichsr/ta101/ta10108.htm**

Beyond these, MEDLINEplus contains a very patient-friendly encyclopedia covering every aspect of medicine (licensed from A.D.A.M., Inc.). The ADAM Medical Encyclopedia can be accessed at **http://www.nlm.nih.gov/medlineplus/encyclopedia.html**. ADAM is also available on commercial Web sites such as drkoop.com (**http://www.drkoop.com/**) and Web MD (**http://my.webmd.com/adam/asset/adam_disease_articles/a_to_z/a**).

Online Dictionary Directories

The following are additional online directories compiled by the National Library of Medicine, including a number of specialized medical dictionaries:

- Medical Dictionaries: Medical & Biological (World Health Organization): **http://www.who.int/hlt/virtuallibrary/English/diction.htm#Medical**
- MEL-Michigan Electronic Library List of Online Health and Medical Dictionaries (Michigan Electronic Library): **http://mel.lib.mi.us/health/health-dictionaries.html**
- Patient Education: Glossaries (DMOZ Open Directory Project): **http://dmoz.org/Health/Education/Patient_Education/Glossaries/**
- Web of Online Dictionaries (Bucknell University): **http://www.yourdictionary.com/diction5.html#medicine**

HEARING IMPAIRMENT DICTIONARY

The definitions below are derived from official public sources, including the National Institutes of Health [NIH] and the European Union [EU].

Abdominal: Having to do with the abdomen, which is the part of the body between the chest and the hips that contains the pancreas, stomach, intestines, liver, gallbladder, and other organs. [NIH]

Acetylcholine: A neurotransmitter. Acetylcholine in vertebrates is the major transmitter at neuromuscular junctions, autonomic ganglia, parasympathetic effector junctions, a subset of sympathetic effector junctions, and at many sites in the central nervous system. It is generally not used as an administered drug because it is broken down very rapidly by cholinesterases, but it is useful in some ophthalmological applications. [NIH]

Acoustic: Having to do with sound or hearing. [NIH]

Actin: Essential component of the cell skeleton. [NIH]

Activities of Daily Living: The performance of the basic activities of self care, such as dressing, ambulation, eating, etc., in rehabilitation. [NIH]

Acuity: Clarity or clearness, especially of the vision. [EU]

Adaptability: Ability to develop some form of tolerance to conditions extremely different from those under which a living organism evolved. [NIH]

Adaptation: 1. The adjustment of an organism to its environment, or the process by which it enhances such fitness. 2. The normal ability of the eye to adjust itself to variations in the intensity of light; the adjustment to such variations. 3. The decline in the frequency of firing of a neuron, particularly of a receptor, under conditions of constant stimulation. 4. In dentistry, (a) the proper fitting of a denture, (b) the degree of proximity and interlocking of restorative material to a tooth preparation, (c) the exact adjustment of bands to teeth. 5. In microbiology, the adjustment of bacterial physiology to a new environment. [EU]

Adjustment: The dynamic process wherein the thoughts, feelings, behavior, and biophysiological mechanisms of the individual continually change to adjust to the environment. [NIH]

Adolescence: The period of life beginning with the appearance of secondary sex characteristics and terminating with the cessation of somatic growth. The years usually referred to as adolescence lie between 13 and 18 years of age. [NIH]

Adverse Effect: An unwanted side effect of treatment. [NIH]

Aetiology: Study of the causes of disease. [EU]

Age Factors: Age as a constituent element or influence contributing to the production of a result. It may be applicable to the cause or the effect of a circumstance. It is used with human or animal concepts but should be differentiated from aging, a physiological process, and time factors which refers only to the passage of time. [NIH]

Age Groups: Persons classified by age from birth (infant, newborn) to octogenarians and older (aged, 80 and over). [NIH]

Age of Onset: The age or period of life at which a disease or the initial symptoms or manifestations of a disease appear in an individual. [NIH]

Aged, 80 and Over: A person 80 years of age and older. [NIH]

Ageing: A physiological or morphological change in the life of an organism or its parts, generally irreversible and typically associated with a decline in growth and reproductive vigor. [NIH]

Agonists: Drugs that trigger an action from a cell or another drug. [NIH]

Algorithms: A procedure consisting of a sequence of algebraic formulas and/or logical steps to calculate or determine a given task. [NIH]

Alkaline: Having the reactions of an alkali. [EU]

Alleles: Mutually exclusive forms of the same gene, occupying the same locus on homologous chromosomes, and governing the same biochemical and developmental process. [NIH]

Alternative medicine: Practices not generally recognized by the medical community as standard or conventional medical approaches and used instead of standard treatments. Alternative medicine includes the taking of dietary supplements, megadose vitamins, and herbal preparations; the drinking of special teas; and practices such as massage therapy, magnet therapy, spiritual healing, and meditation. [NIH]

Ambulatory Care: Health care services provided to patients on an ambulatory basis, rather than by admission to a hospital or other health care facility. The services may be a part of a hospital, augmenting its inpatient services, or may be provided at a free-standing facility. [NIH]

Amino acid: Any organic compound containing an amino (-NH2 and a carboxyl (- COOH) group. The 20 a-amino acids listed in the accompanying table are the amino acids from which proteins are synthesized by formation of peptide bonds during ribosomal translation of messenger RNA; all except glycine, which is not optically active, have the L configuration. Other amino acids occurring in proteins, such as hydroxyproline in collagen, are formed by posttranslational enzymatic modification of amino acids residues in polypeptide chains. There are also several important amino acids, such as the neurotransmitter y-aminobutyric acid, that have no relation to proteins. Abbreviated AA. [EU]

Amino Acid Sequence: The order of amino acids as they occur in a polypeptide chain. This is referred to as the primary structure of proteins. It is of fundamental importance in determining protein conformation. [NIH]

Amplification: The production of additional copies of a chromosomal DNA sequence, found as either intrachromosomal or extrachromosomal DNA. [NIH]

Anaesthesia: Loss of feeling or sensation. Although the term is used for loss of tactile sensibility, or of any of the other senses, it is applied especially to loss of the sensation of pain, as it is induced to permit performance of surgery or other painful procedures. [EU]

Anal: Having to do with the anus, which is the posterior opening of the large bowel. [NIH]

Analog: In chemistry, a substance that is similar, but not identical, to another. [NIH]

Analogous: Resembling or similar in some respects, as in function or appearance, but not in origin or development;. [EU]

Anatomical: Pertaining to anatomy, or to the structure of the organism. [EU]

Anemia: A reduction in the number of circulating erythrocytes or in the quantity of hemoglobin. [NIH]

Anesthesia: A state characterized by loss of feeling or sensation. This depression of nerve function is usually the result of pharmacologic action and is induced to allow performance of surgery or other painful procedures. [NIH]

Animal model: An animal with a disease either the same as or like a disease in humans.

Animal models are used to study the development and progression of diseases and to test new treatments before they are given to humans. Animals with transplanted human cancers or other tissues are called xenograft models. [NIH]

Anions: Negatively charged atoms, radicals or groups of atoms which travel to the anode or positive pole during electrolysis. [NIH]

Annealing: The spontaneous alignment of two single DNA strands to form a double helix. [NIH]

Anomalies: Birth defects; abnormalities. [NIH]

Anthropology: The science devoted to the comparative study of man. [NIH]

Antibacterial: A substance that destroys bacteria or suppresses their growth or reproduction. [EU]

Antibiotic: A drug used to treat infections caused by bacteria and other microorganisms. [NIH]

Antibodies: Immunoglobulin molecules having a specific amino acid sequence by virtue of which they interact only with the antigen that induced their synthesis in cells of the lymphoid series (especially plasma cells), or with an antigen closely related to it. [NIH]

Antibody: A type of protein made by certain white blood cells in response to a foreign substance (antigen). Each antibody can bind to only a specific antigen. The purpose of this binding is to help destroy the antigen. Antibodies can work in several ways, depending on the nature of the antigen. Some antibodies destroy antigens directly. Others make it easier for white blood cells to destroy the antigen. [NIH]

Antigen: Any substance which is capable, under appropriate conditions, of inducing a specific immune response and of reacting with the products of that response, that is, with specific antibody or specifically sensitized T-lymphocytes, or both. Antigens may be soluble substances, such as toxins and foreign proteins, or particulate, such as bacteria and tissue cells; however, only the portion of the protein or polysaccharide molecule known as the antigenic determinant (q.v.) combines with antibody or a specific receptor on a lymphocyte. Abbreviated Ag. [EU]

Anti-inflammatory: Having to do with reducing inflammation. [NIH]

Anti-Inflammatory Agents: Substances that reduce or suppress inflammation. [NIH]

Antioxidant: A substance that prevents damage caused by free radicals. Free radicals are highly reactive chemicals that often contain oxygen. They are produced when molecules are split to give products that have unpaired electrons. This process is called oxidation. [NIH]

Anus: The opening of the rectum to the outside of the body. [NIH]

Anxiety: Persistent feeling of dread, apprehension, and impending disaster. [NIH]

Aponeurosis: Tendinous expansion consisting of a fibrous or membranous sheath which serves as a fascia to enclose or bind a group of muscles. [NIH]

Apoptosis: One of the two mechanisms by which cell death occurs (the other being the pathological process of necrosis). Apoptosis is the mechanism responsible for the physiological deletion of cells and appears to be intrinsically programmed. It is characterized by distinctive morphologic changes in the nucleus and cytoplasm, chromatin cleavage at regularly spaced sites, and the endonucleolytic cleavage of genomic DNA (DNA fragmentation) at internucleosomal sites. This mode of cell death serves as a balance to mitosis in regulating the size of animal tissues and in mediating pathologic processes associated with tumor growth. [NIH]

Archaea: One of the three domains of life (the others being bacteria and Eucarya), formerly called Archaebacteria under the taxon Bacteria, but now considered separate and distinct.

They are characterized by: 1) the presence of characteristic tRNAs and ribosomal RNAs; 2) the absence of peptidoglycan cell walls; 3) the presence of ether-linked lipids built from branched-chain subunits; and 4) their occurrence in unusual habitats. While archaea resemble bacteria in morphology and genomic organization, they resemble eukarya in their method of genomic replication. The domain contains at least three kingdoms: crenarchaeota, euryarchaeota, and korarchaeota. [NIH]

Arginine: An essential amino acid that is physiologically active in the L-form. [NIH]

Arterial: Pertaining to an artery or to the arteries. [EU]

Arteries: The vessels carrying blood away from the heart. [NIH]

Artery: Vessel-carrying blood from the heart to various parts of the body. [NIH]

Articulation: The relationship of two bodies by means of a moveable joint. [NIH]

Aspirin: A drug that reduces pain, fever, inflammation, and blood clotting. Aspirin belongs to the family of drugs called nonsteroidal anti-inflammatory agents. It is also being studied in cancer prevention. [NIH]

Assay: Determination of the amount of a particular constituent of a mixture, or of the biological or pharmacological potency of a drug. [EU]

Ataxia: Impairment of the ability to perform smoothly coordinated voluntary movements. This condition may affect the limbs, trunk, eyes, pharnyx, larnyx, and other structures. Ataxia may result from impaired sensory or motor function. Sensory ataxia may result from posterior column injury or peripheral nerve diseases. Motor ataxia may be associated with cerebellar diseases; cerebral cortex diseases; thalamic diseases; basal ganglia diseases; injury to the red nucleus; and other conditions. [NIH]

Atresia: Lack of a normal opening from the esophagus, intestines, or anus. [NIH]

Attenuated: Strain with weakened or reduced virulence. [NIH]

Audiologist: Study of hearing including treatment of persons with hearing defects. [NIH]

Audiology: The study of hearing and hearing impairment. [NIH]

Audiometry: The testing of the acuity of the sense of hearing to determine the thresholds of the lowest intensity levels at which an individual can hear a set of tones. The frequencies between 125 and 8000 Hz are used to test air conduction thresholds, and the frequencies between 250 and 4000 Hz are used to test bone conduction thresholds. [NIH]

Audition: The sense of hearing. [NIH]

Auditory: Pertaining to the sense of hearing. [EU]

Auditory Cortex: Area of the temporal lobe concerned with hearing. [NIH]

Auditory nerve: The eight cranial nerve; also called vestibulocochlear nerve or acoustic nerve. [NIH]

Auditory Perception: The process whereby auditory stimuli are selected, organized and interpreted by the organism; includes speech discrimination. [NIH]

Auditory Threshold: The audibility limit of discriminating sound intensity and pitch. [NIH]

Aural: Pertaining to or perceived by the ear, as an aural stimulus. [EU]

Autoimmune disease: A condition in which the body recognizes its own tissues as foreign and directs an immune response against them. [NIH]

Autonomic: Self-controlling; functionally independent. [EU]

Axonal: Condition associated with metabolic derangement of the entire neuron and is manifest by degeneration of the distal portion of the nerve fiber. [NIH]

Bacteria: Unicellular prokaryotic microorganisms which generally possess rigid cell walls, multiply by cell division, and exhibit three principal forms: round or coccal, rodlike or bacillary, and spiral or spirochetal. [NIH]

Bacterial Physiology: Physiological processes and activities of bacteria. [NIH]

Bacteriophage: A virus whose host is a bacterial cell; A virus that exclusively infects bacteria. It generally has a protein coat surrounding the genome (DNA or RNA). One of the coliphages most extensively studied is the lambda phage, which is also one of the most important. [NIH]

Bacteriuria: The presence of bacteria in the urine with or without consequent urinary tract infection. Since bacteriuria is a clinical entity, the term does not preclude the use of urine/microbiology for technical discussions on the isolation and segregation of bacteria in the urine. [NIH]

Basal Ganglia: Large subcortical nuclear masses derived from the telencephalon and located in the basal regions of the cerebral hemispheres. [NIH]

Basal Ganglia Diseases: Diseases of the basal ganglia including the putamen; globus pallidus; claustrum; amygdala; and caudate nucleus. Dyskinesias (most notably involuntary movements and alterations of the rate of movement) represent the primary clinical manifestations of these disorders. Common etiologies include cerebrovascular disease; neurodegenerative diseases; and craniocerebral trauma. [NIH]

Base Sequence: The sequence of purines and pyrimidines in nucleic acids and polynucleotides. It is also called nucleotide or nucleoside sequence. [NIH]

Basilar Artery: The artery formed by the union of the right and left vertebral arteries; it runs from the lower to the upper border of the pons, where it bifurcates into the two posterior cerebral arteries. [NIH]

Basilar Membrane: A membrane that stretches from the spiral lamina to the basilar crest consisting of an inner and an outer part. The inner part supports the spiral organ of Corti. [NIH]

Benign: Not cancerous; does not invade nearby tissue or spread to other parts of the body. [NIH]

Bereavement: Refers to the whole process of grieving and mourning and is associated with a deep sense of loss and sadness. [NIH]

Bilateral: Affecting both the right and left side of body. [NIH]

Bile: An emulsifying agent produced in the liver and secreted into the duodenum. Its composition includes bile acids and salts, cholesterol, and electrolytes. It aids digestion of fats in the duodenum. [NIH]

Bilirubin: A bile pigment that is a degradation product of heme. [NIH]

Binaural: Used of the two ears functioning together. [NIH]

Biochemical: Relating to biochemistry; characterized by, produced by, or involving chemical reactions in living organisms. [EU]

Biological therapy: Treatment to stimulate or restore the ability of the immune system to fight infection and disease. Also used to lessen side effects that may be caused by some cancer treatments. Also known as immunotherapy, biotherapy, or biological response modifier (BRM) therapy. [NIH]

Biophysics: The science of physical phenomena and processes in living organisms. [NIH]

Biosynthesis: The building up of a chemical compound in the physiologic processes of a living organism. [EU]

Biotechnology: Body of knowledge related to the use of organisms, cells or cell-derived constituents for the purpose of developing products which are technically, scientifically and clinically useful. Alteration of biologic function at the molecular level (i.e., genetic engineering) is a central focus; laboratory methods used include transfection and cloning technologies, sequence and structure analysis algorithms, computer databases, and gene and protein structure function analysis and prediction. [NIH]

