TINNITUS

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

James N. Parker, M.D.
and Philip M. Parker, Ph.D., Editors
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The collective knowledge generated from academic and applied research summarized in various references has been critical in the creation of this book which is best viewed as a comprehensive compilation and collection of information prepared by various official agencies which produce publications on tinnitus. Books in this series draw from various agencies and institutions associated with the United States Department of Health and Human Services, and in particular, the Office of the Secretary of Health and Human Services (OS), the Administration for Children and Families (ACF), the Administration on Aging (AOA), the Agency for Healthcare Research and Quality (AHRQ), the Agency for Toxic Substances and Disease Registry (ATSDR), the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the Healthcare Financing Administration (HCFA), the Health Resources and Services Administration (HRSA), the Indian Health Service (IHS), the institutions of the National Institutes of Health (NIH), the Program Support Center (PSC), and the Substance Abuse and Mental Health Services Administration (SAMHSA). In addition to these sources, information gathered from the National Library of Medicine, the United States Patent Office, the European Union, and their related organizations has been invaluable in the creation of this book. Some of the work represented was financially supported by the Research and Development Committee at INSEAD. This support is gratefully acknowledged. Finally, special thanks are owed to Tiffany Freeman for her excellent editorial support.
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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." 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 tinnitus 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 tinnitus, 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 tinnitus, 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 tinnitus. 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 tinnitus, 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 tinnitus.

*The Editors*

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1 From the NIH, National Cancer Institute (NCI): http://www.cancer.gov/cancerinfo/ten-things-to-know.
CHAPTER 1. STUDIES ON TINNITUS

Overview

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

The Combined Health Information Database

The Combined Health Information Database summarizes studies across numerous federal agencies. To limit your investigation to research studies and tinnitus, 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 “tinnitus” (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:

- **Masking Revisited: New Tinnitus Tools**
  Summary: Although masking is not a cure for problem tinnitus, it offers a welcome respite from discomfort. This method traditionally uses devices worn at ear level to produce static white noise, a low level sound that is more acceptable to the listener than the intrusive noise of tinnitus. This article reviews advances in the use of masking for people with tinnitus. The authors offer a sampling of innovative treatment tools and therapeutic methods which display promise for treating tinnitus. Topics include
dynamic tinnitus mitigation (DTM), the tinnitus relief system (TRS), the HiSonic bone conductor, Elite headphones, TRANQUIL (a broadband sound generator), Puretone products (16 different maskers), and tinnitus adaptation therapy (TAT), which teaches patients to focus away from the tinnitus. The authors note that for some individuals, the process of masking produces residual inhibition, a decreased awareness of tinnitus for a period of time after the masking sound is discontinued. One sidebar provides the addresses and telephone numbers of the product manufacturers and suppliers discussed.

• The Costs of Tinnitus
  Summary: An estimation of the costs of tinnitus is useful for assessing the effectiveness of treatments and justifying funding for research and education. Although the costs of tinnitus are difficult to calculate because of the wide range of treatments available, this article discusses the variables that should be considered when making those estimates. These include court awards; patient's age, gender, health, income, and employment history; number of treatments used; and perception of severity. The article also suggests ways to reduce the costs through prevention and management.

• Tinnitus and Acoustic Neuroma
  Source: ANA Notes. 2003;68.
  Summary: Dr. John W. House discusses tinnitus, including diagnosis, treatment and prognosis, and its relationship to acoustic neuroma. Dr House describes tinnitus as a common symptom of hearing loss and a possible early sign of an acoustic neuroma.

• Explosive Tinnitus: An Underrecognized Disorder
  Summary: Explosive tinnitus is a condition characterized by a frightening, loud, crashing or banging noise that occurs in association with sleep. Despite 60 case reports and typically dramatic auditory symptoms, a thorough MEDLINE review of the literature published since 1966 failed to identify mention of the disorder in the otologic literature. In this article, the body of information published to date is summarized, and two new cases are presented to illustrate the characteristics of this poorly understood phenomenon. Patients with the syndrome report a wide variety of medical and neurologic conditions, but in no cases have any significant associations been demonstrated. The condition is typically seen in the middle aged and elderly and is more common in women. The cause of the disorder remains speculative, and the condition is harmless. Patients typically have anxiety about their extreme symptoms, and reassurance can be offered if the condition is recognized. In some cases, sedative-hypnotic medications may significantly reduce symptoms by preventing periods of nighttime wakefulness, during which symptoms characteristically occur. 7 references.

• Clinical Associations Between Tinnitus and Chronic Pain
Contact: Send requests to:

Summary: In this article the authors report on a prospective nonrandomized study in which a survey and the Tinnitus Handicap Inventory (THI) were distributed to 72 patients (50 women and 22 men) attending a tertiary chronic pain clinic, to determine the prevalence and severity of tinnitus inpatients with chronic pain. The research findings suggest a high incidence of tinnitus in people suffering with chronic pain.

**Suicide in Tinnitus Sufferers**


Summary: In this article, the authors report six case histories of patients who died in violent circumstances (five suicides and one killed by his son). The authors discuss the role of tinnitus as a factor leading to their deaths, and also consider the potential risk factors for suicide, in terms of demographic features, associated mental illness, and tinnitus parameters. The patients in this group were mainly working class, male, lived alone, and had a history of psychiatric illness and previous suicide threats or attempts. Their tinnitus was generally of recent onset, pulsatile, and in their left ear. The number of cases quoted is small, so it is difficult to make firm conclusions, but the authors believe this represents the first published series on the subject. 1 table. 10 references. (AA-M).

**Tinnitus Improvement Through TMD Therapy**


Summary: Many patients with temporomandibular disorder (TMD) and coexisting tinnitus find that therapy improves or resolves their tinnitus in conjunction with their TMD symptoms. This article reports on a study in which 93 patients with TMD who also reported having coexisting tinnitus were questioned and given clinical tests. These assessment instruments were then evaluated for their ability to suggest tinnitus improvement as a result of TMD therapy. The study suggests that asking targeted questions and performing a clinical test could be of significant value in helping practitioners decide which patients with TMD and coexisting tinnitus will experience improvement in, or resolution of, their tinnitus when TMD symptoms have improved significantly. Tables list characteristics of tinnitus, tinnitus-associated questions to ask patients, and specific clinical tests administered to subjects. 4 tables. 34 references. (AA-M).

**Tinnitus Induced by Occupational and Leisure Noise**


Contact: Available from NRN Publications. Editorial Manager of 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. E-mail: m.patrick@ucl.ac.uk.

Summary: Noise exposure is the most common cause of tinnitus. Noise induced permanent tinnitus (NIPT) can derive from occupational noise exposure, leisure noise, or acoustic trauma. This article explores tinnitus induced by occupational and leisure noise. In general, NIPT is high pitched and tonal. The most common observed frequency of tinnitus on pitch matching is the same as the worst frequency for hearing. The sensation level of NIPT is usually low and sometimes negative. There is no correlation of
significance between the discomfort caused by NIPT and audiometric findings. In occupational NIPT, the interval between the start of noisy work and the appearance of tinnitus is very long (many years) but with leisure noise and acoustic trauma, the interval between exposure and tinnitus is frequently very short (immediate). The incidence of musically induced tinnitus is increasingly more common. The authors contend that it is a much greater handicap for a young individual to suffer from tinnitus than from a small high tone hearing loss. The treatment of NIPT is not different from tinnitus treatment in general. 1 figure. 6 tables. 24 references.

- **Tinnitus and Vertigo in Patients with Temporomandibular Disorder**
  Summary: The association of tinnitus and vertigo with temporomandibular disorder (TMD) has been debated for many years. This article reports on a study conducted to determine if tinnitus and vertigo are actually more prevalent in patients with TMD than in appropriate age-matched controls. One control group was recruited from patients seeking care for health maintenance and the other from patients seeking routine dental care. The authors surveyed 1032 patients: 338 had TMD and 694 served as two age-matched control groups. Tinnitus and vertigo symptoms were significantly more prevalent in the TMD group than in either of the control groups. The authors note that the mechanism of the association of TMD and otologic symptoms is unknown. 2 figures. 5 tables. 43 references. (AA-M).

- **Progressive Sensorineural Hearing Loss, Subjective Tinnitus and Vertigo Caused By Elevated Blood Lipids**
  Summary: The otologist frequently sees patients with progressive sensorineural hearing loss, subjective aural tinnitus, and vertigo with no apparent cause. Elevated blood lipids may be a cause of inner ear malfunction on a biochemical basis. This article reports on a study undertaken to establish the true incidence of this condition. All new patients (n = 4,251) seen during an eight-year period were evaluated; of these, 2,332 patients had complaints of inner ear disease. All the patients had a complete neurotologic examination, appropriate audiometric and vestibular studies and imaging, and blood tests including lipid phenotype studies. Hyperlipoproteinemia was found in 120 patients (5.1 percent). Most patients were found to be overweight and had additional coexisting conditions such as diabetes mellitus. Treatment with vasodilators and a 500 calorie, high-protein, low-carbohydrate diet yielded improvement of symptoms in 83 percent of patients within five months of initiation of treatment. The authors include three detailed case studies. The authors conclude that the cause-and-effect relationship between hyperlipoproteinemia and dysfunction of the inner ear is indisputable. 6 figures. 14 references. (AA-M).