Bladder: The organ that stores urine. [NIH]

Blood Coagulation: The process of the interaction of blood coagulation factors that results in an insoluble fibrin clot. [NIH]

Blood pressure: The pressure of blood against the walls of a blood vessel or heart chamber. Unless there is reference to another location, such as the pulmonary artery or one of the heart chambers, it refers to the pressure in the systemic arteries, as measured, for example, in the forearm. [NIH]

Blood vessel: A tube in the body through which blood circulates. Blood vessels include a network of arteries, arterioles, capillaries, venules, and veins. [NIH]

Blood Viscosity: The internal resistance of the blood to shear forces. The in vitro measure of whole blood viscosity is of limited clinical utility because it bears little relationship to the actual viscosity within the circulation, but an increase in the viscosity of circulating blood can contribute to morbidity in patients suffering from disorders such as sickle cell anemia and polycythemia. [NIH]

Bone Conduction: Sound transmission through the bones of the skull to the inner ear. [NIH]

Bone Marrow: The soft tissue filling the cavities of bones. Bone marrow exists in two types, yellow and red. Yellow marrow is found in the large cavities of large bones and consists mostly of fat cells and a few primitive blood cells. Red marrow is a hematopoietic tissue and is the site of production of erythrocytes and granular leukocytes. Bone marrow is made up of a framework of connective tissue containing branching fibers with the frame being filled with marrow cells. [NIH]

Bowel: The long tube-shaped organ in the abdomen that completes the process of digestion. There is both a small and a large bowel. Also called the intestine. [NIH]

Brain Stem: The part of the brain that connects the cerebral hemispheres with the spinal cord. It consists of the mesencephalon, pons, and medulla oblongata. [NIH]

Cadherins: A group of functionally related glycoproteins responsible for the calcium-dependent cell-to-cell adhesion mechanism. They are divided into subclasses E-, P-, and N-cadherins, which are distinct in immunological specificity and tissue distribution. They promote cell adhesion via a homophilic mechanism. These compounds play a role in the construction of tissues and of the whole animal body. [NIH]

Calcium: A basic element found in nearly all organized tissues. It is a member of the alkaline earth family of metals with the atomic symbol Ca, atomic number 20, and atomic weight 40. Calcium is the most abundant mineral in the body and combines with phosphorus to form calcium phosphate in the bones and teeth. It is essential for the normal functioning of nerves and muscles and plays a role in blood coagulation (as factor IV) and in many enzymatic processes. [NIH]

Calibration: Determination, by measurement or comparison with a standard, of the correct value of each scale reading on a meter or other measuring instrument; or determination of the settings of a control device that correspond to particular values of voltage, current, frequency, or other output. [NIH]

Carbohydrate: An aldehyde or ketone derivative of a polyhydric alcohol, particularly of the

pentahydric and hexahydric alcohols. They are so named because the hydrogen and oxygen are usually in the proportion to form water, (CH2O)n. The most important carbohydrates are the starches, sugars, celluloses, and gums. They are classified into mono-, di-, tri-, poly- and heterosaccharides. [EU]

Carbon Dioxide: A colorless, odorless gas that can be formed by the body and is necessary for the respiration cycle of plants and animals. [NIH]

Carcinogenic: Producing carcinoma. [EU]

Cardiac: Having to do with the heart. [NIH]

Cardiovascular: Having to do with the heart and blood vessels. [NIH]

Cardiovascular disease: Any abnormal condition characterized by dysfunction of the heart and blood vessels. CVD includes atherosclerosis (especially coronary heart disease, which can lead to heart attacks), cerebrovascular disease (e.g., stroke), and hypertension (high blood pressure). [NIH]

Carotid Body: A small cluster of chemoreceptive and supporting cells located near the bifurcation of the internal carotid artery. The carotid body, which is richly supplied with fenestrated capillaries, senses the pH, carbon dioxide, and oxygen concentrations in the blood and plays a crucial role in their homeostatic control. [NIH]

Carrier State: The condition of harboring an infective organism without manifesting symptoms of infection. The organism must be readily transmissable to another susceptible host. [NIH]

Case report: A detailed report of the diagnosis, treatment, and follow-up of an individual patient. Case reports also contain some demographic information about the patient (for example, age, gender, ethnic origin). [NIH]

Cations: Postively charged atoms, radicals or groups of atoms which travel to the cathode or negative pole during electrolysis. [NIH]

Causal: Pertaining to a cause; directed against a cause. [EU]

Cell: The individual unit that makes up all of the tissues of the body. All living things are made up of one or more cells. [NIH]

Cell Adhesion: Adherence of cells to surfaces or to other cells. [NIH]

Cell Communication: Any of several ways in which living cells of an organism communicate with one another, whether by direct contact between cells or by means of chemical signals carried by neurotransmitter substances, hormones, and cyclic AMP. [NIH]

Cell Death: The termination of the cell's ability to carry out vital functions such as metabolism, growth, reproduction, responsiveness, and adaptability. [NIH]

Cell Differentiation: Progressive restriction of the developmental potential and increasing specialization of function which takes place during the development of the embryo and leads to the formation of specialized cells, tissues, and organs. [NIH]

Cell Division: The fission of a cell. [NIH]

Cell Physiology: Characteristics and physiological processes of cells from cell division to cell death. [NIH]

Cell Survival: The span of viability of a cell characterized by the capacity to perform certain functions such as metabolism, growth, reproduction, some form of responsiveness, and adaptability. [NIH]

Central Nervous System: The main information-processing organs of the nervous system, consisting of the brain, spinal cord, and meninges. [NIH]

Cerebellar: Pertaining to the cerebellum. [EU]

Cerebral: Of or pertaining of the cerebrum or the brain. [EU]

Cerebral Cortex: The thin layer of gray matter on the surface of the cerebral hemisphere that develops from the telencephalon and folds into gyri. It reaches its highest development in man and is responsible for intellectual faculties and higher mental functions. [NIH]

Cerebral hemispheres: The two halves of the cerebrum, the part of the brain that controls muscle functions of the body and also controls speech, emotions, reading, writing, and learning. The right hemisphere controls muscle movement on the left side of the body, and the left hemisphere controls muscle movement on the right side of the body. [NIH]

Cerebrovascular: Pertaining to the blood vessels of the cerebrum, or brain. [EU]

Cerebrum: The largest part of the brain. It is divided into two hemispheres, or halves, called the cerebral hemispheres. The cerebrum controls muscle functions of the body and also controls speech, emotions, reading, writing, and learning. [NIH]

Cerumen: The yellow or brown waxy secretions produced by vestigial apocrine sweat glands in the external ear canal. [NIH]

Cervical: Relating to the neck, or to the neck of any organ or structure. Cervical lymph nodes are located in the neck; cervical cancer refers to cancer of the uterine cervix, which is the lower, narrow end (the "neck") of the uterus. [NIH]

Cervix: The lower, narrow end of the uterus that forms a canal between the uterus and vagina. [NIH]

Character: In current usage, approximately equivalent to personality. The sum of the relatively fixed personality traits and habitual modes of response of an individual. [NIH]

Child Development: The continuous sequential physiological and psychological maturing of the child from birth up to but not including adolescence. It includes healthy responses to situations, but does not include growth in stature or size (= growth). [NIH]

Chimera: An individual that contains cell populations derived from different zygotes. [NIH]

Chin: The anatomical frontal portion of the mandible, also known as the mentum, that contains the line of fusion of the two separate halves of the mandible (symphysis menti). This line of fusion divides inferiorly to enclose a triangular area called the mental protuberance. On each side, inferior to the second premolar tooth, is the mental foramen for the passage of blood vessels and a nerve. [NIH]

Cholesteatoma: A non-neoplastic keratinizing mass with stratified squamous epithelium, frequently occurring in the meninges, central nervous system, bones of the skull, and most commonly in the middle ear and mastoid region. [NIH]

Cholinergic: Resembling acetylcholine in pharmacological action; stimulated by or releasing acetylcholine or a related compound. [EU]

Chromatin: The material of chromosomes. It is a complex of DNA, histones, and nonhistone proteins (chromosomal proteins, non-histone) found within the nucleus of a cell. [NIH]

Chromosomal: Pertaining to chromosomes. [EU]

Chromosome: Part of a cell that contains genetic information. Except for sperm and eggs, all human cells contain 46 chromosomes. [NIH]

Chronic: A disease or condition that persists or progresses over a long period of time. [NIH]

Chronic Disease: Disease or ailment of long duration. [NIH]

Clamp: A u-shaped steel rod used with a pin or wire for skeletal traction in the treatment of certain fractures. [NIH]

Cleft Lip: Congenital defect in the upper lip where the maxillary prominence fails to merge with the merged medial nasal prominences. It is thought to be caused by faulty migration of the mesoderm in the head region. [NIH]

Cleft Palate: Congenital fissure of the soft and/or hard palate, due to faulty fusion. [NIH]

Clinical trial: A research study that tests how well new medical treatments or other interventions work in people. Each study is designed to test new methods of screening, prevention, diagnosis, or treatment of a disease. [NIH]

Clone: The term "clone" has acquired a new meaning. It is applied specifically to the bits of inserted foreign DNA in the hybrid molecules of the population. Each inserted segment originally resided in the DNA of a complex genome amid millions of other DNA segment. [NIH]

Cloning: The production of a number of genetically identical individuals; in genetic engineering, a process for the efficient replication of a great number of identical DNA molecules. [NIH]

Cochlea: The part of the internal ear that is concerned with hearing. It forms the anterior part of the labyrinth, is conical, and is placed almost horizontally anterior to the vestibule. [NIH]

Cochlear: Of or pertaining to the cochlea. [EU]

Cochlear Diseases: Diseases of the cochlea, the part of the inner ear that is concerned with hearing. [NIH]

Cochlear Duct: Spiral tube in the bony canal of the cochlea, lying on its outer wall between the scala vestibuli and scala tympani. [NIH]

Cochlear Implantation: Surgical insertion of an electronic device implanted beneath the skin with electrodes to the cochlear nerve to create sound sensation in persons with sensorineural deafness. [NIH]

Cochlear Implants: Electronic devices implanted beneath the skin with electrodes to the cochlear nerve to create sound sensation in persons with sensorineural deafness. [NIH]

Cochlear Nerve: The cochlear part of the 8th cranial nerve (vestibulocochlear nerve). The cochlear nerve fibers originate from neurons of the spiral ganglion and project peripherally to cochlear hair cells and centrally to the cochlear nuclei (cochlear nucleus) of the brain stem. They mediate the sense of hearing. [NIH]

Cochlear Nucleus: The brain stem nucleus that receives the central input from the cochlear nerve. The cochlear nucleus is located lateral and dorsolateral to the inferior cerebellar peduncles and is functionally divided into dorsal and ventral parts. It is tonotopically organized, performs the first stage of central auditory processing, and projects (directly or indirectly) to higher auditory areas including the superior olivary nuclei, the medial geniculi, the inferior colliculi, and the auditory cortex. [NIH]

Codon: A set of three nucleotides in a protein coding sequence that specifies individual amino acids or a termination signal (codon, terminator). Most codons are universal, but some organisms do not produce the transfer RNAs (RNA, transfer) complementary to all codons. These codons are referred to as unassigned codons (codons, nonsense). [NIH]

Cofactor: A substance, microorganism or environmental factor that activates or enhances the action of another entity such as a disease-causing agent. [NIH]

Cognition: Intellectual or mental process whereby an organism becomes aware of or obtains knowledge. [NIH]

Cognitive restructuring: A method of identifying and replacing fear-promoting, irrational beliefs with more realistic and functional ones. [NIH]

Coliphages: Viruses whose host is Escherichia coli. [NIH]

Collagen: A polypeptide substance comprising about one third of the total protein in mammalian organisms. It is the main constituent of skin, connective tissue, and the organic substance of bones and teeth. Different forms of collagen are produced in the body but all consist of three alpha-polypeptide chains arranged in a triple helix. Collagen is differentiated from other fibrous proteins, such as elastin, by the content of proline, hydroxyproline, and hydroxylysine; by the absence of tryptophan; and particularly by the high content of polar groups which are responsible for its swelling properties. [NIH]

Colloidal: Of the nature of a colloid. [EU]

Communication Disorders: Disorders of verbal and nonverbal communication caused by receptive or expressive language disorders, cognitive dysfunction (e.g., mental retardation), psychiatric conditions, and hearing disorders. [NIH]

Complement: A term originally used to refer to the heat-labile factor in serum that causes immune cytolysis, the lysis of antibody-coated cells, and now referring to the entire functionally related system comprising at least 20 distinct serum proteins that is the effector not only of immune cytolysis but also of other biologic functions. Complement activation occurs by two different sequences, the classic and alternative pathways. The proteins of the classic pathway are termed 'components of complement' and are designated by the symbols C1 through C9. C1 is a calcium-dependent complex of three distinct proteins C1q, C1r and C1s. The proteins of the alternative pathway (collectively referred to as the properdin system) and complement regulatory proteins are known by semisystematic or trivial names. Fragments resulting from proteolytic cleavage of complement proteins are designated with lower-case letter suffixes, e.g., C3a. Inactivated fragments may be designated with the suffix 'i', e.g. C3bi. Activated components or complexes with biological activity are designated by a bar over the symbol e.g. C1 or C4b,2a. The classic pathway is activated by the binding of C1 to classic pathway activators, primarily antigen-antibody complexes containing IgM, IgG1, IgG3; C1q binds to a single IgM molecule or two adjacent IgG molecules. The alternative pathway can be activated by IgA immune complexes and also by nonimmunologic materials including bacterial endotoxins, microbial polysaccharides, and cell walls. Activation of the classic pathway triggers an enzymatic cascade involving C1, C4, C2 and C3; activation of the alternative pathway triggers a cascade involving C3 and factors B, D and P. Both result in the cleavage of C5 and the formation of the membrane attack complex. Complement activation also results in the formation of many biologically active complement fragments that act as anaphylatoxins, opsonins, or chemotactic factors. [EU]

Complementary and alternative medicine: CAM. Forms of treatment that are used in addition to (complementary) or instead of (alternative) standard treatments. These practices are not considered standard medical approaches. CAM includes dietary supplements, megadose vitamins, herbal preparations, special teas, massage therapy, magnet therapy, spiritual healing, and meditation. [NIH]

Complementary medicine: Practices not generally recognized by the medical community as standard or conventional medical approaches and used to enhance or complement the standard treatments. Complementary medicine includes the taking of dietary supplements, megadose vitamins, and herbal preparations; the drinking of special teas; and practices such as massage therapy, magnet therapy, spiritual healing, and meditation. [NIH]

Compliance: Distensibility measure of a chamber such as the lungs (lung compliance) or bladder. Compliance is expressed as a change in volume per unit change in pressure. [NIH]

Computational Biology: A field of biology concerned with the development of techniques for the collection and manipulation of biological data, and the use of such data to make biological discoveries or predictions. This field encompasses all computational methods and

theories applicable to molecular biology and areas of computer-based techniques for solving biological problems including manipulation of models and datasets. [NIH]

Computed tomography: CT scan. A series of detailed pictures of areas inside the body, taken from different angles; the pictures are created by a computer linked to an x-ray machine. Also called computerized tomography and computerized axial tomography (CAT) scan. [NIH]

Computer Simulation: Computer-based representation of physical systems and phenomena such as chemical processes. [NIH]

Computerized axial tomography: A series of detailed pictures of areas inside the body, taken from different angles; the pictures are created by a computer linked to an x-ray machine. Also called CAT scan, computed tomography (CT scan), or computerized tomography. [NIH]

Computerized tomography: A series of detailed pictures of areas inside the body, taken from different angles; the pictures are created by a computer linked to an x-ray machine. Also called computerized axial tomography (CAT) scan and computed tomography (CT scan). [NIH]

Conception: The onset of pregnancy, marked by implantation of the blastocyst; the formation of a viable zygote. [EU]