- **Controlling Tinnitus**
Summary: This article addresses the therapeutic management of tinnitus. Tinnitus, noises that are heard by an individual but are not related to any external sound in the environment, is perceived as a variety of sounds. This article is the second in a series of three articles that focuses on a new neurophysiological model of tinnitus and a method of treatment called Tinnitus Retraining Therapy (TRT). In this article, the author describes TRT, a process which involves the habituation of the reactions evoked by tinnitus and one's perception of tinnitus. The author stresses that it is possible to achieve habituation only when tinnitus has no negative associations; therefore, it is necessary to include retraining counseling to de-mystify tinnitus. In addition, habituation occurs more quickly if the strength of tinnitus-related neuronal activity in the brain is decreased, which is achieved by sound therapy. The author describes the implementation of TRT, which consists of four steps: evaluation, consisting of initial interview, tinnitus oriented audiological evaluation, medical evaluation, and diagnosis, on the basis of which one of five major types of treatment is proposed; retraining counseling session; fitting of instruments, if needed; and follow up contacts. The author concludes that, while TRT is not a cure in the classical sense, it makes it possible to achieve a state where individuals are not aware of tinnitus for the majority of time. (AA-M).

- **Selective Cochlear Neurectomy for Debilitating Tinnitus**

Summary: This article describes the use of selective cochlear neurectomy to treat debilitating tinnitus. Eight nerve sections have been performed for this purpose, with various success rates (45 to 76 percent). Patients with a unilateral, profound sensorineural hearing loss and disabling tinnitus are candidates for cochlear neurectomy. The authors introduce the use of a selective cochlear neurectomy with preservation of the vestibular nerve in two case presentations. The indications for surgery, surgical technique, and results are described. Advantages of preserving the vestibular nerve fibers include the lack of postoperative vertigo and disequilibrium and a short length of hospital stay. Another advantage is the conservation of a symmetric vestibular input, obviating the lengthy compensation process that might otherwise be needed, particularly in the elderly. A selective cochlear neurectomy for the control of debilitating tinnitus has proven to be successful in controlling tinnitus in the two patients presented, with the added advantage of preservation of their vestibular function. The authors call for further studies to confirm the advantages and effectiveness of this technique. 11 references. (AA).

- **Tinnitus: An Obscure Symptom**


Summary: This article discusses the etiological factors accounting for tinnitus, including those of the external ear, the middle ear, the inner ear, and the central nervous system. The article includes a case study used to show the obscure nature of tinnitus and how unconventional treatments sometimes help. The article concludes with the contact information for two resource organizations. The author stresses that varied etiologic factors make it important that every patient have a thorough medical examination,
preferably by an otologist who works closely with an audiologist experienced with tinnitus. 1 figure. 1 table.

- **Tinnitus and Craniomandibular Disorders: Is There A Link?**
  
  
  Summary: This article discusses the relationship between tinnitus and craniomandibular disorder (CMD) symptoms. Craniomandibular disorders consist of musculoskeletal discomfort or dysfunction in the stomatognathic system, which is aggravated by mandibular function. The author reviews the literature in an attempt to find parameters which could define a CMD-related tinnitus, and to identify predictors of stomatognathic and biofeedback treatment outcome in this group of patients. The author concludes that several findings in the studies reviewed indicate an association between signs and symptoms of CMD and tinnitus. The relationship between tinnitus complains and several symptoms of CMD, including frequent headaches, seems to be independent of the degree of hearing loss, occupational noise exposure, general morbidity, medication, and socioeconomic status. 2 figures. 1 table. 334 references.

- **Tinnitus Management in the Dispensing Practice**
  
  
  Summary: This article discusses tinnitus management in the dispensing practice. The author first defines aspects of tinnitus which may apply to the dispensing practice and then sets forth a basic tinnitus analysis screening protocol as it applies to the hearing aid evaluation process. Topics covered include personal descriptions of tinnitus; Residual Inhibition (RI); masking with hearing aids, including pitch matching and intensity matching; auditory reattention and stress relief; adjustment of tinnitus instruments; and the protocol. 1 figure. 23 references.

- **Counseling the Tinnitus Patient: Often It's What We Say That Counts**
  
  
  Contact: Available from Lippincott Williams and Wilkins. Customer Service, P.O. Box 1175, Lowell, MA 01853.
  
  Summary: This article encourages hearing health care professionals to make a concerted effort to offer proper education and unwavering compassion and understanding to their patients with tinnitus. The author describes the typical encounter with a patient with tinnitus and the often failed treatment that can result. The author notes that tinnitus patients typically develop a heightened sense of awareness of everything about themselves and their bodies. As a result, every word uttered by their audiologist or their physician takes on increased significance. Misinformation, misrepresentation, or miscommunication can send a patient with tinnitus into complete despair. The author stresses that one does not have to have tinnitus in order to be an advocate for tinnitus patients or to demonstrate compassion and understanding. Information about tinnitus is plentiful and is easily accessible through audiology journals, books, conferences, and the Internet.

- **Learning to Control Tinnitus. Part IV of IV**
  
Studies 9


Summary: This article is the final installment in a four-part series on an integrated treatment approach for tinnitus. The author reports that tinnitus is the most frustrating symptom presented to him by patients. Many people with tinnitus first consult with their primary care physician, internist, or neurologist before reaching an otologist or neurotologist such as the author. By then, besides being frustrated by their condition, these prospective patients generally report discontent with their previous medical experience. The author discusses strategies used to pinpoint the source of the tinnitus. No matter what treatment plan is ultimately established, an accurate diagnosis is the first step in evaluation and management. Once a diagnosis is reached, therapy is tailored so that all the treatable causes of tinnitus can be addressed. For patients who continue to have chronic tinnitus, many techniques and treatment plans can either reduce the severity of the problem or enable the patient to establish and maintain some control. These techniques include masking, cognitive therapy, and a combination of both which is called tinnitus retraining therapy. The author concludes that management of chronic tinnitus is very complex, requiring commitment and dedication from the patient, treating physician, and other healthcare professionals involved. (AA-M).

• Contribution of Social Noise to Tinnitus in Young People: A Preliminary Report


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 offers a preliminary report on a study of the contribution of social noise to tinnitus in young people. In the authors' original study of the Hearing in Young Adults (HIYA) aged 18 to 25 years, there appeared to be little effect of social noise (primarily amplified music) on hearing thresholds. There was however, a threefold increase in the reports of tinnitus in those subjects with significant social noise exposure. No other hearing function abnormality was found for those who were exposed to social noise. The authors invited a subsample of those tested in the earlier phase of the study, resulting in three groups: those in the most social noise group who reported tinnitus (n = 15) and those who did not (n = 15), plus a group of people who had no social noise exposure but who reported tinnitus (n = 8). All groups were retested for their hearing thresholds, using standard audimetry and also the Audioscan technique to look for notches in the audiogram. Speech tests were carried out using an adaptive FAAF test. Transient evoked otoacoustic emissions were measured and also suppressed with a contralateral broad band noise. Some evidence has been found to suggest that those young people who reported tinnitus are affected by social noise exposure, in terms of pure tone thresholds, speech tests, otoacoustic emissions, and reported hearing problems. The authors share some of the lessons to be learned from their attempt to follow up this interesting population. The population is highly mobile and follow up is difficult; and the presumed noise exposure was often not appropriate because even after a year it was possible for several individuals with insignificant social noise to move into the group with significant social noise exposure. The authors conclude with a call for a larger multi center study to look at the effect of social noise in more detail, using a common protocol. 14 references. (AA-M).
• **Tinnitus Thru the Ages**


Summary: This article offers a summary of tinnitus (ringing or other sounds in the ears) and its treatments. The authors present a brief overview of the progression of methods for treating tinnitus, including only those clinical protocols that seem to have a certain degree of acceptance among the majority of qualified tinnitus therapists. The authors stress that a number of theories exist about the causes of tinnitus onset, yet there is no agreement as to the neurophysiologic mechanisms of tinnitus. In addition, there is no common consensus of the best treatment or management strategy. Treatments discussed include medical intervention (drug therapy), masking (using another sound to cover up the tinnitus sounds), and other nonmedical therapies, including Tinnitus Retraining Therapy (TRT) which involves a combination of directive counseling coupled with the use of a noise generator in each ear (for masking), and Cognitive Therapy, a psychologically based behavioral modification approach to treatment.

• **Neurophysiological Approach to Tinnitus Patients**


Summary: This article outlines a neurophysiologic model of tinnitus and an approach to tinnitus management. The model is based on the concept that all levels of the auditory pathways and several nonauditory systems play essential roles in tinnitus. The nonauditory systems may be dominant in determining the level of annoyance caused by the tinnitus. The authors propose to treat tinnitus by inducing and facilitating habituation to the tinnitus signal. The goal is to reach the stage at which patients are unaware of tinnitus unless they focus on it. Even when perceived, tinnitus should not evoke annoyance. Habituation is achieved by directive counseling combined with low-level, broad-band noise generated by wearable generators, and environmental sounds, according to a specific protocol. The authors briefly report on their experiences using this model to treat patients with tinnitus. 2 figures. 38 references. (AA-M).

• **Update on Tinnitus from the NIDCD**


Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org.

Summary: This article presents an update on current research activities on tinnitus. Written by the director of the National Institute on Deafness and Other Communication Disorders (NIDCD), Dr. James B. Snow, Jr., the article discusses the mechanisms of tinnitus; the etiology of tinnitus; ototoxicity; side effects of aminoglycoside antibiotics; the prevention of noise-induced hearing loss; the diseases and disorders with which tinnitus is associated; therapeutic modalities, including surgery; the mission of the NIDCD; present research supported by the NIDCD; a planned NIDCD workshop on tinnitus in 1995; the infrastructure of the NIDCD; temporal bone donation; research funding; and research goals for the future.
• **Modulation of Tinnitus by Voluntary Jaw Movements**


Contact: Available from Lippincott Williams and Wilkins. 12107 Insurance Way, Hagerstown, MD 21740. (800) 638-3030 or (301) 714-2300. Fax (301) 824-7390.

Summary: This article reports on a study in which the authors describe symptoms and population characteristics in patients with tinnitus who report the ability to control the loudness of their tinnitus by performing voluntary movements. The authors used a questionnaire, administered at a tertiary care center, to investigate respondents with the self-reported ability to control the loudness of their tinnitus by using voluntary jaw movements. The authors describe 93 patients with tinnitus (83 percent men, 17 percent women); 85 percent of these patients report jaw movements and 9 percent report eye movements that affect their tinnitus. In the jaw movement group, tinnitus loudness increased in 90 percent. Jaw movement affected the pitch in 51 percent, with an increase in pitch reported by 90 percent of those. Other maneuvers, such as pressure applied to the head, affected tinnitus in many subjects. Tinnitus had a major impact on the lives of the authors respondents: 27 percent registered mild to moderate depression and 8 percent moderate to severe depression as shown by the Beck Depression Inventory. The authors conclude that the ability to modulate tinnitus by performing voluntary somatosensory or motor acts is likely the result of plastic changes in the brains of these patients with the development of aberrant connections between the auditory and sensory motor systems. The strong predominance of men in the sample suggests the presence of a gender specific factor that mediates these changes. 2 tables. 20 references. (AA-M).

• **Computer-Automated Clinical Technique for Tinnitus Quantification**


Summary: This article reports on a study that addressed the need for uniformity in techniques for clinical quantification of tinnitus (ringing or other sounds in the ear). The authors' laboratory is developing techniques to perform computer automated tinnitus testing. A computer controlled psychoacoustical system was developed to quantify tinnitus loudness and pitch using a tone matching technique. Hearing thresholds were also obtained as part of the procedure. The system generated test stimuli and simultaneously controlled a notebook computer positioned in the sound chamber facing the patient. The notebook computer displayed instructions for responding and relayed response choices through on screen 'buttons' that the patient touched with a pen device. Twenty individuals with tinnitus were evaluated with the technique over two sessions, and responses were analyzed for test retest reliability. Analyses revealed good reliability of thresholds, loudness matches, and pitch matches. The authors conclude that these results demonstrate that use of a fully automated system to obtain reliable measurements of tinnitus loudness and pitch is feasible for clinical application. 5 figures. 5 tables. 62 references.

• **Longitudinal Follow-Up of Tinnitus Complaints**

Summary: This article reports on a study undertaken to investigate the long term outcome of patients with tinnitus (ringing or other sounds in the ears), the long term effects of cognitive behavior therapy for their tinnitus, and what characteristics of tinnitus predict distress at follow up. The study consisted of longitudinal follow up of a consecutive sample of patients with tinnitus initially seen by a clinical psychologist at the Department of Audiology, University Hospital in Uppsala, Sweden. The consecutive series of 189 patients with tinnitus treated between January 1988 and March 1995 were sent a mailed questionnaire. One hundred forty six (77 women and 69 men) provided usable responses, in all yielding a 77 percent response rate. Questionnaire data showed that many patients with tinnitus still experienced distress an average of 4.9 years after admission. Tolerance of tinnitus increased over time overall. For patients who had received cognitive behavior therapy (59 percent), there was a reduction in tinnitus related distress. Further, an open ended question showed that the benefits from treatment outweighed the deficits. Analysis showed that tinnitus maskability at admission was a significant predictor of distress at follow up. The authors conclude that severe tinnitus shows some signs of improvement over time, especially when psychological treatment has been given. Tinnitus maskability is an important prognostic factor of future tinnitus annoyance. 3 figures. 22 references.

- **Tinnitus: In the Eyes of the Law**


  Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org.

  Summary: This article reports on legal issues specific to tinnitus, particularly as tinnitus is recognized as a compensable disability. Topics covered include Social Security, how disability claims are processed, pitch and loudness matching, Worker's Compensation laws, the Department of Veteran's Affairs, the Americans With Disabilities Act, and actual courtroom experiences. The article concludes with a list of technical and legal consultants on tinnitus and other hearing issues and a brief list of lawyers who represented successful tinnitus cases. 17 references.

- **Tinnitus: Keeping Up to Date**


  Summary: This article reviews some recent research on tinnitus and its management. Topics include tinnitus in children, benefits or detriments of alcohol use in people with tinnitus, drug treatment and tinnitus, psychological factors, and future research, particularly that on children with tinnitus. Drugs discussed include carbamazepine, betahistine hydrochloride, benzodiazepines, propranol, pitzotifen, and antidepressants. The author notes that most children with tinnitus believe it is normal, a regular aspect of every day life. The author stresses that children must be educated about avoiding loud noise.
• **Tinnitus: Among Many Uncertainties, A Message of Hope is One Constant**


Contact: Available from Self Help for Hard of Hearing People, Inc. (SHHH). 7910 Woodmont Avenue, Suite 1200, Bethesda, MD 20814. (301) 657-2248; TTY (301) 657-2249; Fax (301) 913-9413.

Summary: This article reviews the controversies surrounding tinnitus and its treatment. Topics covered include the connections between tinnitus and hearing loss, the hidden nature of tinnitus, medical referrals, the need to provide tinnitus patients with information and reassurance, the American Tinnitus Association, the role of counseling for tinnitus patients, diagnostic considerations, lifestyle factors, psychoacoustic testing, treatment options, the use of amplification, masking devices, drug therapy, habituation, support groups, cognitive behavioral therapy, other treatments that may be of some use, and research on tinnitus and its treatments. The author includes the address and telephone number of the American Tinnitus Association at the end of the article.

• **Tinnitus: Etiology and Management**


Summary: This article reviews the etiology and management of tinnitus, defined as the perceived sensation of sound in the absence of an acoustic stimulus. The authors contend that because tinnitus has the potential to drastically affect a person's life (particularly older adults), it is important for physicians to take the time to closely evaluate this complaint. The authors review the causes of objective and subjective tinnitus, patient evaluation strategies, and the management of tinnitus. The authors include information about the American Tinnitus Association, cited as a source for excellent information on tinnitus. The authors reiterate that a caring physician can make a significant difference in the tinnitus patient's quality of life by properly evaluating the patient to rule out significant underlying disease and explaining the commonality of their condition. Many times, these patients will show much improvement with reassurance and some basic guidance. 27 references.

• **Managing Tinnitus: What You Can Do!**


Summary: This article reviews the impact that tinnitus (ringing or other noises in the ear) can have on a person's quality of life, focusing on the ways that an individual's perspective and approach can make their tinnitus problem greater or less. The author stresses the importance of continuing to do activities that one enjoys, even when there are some things that might need to be limited. The author outlines six basic guidelines: excessively loud noise for any appreciable amount of time should be avoided; medication which is known to potentially cause damage to the auditory system should never be taken, unless the situation is life threatening and no acceptable alternative can be found; exposure to all kinds of sounds that are not excessively loud should be incorporated as a way of life; medically indicated drugs and medications should be used
(not avoided); in moderation, one can and should feel comfortable about participating prudently in life's activities; and look forward to a future that might bring about more understanding or even a cure for tinnitus. The author uses the story of one of his patients to explain how these guidelines can be used to cope with tinnitus. The author stresses that even though there is not a cure for tinnitus, there are treatment and approach methods that can ease suffering.

- **Drug-Induced Tinnitus and Other Hearing Disorders**  
  Summary: This article reviews the pharmacoepidemiology of drug-induced tinnitus and other hearing disorders. Tinnitus and hearing loss, both reversible and irreversible, are associated both with acute intoxication and long term administration of a large range of drugs. The mechanism causing drug-induced ototoxicity is unclear, but may involve biochemical and consequent electrophysiological changes in the inner ear and eighth cranial nerve impulse transmission. Over 130 drugs and chemicals have been reported to be potentially ototoxic. The major classes are the aminoglycosides and other antimicrobials, anti-inflammatory agents, diuretics, antimalarial drugs, antineoplastic agents, and some topically administered agents. Prevention of drug-induced ototoxicity is generally based upon consideration and avoidance of appropriate risk factors, as well as on monitoring of renal function, serum drug concentrations, and cochlear and auditory functions before and during drug therapy. Ototoxicity, although not life-threatening, may cause considerable discomfort to patients taking ototoxic drugs, and in some cases, drug discontinuation may be necessary to prevent permanent damage. Drug categories discussed include antimicrobials, salicylates and other nonsteroidal anti-inflammatory drugs, loop diuretics, antimalarial drugs, antineoplastic drugs, topically and regionally applied drugs, and miscellaneous drugs. 2 tables. 168 references. (AA).

- **New Look at Tinnitus**  
  Summary: This article reviews the problem of tinnitus, including a brief discussion of hyeracusis (extremely sensitive hearing). Tinnitus, noises that are heard by an individual but are not related to any external sound in the environment, is perceived as a variety of sounds. This article is the first in a series of three articles that focuses on a new neurophysiological model of tinnitus and a method of treatment called Tinnitus Retraining Therapy (TRT). In this first article, the author describes the symptoms and effects of tinnitus, the interrelationship of tinnitus and hearing loss, brain function, and habituation (of the reactions and of tinnitus perception). The author concludes that, once the habituation of reaction is achieved, patients are no longer annoyed by tinnitus, disregarding the fact that their tinnitus has the same loudness and pitch as before treatment. (AA-M).