Concomitant: Accompanying; accessory; joined with another. [EU]

Conduction: The transfer of sound waves, heat, nervous impulses, or electricity. [EU]

Cone: One of the special retinal receptor elements which are presumed to be primarily concerned with perception of light and color stimuli when the eye is adapted to light. [NIH]

Connective Tissue: Tissue that supports and binds other tissues. It consists of connective tissue cells embedded in a large amount of extracellular matrix. [NIH]

Connective Tissue: Tissue that supports and binds other tissues. It consists of connective tissue cells embedded in a large amount of extracellular matrix. [NIH]

Connective Tissue Cells: A group of cells that includes fibroblasts, cartilage cells, adipocytes, smooth muscle cells, and bone cells. [NIH]

Connexins: A group of homologous proteins which form the intermembrane channels of gap junctions. The connexins are the products of an identified gene family which has both highly conserved and highly divergent regions. The variety contributes to the wide range of functional properties of gap junctions. [NIH]

Consciousness: Sense of awareness of self and of the environment. [NIH]

Consultation: A deliberation between two or more physicians concerning the diagnosis and the proper method of treatment in a case. [NIH]

Contraindications: Any factor or sign that it is unwise to pursue a certain kind of action or treatment, e. g. giving a general anesthetic to a person with pneumonia. [NIH]

Control group: In a clinical trial, the group that does not receive the new treatment being studied. This group is compared to the group that receives the new treatment, to see if the new treatment works. [NIH]

Coordination: Muscular or motor regulation or the harmonious cooperation of muscles or groups of muscles, in a complex action or series of actions. [NIH]

Coronary: Encircling in the manner of a crown; a term applied to vessels; nerves, ligaments, etc. The term usually denotes the arteries that supply the heart muscle and, by extension, a pathologic involvement of them. [EU]

Coronary heart disease: A type of heart disease caused by narrowing of the coronary

arteries that feed the heart, which needs a constant supply of oxygen and nutrients carried by the blood in the coronary arteries. When the coronary arteries become narrowed or clogged by fat and cholesterol deposits and cannot supply enough blood to the heart, CHD results. [NIH]

Coronary Thrombosis: Presence of a thrombus in a coronary artery, often causing a myocardial infarction. [NIH]

Cortex: The outer layer of an organ or other body structure, as distinguished from the internal substance. [EU]

Cortical: Pertaining to or of the nature of a cortex or bark. [EU]

Cortices: The outer layer of an organ; used especially of the cerebrum and cerebellum. [NIH]

Cranial: Pertaining to the cranium, or to the anterior (in animals) or superior (in humans) end of the body. [EU]

Craniocerebral Trauma: Traumatic injuries involving the cranium and intracranial structures (i.e., brain; cranial nerves; meninges; and other structures). Injuries may be classified by whether or not the skull is penetrated (i.e., penetrating vs. nonpenetrating) or whether there is an associated hemorrhage. [NIH]

Cues: Signals for an action; that specific portion of a perceptual field or pattern of stimuli to which a subject has learned to respond. [NIH]

Cultured cell line: Cells of a single type that have been grown in the laboratory for several generations (cell divisions). [NIH]

Curative: Tending to overcome disease and promote recovery. [EU]

Custom-made: Any active implantable medical device specifically made in accordance with a medical specialist's written prescription which gives, under his responsibility, specific design characteristics and is intended to be used only for an individually named patient. [NIH]

Cyclic: Pertaining to or occurring in a cycle or cycles; the term is applied to chemical compounds that contain a ring of atoms in the nucleus. [EU]

Cytomegalovirus: A genus of the family Herpesviridae, subfamily Betaherpesvirinae, infecting the salivary glands, liver, spleen, lungs, eyes, and other organs, in which they produce characteristically enlarged cells with intranuclear inclusions. Infection with Cytomegalovirus is also seen as an opportunistic infection in AIDS. [NIH]

Cytoplasm: The protoplasm of a cell exclusive of that of the nucleus; it consists of a continuous aqueous solution (cytosol) and the organelles and inclusions suspended in it (phaneroplasm), and is the site of most of the chemical activities of the cell. [EU]

Cytoskeleton: The network of filaments, tubules, and interconnecting filamentous bridges which give shape, structure, and organization to the cytoplasm. [NIH]

Data Collection: Systematic gathering of data for a particular purpose from various sources, including questionnaires, interviews, observation, existing records, and electronic devices. The process is usually preliminary to statistical analysis of the data. [NIH]

Decision Making: The process of making a selective intellectual judgment when presented with several complex alternatives consisting of several variables, and usually defining a course of action or an idea. [NIH]

Degenerative: Undergoing degeneration : tending to degenerate; having the character of or involving degeneration; causing or tending to cause degeneration. [EU]

Deletion: A genetic rearrangement through loss of segments of DNA (chromosomes), bringing sequences, which are normally separated, into close proximity. [NIH]

Dementia: An acquired organic mental disorder with loss of intellectual abilities of sufficient severity to interfere with social or occupational functioning. The dysfunction is multifaceted and involves memory, behavior, personality, judgment, attention, spatial relations, language, abstract thought, and other executive functions. The intellectual decline is usually progressive, and initially spares the level of consciousness. [NIH]

Denaturation: Rupture of the hydrogen bonds by heating a DNA solution and then cooling it rapidly causes the two complementary strands to separate. [NIH]

Dendrites: Extensions of the nerve cell body. They are short and branched and receive stimuli from other neurons. [NIH]

Density: The logarithm to the base 10 of the opacity of an exposed and processed film. [NIH]

Depressive Disorder: An affective disorder manifested by either a dysphoric mood or loss of interest or pleasure in usual activities. The mood disturbance is prominent and relatively persistent. [NIH]

Deprivation: Loss or absence of parts, organs, powers, or things that are needed. [EU]

Developing Countries: Countries in the process of change directed toward economic growth, that is, an increase in production, per capita consumption, and income. The process of economic growth involves better utilization of natural and human resources, which results in a change in the social, political, and economic structures. [NIH]

Diabetes Mellitus: A heterogeneous group of disorders that share glucose intolerance in common. [NIH]

Diagnostic procedure: A method used to identify a disease. [NIH]

Diagnostic Services: Organized services for the purpose of providing diagnosis to promote and maintain health. [NIH]

Diaphragm: The musculofibrous partition that separates the thoracic cavity from the abdominal cavity. Contraction of the diaphragm increases the volume of the thoracic cavity aiding inspiration. [NIH]

Digestion: The process of breakdown of food for metabolism and use by the body. [NIH]

Direct: 1. Straight; in a straight line. 2. Performed immediately and without the intervention of subsidiary means. [EU]

Directivity: A measure of the degree to which a microphone is able to differentiate between sounds from different directions. [NIH]

Discrimination: The act of qualitative and/or quantitative differentiation between two or more stimuli. [NIH]

Dispenser: Glass, metal or plastic shell fitted with valve from which a pressurized formulation is dispensed; an instrument for atomizing. [NIH]

Dissection: Cutting up of an organism for study. [NIH]

Distal: Remote; farther from any point of reference; opposed to proximal. In dentistry, used to designate a position on the dental arch farther from the median line of the jaw. [EU]

Dizziness: An imprecise term which may refer to a sense of spatial disorientation, motion of the environment, or lightheadedness. [NIH]

Dorsal: 1. Pertaining to the back or to any dorsum. 2. Denoting a position more toward the back surface than some other object of reference; same as posterior in human anatomy; superior in the anatomy of quadrupeds. [EU]

Dorsum: A plate of bone which forms the posterior boundary of the sella turcica. [NIH]

Drive: A state of internal activity of an organism that is a necessary condition before a given

stimulus will elicit a class of responses; e.g., a certain level of hunger (drive) must be present before food will elicit an eating response. [NIH]

Drug Interactions: The action of a drug that may affect the activity, metabolism, or toxicity of another drug. [NIH]

Drug Toxicity: Manifestations of the adverse effects of drugs administered therapeutically or in the course of diagnostic techniques. It does not include accidental or intentional poisoning for which specific headings are available. [NIH]

Dura mater: The outermost, toughest, and most fibrous of the three membranes (meninges) covering the brain and spinal cord; called also pachymeninx. [EU]

Dyes: Chemical substances that are used to stain and color other materials. The coloring may or may not be permanent. Dyes can also be used as therapeutic agents and test reagents in medicine and scientific research. [NIH]

Dysgenesis: Defective development. [EU]

Dysostosis: Defective bone formation. [NIH]

Dysphoria: Disquiet; restlessness; malaise. [EU]

Dysplasia: Cells that look abnormal under a microscope but are not cancer. [NIH]

Dystrophy: Any disorder arising from defective or faulty nutrition, especially the muscular dystrophies. [EU]

Ear Diseases: Diseases of the ear, general or unspecified. [NIH]

Eardrum: A thin, tense membrane forming the greater part of the outer wall of the tympanic cavity and separating it from the external auditory meatus; it constitutes the boundary between the external and middle ear. [NIH]

Effector: It is often an enzyme that converts an inactive precursor molecule into an active second messenger. [NIH]

Efferent: Nerve fibers which conduct impulses from the central nervous system to muscles and glands. [NIH]

Efficacy: The extent to which a specific intervention, procedure, regimen, or service produces a beneficial result under ideal conditions. Ideally, the determination of efficacy is based on the results of a randomized control trial. [NIH]

Effusion: The escape of fluid into a part or tissue, as an exudation or a transudation. [EU]

Elastic: Susceptible of resisting and recovering from stretching, compression or distortion applied by a force. [EU]

Elective: Subject to the choice or decision of the patient or physician; applied to procedures that are advantageous to the patient but not urgent. [EU]

Electrocardiogram: Measurement of electrical activity during heartbeats. [NIH]

Electrode: Component of the pacing system which is at the distal end of the lead. It is the interface with living cardiac tissue across which the stimulus is transmitted. [NIH]

Electrolyte: A substance that dissociates into ions when fused or in solution, and thus becomes capable of conducting electricity; an ionic solute. [EU]

Electrons: Stable elementary particles having the smallest known negative charge, present in all elements; also called negatrons. Positively charged electrons are called positrons. The numbers, energies and arrangement of electrons around atomic nuclei determine the chemical identities of elements. Beams of electrons are called cathode rays or beta rays, the latter being a high-energy biproduct of nuclear decay. [NIH]

Electrophysiological: Pertaining to electrophysiology, that is a branch of physiology that is

concerned with the electric phenomena associated with living bodies and involved in their functional activity. [EU]

Embryo: The prenatal stage of mammalian development characterized by rapid morphological changes and the differentiation of basic structures. [NIH]

Empirical: A treatment based on an assumed diagnosis, prior to receiving confirmatory laboratory test results. [NIH]

Emulsion: A preparation of one liquid distributed in small globules throughout the body of a second liquid. The dispersed liquid is the discontinuous phase, and the dispersion medium is the continuous phase. When oil is the dispersed liquid and an aqueous solution is the continuous phase, it is known as an oil-in-water emulsion, whereas when water or aqueous solution is the dispersed phase and oil or oleaginous substance is the continuous phase, it is known as a water-in-oil emulsion. Pharmaceutical emulsions for which official standards have been promulgated include cod liver oil emulsion, cod liver oil emulsion with malt, liquid petrolatum emulsion, and phenolphthalein in liquid petrolatum emulsion. [EU]

Endemic: Present or usually prevalent in a population or geographical area at all times; said of a disease or agent. Called also endemial. [EU]

Endogenous: Produced inside an organism or cell. The opposite is external (exogenous) production. [NIH]

Endolymph: The fluid contained in the membranous labyrinth of the ear. [NIH]

Endolymphatic Duct: Duct connecting the endolymphatic sac with the membranous labyrinth. [NIH]

Endolymphatic Sac: The blind pouch at the end of the endolymphatic duct. [NIH]

Energetic: Exhibiting energy : strenuous; operating with force, vigour, or effect. [EU]

Enhancer: Transcriptional element in the virus genome. [NIH]

Environmental Exposure: The exposure to potentially harmful chemical, physical, or biological agents in the environment or to environmental factors that may include ionizing radiation, pathogenic organisms, or toxic chemicals. [NIH]

Environmental Health: The science of controlling or modifying those conditions, influences, or forces surrounding man which relate to promoting, establishing, and maintaining health. [NIH]

Enzymatic: Phase where enzyme cuts the precursor protein. [NIH]

Enzyme: A protein that speeds up chemical reactions in the body. [NIH]

Epidemic: Occurring suddenly in numbers clearly in excess of normal expectancy; said especially of infectious diseases but applied also to any disease, injury, or other health-related event occurring in such outbreaks. [EU]

Epidemiological: Relating to, or involving epidemiology. [EU]

Epithelial: Refers to the cells that line the internal and external surfaces of the body. [NIH]

Epithelial Cells: Cells that line the inner and outer surfaces of the body. [NIH]

Epithelium: One or more layers of epithelial cells, supported by the basal lamina, which covers the inner or outer surfaces of the body. [NIH]

Esophagus: The muscular tube through which food passes from the throat to the stomach. [NIH]

Eukaryotic Cells: Cells of the higher organisms, containing a true nucleus bounded by a nuclear membrane. [NIH]

Evoke: The electric response recorded from the cerebral cortex after stimulation of a

peripheral sense organ. [NIH]

Evoked Potentials: The electric response evoked in the central nervous system by stimulation of sensory receptors or some point on the sensory pathway leading from the receptor to the cortex. The evoked stimulus can be auditory, somatosensory, or visual, although other modalities have been reported. Event-related potentials is sometimes used synonymously with evoked potentials but is often associated with the execution of a motor, cognitive, or psychophysiological task, as well as with the response to a stimulus. [NIH]

Excitation: An act of irritation or stimulation or of responding to a stimulus; the addition of energy, as the excitation of a molecule by absorption of photons. [EU]

Excitatory: When cortical neurons are excited, their output increases and each new input they receive while they are still excited raises their output markedly. [NIH]

Exogenous: Developed or originating outside the organism, as exogenous disease. [EU]

Expander: Any of several colloidal substances of high molecular weight. used as a blood or plasma substitute in transfusion for increasing the volume of the circulating blood. called also extender. [NIH]

Expert Systems: Computer programs based on knowledge developed from consultation with experts on a problem, and the processing and/or formalizing of this knowledge using these programs in such a manner that the problems may be solved. [NIH]

Extender: Any of several colloidal substances of high molecular weight, used as a blood or plasma substitute in transfusion for increasing the volume of the circulating blood. [NIH]

Extracellular: Outside a cell or cells. [EU]

Extracellular Matrix: A meshwork-like substance found within the extracellular space and in association with the basement membrane of the cell surface. It promotes cellular proliferation and provides a supporting structure to which cells or cell lysates in culture dishes adhere. [NIH]

Extracellular Space: Interstitial space between cells, occupied by fluid as well as amorphous and fibrous substances. [NIH]

Extraction: The process or act of pulling or drawing out. [EU]

Facial: Of or pertaining to the face. [EU]

Facial Nerve: The 7th cranial nerve. The facial nerve has two parts, the larger motor root which may be called the facial nerve proper, and the smaller intermediate or sensory root. Together they provide efferent innervation to the muscles of facial expression and to the lacrimal and salivary glands, and convey afferent information for taste from the anterior two-thirds of the tongue and for touch from the external ear. [NIH]

Facial Nerve Diseases: Diseases of the facial nerve or nuclei. Pontine disorders may affect the facial nuclei or nerve fascicle. The nerve may be involved intracranially, along its course through the petrous portion of the temporal bone, or along its extracranial course. Clinical manifestations include facial muscle weakness, loss of taste from the anterior tongue, hyperacusis, and decreased lacrimation. [NIH]

Family Planning: Programs or services designed to assist the family in controlling reproduction by either improving or diminishing fertility. [NIH]

Fat: Total lipids including phospholipids. [NIH]

Fetal Development: Morphologic and physiologic growth and development of the mammalian embryo or fetus. [NIH]

Fetus: The developing offspring from 7 to 8 weeks after conception until birth. [NIH]

Fissure: Any cleft or groove, normal or otherwise; especially a deep fold in the cerebral

cortex which involves the entire thickness of the brain wall. [EU]

Fixation: 1. The act or operation of holding, suturing, or fastening in a fixed position. 2. The condition of being held in a fixed position. 3. In psychiatry, a term with two related but distinct meanings : (1) arrest of development at a particular stage, which like regression (return to an earlier stage), if temporary is a normal reaction to setbacks and difficulties but if protracted or frequent is a cause of developmental failures and emotional problems, and (2) a close and suffocating attachment to another person, especially a childhood figure, such as one's mother or father. Both meanings are derived from psychoanalytic theory and refer to 'fixation' of libidinal energy either in a specific erogenous zone, hence fixation at the oral, anal, or phallic stage, or in a specific object, hence mother or father fixation. 4. The use of a fixative (q.v.) to preserve histological or cytological specimens. 5. In chemistry, the process whereby a substance is removed from the gaseous or solution phase and localized, as in carbon dioxide fixation or nitrogen fixation. 6. In ophthalmology, direction of the gaze so that the visual image of the object falls on the fovea centralis. 7. In film processing, the chemical removal of all undeveloped salts of the film emulsion, leaving only the developed silver to form a permanent image. [EU]

Focus Groups: A method of data collection and a qualitative research tool in which a small group of individuals are brought together and allowed to interact in a discussion of their opinions about topics, issues, or questions. [NIH]

Folate: A B-complex vitamin that is being studied as a cancer prevention agent. Also called folic acid. [NIH]

Fold: A plication or doubling of various parts of the body. [NIH]

Folic Acid: N-(4-(((2-Amino-1,4-dihydro-4-oxo-6-pteridinyl)methyl)amino)benzoyl)-L-glutamic acid. A member of the vitamin B family that stimulates the hematopoietic system. It is present in the liver and kidney and is found in mushrooms, spinach, yeast, green leaves, and grasses. Folic acid is used in the treatment and prevention of folate deficiencies and megaloblastic anemia. [NIH]

Foramen: A natural hole of perforation, especially one in a bone. [NIH]

Fovea: The central part of the macula that provides the sharpest vision. [NIH]

Frameshift: A type of mutation which causes out-of-phase transcription of the base sequence; such mutations arise from the addition or delection of nucleotide(s) in numbers other than 3 or multiples of 3. [NIH]

Frameshift Mutation: A type of mutation in which a number of nucleotides not divisible by three is deleted from or inserted into a coding sequence, thereby causing an alteration in the reading frame of the entire sequence downstream of the mutation. These mutations may be induced by certain types of mutagens or may occur spontaneously. [NIH]

Free Radicals: Highly reactive molecules with an unsatisfied electron valence pair. Free radicals are produced in both normal and pathological processes. They are proven or suspected agents of tissue damage in a wide variety of circumstances including radiation, damage from environment chemicals, and aging. Natural and pharmacological prevention of free radical damage is being actively investigated. [NIH]

Fungi: A kingdom of eukaryotic, heterotrophic organisms that live as saprobes or parasites, including mushrooms, yeasts, smuts, molds, etc. They reproduce either sexually or asexually, and have life cycles that range from simple to complex. Filamentous fungi refer to those that grow as multicelluar colonies (mushrooms and molds). [NIH]

Fuzzy Logic: Approximate, quantitative reasoning that is concerned with the linguistic ambiguity which exists in natural or synthetic language. At its core are variables such as good, bad, and young as well as modifiers such as more, less, and very. These ordinary

terms represent fuzzy sets in a particular problem. Fuzzy logic plays a key role in many medical expert systems. [NIH]

Ganglia: Clusters of multipolar neurons surrounded by a capsule of loosely organized connective tissue located outside the central nervous system. [NIH]

Ganglion: 1. A knot, or knotlike mass. 2. A general term for a group of nerve cell bodies located outside the central nervous system; occasionally applied to certain nuclear groups within the brain or spinal cord, e.g. basal ganglia. 3. A benign cystic tumour occurring on a aponeurosis or tendon, as in the wrist or dorsum of the foot; it consists of a thin fibrous capsule enclosing a clear mucinous fluid. [EU]

Gap Junctions: Connections between cells which allow passage of small molecules and electric current. Gap junctions were first described anatomically as regions of close apposition between cells with a narrow (1-2 nm) gap between cell membranes. The variety in the properties of gap junctions is reflected in the number of connexins, the family of proteins which form the junctions. [NIH]

Gene: The functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein. [NIH]

Gene Deletion: A genetic rearrangement through loss of segments of DNA or RNA, bringing sequences which are normally separated into close proximity. This deletion may be detected using cytogenetic techniques and can also be inferred from the phenotype, indicating a deletion at one specific locus. [NIH]

Gene Expression: The phenotypic manifestation of a gene or genes by the processes of gene action. [NIH]

Gene Therapy: The introduction of new genes into cells for the purpose of treating disease by restoring or adding gene expression. Techniques include insertion of retroviral vectors, transfection, homologous recombination, and injection of new genes into the nuclei of single cell embryos. The entire gene therapy process may consist of multiple steps. The new genes may be introduced into proliferating cells in vivo (e.g., bone marrow) or in vitro (e.g., fibroblast cultures) and the modified cells transferred to the site where the gene expression is required. Gene therapy may be particularly useful for treating enzyme deficiency diseases, hemoglobinopathies, and leukemias and may also prove useful in restoring drug sensitivity, particularly for leukemia. [NIH]

Generator: Any system incorporating a fixed parent radionuclide from which is produced a daughter radionuclide which is to be removed by elution or by any other method and used in a radiopharmaceutical. [NIH]

Genetic Code: The specifications for how information, stored in nucleic acid sequence (base sequence), is translated into protein sequence (amino acid sequence). The start, stop, and order of amino acids of a protein is specified by consecutive triplets of nucleotides called codons (codon). [NIH]

Genetic Counseling: Advising families of the risks involved pertaining to birth defects, in order that they may make an informed decision on current or future pregnancies. [NIH]

Genetic Engineering: Directed modification of the gene complement of a living organism by such techniques as altering the DNA, substituting genetic material by means of a virus, transplanting whole nuclei, transplanting cell hybrids, etc. [NIH]

Genetic Techniques: Chromosomal, biochemical, intracellular, and other methods used in the study of genetics. [NIH]

Genetic testing: Analyzing DNA to look for a genetic alteration that may indicate an increased risk for developing a specific disease or disorder. [NIH]

Genetics: The biological science that deals with the phenomena and mechanisms of heredity. [NIH]

Genomics: The systematic study of the complete DNA sequences (genome) of organisms. [NIH]

Genotype: The genetic constitution of the individual; the characterization of the genes. [NIH]

Geriatric: Pertaining to the treatment of the aged. [EU]

Germ Cells: The reproductive cells in multicellular organisms. [NIH]

Gestation: The period of development of the young in viviparous animals, from the time of fertilization of the ovum until birth. [EU]

Gestures: Movement of a part of the body for the purpose of communication. [NIH]

Gland: An organ that produces and releases one or more substances for use in the body. Some glands produce fluids that affect tissues or organs. Others produce hormones or participate in blood production. [NIH]

Glucose: D-Glucose. A primary source of energy for living organisms. It is naturally occurring and is found in fruits and other parts of plants in its free state. It is used therapeutically in fluid and nutrient replacement. [NIH]

Glucose Intolerance: A pathological state in which the fasting plasma glucose level is less than 140 mg per deciliter and the 30-, 60-, or 90-minute plasma glucose concentration following a glucose tolerance test exceeds 200 mg per deciliter. This condition is seen frequently in diabetes mellitus but also occurs with other diseases. [NIH]

Glycoproteins: Conjugated protein-carbohydrate compounds including mucins, mucoid, and amyloid glycoproteins. [NIH]

Governing Board: The group in which legal authority is vested for the control of health-related institutions and organizations. [NIH]

Grade: The grade of a tumor depends on how abnormal the cancer cells look under a microscope and how quickly the tumor is likely to grow and spread. Grading systems are different for each type of cancer. [NIH]

Grafting: The operation of transfer of tissue from one site to another. [NIH]

Granule: A small pill made from sucrose. [EU]

Growth factors: Substances made by the body that function to regulate cell division and cell survival. Some growth factors are also produced in the laboratory and used in biological therapy. [NIH]

Habitual: Of the nature of a habit; according to habit; established by or repeated by force of habit, customary. [EU]

Hair Cells: Mechanoreceptors located in the organ of Corti that are sensitive to auditory stimuli and in the vestibular apparatus that are sensitive to movement of the head. In each case the accessory sensory structures are arranged so that appropriate stimuli cause movement of the hair-like projections (stereocilia and kinocilia) which relay the information centrally in the nervous system. [NIH]

Handicap: A handicap occurs as a result of disability, but disability does not always constitute a handicap. A handicap may be said to exist when a disability causes a substantial and continuing reduction in a person's capacity to function socially and vocationally. [NIH]

Health Promotion: Encouraging consumer behaviors most likely to optimize health potentials (physical and psychosocial) through health information, preventive programs, and access to medical care. [NIH]

Health Services: Services for the diagnosis and treatment of disease and the maintenance of health. [NIH]

Health Status: The level of health of the individual, group, or population as subjectively assessed by the individual or by more objective measures. [NIH]

Hearing aid: A miniature, portable sound amplifier for persons with impaired hearing, consisting of a microphone, audio amplifier, earphone, and battery. [NIH]

Hearing Disorders: Conditions that impair the transmission or perception of auditory impulses and information from the level of the ear to the temporal cortices, including the sensorineural pathways. [NIH]

Hearing Impaired Persons: Persons with any degree of loss of hearing that has an impact on their activities of daily living or that requires special assistance or intervention. [NIH]

Heart attack: A seizure of weak or abnormal functioning of the heart. [NIH]

Heme: The color-furnishing portion of hemoglobin. It is found free in tissues and as the prosthetic group in many hemeproteins. [NIH]

Hemoglobinopathies: A group of inherited disorders characterized by structural alterations within the hemoglobin molecule. [NIH]

Hemorrhage: Bleeding or escape of blood from a vessel. [NIH]

Hereditary: Of, relating to, or denoting factors that can be transmitted genetically from one generation to another. [NIH]

Heredity: 1. The genetic transmission of a particular quality or trait from parent to offspring. 2. The genetic constitution of an individual. [EU]

Herpes: Any inflammatory skin disease caused by a herpesvirus and characterized by the formation of clusters of small vesicles. When used alone, the term may refer to herpes simplex or to herpes zoster. [EU]

Herpes Zoster: Acute vesicular inflammation. [NIH]

Heterogeneity: The property of one or more samples or populations which implies that they are not identical in respect of some or all of their parameters, e. g. heterogeneity of variance. [NIH]

Heterozygotes: Having unlike alleles at one or more corresponding loci on homologous chromosomes. [NIH]

Histamine: 1H-Imidazole-4-ethanamine. A depressor amine derived by enzymatic decarboxylation of histidine. It is a powerful stimulant of gastric secretion, a constrictor of bronchial smooth muscle, a vasodilator, and also a centrally acting neurotransmitter. [NIH]

Histidine: An essential amino acid important in a number of metabolic processes. It is required for the production of histamine. [NIH]

Homeostasis: The processes whereby the internal environment of an organism tends to remain balanced and stable. [NIH]

Homologous: Corresponding in structure, position, origin, etc., as (a) the feathers of a bird and the scales of a fish, (b) antigen and its specific antibody, (c) allelic chromosomes. [EU]

Homozygote: An individual in which both alleles at a given locus are identical. [NIH]

Hormone: A substance in the body that regulates certain organs. Hormones such as gastrin help in breaking down food. Some hormones come from cells in the stomach and small intestine. [NIH]

Hybrid: Cross fertilization between two varieties or, more usually, two species of vines, see also crossing. [NIH]

Hyperacusis: An abnormally disproportionate increase in the sensation of loudness in response to auditory stimuli of normal volume. Cochlear diseases; vestibulocochlear nerve diseases; facial nerve diseases; stapes surgery; and other disorders may be associated with this condition. [NIH]

Hypersensitivity: Altered reactivity to an antigen, which can result in pathologic reactions upon subsequent exposure to that particular antigen. [NIH]

Hypertension: Persistently high arterial blood pressure. Currently accepted threshold levels are 140 mm Hg systolic and 90 mm Hg diastolic pressure. [NIH]

Hypoplasia: Incomplete development or underdevelopment of an organ or tissue. [EU]

Hypothyroidism: Deficiency of thyroid activity. In adults, it is most common in women and is characterized by decrease in basal metabolic rate, tiredness and lethargy, sensitivity to cold, and menstrual disturbances. If untreated, it progresses to full-blown myxoedema. In infants, severe hypothyroidism leads to cretinism. In juveniles, the manifestations are intermediate, with less severe mental and developmental retardation and only mild symptoms of the adult form. When due to pituitary deficiency of thyrotropin secretion it is called secondary hypothyroidism. [EU]

Hypoxia: Reduction of oxygen supply to tissue below physiological levels despite adequate perfusion of the tissue by blood. [EU]

Imaging procedures: Methods of producing pictures of areas inside the body. [NIH]

Immune response: The activity of the immune system against foreign substances (antigens). [NIH]

Immune Sera: Serum that contains antibodies. It is obtained from an animal that has been immunized either by antigen injection or infection with microorganisms containing the antigen. [NIH]

Immune system: The organs, cells, and molecules responsible for the recognition and disposal of foreign ("non-self") material which enters the body. [NIH]

Immunization: Deliberate stimulation of the host's immune response. Active immunization involves administration of antigens or immunologic adjuvants. Passive immunization involves administration of immune sera or lymphocytes or their extracts (e.g., transfer factor, immune RNA) or transplantation of immunocompetent cell producing tissue (thymus or bone marrow). [NIH]

Immunoglobulin: A protein that acts as an antibody. [NIH]

Immunohistochemistry: Histochemical localization of immunoreactive substances using labeled antibodies as reagents. [NIH]

Immunologic: The ability of the antibody-forming system to recall a previous experience with an antigen and to respond to a second exposure with the prompt production of large amounts of antibody. [NIH]

Immunology: The study of the body's immune system. [NIH]

Impairment: In the context of health experience, an impairment is any loss or abnormality of psychological, physiological, or anatomical structure or function. [NIH]

Implantation: The insertion or grafting into the body of biological, living, inert, or radioactive material. [EU]

In situ: In the natural or normal place; confined to the site of origin without invasion of neighbouring tissues. [EU]

In Situ Hybridization: A technique that localizes specific nucleic acid sequences within intact chromosomes, eukaryotic cells, or bacterial cells through the use of specific nucleic

acid-labeled probes. [NIH]

In vitro: In the laboratory (outside the body). The opposite of in vivo (in the body). [NIH]

In vivo: In the body. The opposite of in vitro (outside the body or in the laboratory). [NIH]

Incidental: 1. Small and relatively unimportant, minor; 2. Accompanying, but not a major part of something; 3. (To something) Liable to occur because of something or in connection with something (said of risks, responsibilities, .) [EU]

Incompetence: Physical or mental inadequacy or insufficiency. [EU]

Incus: One of three ossicles of the middle ear. It conducts sound vibrations from the malleus to the stapes. [NIH]

Induction: The act or process of inducing or causing to occur, especially the production of a specific morphogenetic effect in the developing embryo through the influence of evocators or organizers, or the production of anaesthesia or unconsciousness by use of appropriate agents. [EU]

Infancy: The period of complete dependency prior to the acquisition of competence in walking, talking, and self-feeding. [NIH]

Infant, Newborn: An infant during the first month after birth. [NIH]

Infarction: A pathological process consisting of a sudden insufficient blood supply to an area, which results in necrosis of that area. It is usually caused by a thrombus, an embolus, or a vascular torsion. [NIH]

Infection: 1. Invasion and multiplication of microorganisms in body tissues, which may be clinically unapparent or result in local cellular injury due to competitive metabolism, toxins, intracellular replication, or antigen-antibody response. The infection may remain localized, subclinical, and temporary if the body's defensive mechanisms are effective. A local infection may persist and spread by extension to become an acute, subacute, or chronic clinical infection or disease state. A local infection may also become systemic when the microorganisms gain access to the lymphatic or vascular system. 2. An infectious disease. [EU]

Inflammation: A pathological process characterized by injury or destruction of tissues caused by a variety of cytologic and chemical reactions. It is usually manifested by typical signs of pain, heat, redness, swelling, and loss of function. [NIH]

Informed Consent: Voluntary authorization, given to the physician by the patient, with full comprehension of the risks involved, for diagnostic or investigative procedures and medical and surgical treatment. [NIH]

Initiation: Mutation induced by a chemical reactive substance causing cell changes; being a step in a carcinogenic process. [NIH]

Inner ear: The labyrinth, comprising the vestibule, cochlea, and semicircular canals. [NIH]

Innervation: 1. The distribution or supply of nerves to a part. 2. The supply of nervous energy or of nerve stimulus sent to a part. [EU]

Insight: The capacity to understand one's own motives, to be aware of one's own psychodynamics, to appreciate the meaning of symbolic behavior. [NIH]

Insulator: Material covering the metal conductor of the lead. It is usually polyurethane or silicone. [NIH]

Integumentary: Pertaining to or composed of skin. [EU]

Intensive Care: Advanced and highly specialized care provided to medical or surgical patients whose conditions are life-threatening and require comprehensive care and constant monitoring. It is usually administered in specially equipped units of a health care facility.