- **Meeting of the Minds: What’s Up with Tinnitus?**  

Summary: This article summarizes the activities of the 1998 Sixth Annual Conference on Management of the Tinnitus Patient (Iowa City, Iowa), including an overview of the event's origins and a sneak preview of the 1999 workshop. The conference was initially intended for professionals (otologists, audiologists, psychologists, nurses) who provide clinical services, but in 1997 it was opened to people who have tinnitus. The conference is intended to disseminate the current thinking on evaluation and treatment strategies for tinnitus. The article briefly reviews the psychological approaches covered in the conference, the use of cognitive therapy, Tinnitus Retraining Therapy (TRT), the role of psychological factors in tinnitus, social activity (coffeehouses) as a treatment strategy, tinnitus and sleep, and tinnitus in children. The author concludes the article by briefly introducing the topics and speakers who will be presenting in October 1999, at the next conference. One sidebar summarizes present tinnitus research activities. 2 figures.

• Update on Tinnitus

Summary: This article updates readers on tinnitus, the perception of sound or noise without any external stimulation. The authors discuss attempts to objectify tinnitus. They describe the relationship between active cochlear processes and tinnitus, eighth nerve and brain stem considerations, the cerebral cortex, and evaluation of patients with tinnitus. The author also addresses the management of tinnitus, medicolegal concerns, the need for an international tinnitus classification system, and other philosophical issues. The authors conclude that the problems of managing tinnitus are compounded by the several different mechanisms that contribute to the persistent sensation of tinnitus. They conclude that it is naive to conceptualize tinnitus as a disease with a single origin and treatment. 3 tables. 28 references.

• Tinnitus: Research Highlights, Treatment Options

Contact: Available from Merion Publications, Inc. 650 Park Avenue, Box 61556, King of Prussia, PA 19406-0956. (800) 355-1088 or (610) 265-7812.

Summary: This article, from a professional newsletter for speech language pathologists and audiologists, describes research and treatment in the area of tinnitus. The author describes recent research that has revealed new information about the disorder and paved the way for new treatment options, including habituation, medication, hearing aids, and maskers. Topics include tinnitus in children and in elderly people, audiological evaluation and habituation therapy, therapeutic results using habituation therapy, a comparison of maskers and habituation therapy, and a brief discussion of drug therapy for tinnitus. The article concludes with the addresses and telephone numbers of the researchers interviewed in the article.

• Tinnitus: From Symptom to Management
Summary: This article, the third in a four-part series on tinnitus, outlines treatment and management options. The author first stresses that an accurate diagnosis underlies all successful attempts to manage tinnitus. The author notes that tinnitus is a symptom, not a disease unto itself. It can be an early signal of a hearing loss in progress or an auditory condition in a period of change, either for the better or the worse. Tinnitus can be caused by impacted cerumen (earwax), foreign bodies, otosclerosis, auditory nerve tumor, sensorineural hearing loss, ototoxicity (drugs that damage the ear), or noise exposure. A complete evaluation by an audiologist experienced in tinnitus treatment is recommended. The maskability of the sound and the presence or absence of residual inhibitions should be assessed. Residual inhibition occurs after exposure to a narrow band of noise surrounding the frequency of the person's tinnitus. Maskable tinnitus is a good predictor of success with maskers or hearing aids, which are among the most effective forms of instrumentation for this type of problem. The author includes a section discussing the emotional component of chronic tinnitus. In addition, a major aspect to be evaluated in the success of tinnitus management is how long the improvement is maintained. Only when a person with severe tinnitus experiences significant relief which is maintained over time can it be considered that this symptom is truly managed. One sidebar lists the steps to successful treatment for tinnitus and notes the addresses of four resource and support organizations (in the United States, Canada, England, and Germany).

New Finding in Tinnitus Research


Summary: This brief article provides readers with new information about identifying and treating tinnitus. The article reports on a study in that used positron emission tomography (PET) scans to determine neural activity in the brains of four tinnitus patients and six control subjects. PET is an imaging technique that can show functional activity in the body as opposed to only showing the anatomy of the organ. Neural activity is determined by the amount of cerebral (brain) blood flow, which increases as neural activity in a certain region of the brain rises. This increase shows up on the PET scans. The tinnitus patients in the study all had cochlear hearing loss, and were able to control the loudness of their tinnitus through oral facial movements, such as clenching the jaws. Although loudness and pitch of tinnitus are subjective measures, changes in cerebral blood flow (as shown on the PET scans) indicated that the patients were indeed changing something. Researchers used an injection of a liquid tracer to measure cerebral blood flow in all test subjects at rest, and tinnitus patients were also scanned while they manipulated their symptoms through facial movements. Study of images taken from each patient pinpointed the origin of the tinnitus activity to sites in the temporal lobe opposite the affected ear. In other words, if a patient reported tinnitus in the right ear, the origin of the activity was in the left temporal lobe. The remainder of the article describes ongoing and planned research in this area. 1 figure.
• **Tinnitus: Its Causes, Diagnosis, and Treatment**


Summary: This brief article reviews the causes, diagnosis of, and treatment for tinnitus. After a discussion of the pathophysiology and diagnosis of tinnitus, the author summarizes management issues. The main management of tinnitus is medical and comprises psychological, pharmacological, and prosthetic considerations. The author stresses that surgery must be reserved for rare cases. She notes that it is much better for patients with troublesome tinnitus to be investigated for a cause and managed by someone with a positive attitude towards the condition, prepared to give an informed explanation and appropriate psychological or psychiatric support. 11 references.

• **Tinnitus Caused By Sudden, Intense Changes in Air Pressure**


Contact: Available from American Tinnitus Association. P.O. Box 5, Portland, OR 97207. (800) 634-8978 or (503) 248-9985. E-mail: tinnitus@ata.org. Website: www.ata.org.

Summary: This brief article reviews the problem of tinnitus (ringing or other sounds in the ear) caused by sudden, intense changes in air trauma (barotrauma). Normally the air pressure within the middle ear (the space enclosed by the ear drum) is equalized to the outside air pressure whenever the Eustachian tube opens. But sometimes equalization cannot occur, causing pain, feeling of intense pressure, and sometimes bleeding or rupture of the eardrum. Hearing damage or tinnitus may then result. The authors report on their findings of tinnitus caused by barotrauma, as demonstrated by data from the Tinnitus Data Registry (collected at the Tinnitus Clinic of the Oregon Health Sciences University in Portland, Oregon). The authors note that a total of 17 patients in the database reported barotrauma as the cause of their tinnitus (about seven-tenths of 1 percent of the database). The authors report on the characteristics of this subgroup, noting similarities and differences between this group and the overall Clinic group.

• **Tinnitus with Calcium-Channel Blockers (letter)**


Summary: This brief letter to the editor discusses the problem of tinnitus associated with calcium-channel blockers (CCB); the authors stress that this side-effect has only been reported with nicardipine. They report information on eight patients who developed tinnitus while being treated with CCBs. Five of these patients were being treated only with a CCB, while three were also receiving other well-known ototoxic drugs. The induction period was 1 day or less in all 5 cases; all patients completely recovered after drug withdrawal. The authors conclude that the close temporal relation between drug exposure and tinnitus in the five patients who had been exposed only to a CCB suggests a possible causal relation. 3 references.

• **Tinnitus: Tuning Out the Noises in Your Head**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. PRICE: 1.99 pounds.

Summary: This issue focusing on tinnitus is a special supplement to ‘One in Seven,’ a magazine published by the British Royal National Institute for Deaf People (RNID).
Tinnitus is the word for noises that some people hear in their ears or in their head, including buzzing, ringing, whistling, hissing, and other sounds that do not come from any external source. Most people have experienced tinnitus on occasion, but it can become a problem when it persists. The issue offers eight articles that cover the causes and effects of tinnitus; treatment options after receiving a diagnosis of tinnitus; self help strategies for diet and lifestyle; recommendations for managing tinnitus; products available to help with relaxation and stress reduction; the latest developments in the treatment of tinnitus; research studies on tinnitus; and facts about tinnitus. The magazine features interviews with people who have tinnitus and who explain their own coping and management strategies. The magazine contains numerous full color photographs and graphics. The inside back cover of the magazine lists the patient education leaflets available from RNID.

**Elderly People and Tinnitus**


Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org.

Summary: This newsletter article reviews the issue of tinnitus in elderly people. The author discusses hearing loss, health and mobility problems, depression, polypharmacy (taking multiple medications), isolation and loneliness, and attitudes (of health care providers and of the patients themselves). The author cautions that the increasing loss of hearing that often accompanies aging can accentuate the internal sounds of tinnitus and make the intervention of low noise therapy or masking techniques more problematic and less effective. In addition, mobility difficulties that can interfere with a range of everyday activities can also make it hard to get to a doctor, hospital, or local tinnitus group, or to simply get out of the house and away from tinnitus. Debilitating conditions can lower confidence and self-esteem, and the motivation to seek help. However, the author encourages readers to think optimistically about managing tinnitus problems in the elderly. 8 references. (AA-M).

**Unique Case of Pulsatile Tinnitus**


Contact: Available from Annals Publishing Company. 4507 Laclede Avenue, St. Louis, MO 63108.