[NIH]

Intermittent: Occurring at separated intervals; having periods of cessation of activity. [EU]

Intestines: The section of the alimentary canal from the stomach to the anus. It includes the large intestine and small intestine. [NIH]

Intoxication: Poisoning, the state of being poisoned. [EU]

Intracellular: Inside a cell. [NIH]

Intracranial Hypertension: Increased pressure within the cranial vault. This may result from several conditions, including hydrocephalus; brain edema; intracranial masses; severe systemic hypertension; pseudotumor cerebri; and other disorders. [NIH]

Intrinsic: Situated entirely within or pertaining exclusively to a part. [EU]

Involuntary: Reaction occurring without intention or volition. [NIH]

Ion Channels: Gated, ion-selective glycoproteins that traverse membranes. The stimulus for channel gating can be a membrane potential, drug, transmitter, cytoplasmic messenger, or a mechanical deformation. Ion channels which are integral parts of ionotropic neurotransmitter receptors are not included. [NIH]

Ionizing: Radiation comprising charged particles, e. g. electrons, protons, alpha-particles, etc., having sufficient kinetic energy to produce ionization by collision. [NIH]

Ions: An atom or group of atoms that have a positive or negative electric charge due to a gain (negative charge) or loss (positive charge) of one or more electrons. Atoms with a positive charge are known as cations; those with a negative charge are anions. [NIH]

Kb: A measure of the length of DNA fragments, 1 Kb = 1000 base pairs. The largest DNA fragments are up to 50 kilobases long. [NIH]

Kidney Disease: Any one of several chronic conditions that are caused by damage to the cells of the kidney. People who have had diabetes for a long time may have kidney damage. Also called nephropathy. [NIH]

Labyrinth: The internal ear; the essential part of the organ of hearing. It consists of an osseous and a membranous portion. [NIH]

Language Development: The gradual expansion in complexity and meaning of symbols and sounds as perceived and interpreted by the individual through a maturational and learning process. Stages in development include babbling, cooing, word imitation with cognition, and use of short sentences. [NIH]

Language Disorders: Conditions characterized by deficiencies of comprehension or expression of written and spoken forms of language. These include acquired and developmental disorders. [NIH]

Laryngectomy: Total or partial excision of the larynx. [NIH]

Larynx: An irregularly shaped, musculocartilaginous tubular structure, lined with mucous membrane, located at the top of the trachea and below the root of the tongue and the hyoid bone. It is the essential sphincter guarding the entrance into the trachea and functioning secondarily as the organ of voice. [NIH]

Latency: The period of apparent inactivity between the time when a stimulus is presented and the moment a response occurs. [NIH]

Least-Squares Analysis: A principle of estimation in which the estimates of a set of parameters in a statistical model are those quantities minimizing the sum of squared differences between the observed values of a dependent variable and the values predicted by the model. [NIH]

Lesion: An area of abnormal tissue change. [NIH]

Lethargy: Abnormal drowsiness or stupor; a condition of indifference. [EU]

Leukemia: Cancer of blood-forming tissue. [NIH]

Ligament: A band of fibrous tissue that connects bones or cartilages, serving to support and strengthen joints. [EU]

Ligands: A RNA simulation method developed by the MIT. [NIH]

Likelihood Functions: Functions constructed from a statistical model and a set of observed data which give the probability of that data for various values of the unknown model parameters. Those parameter values that maximize the probability are the maximum likelihood estimates of the parameters. [NIH]

Linear Models: Statistical models in which the value of a parameter for a given value of a factor is assumed to be equal to a + bx, where a and b are constants. The models predict a linear regression. [NIH]

Linkage: The tendency of two or more genes in the same chromosome to remain together from one generation to the next more frequently than expected according to the law of independent assortment. [NIH]

Linkage Disequilibrium: Nonrandom association of linked genes. This is the tendency of the alleles of two separate but already linked loci to be found together more frequently than would be expected by chance alone. [NIH]

Lip: Either of the two fleshy, full-blooded margins of the mouth. [NIH]

Lipid: Fat. [NIH]

Lithium: An element in the alkali metals family. It has the atomic symbol Li, atomic number 3, and atomic weight 6.94. Salts of lithium are used in treating manic-depressive disorders. [NIH]

Liver: A large, glandular organ located in the upper abdomen. The liver cleanses the blood and aids in digestion by secreting bile. [NIH]

Localization: The process of determining or marking the location or site of a lesion or disease. May also refer to the process of keeping a lesion or disease in a specific location or site. [NIH]

Localized: Cancer which has not metastasized yet. [NIH]

Logistic Models: Statistical models which describe the relationship between a qualitative dependent variable (that is, one which can take only certain discrete values, such as the presence or absence of a disease) and an independent variable. A common application is in epidemiology for estimating an individual's risk (probability of a disease) as a function of a given risk factor. [NIH]

Loneliness: The state of feeling sad or dejected as a result of lack of companionship or being separated from others. [NIH]

Longitudinal Studies: Studies in which variables relating to an individual or group of individuals are assessed over a period of time. [NIH]

Longitudinal study: Also referred to as a "cohort study" or "prospective study"; the analytic method of epidemiologic study in which subsets of a defined population can be identified who are, have been, or in the future may be exposed or not exposed, or exposed in different degrees, to a factor or factors hypothesized to influence the probability of occurrence of a given disease or other outcome. The main feature of this type of study is to observe large numbers of subjects over an extended time, with comparisons of incidence rates in groups that differ in exposure levels. [NIH]

Long-Term Care: Care over an extended period, usually for a chronic condition or disability, requiring periodic, intermittent, or continuous care. [NIH]

Loop: A wire usually of platinum bent at one end into a small loop (usually 4 mm inside diameter) and used in transferring microorganisms. [NIH]

Lymph: The almost colorless fluid that travels through the lymphatic system and carries cells that help fight infection and disease. [NIH]

Lymph node: A rounded mass of lymphatic tissue that is surrounded by a capsule of connective tissue. Also known as a lymph gland. Lymph nodes are spread out along lymphatic vessels and contain many lymphocytes, which filter the lymphatic fluid (lymph). [NIH]

Lymphatic: The tissues and organs, including the bone marrow, spleen, thymus, and lymph nodes, that produce and store cells that fight infection and disease. [NIH]

Lymphatic system: The tissues and organs that produce, store, and carry white blood cells that fight infection and other diseases. This system includes the bone marrow, spleen, thymus, lymph nodes and a network of thin tubes that carry lymph and white blood cells. These tubes branch, like blood vessels, into all the tissues of the body. [NIH]

Lymphocytes: White blood cells formed in the body's lymphoid tissue. The nucleus is round or ovoid with coarse, irregularly clumped chromatin while the cytoplasm is typically pale blue with azurophilic (if any) granules. Most lymphocytes can be classified as either T or B (with subpopulations of each); those with characteristics of neither major class are called null cells. [NIH]

Lymphoid: Referring to lymphocytes, a type of white blood cell. Also refers to tissue in which lymphocytes develop. [NIH]

Macula: A stain, spot, or thickening. Often used alone to refer to the macula retinae. [EU]

Malaise: A vague feeling of bodily discomfort. [EU]

Malformation: A morphologic defect resulting from an intrinsically abnormal developmental process. [EU]

Malignant: Cancerous; a growth with a tendency to invade and destroy nearby tissue and spread to other parts of the body. [NIH]

Malleus: The largest of the auditory ossicles, and the one attached to the membrana tympani (tympanic membrane). Its club-shaped head articulates with the incus. [NIH]

Manic: Affected with mania. [EU]

Manifest: Being the part or aspect of a phenomenon that is directly observable : concretely expressed in behaviour. [EU]

Manual Communication: Method of nonverbal communication utilizing hand movements as speech equivalents. [NIH]

Maxillary: Pertaining to the maxilla : the irregularly shaped bone that with its fellow forms the upper jaw. [EU]

Meatus: A canal running from the internal auditory foramen through the petrous portion of the temporal bone. It gives passage to the facial and auditory nerves together with the auditory branch of the basilar artery and the internal auditory veins. [NIH]

Medial: Lying near the midsaggital plane of the body; opposed to lateral. [NIH]

Mediate: Indirect; accomplished by the aid of an intervening medium. [EU]

MEDLINE: An online database of MEDLARS, the computerized bibliographic Medical Literature Analysis and Retrieval System of the National Library of Medicine. [NIH]

Meiosis: A special method of cell division, occurring in maturation of the germ cells, by means of which each daughter nucleus receives half the number of chromosomes characteristic of the somatic cells of the species. [NIH]

Membrane: A very thin layer of tissue that covers a surface. [NIH]

Memory: Complex mental function having four distinct phases: (1) memorizing or learning, (2) retention, (3) recall, and (4) recognition. Clinically, it is usually subdivided into immediate, recent, and remote memory. [NIH]

Meninges: The three membranes that cover and protect the brain and spinal cord. [NIH]

Meningitis: Inflammation of the meninges. When it affects the dura mater, the disease is termed pachymeningitis; when the arachnoid and pia mater are involved, it is called leptomeningitis, or meningitis proper. [EU]

Mental: Pertaining to the mind; psychic. 2. (L. mentum chin) pertaining to the chin. [EU]

Mental Health: The state wherein the person is well adjusted. [NIH]

Mental Processes: Conceptual functions or thinking in all its forms. [NIH]

Mental Retardation: Refers to sub-average general intellectual functioning which originated during the developmental period and is associated with impairment in adaptive behavior. [NIH]

Mesenchymal: Refers to cells that develop into connective tissue, blood vessels, and lymphatic tissue. [NIH]

Mesoderm: The middle germ layer of the embryo. [NIH]

Metabolic disorder: A condition in which normal metabolic processes are disrupted, usually because of a missing enzyme. [NIH]

MI: Myocardial infarction. Gross necrosis of the myocardium as a result of interruption of the blood supply to the area; it is almost always caused by atherosclerosis of the coronary arteries, upon which coronary thrombosis is usually superimposed. [NIH]

Microbe: An organism which cannot be observed with the naked eye; e. g. unicellular animals, lower algae, lower fungi, bacteria. [NIH]

Microbiology: The study of microorganisms such as fungi, bacteria, algae, archaea, and viruses. [NIH]

Microorganism: An organism that can be seen only through a microscope. Microorganisms include bacteria, protozoa, algae, and fungi. Although viruses are not considered living organisms, they are sometimes classified as microorganisms. [NIH]

Migration: The systematic movement of genes between populations of the same species, geographic race, or variety. [NIH]

Mitosis: A method of indirect cell division by means of which the two daughter nuclei normally receive identical complements of the number of chromosomes of the somatic cells of the species. [NIH]

Mobility: Capability of movement, of being moved, or of flowing freely. [EU]

Mode of Transmission: Hepatitis A [NIH]

Modeling: A treatment procedure whereby the therapist presents the target behavior which the learner is to imitate and make part of his repertoire. [NIH]

Modification: A change in an organism, or in a process in an organism, that is acquired from its own activity or environment. [NIH]

Molecular: Of, pertaining to, or composed of molecules : a very small mass of matter. [EU]

Molecule: A chemical made up of two or more atoms. The atoms in a molecule can be the same (an oxygen molecule has two oxygen atoms) or different (a water molecule has two hydrogen atoms and one oxygen atom). Biological molecules, such as proteins and DNA, can be made up of many thousands of atoms. [NIH]

Monitor: An apparatus which automatically records such physiological signs as respiration, pulse, and blood pressure in an anesthetized patient or one undergoing surgical or other procedures. [NIH]

Monoclonal: An antibody produced by culturing a single type of cell. It therefore consists of a single species of immunoglobulin molecules. [NIH]

Monoclonal antibodies: Laboratory-produced substances that can locate and bind to cancer cells wherever they are in the body. Many monoclonal antibodies are used in cancer detection or therapy; each one recognizes a different protein on certain cancer cells. Monoclonal antibodies can be used alone, or they can be used to deliver drugs, toxins, or radioactive material directly to a tumor. [NIH]

Morphological: Relating to the configuration or the structure of live organs. [NIH]

Morphology: The science of the form and structure of organisms (plants, animals, and other forms of life). [NIH]

Motility: The ability to move spontaneously. [EU]

Mucinous: Containing or resembling mucin, the main compound in mucus. [NIH]

Multiple sclerosis: A disorder of the central nervous system marked by weakness, numbness, a loss of muscle coordination, and problems with vision, speech, and bladder control. Multiple sclerosis is thought to be an autoimmune disease in which the body's immune system destroys myelin. Myelin is a substance that contains both protein and fat (lipid) and serves as a nerve insulator and helps in the transmission of nerve signals. [NIH]

Muscle Fibers: Large single cells, either cylindrical or prismatic in shape, that form the basic unit of muscle tissue. They consist of a soft contractile substance enclosed in a tubular sheath. [NIH]

Muscular Dystrophies: A general term for a group of inherited disorders which are characterized by progressive degeneration of skeletal muscles. [NIH]

Musculature: The muscular apparatus of the body, or of any part of it. [EU]

Mutagens: Chemical agents that increase the rate of genetic mutation by interfering with the function of nucleic acids. A clastogen is a specific mutagen that causes breaks in chromosomes. [NIH]

Mutate: To change the genetic material of a cell. Then changes (mutations) can be harmful, beneficial, or have no effect. [NIH]

Mutism: Inability or refusal to speak. [EU]

Myelin: The fatty substance that covers and protects nerves. [NIH]

Myocardium: The muscle tissue of the heart composed of striated, involuntary muscle known as cardiac muscle. [NIH]

Myosin: Chief protein in muscle and the main constituent of the thick filaments of muscle fibers. In conjunction with actin, it is responsible for the contraction and relaxation of muscles. [NIH]

Necrosis: A pathological process caused by the progressive degradative action of enzymes that is generally associated with severe cellular trauma. It is characterized by mitochondrial swelling, nuclear flocculation, uncontrolled cell lysis, and ultimately cell death. [NIH]

Neonatal: Pertaining to the first four weeks after birth. [EU]

Neonatal period: The first 4 weeks after birth. [NIH]

Neonatal Screening: The identification of selected parameters in newborn infants by various tests, examinations, or other procedures. Screening may be performed by clinical or laboratory measures. A screening test is designed to sort out healthy neonates from those not well, but the screening test is not intended as a diagnostic device, rather instead as epidemiologic. [NIH]