Summary: Tinnitus (noise or ringing in the ears) is a common symptom encountered by otolaryngologists (ear, nose and throat specialists). However, pulsatile tinnitus (where the symptom of sound is perceived in pulses or beats, like a heart beat) is rare and can present a diagnostic challenge. Establishing a diagnosis is important because pulsatile tinnitus may indicate serious intracranial (inside the skull) or extracranial (outside the skull) disease. This article presents a case of pulsatile tinnitus caused by cervical artery dissection; the authors discuss the differential diagnosis and treatment. The case subject, a 32 year old woman driving a car, was involved in a head on motor vehicle accident in December 1993. She was wearing a combination shoulder lap belt at the time of the accident. She had no loss of consciousness, head injury, or external signs of trauma other than a fractured clavicle (shoulder blade). Three days after the accident, she noted a right sided aural (ear) pressure and pulsatile tinnitus. There was no associated earache, otorrhea (drainage from the ear), hearing loss, headache, or visual changes. Because of
the high suspicion for possible vascular injury, the patient was sent for magnetic
resonance imaging (MRI) which demonstrated a right vertebral (neck) artery dissection.
The authors discuss the therapy (hospitalization and anticoagulation therapy) and her
follow up, which was uneventful. The authors reiterate the importance of accurate and
speedy diagnosis: in dissections of the internal carotid artery (ICA), stroke usually
occurs in the first few days. 2 figures. 37 references.

- Tinnitus in Childhood

Source: International Journal of Pediatric Otorhinolaryngology. 49(2): 99-105. August 5,
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: Tinnitus (ringing or other sounds in the ears) is a common symptom in adults
and there is a wealth of published information on the pathogenesis and management of
the condition. Tinnitus in childhood is likewise quite common when children are
directed asked about the symptom. This article reviews the literature regarding the
prevalence and nature of pediatric tinnitus and suggests a logical and practical approach
to managing this symptom. The authors caution that children rarely spontaneously
complain of tinnitus. Little is known about effective management strategies for pediatric
tinnitus. The authors recommend an initial appointment with a pediatric otologist to
exclude significant, potentially treatable, pathology and to introduce the concept that
tinnitus is a treatable condition. Therapy should then focus on the reduction of tinnitus
associated distress and reduction of tinnitus awareness. Counseling, and the use of
white noise generators (maskers) or hearing aids should then be considered. Care
should also be taken to address the concerns and anxieties of the parent. 1 table. 26
references.

- Tinnitus: Current Evaluation and Management


Contact: Available from W.B. Saunders. Periodicals Fulfillment, 6277 Sea Harbor Drive,

Summary: Tinnitus is defined as any abnormal noise perceived by the patient when no
external acoustic stimulus exists. Tinnitus may be described as low pitched or high
pitched, loud or soft, buzzing or ringing, paroxysmal or constant. This article reviews
the current evaluation and management of tinnitus. The authors give the primary care
physician a basis of understanding of the various types of tinnitus, the diseases that are
commonly associated with tinnitus, the current options available for treatment of the
disease, and criteria for referral to an otolaryngologist and audiologist for evaluation of
tinnitus. The authors also review recent research data on tinnitus. The causes of
subjective tinnitus are categorized in six groups: dental factors, metabolic dysfunction,
neurologic abnormalities, otologic, pharmacologic factors, and psychological factors.
The authors note that separating patients into two groups, either objective or subjective
tinnitus, will assist with evaluation and treatment regimens. In certain situations,
multidisciplinary care is required for tinnitus patients (e.g., glomus tumors, benign
intracranial hypertension). Patients with objective tinnitus do well over time with
treatment. Subjective tinnitus responds well to management of the primary systemic
disorder when one can be identified. The article includes the contact information for the
American Tinnitus Association, cited as a good source of current information on tinnitus
and management options. 2 tables. 17 references.
• **Tinnitus: Current Concepts in Diagnosis and Management**


Summary: Tinnitus is defined as the perception of sound or noise in the ears or head without any external stimulation. It can present itself in many forms, such as a ringing, a hissing, a jetstream, crickets chirping, or even the sound of the ocean. This chapter on tinnitus is from a monograph that was written by assembling the leading experts from all over the country to present to both the consumer and the professional the latest information on the diagnosis and management of hearing loss in children and adults. The author notes that a pulsating type of tinnitus is unique in the sense that it may represent a muscle spasm or an abnormality of the blood vessels within the ear or head and neck area. Tinnitus can be continuous or intermittent, and may be aggravated by loud noises, certain medications, stress, and changing positions of the head and neck. It is usually more noticeable to people in a relatively quiet environment. Although tinnitus in one ear is less common than complaints of tinnitus in both ears, it may be suggestive of an inner ear tumor, vascular abnormality, or spasm of palatal, face, or neck muscles. Subjective tinnitus is heard by the affected person only and is usually related to some form of hearing loss. Objective tinnitus is heard by both the affected person and the examiner and is generally caused by a blood vessel abnormality, muscle spasm, or joint clicking within the head or neck area. The author reviews treatment options, including reassurance of the patient, diet, avoidance of certain medication, reduction of exposure to loud music and noise, the use of amplification and masking, medications, surgery, and habituation or Tinnitus Retraining Therapy (TRT).

• **A Primer on Tinnitus**


Summary: Until there is a cure for tinnitus, people who have the condition can use several strategies to manage or relieve their symptoms. This journal article provides an overview of tinnitus and some of the available treatment methods, including the use of maskers, background sounds that help cover up the ringing; vitamin B3, or niacin; music therapy; homeopathy; and positioning. In addition, readers are provided with suggestions for locating additional information on tinnitus and its possible treatment.

**Federally Funded Research on Tinnitus**

The U.S. Government supports a variety of research studies relating to tinnitus. These studies are tracked by the Office of Extramural Research at the National Institutes of Health. CRISP (Computerized Retrieval of Information on Scientific Projects) is a searchable database maintained by the National Institutes of Health that includes federally funded research on tinnitus.
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 tinnitus.

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 tinnitus. The following is typical of the type of information found when searching the CRISP database for tinnitus:

- **Project Title**: ACTIVE AND NONLINEAR MODELS FOR COCHLEAR MECHANICS  
  **Principal Investigator & Institution**: Grosh, Karl; Mechanical Engineering; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, Mi 481091274  
  **Timing**: Fiscal Year 2001; Project Start 01-MAY-1999; Project End 30-APR-2004  
  **Summary**: In order to better understand the hearing process, numerous efforts in cochlear modeling and physiological measurement have been undertaken. Understanding the process of normal auditory function holds the significant promise of assisting in the determination of the causes of hearing loss and tinnitus. Understanding the morphology and function of each component can lead the way to the development of better cochlear prostheses and diagnostic processes for noninvasive determination of disease. Biologically inspired designs for speech recognition and signal processing of non-auditory systems are also possible and could have a significant impact for applications other than hearing. Current research in cochlear mechanics is focussed on determining the source of the enhanced filtering and nonlinear compression seen in in vivo measurements. The hypothesis that an active amplification process is the source of the enhanced filtering has been studied widely since first proposed in 1948. In this grant a comprehensive, efficient numerical strategy for nonlinear and active macroscopic cochlear mechanics is proposed. Through this capability, a virtual laboratory for model testing will be developed capable of incorporating the most general nonlinear models for activity and geometric nonuniformity. Using a hybrid analytic and numeric approach the micromechanics of the Organ of Corti, especially the outer hair cells and their connecting structures, will be included in the global response modeling. These predictions will be compared to in vivo data obtained from physiological experiments. Experimental validation is a central focus of this modeling effort. Close ties to the physiological measurements is important to validate modeling parameters, most importantly the relation of the hypothesized transductions models to the endocochlear potential (or current). Controlled experiments will be used to both identify transducer model parameters (e.g., gains) and to validate/invalidate the hypothesis.  
  **Website**: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title**: ADENYLYL CYCLASE SIGNALING IN EARS SENSORY EPITHELIA  
  **Principal Investigator & Institution**: Drescher, Marian J.; None; Wayne State University 656 W. Kirby Detroit, Mi 48202  
  **Timing**: Fiscal Year 2001; Project Start 01-MAY-1999; Project End 30-APR-2003  
  **Summary**: Adenylyl cyclase isoform expression in hair cells and their neural contacts, both efferent axons and afferent dendrites, will determine the pharmacology of cAMP-
mediated signal transduction at the specified cellular sites, hypothesized to modulate receptoneural transmission and adaptation of mechanosensory transduction. (1) A goal is to ascertain this expression, utilizing RT-PCR applied to the organ of Corti and spiral ganglion tissue fractions and PCR with nested primers applied to lambdaZAP cDNA libraries of inner hair cells and outer hair cells and in a teleost hair cell preparation. (2) G-protein coupling to adenylyl cyclase enzymatic activity will be determined at an ultrastructural level with pertussis/cholera toxins, and if evidence of Galphas is absent, the effect of calcium ionophores will be examined as a putative mechanism for activating adenylyl cyclase isoforms, specifically, in hair cells. Inhibition of adenylyl cyclase enzymatic activity by glutamate metabotropic agonists will be analyzed. (3) Protein targets of adenylyl cyclase action in hair cells will be identified including those proteins that are substrates for protein kinase A phosphorylation and cyclic nucleotide gated ion channels. (4) Dopaminergic efferent regulation via D2L receptor coupling of Galpha12 to adenylyl cyclase will be ascertained with agonist-elicited modulation of intracellular cAMP in the intact rat organ of Corti compared to the intact sensory epithelium and separately, hair cells, of the teleost saccular macula. Proteins specifically targeted by D2L receptor occupation for PKA-driven phosphorylation (or inhibition of PKA-driven phosphorylation) will be identified. A consequential presynaptic modulation of dopamine synthesis and content in the lateral efferents will be determined with radioactive precursors and electrochemical detection of dopamine chromatographically resolved by HPLC. The elucidation of adenylyl cyclase-mediated signal transduction in inner-ear sensory epithelia through dopaminergic innervation may allow eventual pharmacological amelioration of sensorineural deafness and tinnitus.