Neonatology: A subspecialty of pediatrics concerned with the newborn infant. [NIH]

Neoplastic: Pertaining to or like a neoplasm (= any new and abnormal growth); pertaining to neoplasia (= the formation of a neoplasm). [EU]

Nephropathy: Disease of the kidneys. [EU]

Nerve: A cordlike structure of nervous tissue that connects parts of the nervous system with other tissues of the body and conveys nervous impulses to, or away from, these tissues. [NIH]

Nerve Growth Factor: Nerve growth factor is the first of a series of neurotrophic factors that were found to influence the growth and differentiation of sympathetic and sensory neurons. It is comprised of alpha, beta, and gamma subunits. The beta subunit is responsible for its growth stimulating activity. [NIH]

Nervous System: The entire nerve apparatus composed of the brain, spinal cord, nerves and ganglia. [NIH]

Networks: Pertaining to a nerve or to the nerves, a meshlike structure of interlocking fibers or strands. [NIH]

Neural: 1. Pertaining to a nerve or to the nerves. 2. Situated in the region of the spinal axis, as the neutral arch. [EU]

Neuroanatomy: Study of the anatomy of the nervous system as a specialty or discipline. [NIH]

Neuroblastoma: Cancer that arises in immature nerve cells and affects mostly infants and children. [NIH]

Neuroma: A tumor that arises in nerve cells. [NIH]

Neuromuscular: Pertaining to muscles and nerves. [EU]

Neuromuscular Junction: The synapse between a neuron and a muscle. [NIH]

Neuronal: Pertaining to a neuron or neurons (= conducting cells of the nervous system). [EU]

Neurons: The basic cellular units of nervous tissue. Each neuron consists of a body, an axon, and dendrites. Their purpose is to receive, conduct, and transmit impulses in the nervous system. [NIH]

Neuropathy: A problem in any part of the nervous system except the brain and spinal cord. Neuropathies can be caused by infection, toxic substances, or disease. [NIH]

Neurophysiology: The scientific discipline concerned with the physiology of the nervous system. [NIH]

Neuropsychology: A branch of psychology which investigates the correlation between experience or behavior and the basic neurophysiological processes. The term neuropsychology stresses the dominant role of the nervous system. It is a more narrowly defined field than physiological psychology or psychophysiology. [NIH]

Neurotransmitter: Any of a group of substances that are released on excitation from the axon terminal of a presynaptic neuron of the central or peripheral nervous system and travel across the synaptic cleft to either excite or inhibit the target cell. Among the many substances that have the properties of a neurotransmitter are acetylcholine, norepinephrine,

epinephrine, dopamine, glycine, y-aminobutyrate, glutamic acid, substance P, enkephalins, endorphins, and serotonin. [EU]

Neurotrophins: A nerve growth factor. [NIH]

Nitrogen: An element with the atomic symbol N, atomic number 7, and atomic weight 14. Nitrogen exists as a diatomic gas and makes up about 78% of the earth's atmosphere by volume. It is a constituent of proteins and nucleic acids and found in all living cells. [NIH]

Nonverbal Communication: Transmission of emotions, ideas, and attitudes between individuals in ways other than the spoken language. [NIH]

Nuclear: A test of the structure, blood flow, and function of the kidneys. The doctor injects a mildly radioactive solution into an arm vein and uses x-rays to monitor its progress through the kidneys. [NIH]

Nuclei: A body of specialized protoplasm found in nearly all cells and containing the chromosomes. [NIH]

Nucleic acid: Either of two types of macromolecule (DNA or RNA) formed by polymerization of nucleotides. Nucleic acids are found in all living cells and contain the information (genetic code) for the transfer of genetic information from one generation to the next. [NIH]

Nucleus: A body of specialized protoplasm found in nearly all cells and containing the chromosomes. [NIH]

Ocular: 1. Of, pertaining to, or affecting the eye. 2. Eyepiece. [EU]

Omnidirectional: Sound source which radiates uniformly in all directions. [NIH]

On-line: A sexually-reproducing population derived from a common parentage. [NIH]

Oocytes: Female germ cells in stages between the prophase of the first maturation division and the completion of the second maturation division. [NIH]

Opacity: Degree of density (area most dense taken for reading). [NIH]

Ophthalmology: A surgical specialty concerned with the structure and function of the eye and the medical and surgical treatment of its defects and diseases. [NIH]

Organ of Corti: The organ that contains the special sensory receptors for hearing. It is composed of a series of epithelial structures placed upon the inner part of the basilar membrane. [NIH]

Ossicle: A small bone. [EU]

Ossification: The formation of bone or of a bony substance; the conversion of fibrous tissue or of cartilage into bone or a bony substance. [EU]

Osteoblasts: Bone-forming cells which secrete an extracellular matrix. Hydroxyapatite crystals are then deposited into the matrix to form bone. [NIH]

Osteogenesis: The histogenesis of bone including ossification. It occurs continuously but particularly in the embryo and child and during fracture repair. [NIH]

Osteogenesis Imperfecta: A collagen disorder resulting from defective biosynthesis of type I collagen and characterized by brittle, osteoporotic, and easily fractured bones. It may also present with blue sclerae, loose joints, and imperfect dentin formation. There are four major types, I-IV. [NIH]

Otitis: Inflammation of the ear, which may be marked by pain, fever, abnormalities of hearing, hearing loss, tinnitus, and vertigo. [EU]

Otitis Media: Inflammation of the middle ear. [NIH]

Otitis Media with Effusion: Inflammation of the middle ear with a clear pale yellow-

colored transudate. [NIH]

Otolaryngology: A surgical specialty concerned with the study and treatment of disorders of the ear, nose, and throat. [NIH]

Otology: The branch of medicine which deals with the diagnosis and treatment of the disorders and diseases of the ear. [NIH]

Otorhinolaryngology: That branch of medicine concerned with medical and surgical treatment of the head and neck, including the ears, nose and throat. [EU]

Otosclerosis: The formation of spongy bone in the labyrinth capsule. The ossicles can become fixed and unable to transmit sound vibrations, thereby causing deafness. [NIH]

Ototoxic: Having a deleterious effect upon the eighth nerve, or upon the organs of hearing and balance. [EU]

Outer ear: The pinna and external meatus of the ear. [NIH]

Outpatient: A patient who is not an inmate of a hospital but receives diagnosis or treatment in a clinic or dispensary connected with the hospital. [NIH]

Ovum: A female germ cell extruded from the ovary at ovulation. [NIH]

Oxidation: The act of oxidizing or state of being oxidized. Chemically it consists in the increase of positive charges on an atom or the loss of negative charges. Most biological oxidations are accomplished by the removal of a pair of hydrogen atoms (dehydrogenation) from a molecule. Such oxidations must be accompanied by reduction of an acceptor molecule. Univalent o. indicates loss of one electron; divalent o., the loss of two electrons. [EU]

Pachymeningitis: Inflammation of the dura mater of the brain, the spinal cord or the optic nerve. [NIH]

Palate: The structure that forms the roof of the mouth. It consists of the anterior hard palate and the posterior soft palate. [NIH]

Palliative: 1. Affording relief, but not cure. 2. An alleviating medicine. [EU]

Panacea: A cure-all. [NIH]

Parotid: The space that contains the parotid gland, the facial nerve, the external carotid artery, and the retromandibular vein. [NIH]

Particle: A tiny mass of material. [EU]

Patch: A piece of material used to cover or protect a wound, an injured part, etc.: a patch over the eye. [NIH]

Pathogenesis: The cellular events and reactions that occur in the development of disease. [NIH]

Pathologic: 1. Indicative of or caused by a morbid condition. 2. Pertaining to pathology (= branch of medicine that treats the essential nature of the disease, especially the structural and functional changes in tissues and organs of the body caused by the disease). [EU]

Pathologic Processes: The abnormal mechanisms and forms involved in the dysfunctions of tissues and organs. [NIH]

Pathologies: The study of abnormality, especially the study of diseases. [NIH]

Pathologist: A doctor who identifies diseases by studying cells and tissues under a microscope. [NIH]

Pathophysiology: Altered functions in an individual or an organ due to disease. [NIH]

Patient Education: The teaching or training of patients concerning their own health needs. [NIH]

Patient Selection: Criteria and standards used for the determination of the appropriateness of the inclusion of patients with specific conditions in proposed treatment plans and the criteria used for the inclusion of subjects in various clinical trials and other research protocols. [NIH]

Pediatrics: A medical specialty concerned with maintaining health and providing medical care to children from birth to adolescence. [NIH]

Peptide: Any compound consisting of two or more amino acids, the building blocks of proteins. Peptides are combined to make proteins. [NIH]

Perception: The ability quickly and accurately to recognize similarities and differences among presented objects, whether these be pairs of words, pairs of number series, or multiple sets of these or other symbols such as geometric figures. [NIH]

Perfusion: Bathing an organ or tissue with a fluid. In regional perfusion, a specific area of the body (usually an arm or a leg) receives high doses of anticancer drugs through a blood vessel. Such a procedure is performed to treat cancer that has not spread. [NIH]

Perilymph: The fluid contained within the space separating the membranous from the osseous labyrinth of the ear. [NIH]

Perinatal: Pertaining to or occurring in the period shortly before and after birth; variously defined as beginning with completion of the twentieth to twenty-eighth week of gestation and ending 7 to 28 days after birth. [EU]

Perioperative: Around the time of surgery; usually lasts from the time of going into the hospital or doctor's office for surgery until the time the patient goes home. [NIH]

Peripheral Neuropathy: Nerve damage, usually affecting the feet and legs; causing pain, numbness, or a tingling feeling. Also called "somatic neuropathy" or "distal sensory polyneuropathy." [NIH]

Phallic: Pertaining to the phallus, or penis. [EU]

Pharmacologic: Pertaining to pharmacology or to the properties and reactions of drugs. [EU]

Phenotype: The outward appearance of the individual. It is the product of interactions between genes and between the genotype and the environment. This includes the killer phenotype, characteristic of yeasts. [NIH]

Phosphates: Inorganic salts of phosphoric acid. [NIH]

Phosphorus: A non-metallic element that is found in the blood, muscles, nevers, bones, and teeth, and is a component of adenosine triphosphate (ATP; the primary energy source for the body's cells.) [NIH]

Physical Examination: Systematic and thorough inspection of the patient for physical signs of disease or abnormality. [NIH]

Physiologic: Having to do with the functions of the body. When used in the phrase "physiologic age," it refers to an age assigned by general health, as opposed to calendar age. [NIH]

Physiology: The science that deals with the life processes and functions of organismus, their cells, tissues, and organs. [NIH]

Pigment: A substance that gives color to tissue. Pigments are responsible for the color of skin, eyes, and hair. [NIH]

Pilot study: The initial study examining a new method or treatment. [NIH]

Pitch: The subjective awareness of the frequency or spectral distribution of a sound. [NIH]

Plants: Multicellular, eukaryotic life forms of the kingdom Plantae. They are characterized

by a mainly photosynthetic mode of nutrition; essentially unlimited growth at localized regions of cell divisions (meristems); cellulose within cells providing rigidity; the absence of organs of locomotion; absense of nervous and sensory systems; and an alteration of haploid and diploid generations. [NIH]

Plasma: The clear, yellowish, fluid part of the blood that carries the blood cells. The proteins that form blood clots are in plasma. [NIH]

Plasma cells: A type of white blood cell that produces antibodies. [NIH]

Plasmid: An autonomously replicating, extra-chromosomal DNA molecule found in many bacteria. Plasmids are widely used as carriers of cloned genes. [NIH]

Platinum: Platinum. A heavy, soft, whitish metal, resembling tin, atomic number 78, atomic weight 195.09, symbol Pt. (From Dorland, 28th ed) It is used in manufacturing equipment for laboratory and industrial use. It occurs as a black powder (platinum black) and as a spongy substance (spongy platinum) and may have been known in Pliny's time as "alutiae". [NIH]

Pneumonia: Inflammation of the lungs. [NIH]

Point Mutation: A mutation caused by the substitution of one nucleotide for another. This results in the DNA molecule having a change in a single base pair. [NIH]

Poisoning: A condition or physical state produced by the ingestion, injection or inhalation of, or exposure to a deleterious agent. [NIH]

Polymerase: An enzyme which catalyses the synthesis of DNA using a single DNA strand as a template. The polymerase copies the template in the 5'-3'direction provided that sufficient quantities of free nucleotides, dATP and dTTP are present. [NIH]

Polymerase Chain Reaction: In vitro method for producing large amounts of specific DNA or RNA fragments of defined length and sequence from small amounts of short oligonucleotide flanking sequences (primers). The essential steps include thermal denaturation of the double-stranded target molecules, annealing of the primers to their complementary sequences, and extension of the annealed primers by enzymatic synthesis with DNA polymerase. The reaction is efficient, specific, and extremely sensitive. Uses for the reaction include disease diagnosis, detection of difficult-to-isolate pathogens, mutation analysis, genetic testing, DNA sequencing, and analyzing evolutionary relationships. [NIH]

Polymorphic: Occurring in several or many forms; appearing in different forms at different stages of development. [EU]

Pons: The part of the central nervous system lying between the medulla oblongata and the mesencephalon, ventral to the cerebellum, and consisting of a pars dorsalis and a pars ventralis. [NIH]

Posterior: Situated in back of, or in the back part of, or affecting the back or dorsal surface of the body. In lower animals, it refers to the caudal end of the body. [EU]

Postnatal: Occurring after birth, with reference to the newborn. [EU]

Potassium: An element that is in the alkali group of metals. It has an atomic symbol K, atomic number 19, and atomic weight 39.10. It is the chief cation in the intracellular fluid of muscle and other cells. Potassium ion is a strong electrolyte and it plays a significant role in the regulation of fluid volume and maintenance of the water-electrolyte balance. [NIH]

Potentiates: A degree of synergism which causes the exposure of the organism to a harmful substance to worsen a disease already contracted. [NIH]

Practice Guidelines: Directions or principles presenting current or future rules of policy for the health care practitioner to assist him in patient care decisions regarding diagnosis, therapy, or related clinical circumstances. The guidelines may be developed by government

agencies at any level, institutions, professional societies, governing boards, or by the convening of expert panels. The guidelines form a basis for the evaluation of all aspects of health care and delivery. [NIH]

Prenatal: Existing or occurring before birth, with reference to the fetus. [EU]

Preoperative: Preceding an operation. [EU]

Presbycusis: Progressive bilateral loss of hearing that occurs in the aged. Syn: senile deafness. [NIH]

Prevalence: The total number of cases of a given disease in a specified population at a designated time. It is differentiated from incidence, which refers to the number of new cases in the population at a given time. [NIH]

Private Sector: That distinct portion of the institutional, industrial, or economic structure of a country that is controlled or owned by non-governmental, private interests. [NIH]

Probe: An instrument used in exploring cavities, or in the detection and dilatation of strictures, or in demonstrating the potency of channels; an elongated instrument for exploring or sounding body cavities. [NIH]

Progression: Increase in the size of a tumor or spread of cancer in the body. [NIH]

Progressive: Advancing; going forward; going from bad to worse; increasing in scope or severity. [EU]

Promoter: A chemical substance that increases the activity of a carcinogenic process. [NIH]

Prophase: The first phase of cell division, in which the chromosomes become visible, the nucleus starts to lose its identity, the spindle appears, and the centrioles migrate toward opposite poles. [NIH]

Prophylaxis: An attempt to prevent disease. [NIH]

Prospective Studies: Observation of a population for a sufficient number of persons over a sufficient number of years to generate incidence or mortality rates subsequent to the selection of the study group. [NIH]

Prospective study: An epidemiologic study in which a group of individuals (a cohort), all free of a particular disease and varying in their exposure to a possible risk factor, is followed over a specific amount of time to determine the incidence rates of the disease in the exposed and unexposed groups. [NIH]

Protective Devices: Devices designed to provide personal protection against injury to individuals exposed to hazards in industry, sports, aviation, or daily activities. [NIH]