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

- **Project Title: ANATOMY OF 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 2001; Project Start 01-JUL-1979; Project End 30-JUN-2004
  Summary: The focus of this research is the synaptic nests of the mammalian cochlear nucleus. The unifying hypothesis is that the nests are structured so as to mediate plastic changes in response to acoustic overstimulation and damage to the auditory system. These newly discovered nests consist of aggregations of closely packed synaptic endings which are unusual in not being separated from each other by glial processes. The nests occur throughout the cochlear nucleus and may reach their greatest development in the human. Their fine structure and lack of astrocytic processes having high-affinity glutamate transporters may endow the nests with an unusual potential for producing plastic changes to ongoing stimulation and to damaging levels of noise. A specific hypothesis is that overstimulation produces structural and histochemical changes, including chronic degeneration and new growth of synaptic endings in the nests and the regions associated with them. To see if the balance of excitatory and inhibitory input is thereby disturbed, the analysis will focus on the relative proportions of the different types of synaptic ending in the nests, the transmitter-related molecules associated with them, their origins, and the plastic changes they undergo in response to noise damage. Electron microscopy will be used to characterize the fine structure and quantify the types of synaptic endings in the nests of the chinchilla and mouse cochlear nucleus. The origins of the major inputs for each type of ending will be determined with anterograde-labeling and silver-degeneration methods. Immunocytochemistry and in situ hybridization will be used to identify the transmitter-related molecules associated with
each type of ending. These normative data will be used as a basis for determining changes in the relative proportions of ending types in the nests following exposure to noise. These findings will suggest ways of perturbing the degenerative and regenerative changes of these endings, including the insertion of small lesions, cells or latex microspheres for delivery of growth factors, and single gene deletions or overexpression. These changes may account for some of the auditory dysfunction in human nerve deafness caused by noise, including tinnitus and loudness recruitment. The perturbation experiments should lead directly to proposals for new therapies in this disorder.

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

• Project Title: **AUDITORY SIGNALING, THE FUNCTIONAL ROLE OF KV CHANNELS**
  
  Principal Investigator & Institution: Tempel, Bruce L.; Professor of Otolaryngology; Otolaryngology-Head & Neck Surgery; University of Washington Seattle, WA 98195
  
  Timing: Fiscal Year 2001; Project Start 01-AUG-1999; Project End 31-JUL-2004
  
  Summary: from applicant's summary) A major challenge confronting neurobiology is to define how specific voltage-gated potassium (Kv) channel genes influence the timing, duration and frequency of the neuronal signals that encode and transmit information. Neurons in the auditory system have the unique advantages of relatively simple circuitry, well defined functional roles (involving precise signal fidelity) and strong expression of Kv currents. The goal of this proposal is to examine the functional roles of Kv channel genes in three types of auditory neuron-bushy neurons and octopus cells of the cochlear nucleus, and neurons of the medial nucleus of the trapezoid body -each performing related but distinct information processing tasks. Using molecular and immunocytochemical techniques, the applicant will determine the complement of Kv channel subunits expressed in these neurons and examine their subcellular localizations. Using electrophysiological techniques, the applicant will characterize Kv currents in these auditory neurons in brainstem slices from wildtype mice and from hearing impaired mice that lack the Kv1.1 channel subunit gene (i.e. Kv1.1 knockout mice). These data should reveal rules governing Kv channel assembly and localization in parts of the neuron specialized for either encoding or transmission of information, and elucidate specialized roles in auditory information processing for different subunits, or subsets of subunits within a subfamily. Our thorough characterization of the functional role of Kv channels at the cellular level will also help to explain at the organismal level the hearing loss, movement abnormalities and seizures observed in Kv1.1 knockout mice. Using both anatomical and electrophysiological data, the applicant will develop computer models to assess the relevance of Kv channels/currents in auditory information processing. The model will be used to predict the effects of removing other Kv genes strongly expressed in auditory neurons, such as Kv 1.2 for which the applicant's predictions will be tested directly by examining Kv1.2 knockout mice. Episodic ataxia myokymia is caused by mutations in the Kv1.1 (KCNA1) gene in humans. Clinical reports on these patients often include **tinnitus**, vertigo and sometimes profound hearing loss. The proposed studies and models based on the Kv1.1 knockout mouse mutants should also be informative regarding the neuronal dysfunction that underlies this human disease.

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

• Project Title: **CENTRAL MECHANISMS RELATED TO TINNITUS**
  
  Principal Investigator & Institution: Kaltenbach, James A.; Professor; Otolaryngology; Wayne State University 656 W. Kirby Detroit, MI 48202
Timing: Fiscal Year 2001; Project Start 01-JAN-1997; Project End 30-JUN-2004

Summary: The main objective of this study is to further develop our animal model of tinnitus with the goal of defining physiological and chemical correlates of this hearing disorder at the level of the cochlear nucleus. This project builds on our recent studies showing that intense sound exposure at levels sufficient to induce tinnitus in humans leads to increases in spontaneous neural activity (hyperactivity) in the dorsal cochlear nucleus. The specific aims of this project are as follows: 1) Two-choice behavioral tests will be employed to characterize the pitch and loudness of sound-induced tinnitus in hamsters. The relationship of these measures to altered activity in the cochlear nucleus will be investigated by quantifying the magnitude and spatial distribution patterns of hyperactivity in the same animals. 2) The laminar distribution of the hyperactive cells will be determined by marking sites where activity is highest with horseradish peroxidase, HRP. Further clarification of the cellular substrates underlying hyperactivity will be sought by immunolabeling hyperactive cells with antibodies to the c-fos gene product in cochlear nucleus sections. 3) The cochlear nuclei will then be analyzed chemically to determine whether increases in spontaneous activity are correlated with chemical changes. The concentrations of selected neurotransmitter candidates, neurotransmitter-associated enzymes, and neurotransmitter receptors will be assayed using high performance liquid chromatography and autoradiography. Changes in these elements will be mapped along the tonotopic axis. Chemically altered areas will be identified and correlated with regions showing hyperactivity. 4) The possible role of cochlear outer hair cell loss as a trigger of hyperactivity and tinnitus will be investigated by testing whether animals treated with cisplatin, an agent known to induce tinnitus in humans and to cause selective outer hair cell loss in humans and animals, show evidence of behavioral tinnitus and hyperactivity in the cochlear nucleus. Findings from these experiments are expected to contribute to an understanding of central mechanisms of tinnitus and pave the way toward the development of anti-tinnitus therapies.

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• Project Title: CHARACTERIZATION OF THE HUMAN HAIR CELL RECEPTOR ALPHA-9

Principal Investigator & Institution: Lustig, Lawerence R.; Professor; Otolaryn & Head & Neck Surgery; Johns Hopkins University 3400 N Charles St Baltimore, Md 21218

Timing: Fiscal Year 2001; Project Start 01-AUG-2000; Project End 31-JUL-2005

Summary: The family of nicotinic acetylcholine receptors supports chemical synaptic transmission throughout the nervous system, including efferent, or centrifugal regulation of the inner ear. While cholinergic innervation of the inner-ear has been studied in several animal models, our understanding of cholinergic transmission within the human inner ear is quite limited. We propose here to undertake molecular, electrophysiological and histological studies of a putative nicotinic receptor, alpha-9, in the human inner ear. This work will provide not only a molecular basis for the cholinergic modulation of human hair cells, but also will establish targets of novel therapies for diseases such as vertigo and tinnitus. Furthermore, mutations and disorders of nicotinic receptor function have been implicated in such diverse diseases as myasthenia gravis, nocturnal frontal lobe epilepsy and schizophrenia. Thus, the present work may also have wider implications for understanding otologic diseases without a known etiology, including autoimmune inner ear disorders or M ni re's syndrome. Recent work in our lab has led to the identification of the human ortholgue of alpha-9, included a complete elucidation of its cDNA and genomic sequence. The goal of the current research proposal is to fully characterize this newly identified receptor, which is
a likely mediator of the efferent cholinergic response in the human inner-ear. Ongoing work during the initial characterization will include the search for splice variants within human tissue, as well as further genomic analysis of its regulatory elements. The second phase of the project will include the cellular localization of the alpha-9 gene product within surgically-derived hair populations and other tissue types. The third phase of the project will include functional expression of human alpha-9 to evaluate its physiologic response to acetylcholine and its antagonists. The final phase of the project will employ these same techniques in an effort to identify additional cholinergic receptor types that may be involved in efferent cholinergic transmission within the inner-ear.