Protein C: A vitamin-K dependent zymogen present in the blood, which, upon activation by thrombin and thrombomodulin exerts anticoagulant properties by inactivating factors Va and VIIIa at the rate-limiting steps of thrombin formation. [NIH]

Protein S: The vitamin K-dependent cofactor of activated protein C. Together with protein C, it inhibits the action of factors VIIIa and Va. A deficiency in protein S can lead to recurrent venous and arterial thrombosis. [NIH]

Proteins: Polymers of amino acids linked by peptide bonds. The specific sequence of amino acids determines the shape and function of the protein. [NIH]

Protocol: The detailed plan for a clinical trial that states the trial's rationale, purpose, drug or vaccine dosages, length of study, routes of administration, who may participate, and other aspects of trial design. [NIH]

Protozoa: A subkingdom consisting of unicellular organisms that are the simplest in the animal kingdom. Most are free living. They range in size from submicroscopic to macroscopic. Protozoa are divided into seven phyla: Sarcomastigophora,

Labyrinthomorpha, Apicomplexa, Microspora, Ascetospora, Myxozoa, and Ciliophora. [NIH]

Protozoal: Having to do with the simplest organisms in the animal kingdom. Protozoa are single-cell organisms, such as ameba, and are different from bacteria, which are not members of the animal kingdom. Some protozoa can be seen without a microscope. [NIH]

Psychiatric: Pertaining to or within the purview of psychiatry. [EU]

Psychiatry: The medical science that deals with the origin, diagnosis, prevention, and treatment of mental disorders. [NIH]

Psychic: Pertaining to the psyche or to the mind; mental. [EU]

Psychoacoustic: That branch of psychophysics dealing with acoustic stimuli. [NIH]

Psychoactive: Those drugs which alter sensation, mood, consciousness or other psychological or behavioral functions. [NIH]

Psychology: The science dealing with the study of mental processes and behavior in man and animals. [NIH]

Psychomotor: Pertaining to motor effects of cerebral or psychic activity. [EU]

Psychopathology: The study of significant causes and processes in the development of mental illness. [NIH]

Psychophysics: The science dealing with the correlation of the physical characteristics of a stimulus, e.g., frequency or intensity, with the response to the stimulus, in order to assess the psychologic factors involved in the relationship. [NIH]

Psychophysiology: The study of the physiological basis of human and animal behavior. [NIH]

Public Health: Branch of medicine concerned with the prevention and control of disease and disability, and the promotion of physical and mental health of the population on the international, national, state, or municipal level. [NIH]

Public Policy: A course or method of action selected, usually by a government, from among alternatives to guide and determine present and future decisions. [NIH]

Publishing: "The business or profession of the commercial production and issuance of literature" (Webster's 3d). It includes the publisher, publication processes, editing and editors. Production may be by conventional printing methods or by electronic publishing. [NIH]

Pulse: The rhythmical expansion and contraction of an artery produced by waves of pressure caused by the ejection of blood from the left ventricle of the heart as it contracts. [NIH]

Quality of Life: A generic concept reflecting concern with the modification and enhancement of life attributes, e.g., physical, political, moral and social environment. [NIH]

Race: A population within a species which exhibits general similarities within itself, but is both discontinuous and distinct from other populations of that species, though not sufficiently so as to achieve the status of a taxon. [NIH]

Radiation: Emission or propagation of electromagnetic energy (waves/rays), or the waves/rays themselves; a stream of electromagnetic particles (electrons, neutrons, protons, alpha particles) or a mixture of these. The most common source is the sun. [NIH]

Radioactive: Giving off radiation. [NIH]

Radioisotope: An unstable element that releases radiation as it breaks down. Radioisotopes can be used in imaging tests or as a treatment for cancer. [NIH]

Radiopharmaceutical: Any medicinal product which, when ready for use, contains one or

more radionuclides (radioactive isotopes) included for a medicinal purpose. [NIH]

Random Allocation: A process involving chance used in therapeutic trials or other research endeavor for allocating experimental subjects, human or animal, between treatment and control groups, or among treatment groups. It may also apply to experiments on inanimate objects. [NIH]

Randomization: Also called random allocation. Is allocation of individuals to groups, e.g., for experimental and control regimens, by chance. Within the limits of chance variation, random allocation should make the control and experimental groups similar at the start of an investigation and ensure that personal judgment and prejudices of the investigator do not influence allocation. [NIH]

Randomized: Describes an experiment or clinical trial in which animal or human subjects are assigned by chance to separate groups that compare different treatments. [NIH]

Randomized clinical trial: A study in which the participants are assigned by chance to separate groups that compare different treatments; neither the researchers nor the participants can choose which group. Using chance to assign people to groups means that the groups will be similar and that the treatments they receive can be compared objectively. At the time of the trial, it is not known which treatment is best. It is the patient's choice to be in a randomized trial. [NIH]

Reaction Time: The time from the onset of a stimulus until the organism responds. [NIH]

Receptor: A molecule inside or on the surface of a cell that binds to a specific substance and causes a specific physiologic effect in the cell. [NIH]

Recombinant: A cell or an individual with a new combination of genes not found together in either parent; usually applied to linked genes. [EU]

Recombination: The formation of new combinations of genes as a result of segregation in crosses between genetically different parents; also the rearrangement of linked genes due to crossing-over. [NIH]

Red Nucleus: A pinkish-yellow portion of the midbrain situated in the rostral mesencephalic tegmentum. It receives a large projection from the contralateral half of the cerebellum via the superior cerebellar peduncle and a projection from the ipsilateral motor cortex. [NIH]

Refer: To send or direct for treatment, aid, information, de decision. [NIH]

Reflective: Capable of throwing back light, images, sound waves : reflecting. [EU]

Reflex: An involuntary movement or exercise of function in a part, excited in response to a stimulus applied to the periphery and transmitted to the brain or spinal cord. [NIH]

Refraction: A test to determine the best eyeglasses or contact lenses to correct a refractive error (myopia, hyperopia, or astigmatism). [NIH]

Regeneration: The natural renewal of a structure, as of a lost tissue or part. [EU]

Regimen: A treatment plan that specifies the dosage, the schedule, and the duration of treatment. [NIH]

Regression Analysis: Procedures for finding the mathematical function which best describes the relationship between a dependent variable and one or more independent variables. In linear regression (see linear models) the relationship is constrained to be a straight line and least-squares analysis is used to determine the best fit. In logistic regression (see logistic models) the dependent variable is qualitative rather than continuously variable and likelihood functions are used to find the best relationship. In multiple regression the dependent variable is considered to depend on more than a single independent variable. [NIH]

Rehabilitative: Instruction of incapacitated individuals or of those affected with some mental disorder, so that some or all of their lost ability may be regained. [NIH]

Respiration: The act of breathing with the lungs, consisting of inspiration, or the taking into the lungs of the ambient air, and of expiration, or the expelling of the modified air which contains more carbon dioxide than the air taken in (Blakiston's Gould Medical Dictionary, 4th ed.). This does not include tissue respiration (= oxygen consumption) or cell respiration (= cell respiration). [NIH]

Retinae: A congenital notch or cleft of the retina, usually located inferiorly. [NIH]

Retinal: 1. Pertaining to the retina. 2. The aldehyde of retinol, derived by the oxidative enzymatic splitting of absorbed dietary carotene, and having vitamin A activity. In the retina, retinal combines with opsins to form visual pigments. One isomer, 11-cis retinal combines with opsin in the rods (scotopsin) to form rhodopsin, or visual purple. Another, all-trans retinal (trans-r.); visual yellow; xanthopsin) results from the bleaching of rhodopsin by light, in which the 11-cis form is converted to the all-trans form. Retinal also combines with opsins in the cones (photopsins) to form the three pigments responsible for colour vision. Called also retinal, and retinene1. [EU]

Retrospective: Looking back at events that have already taken place. [NIH]

Retrospective Studies: Studies used to test etiologic hypotheses in which inferences about an exposure to putative causal factors are derived from data relating to characteristics of persons under study or to events or experiences in their past. The essential feature is that some of the persons under study have the disease or outcome of interest and their characteristics are compared with those of unaffected persons. [NIH]

Retroviral vector: RNA from a virus that is used to insert genetic material into cells. [NIH]

Reverberant: The sound field prevailing in a large enclosure with moderately reflecting surfaces. [NIH]

Reversion: A return to the original condition, e. g. the reappearance of the normal or wild type in previously mutated cells, tissues, or organisms. [NIH]

Ribosome: A granule of protein and RNA, synthesized in the nucleolus and found in the cytoplasm of cells. Ribosomes are the main sites of protein synthesis. Messenger RNA attaches to them and there receives molecules of transfer RNA bearing amino acids. [NIH]

Risk factor: A habit, trait, condition, or genetic alteration that increases a person's chance of developing a disease. [NIH]

Rod: A reception for vision, located in the retina. [NIH]

Role-play: In this method, a conflict is artificially constructed, and the trainee is given a strategic position in it. [NIH]

Rubella: An acute, usually benign, infectious disease caused by a togavirus and most often affecting children and nonimmune young adults, in which the virus enters the respiratory tract via droplet nuclei and spreads to the lymphatic system. It is characterized by a slight cold, sore throat, and fever, followed by enlargement of the postauricular, suboccipital, and cervical lymph nodes, and the appearances of a fine pink rash that begins on the head and spreads to become generalized. Called also German measles, roetln, röteln, and three-day measles, and rubeola in French and Spanish. [EU]

Salivary: The duct that convey saliva to the mouth. [NIH]

Salivary glands: Glands in the mouth that produce saliva. [NIH]

Scala Tympani: The lower tube of the cochlea, extending from the round window to the helicotrema and containing perilymph. [NIH]

Schizoid: Having qualities resembling those found in greater degree in schizophrenics; a person of schizoid personality. [NIH]

Schizophrenia: A mental disorder characterized by a special type of disintegration of the personality. [NIH]

Schizotypal Personality Disorder: A personality disorder in which there are oddities of thought (magical thinking, paranoid ideation, suspiciousness), perception (illusions, depersonalization), speech (digressive, vague, overelaborate), and behavior (inappropriate affect in social interactions, frequently social isolation) that are not severe enough to characterize schizophrenia. [NIH]

Sclerae: A circular furrow between the sclerocorneal junction and the iris. [NIH]

Sclerosis: A pathological process consisting of hardening or fibrosis of an anatomical structure, often a vessel or a nerve. [NIH]

Screening: Checking for disease when there are no symptoms. [NIH]

Secretion: 1. The process of elaborating a specific product as a result of the activity of a gland; this activity may range from separating a specific substance of the blood to the elaboration of a new chemical substance. 2. Any substance produced by secretion. [EU]

Sediment: A precipitate, especially one that is formed spontaneously. [EU]

Segmental: Describing or pertaining to a structure which is repeated in similar form in successive segments of an organism, or which is undergoing segmentation. [NIH]

Segmentation: The process by which muscles in the intestines move food and wastes through the body. [NIH]

Segregation: The separation in meiotic cell division of homologous chromosome pairs and their contained allelomorphic gene pairs. [NIH]

Seizures: Clinical or subclinical disturbances of cortical function due to a sudden, abnormal, excessive, and disorganized discharge of brain cells. Clinical manifestations include abnormal motor, sensory and psychic phenomena. Recurrent seizures are usually referred to as epilepsy or "seizure disorder." [NIH]

Self Care: Performance of activities or tasks traditionally performed by professional health care providers. The concept includes care of oneself or one's family and friends. [NIH]

Self-Help Groups: Organizations which provide an environment encouraging social interactions through group activities or individual relationships especially for the purpose of rehabilitating or supporting patients, individuals with common health problems, or the elderly. They include therapeutic social clubs. [NIH]

Semicircular canal: Three long canals of the bony labyrinth of the ear, forming loops and opening into the vestibule by five openings. [NIH]

Senile: Relating or belonging to old age; characteristic of old age; resulting from infirmity of old age. [NIH]

Sensory loss: A disease of the nerves whereby the myelin or insulating sheath of myelin on the nerves does not stay intact and the messages from the brain to the muscles through the nerves are not carried properly. [NIH]

Sequence Analysis: A multistage process that includes the determination of a sequence (protein, carbohydrate, etc.), its fragmentation and analysis, and the interpretation of the resulting sequence information. [NIH]

Sequencing: The determination of the order of nucleotides in a DNA or RNA chain. [NIH]

Serology: The study of serum, especially of antigen-antibody reactions in vitro. [NIH]

Serum: The clear liquid part of the blood that remains after blood cells and clotting proteins have been removed. [NIH]

Sex Characteristics: Those characteristics that distinguish one sex from the other. The primary sex characteristics are the ovaries and testes and their related hormones. Secondary sex characteristics are those which are masculine or feminine but not directly related to reproduction. [NIH]

Shock: The general bodily disturbance following a severe injury; an emotional or moral upset occasioned by some disturbing or unexpected experience; disruption of the circulation, which can upset all body functions: sometimes referred to as circulatory shock. [NIH]

Side effect: A consequence other than the one(s) for which an agent or measure is used, as the adverse effects produced by a drug, especially on a tissue or organ system other than the one sought to be benefited by its administration. [EU]

Siderosis: The deposition of iron in a tissue. In the eye, the iron may be deposited in the stroma adjacent to the Descemet's membrane. [NIH]

Sign Language: A system of hand gestures used for communication by the deaf or by people speaking different languages. [NIH]

Signs and Symptoms: Clinical manifestations that can be either objective when observed by a physician, or subjective when perceived by the patient. [NIH]

Skeletal: Having to do with the skeleton (boney part of the body). [NIH]

Skeleton: The framework that supports the soft tissues of vertebrate animals and protects many of their internal organs. The skeletons of vertebrates are made of bone and/or cartilage. [NIH]

Skull: The skeleton of the head including the bones of the face and the bones enclosing the brain. [NIH]

Social Environment: The aggregate of social and cultural institutions, forms, patterns, and processes that influence the life of an individual or community. [NIH]

Social Isolation: The separation of individuals or groups resulting in the lack of or minimizing of social contact and/or communication. This separation may be accomplished by physical separation, by social barriers and by psychological mechanisms. In the latter, there may be interaction but no real communication. [NIH]

Social Support: Support systems that provide assistance and encouragement to individuals with physical or emotional disabilities in order that they may better cope. Informal social support is usually provided by friends, relatives, or peers, while formal assistance is provided by churches, groups, etc. [NIH]

Socialization: The training or molding of an individual through various relationships, educational agencies, and social controls, which enables him to become a member of a particular society. [NIH]

Soft tissue: Refers to muscle, fat, fibrous tissue, blood vessels, or other supporting tissue of the body. [NIH]

Somatic: 1. Pertaining to or characteristic of the soma or body. 2. Pertaining to the body wall in contrast to the viscera. [EU]

Sound Localization: Ability to determine the specific location of a sound source. [NIH]

Sound wave: An alteration of properties of an elastic medium, such as pressure, particle displacement, or density, that propagates through the medium, or a superposition of such alterations. [NIH]

Spatial disorientation: Loss of orientation in space where person does not know which way is up. [NIH]

Specialist: In medicine, one who concentrates on 1 special branch of medical science. [NIH]

Species: A taxonomic category subordinate to a genus (or subgenus) and superior to a subspecies or variety, composed of individuals possessing common characters distinguishing them from other categories of individuals of the same taxonomic level. In taxonomic nomenclature, species are designated by the genus name followed by a Latin or Latinized adjective or noun. [EU]

Specificity: Degree of selectivity shown by an antibody with respect to the number and types of antigens with which the antibody combines, as well as with respect to the rates and the extents of these reactions. [NIH]

Spectrum: A charted band of wavelengths of electromagnetic vibrations obtained by refraction and diffraction. By extension, a measurable range of activity, such as the range of bacteria affected by an antibiotic (antibacterial s.) or the complete range of manifestations of a disease. [EU]

Speech Intelligibility: Ability to make speech sounds that are recognizable. [NIH]

Speech Perception: The process whereby an utterance is decoded into a representation in terms of linguistic units (sequences of phonetic segments which combine to form lexical and grammatical morphemes). [NIH]

Speech-Language Pathology: The study of speech or language disorders and their diagnosis and correction. [NIH]

Sperm: The fecundating fluid of the male. [NIH]

Spinal cord: The main trunk or bundle of nerves running down the spine through holes in the spinal bone (the vertebrae) from the brain to the level of the lower back. [NIH]

Spiral Ganglion: The sensory ganglion of the cochlear nerve. The cells of the spiral ganglion send fibers peripherally to the cochlear hair cells and centrally to the cochlear nuclei of the brain stem. [NIH]

Spirochete: Lyme disease. [NIH]

Spleen: An organ that is part of the lymphatic system. The spleen produces lymphocytes, filters the blood, stores blood cells, and destroys old blood cells. It is located on the left side of the abdomen near the stomach. [NIH]

Sporadic: Neither endemic nor epidemic; occurring occasionally in a random or isolated manner. [EU]

Squamous: Scaly, or platelike. [EU]

Squamous Epithelium: Tissue in an organ such as the esophagus. Consists of layers of flat, scaly cells. [NIH]

Stapedius: The stapedius muscle arises from the wall of the middle ear and is inserted into the neck of the stapes. Its action is to pull the head of the stapes backward. [NIH]

Stapes: One of the three ossicles of the middle ear. It transmits sound vibrations from the incus to the internal ear. [NIH]

Status Epilepticus: Repeated and prolonged epileptic seizures without recovery of consciousness between attacks. [NIH]

Steel: A tough, malleable, iron-based alloy containing up to, but no more than, two percent carbon and often other metals. It is used in medicine and dentistry in implants and instrumentation. [NIH]

Stem Cells: Relatively undifferentiated cells of the same lineage (family type) that retain the ability to divide and cycle throughout postnatal life to provide cells that can become specialized and take the place of those that die or are lost. [NIH]

Stimulus: That which can elicit or evoke action (response) in a muscle, nerve, gland or other excitable issue, or cause an augmenting action upon any function or metabolic process. [NIH]

Strand: DNA normally exists in the bacterial nucleus in a helix, in which two strands are coiled together. [NIH]

Stress: Forcibly exerted influence; pressure. Any condition or situation that causes strain or tension. Stress may be either physical or psychologic, or both. [NIH]

Stress management: A set of techniques used to help an individual cope more effectively with difficult situations in order to feel better emotionally, improve behavioral skills, and often to enhance feelings of control. Stress management may include relaxation exercises, assertiveness training, cognitive restructuring, time management, and social support. It can be delivered either on a one-to-one basis or in a group format. [NIH]

Stria: 1. A streak, or line. 2. A narrow bandlike structure; a general term for such longitudinal collections of nerve fibres in the brain. [EU]

Stria Vascularis: A layer of highly vascular pigmented granular cells on the outer wall of the cochlear duct. [NIH]

Stroke: Sudden loss of function of part of the brain because of loss of blood flow. Stroke may be caused by a clot (thrombosis) or rupture (hemorrhage) of a blood vessel to the brain. [NIH]

Stroma: The middle, thickest layer of tissue in the cornea. [NIH]

Subacute: Somewhat acute; between acute and chronic. [EU]

Subclinical: Without clinical manifestations; said of the early stage(s) of an infection or other disease or abnormality before symptoms and signs become apparent or detectable by clinical examination or laboratory tests, or of a very mild form of an infection or other disease or abnormality. [EU]

Supplementation: Adding nutrients to the diet. [NIH]

Support group: A group of people with similar disease who meet to discuss how better to cope with their cancer and treatment. [NIH]

Suppression: A conscious exclusion of disapproved desire contrary with repression, in which the process of exclusion is not conscious. [NIH]

Sweat: The fluid excreted by the sweat glands. It consists of water containing sodium chloride, phosphate, urea, ammonia, and other waste products. [NIH]

Sweat Glands: Sweat-producing structures that are embedded in the dermis. Each gland consists of a single tube, a coiled body, and a superficial duct. [NIH]

Synapse: The region where the processes of two neurons come into close contiguity, and the nervous impulse passes from one to the other; the fibers of the two are intermeshed, but, according to the general view, there is no direct contiguity. [NIH]

Synaptic: Pertaining to or affecting a synapse (= site of functional apposition between neurons, at which an impulse is transmitted from one neuron to another by electrical or chemical means); pertaining to synapsis (= pairing off in point-for-point association of homologous chromosomes from the male and female pronuclei during the early prophase of meiosis). [EU]

Synostosis: The joining of contiguous and separate bones by osseous tissue. [NIH]

Syphilis: A contagious venereal disease caused by the spirochete Treponema pallidum. [NIH]

Systemic: Affecting the entire body. [NIH]

Systemic disease: Disease that affects the whole body. [NIH]

Telecommunications: Transmission of information over distances via electronic means. [NIH]

Temporal: One of the two irregular bones forming part of the lateral surfaces and base of the skull, and containing the organs of hearing. [NIH]

Temporal Lobe: Lower lateral part of the cerebral hemisphere. [NIH]

Tendon: A discrete band of connective tissue mainly composed of parallel bundles of collagenous fibers by which muscles are attached, or two muscles bellies joined. [NIH]

Thalamic: Cell that reaches the lateral nucleus of amygdala. [NIH]

Thalamic Diseases: Disorders of the centrally located thalamus, which integrates a wide range of cortical and subcortical information. Manifestations include sensory loss, movement disorders; ataxia, pain syndromes, visual disorders, a variety of neuropsychological conditions, and coma. Relatively common etiologies include cerebrovascular disorders; craniocerebral trauma; brain neoplasms; brain hypoxia; intracranial hemorrhages; and infectious processes. [NIH]

Therapeutics: The branch of medicine which is concerned with the treatment of diseases, palliative or curative. [NIH]

Thermal: Pertaining to or characterized by heat. [EU]

Thoracic: Having to do with the chest. [NIH]

Threshold: For a specified sensory modality (e. g. light, sound, vibration), the lowest level (absolute threshold) or smallest difference (difference threshold, difference limen) or intensity of the stimulus discernible in prescribed conditions of stimulation. [NIH]

Thrombosis: The formation or presence of a blood clot inside a blood vessel. [NIH]

Thymus: An organ that is part of the lymphatic system, in which T lymphocytes grow and multiply. The thymus is in the chest behind the breastbone. [NIH]

Thyroid: A gland located near the windpipe (trachea) that produces thyroid hormone, which helps regulate growth and metabolism. [NIH]

Thyrotropin: A peptide hormone secreted by the anterior pituitary. It promotes the growth of the thyroid gland and stimulates the synthesis of thyroid hormones and the release of thyroxine by the thyroid gland. [NIH]

Tinnitus: Sounds that are perceived in the absence of any external noise source which may take the form of buzzing, ringing, clicking, pulsations, and other noises. Objective tinnitus refers to noises generated from within the ear or adjacent structures that can be heard by other individuals. The term subjective tinnitus is used when the sound is audible only to the affected individual. Tinnitus may occur as a manifestation of cochlear diseases; vestibulocochlear nerve diseases; intracranial hypertension; craniocerebral trauma; and other conditions. [NIH]

Tissue: A group or layer of cells that are alike in type and work together to perform a specific function. [NIH]

Tissue Distribution: Accumulation of a drug or chemical substance in various organs (including those not relevant to its pharmacologic or therapeutic action). This distribution depends on the blood flow or perfusion rate of the organ, the ability of the drug to penetrate organ membranes, tissue specificity, protein binding. The distribution is usually expressed as tissue to plasma ratios. [NIH]

Tomography: Imaging methods that result in sharp images of objects located on a chosen

plane and blurred images located above or below the plane. [NIH]

Tonal: Based on special tests used for a topographic diagnosis of perceptive deafness (damage of the Corti organ, peripheral or central damage, i. e. the auditive cortex). [NIH]

Tone: 1. The normal degree of vigour and tension; in muscle, the resistance to passive elongation or stretch; tonus. 2. A particular quality of sound or of voice. 3. To make permanent, or to change, the colour of silver stain by chemical treatment, usually with a heavy metal. [EU]

Tonus: A state of slight tension usually present in muscles even when they are not undergoing active contraction. [NIH]

Tooth Preparation: Procedures carried out with regard to the teeth or tooth structures preparatory to specified dental therapeutic and surgical measures. [NIH]

Toxic: Having to do with poison or something harmful to the body. Toxic substances usually cause unwanted side effects. [NIH]

Toxicity: The quality of being poisonous, especially the degree of virulence of a toxic microbe or of a poison. [EU]

Toxicology: The science concerned with the detection, chemical composition, and pharmacologic action of toxic substances or poisons and the treatment and prevention of toxic manifestations. [NIH]

Toxins: Specific, characterizable, poisonous chemicals, often proteins, with specific biological properties, including immunogenicity, produced by microbes, higher plants, or animals. [NIH]

Tracer: A substance (such as a radioisotope) used in imaging procedures. [NIH]

Trachea: The cartilaginous and membranous tube descending from the larynx and branching into the right and left main bronchi. [NIH]

Traction: The act of pulling. [NIH]

Transduction: The transfer of genes from one cell to another by means of a viral (in the case of bacteria, a bacteriophage) vector or a vector which is similar to a virus particle (pseudovirion). [NIH]

Transfection: The uptake of naked or purified DNA into cells, usually eukaryotic. It is analogous to bacterial transformation. [NIH]

Transfer Factor: Factor derived from leukocyte lysates of immune donors which can transfer both local and systemic cellular immunity to nonimmune recipients. [NIH]

Transfusion: The infusion of components of blood or whole blood into the bloodstream. The blood may be donated from another person, or it may have been taken from the person earlier and stored until needed. [NIH]

Translation: The process whereby the genetic information present in the linear sequence of ribonucleotides in mRNA is converted into a corresponding sequence of amino acids in a protein. It occurs on the ribosome and is unidirectional. [NIH]

Transmitter: A chemical substance which effects the passage of nerve impulses from one cell to the other at the synapse. [NIH]

Transplantation: Transference of a tissue or organ, alive or dead, within an individual, between individuals of the same species, or between individuals of different species. [NIH]

Trauma: Any injury, wound, or shock, must frequently physical or structural shock, producing a disturbance. [NIH]

Tumour: 1. Swelling, one of the cardinal signs of inflammations; morbid enlargement. 2. A

new growth of tissue in which the multiplication of cells is uncontrolled and progressive; called also neoplasm. [EU]

Tympani: The part of the cochlea below the spiral lamina. [NIH]

Tympanic membrane: A thin, tense membrane forming the greater part of the outer wall of the tympanic cavity and separating it from the external auditory meatus; it constitutes the boundary between the external and middle ear. [NIH]

Urinalysis: Examination of urine by chemical, physical, or microscopic means. Routine urinalysis usually includes performing chemical screening tests, determining specific gravity, observing any unusual color or odor, screening for bacteriuria, and examining the sediment microscopically. [NIH]

Urinate: To release urine from the bladder to the outside. [NIH]

Urine: Fluid containing water and waste products. Urine is made by the kidneys, stored in the bladder, and leaves the body through the urethra. [NIH]

Uterus: The small, hollow, pear-shaped organ in a woman's pelvis. This is the organ in which a fetus develops. Also called the womb. [NIH]

Vaccines: Suspensions of killed or attenuated microorganisms (bacteria, viruses, fungi, protozoa, or rickettsiae), antigenic proteins derived from them, or synthetic constructs, administered for the prevention, amelioration, or treatment of infectious and other diseases. [NIH]

Vascular: Pertaining to blood vessels or indicative of a copious blood supply. [EU]

Vector: Plasmid or other self-replicating DNA molecule that transfers DNA between cells in nature or in recombinant DNA technology. [NIH]

Vein: Vessel-carrying blood from various parts of the body to the heart. [NIH]

Venereal: Pertaining or related to or transmitted by sexual contact. [EU]

Venous: Of or pertaining to the veins. [EU]

Venter: Belly. [NIH]

Ventral: 1. Pertaining to the belly or to any venter. 2. Denoting a position more toward the belly surface than some other object of reference; same as anterior in human anatomy. [EU]

Vertigo: An illusion of movement; a sensation as if the external world were revolving around the patient (objective vertigo) or as if he himself were revolving in space (subjective vertigo). The term is sometimes erroneously used to mean any form of dizziness. [EU]

Vestibular: Pertaining to or toward a vestibule. In dental anatomy, used to refer to the tooth surface directed toward the vestibule of the mouth. [EU]

Vestibular Aqueduct: A small bony canal linking the vestibule of the inner ear to the posterior part of the internal surface of the petrous temporal bone. It surrounds the endolymphatic duct. [NIH]

Vestibule: A small, oval, bony chamber of the labyrinth. The vestibule contains the utricle and saccule, organs which are part of the balancing apparatus of the ear. [NIH]

Vestibulocochlear Nerve: The 8th cranial nerve. The vestibulocochlear nerve has a cochlear part (cochlear nerve) which is concerned with hearing and a vestibular part (vestibular nerve) which mediates the sense of balance and head position. The fibers of the cochlear nerve originate from neurons of the spiral ganglion and project to the cochlear nuclei (cochlear nucleus). The fibers of the vestibular nerve arise from neurons of Scarpa's ganglion and project to the vestibular nuclei. [NIH]

Vestibulocochlear Nerve Diseases: Diseases of the vestibular and/or cochlear (acoustic)

nerves, which join to form the vestibulocochlear nerve. Vestibular neuritis, cochlear neuritis, and acoustic neuromas are relatively common conditions that affect these nerves. Clinical manifestations vary with which nerve is primarily affected, and include hearing loss, vertigo, and tinnitus. [NIH]

Veterinary Medicine: The medical science concerned with the prevention, diagnosis, and treatment of diseases in animals. [NIH]

Viral: Pertaining to, caused by, or of the nature of virus. [EU]

Virulence: The degree of pathogenicity within a group or species of microorganisms or viruses as indicated by case fatality rates and/or the ability of the organism to invade the tissues of the host. [NIH]

Virus: Submicroscopic organism that causes infectious disease. In cancer therapy, some viruses may be made into vaccines that help the body build an immune response to, and kill, tumor cells. [NIH]

Viscosity: A physical property of fluids that determines the internal resistance to shear forces. [EU]

Vitro: Descriptive of an event or enzyme reaction under experimental investigation occurring outside a living organism. Parts of an organism or microorganism are used together with artificial substrates and/or conditions. [NIH]

Vivo: Outside of or removed from the body of a living organism. [NIH]

Voice Disorders: Disorders of voice pitch, loudness, or quality. Dysphonia refers to impaired utterance of sounds by the vocal folds. [NIH]

Void: To urinate, empty the bladder. [NIH]

White blood cell: A type of cell in the immune system that helps the body fight infection and disease. White blood cells include lymphocytes, granulocytes, macrophages, and others. [NIH]

Windpipe: A rigid tube, 10 cm long, extending from the cricoid cartilage to the upper border of the fifth thoracic vertebra. [NIH]

Withdrawal: 1. A pathological retreat from interpersonal contact and social involvement, as may occur in schizophrenia, depression, or schizoid avoidant and schizotypal personality disorders. 2. (DSM III-R) A substance-specific organic brain syndrome that follows the cessation of use or reduction in intake of a psychoactive substance that had been regularly used to induce a state of intoxication. [EU]

Xenograft: The cells of one species transplanted to another species. [NIH]

X-ray: High-energy radiation used in low doses to diagnose diseases and in high doses to treat cancer. [NIH]

Yeasts: A general term for single-celled rounded fungi that reproduce by budding. Brewers' and bakers' yeasts are Saccharomyces cerevisiae; therapeutic dried yeast is dried yeast. [NIH]

Zebrafish: A species of North American fishes of the family Cyprinidae. They are used in embryological studies and to study the effects of certain chemicals on development. [NIH]

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