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- Project Title: CLINICAL TRIAL FOR TINNITUS RETRAINING THERAPY(TRT)
  Principal Investigator & Institution: Formby, C C.; Surgery; University of Maryland Balt Prof School Baltimore, Md 21201
  Timing: Fiscal Year 2002; Project Start 01-FEB-2002; Project End 31-JAN-2004
  Summary: (provided by applicant): The purpose of this Planning Grant is to develop operations and procedures as part of the planning process for conducting a large-scale, multi-center trial of Tinnitus Retraining Therapy (TRT). TRT is a habituation-based intervention that uses directive counseling and low-level sound therapy to facilitate habituation of the awareness of tinnitus, its annoyance, and impact on the patient's life. Millions of Americans experience tinnitus, but for about 2.5 million individuals it is severely disabling. With no other proven or more successful intervention, TRT has become the therapeutic intervention "of this decade" for disabling tinnitus. TRT, however, remains highly controversial despite many reported successes in this country and abroad. It now lacks and requires validation in a controlled clinical trial. In light of a real need for a rigorous controlled study of TRT, we will develop, organize, and plan a formal randomized, double-blind, placebo-controlled, longitudinal clinical trial of TRT. The trial will be conducted at flagship Army, Air Force, and Navy Medical Centers with active duty and retired military personnel and their dependents. The likely higher incidence of noise-induced tinnitus (than in the general population) and the great diversity of this study population make the U.S. Armed Forces an ideal study group for a clinical trial of TRT. The 3x2 trial design will incorporate six treatment arms to control for the treatment effects of directive counseling and sound therapy, including a double-blind placebo sound therapy and a "no treatment" control arm to establish the natural history of tinnitus. The trial will use a repeated-measures questionnaire, psychoacoustic, and audiologic data as outcome measures to evaluate the validity and efficacy of TRT and its component parts in habituating the perceived tinnitus sensation, awareness, annoyance, and overall impact on life (Aim 1); characterize and monitor the temporal courses of the habituation effects over the course of TRT in relation to the non-treatment control arm and those arms receiving alternative placebo and partial treatments (lacking either the counseling or sound therapy components) (Aim 2); establish the permanence and sustained benefits of TRT and the alternative interventions, post-treatment (Aim 3); and develop statistical models and methods to establish and predict the success of TRT, the treatment effects from directive counseling and sound therapy, the mechanisms by which each works, and the target population for TRT (Aim 4).
  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen
• **Project Title: COCHLEAR BLOOD FLOW AND NEUROPEPTIDES**

Principal Investigator & Institution: Nuttall, Alfred L.; Professor; Otolaryngology Head & Neck Surgery; Oregon Health & Science University Portland, or 972393098

Timing: Fiscal Year 2001; Project Start 30-SEP-1995; Project End 31-JUL-2003

Summary: The migraine related inner ear symptoms for phonophobia, tinnitus, hearing fluctuation, hearing loss, and increased noise sensitivity provide evidence for a possible neurological substrate connecting basilar artery migraine and cochlear pathophysiological mechanisms. Recently we have identified a previously unreported sensory innervation of the cochlear blood vessels originating from the trigeminal ganglia. We have shown that this sensory innervation has a significant effect on cochlear blood flow (CBF) in both normal and pathological conditions (e.g., in the animal model of endolymphatic hydrops, one of the symptoms of Meniere’s disease). This proposal seeks to further define the anatomical basis and mechanisms of the trigemino-sensory network around the vertebrovasilar and cochlear vascular system. The proposal offers the hypothesis that the trigemino-sensory system and its related neuropeptide system are important factors contributing to basilar migraine and vascular homeostasis of the cochlea. The study has three specific aims. Aim 1. To establish if there is a physiological basis for the cochlear symptoms in basilar artery migraine headache. Positive results will confirm a common functional basis for basilar migraine and cochlear symptoms, the basis could be neurogenic inflammation. Aim 2. To demonstrate if vanilloid receptor (VR1) and substance P (SP) are co-localized around cochlear blood vessels, the basilar artery and its related branches. Positive immunocytochemical results will demonstrate: (a) network of the VR1 and (b) SP co-labeled primary sensory neurons around the basilar artery; anterior inferior cerebellar artery (AICA), spiral modiolar artery (SMA) and radial artery; (c) Capsaicin will cause a significant reduction in the density of labeled sensory fibers. Aim 3. To determine the vasoregulatory disturbance of the trigemino-sensory neurons in endolymphatic hydrops. In this study positive results will demonstrate that endolymphatic hydrops causes a reduction in the stimulated trigeminal ganglion induced CBF change. The studies of the proposal will help clarify how trigemino-sensory neurons regulate the vertebro-basilar vascular system and cochlear fluid balance under normal and pathological conditions.


• **Project Title: CORTICAL PLASTICITY AND PROCESSING OF COMPLEX STIMULI**

Principal Investigator & Institution: Kilgard, Michael P.; Assistant Professor; Human Development; University of Texas Dallas Richardson, Tx 75080

Timing: Fiscal Year 2001; Project Start 01-JAN-2000; Project End 31-DEC-2002

Summary: The insights derived from neuroscience studies of cortical plasticity have been indispensable in the development of treatment strategies for a number of neurological disorders, including dyslexia, tinnitus, and stroke. However, because most of these studies were focused on relatively simple sensory stimuli, our understanding of the plasticity principles that shape the cortical representation of more complex stimuli, such as speech, remains rudimentary. The proposed experiments document how experience-dependent plasticity improves the auditory cortex representation of spectro temporally complex stimuli and, by advancing our understanding of brain mechanisms involved in the learning of language, will aid in the treatment of communicative disorders. Using simple stimuli, we have demonstrated that electrical stimulation of the cholinergic nucleus basalis (NB) generates robust cortical plasticity that parallels natural...
learning. The proposed experiments will extend this series by pairing NB stimulation with complex spectrotemporal stimuli. Two different coding strategies, which have demonstrated stimulation of the cholinergic nucleus basis (NB) generates robust cortical plasticity that parallels natural learning. The proposed experiments will extend this series by pairing NB stimulation with complex spectrotemporal stimuli. Two different strategies, which have been proposed to represent the neural basis of memory, emerge with natural learning of behaviorally important complexes stimuli. In the first, complex features are represented by the distributed activity of neurons (coarse coding); while in the second, complex stimuli are represented with specialized filters tuned to specific spectrotemporal transitions (sparse coding). Our preliminary evidence indicates that NB-stimulation leads to representational plasticity that combines both coding strategies. In addition to sharpening spectral and temporal responses generally, NB activation paired with a spectrotemporal sequence created combination selective neural responses that do not exist in naive cortex. These results demonstrate that combination selectivity is not limited to species-specific vocalizations, and representations of the acoustic environment. Our continuing studies will examine several other acoustic stimuli to determine precisely what stimulus features are required to generate each element of representational plasticity observed in our preliminary results.

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• **Project Title: DANGEROUS DECIBELS--PARTNERSHIPS IN PUBLIC HEALTH**
Principal Investigator & Institution: Holloway, Susan I.; Oregon Museum of Sciences and Industry and Industry Portland, or 97214
Timing: Fiscal Year 2001; Project Start 30-SEP-2000; Project End 31-AUG-2005
Summary: (Adapted from the applicants abstract): A consortium of innovative basic science researchers, museum educators, civic leaders and volunteers propose a unique partnership to reduce the incidence and prevalence of Noise Induced Hearing Loss (NIHL), a growing problem among children and adults. To address this critical public health concern, a unique public/private partnership, including the Oregon Museum of Science and Industry (OMSI), the Oregon Hearing Research Center at the Oregon Health Sciences University (OHSU), the Portland Veterans Administration Medical Center National Center for Rehabilitative Auditory Research (NCRAR), the American Tinnitus Association (ATA), and Oregon and Southwest Washington elementary and secondary schools, propose a regional campaign to significantly reduce the prevalence of preventable hearing loss and tinnitus. The project is comprised of three freestanding, but interlocking components that create a strong public health campaign against Noise Induced Hearing Loss. These components are: (1) exhibitry; (2) curriculum; and (3) research. We propose a three phase, five-year program, directly targeting school-age youth, using established volunteer and volunteer training programs among each of the participating institutions: Phase I: Prototype exhibit development and full production of one exhibit incorporating education, entertainment and pre-post knowledge evaluation; test-ready curriculum; draft evaluation tools and hearing screening capabilities for data acquisition. Phase II: Classroom presentations with exhibitry and data acquisition in six Oregon and Southwest Washington for pilot testing. Phase III: Regional model program and implementation strategy for hearing science education and hearing loss prevention. Program evaluation analysis will include research results regarding subject factors and noise induced hearing loss in children.

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• **Project Title: EARLY DETECTION OF ENDOLYMPHATIC HYDROPS**
  Principal Investigator & Institution: Ator, Gregory A.; Ophthalmology; University of Kansas Medical Center Msn 1039 Kansas City, Ks 66160
  Timing: Fiscal Year 2001; Project Start 01-JUL-1998; Project End 30-JUN-2002
  Summary: An ongoing problem in clinical otology has been the difficulty in identifying patients with endolymphatic hydrops (ELH) in the early stages when the presentation of the classic triad of *tinnitus*, fluctuating hearing loss, and episodic vertigo is incomplete. Consequently, delays in diagnosis and subsequent treatment lead to progressive sensorineural hearing loss, recurring vertigo and eventually deafness. Most cases of ELH are idiopathic and thus such patients are diagnosed with what is termed Meniere's disease. The long term goal of this investigation is to identify patients in the early stages of Meniere's disease, thus permitting early treatment. The symptoms with which Meniere's patients present are commonly seen in other diseases, making an accurate diagnosis difficult to obtain. Therefore, proper identification of patients early in the course of the disease requires indices which are sensitive to subtle changes in cochlear function and which are also specific to the pathology of endolymphatic hydrops. The specific aim of this project is to use the guinea pig model of ELH to derive an index sensitive and specific to endolymphatic hydrops from measures which reflect cochlear mechanics such as otoacoustic emissions and electrocochleography. A new nonlinear systems identification (NLSI) technique will be used to measure cochlear mechanoelectric transduction. The index will be derived from conventional electrocochleography measures (i.e. SP/AP ratio, N1 latency) and otoacoustic emissions as well the NLSI measures. Once such an index has been developed in our animal model, we will apply it to measurements made in human patients.
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• **Project Title: EXPRESSION OF ION CHANNELS IN THE AUDITORY SYSTEM**
  Principal Investigator & Institution: Kaczmarek, Leonard K.; Professor; Pharmacology; Yale University 47 College Street, Suite 203 New Haven, Ct 065208047
  Timing: Fiscal Year 2001; Project Start 01-APR-1993; Project End 31-MAR-2006
  Summary: The firing patterns of neurons in central auditory pathways encode specific features of sound stimuli, such as frequency, intensity and localization in space. The generation of the appropriate pattern depends, to a major extent, on the properties of the voltage-dependent potassium channels in these neurons. The Shaw-family Kv3.1 and Kv3.3 channels and the two-pore family rTWIK channel are expressed at high levels in neurons that are capable to firing at very rapid rates and that lock their action potentials to specific phases of auditory stimuli. We plan to determine the mechanisms that regulate these channels in the presynaptic terminals of cochlear nucleus neurons and their postsynaptic targets, neurons of the medial nucleus of the trapezoid body. To test the roles of these channels in timing and regulation of transmitter release, we shall record the responses of neuronal terminals and somata in which the genes for these channels have been eliminated by homologous recombination. We shall test the hypothesis that phosphorylation of the channel proteins alters the transmission of information through this synaptic pathway. Using transgenic animals in which the promoters for the channels are coupled to a fluorescent reporter gene, we shall test whether the naturally occurring differences in the level of expression of the Kv3.1 channel along tonotopic axes can be induced by changes in the pattern of activity to which the neurons are exposed. An understanding of how ion channels are regulated in central auditory neurons is likely to lead to therapies for certain forms of deafness, as
well as for tinnitus, disorders in the interpretation of auditory stimuli, and states of hyperexcitability such as audiogenic seizures.

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• Project Title: FUNCTION OF THE TRIGEMINAL GANGLION-COCHLEAR NUCLEUS

Principal Investigator & Institution: Shore, Susan E.; Otolaryngology; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, MI 481091274

Timing: Fiscal Year 2001; Project Start 01-APR-2001; Project End 31-MAR-2006

Summary: (Adapted from applicant's abstract): We have demonstrated that the trigeminal ganglion sends a projection to the auditory brain stem and to the cochlear vasculature. The terminations in the brainstem end in granular and magnocellular regions of the ventral cochlear nucleus (VCN) and at the locations of olivocochlear neurons in the superior olivary complex. The cochlear portion of the innervation modulates blood flow within the cochlea. However, the function of the brainstem projection is unknown. Preliminary findings suggest that the projection to the VCN is excitatory. The axons of granule' cells (parallel fibers) project to the dorsal cochlear nucleus (DCN). Therefore, excitation by the trigeminal innervation could affect most of the output neurons of the cochlear nucleus (CN). A series of studies is designed to elucidate the function of the CN portion of this new projection and define its neurotransmitters: The trigeminal ganglion will be electrically stimulated while observing the responses of single units in the CN. The candidate neurotransmitters, Substance P and Nitric Oxide, will be evaluated using immunocytochemistry and neuropharmacology. A role for the trigeminal ganglion in the generation and modulation of tinnitus will be explored: As many as two thirds of tinnitus patients are able modulate their tinnitus by clenching the jaw or touching the skin on the face, areas innervated by the trigeminal ganglion. Others can attribute the onset of tinnitus to a somatic insult in the head and neck region (“somatic tinnitus”). On the assumption that increased spontaneous rate is a manifestation of tinnitus, its modulation by somatosensory input to the CN could play a role in the generation and modulation of tinnitus. The hypothesis will be tested by electrically stimulating the trigeminal ganglion while recording spontaneous activity in single units of the CN. Identifying the neurotransmitter used in this pathway could then set the stage for later drug treatments.

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• Project Title: FUNCTIONAL IMAGING OF TINNITUS AND HEARING LOSS

Principal Investigator & Institution: Lockwood, Alan H.; Professor of Neurology and Nuclear Medic; Neurology; State University of New York at Buffalo Suite 211 Ub Commons Amherst, Ny 14228

Timing: Fiscal Year 2001; Project Start 01-JAN-1998; Project End 31-DEC-2002

Summary: The overall goal of this project is to develop a better understanding of the functional neuroanatomy of the auditory system and how this is affected by tinnitus, sensorineural hearing loss (SNHL) and phenomena associated with SNHL such as loudness recruitment. In preliminary studies, using positron emission tomography (PET) to measure cerebral blood flow (CBF), we have identified spontaneous neural activity in the central auditory system associated with tinnitus, evidence for plastic reorganization of central auditory systems, and links between sensory-motor systems and limbic and frontal brain regions that may mediate the emotional disability associated with tinnitus. We will broaden our successful preliminary approach by using
statistical parametric mapping (SPM) to map CBF to focus on 5 specific aims: 1) What is the relationship between the intensity of an external tone and the degree of activation in the auditory cortex for subjects who have: (A) normal hearing, (B) loudness recruitment and (C) loudness recruitment plus tinnitus? 2) What effects do tinnitus and SNHL have on resting neural activity and what are the effects of high-frequency SNHL and tinnitus on the cortical frequency-place map? 3) What regions of the cerebral cortex are activated in patients who can modulate the loudness or pitch of their tinnitus with an oral-facial movement or eye movements? 4) Do lidocaine and residual inhibition reduce activity in regions of the brain activated by tinnitus? 5) What is the anatomical link between tinnitus and depression? This application of advanced imaging technology to study patients with communication disorders to investigate perception, and plasticity in the central auditory system should elucidate normal sensory processing of auditory information and how this is disturbed by tinnitus and SNHL. We expect to identify neural systems mediating tinnitus and related phenomena that will lead to the development of rational therapy targeted at affected neural areas.

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- **Project Title: FUNCTIONS OF CORTICOFUGAL AUDITORY SYSTEMS**

  Principal Investigator & Institution: Suga, Nobuo; Biology; Washington University Lindell and Skinker Blvd St. Louis, Mo 63130

  Timing: Fiscal Year 2001; Project Start 01-JUL-1981; Project End 30-JUN-2005

  Summary: Our ultimate goal is the complete understanding of neural mechanisms for both species-specific (biosonar) and common (communication) auditory functions. Unlike the auditory periphery, the central auditory system contains many different types of neurons. Some neurons are tuned to particular acoustic parameters characterizing sounds other than frequency. Some of these, called "combination-sensitive" neurons, are tuned to specific parameters characterizing combinations of signal elements in complex sounds. Different types of neurons are clustered in different cortical areas. It has been explained that all these neurons result from the divergent and convergent projections within the ascending auditory system. However, the descending (corticofugal) system plays a very important role in signal processing. Response properties of subcortical neurons, and accordingly those of cortical neurons, are shaped by both the ascending and descending systems. The organization of the subcortical nucleus can be changed by the corticofugal system according to auditory experience, including associative learning. Our aims for the proposed research are to explore the functions of the corticofugal system and to test our hypotheses: (1) that the auditory cortex has an intrinsic mechanism which works together with the corticofugal system to adjust and improve auditory signal processing according to auditory experience, (2) that this mechanism is augmented if the acoustic signals become behaviorally relevant to the animal, e.g., through associative learning, and (3) that such augmentation is mediated by the cholinergic basal forebrain. Our proposed research will contribute further toward our understanding of the neural mechanisms for processing behaviorally relevant sounds and the functional organization of the central auditory system. We will be able to propose possible neural mechanisms for hearing disorders such as neural tinnitus. We will study the response properties of cortical and subcortical neurons to acoustic stimuli. We will then study how their response properties are changed by focal electrical stimulation of the auditory cortex, somatosensory cortex and/or basal forebrain or classical conditioning and also by focal applications of different types of drugs to the auditory cortex and subcortical nuclei. All the data which will be obtained will be evaluated in relation to our hypotheses.
• **Project Title: GENE REGULATION OF RAT DENTIN SIALOPROTEIN**

Principal Investigator & Institution: Ritchie, Helena H.; Cariology/Restor Sci/Endod; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, Mi 481091274

Timing: Fiscal Year 2003; Project Start 30-SEP-1995; Project End 30-JUN-2007

Summary: (provided by applicant): During tooth development, odontoblasts modulate dentin formation by producing a predentin matrix into which additional NCPs are subsequently secreted to initiate the mineralization process so necessary for healthy tooth formation. Abnormalities in dentin mineralization due to genetic diseases such as dentinogenesis imperfecta II (DGI-II; affecting 1 in 7,000 newborns) leave these children few choices other than placement of crowns on the teeth or a complete denture. A nonsense mutation, located in the coding sequence for dentin sialoprotein (DSP) is likely responsible for blocking both DSP and phosphophoryn (PP) expression in these individuals because these two NCPs are located on a single DSP-PP transcript. Importantly, some DGI patients also experience tinnitus as well as balancing problems making it necessary to consider problems in DSP-PP transcript and protein expression as an important public health concern. This application proposes a series of studies to better define DSP-PP transcript expression and DSP/PP protein function in dentin mineralization. The specific aims of this proposal are 1) to test the hypothesis that odontoblast-specific factors acting on the DSP-PP gene promoter, regulate DSP-PP expression, 2) to test the hypothesis that multiple DSP-PP transcripts generate functionally distinct PP isoforms with distinct calcium binding capacity and hydroxyapatite forming ability which are required for orderly dentin mineralization, 3) to correlate DSP-PP transcript and DSP-only transcript expression patterns with dentin mineralization, and 4) to validate Aims 2 and 3 by examining mineral formation as a function of DSP and PP isoform expression in cell culture. These ongoing studies, which combine gene regulation and protein function approaches, will reveal underlying mechanisms of dentin mineralization and will later be applicable to reparative dentistry.

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• **Project Title: HEALTH COMMUNICATION: NIHL AND TINNITUS PREVENTION**

Principal Investigator & Institution: Martin, William H.; Otolaryngology Head & Neck Surgery; Oregon Health & Science University Portland, or 972393098

Timing: Fiscal Year 2004; Project Start 01-DEC-2003; Project End 30-NOV-2006

Summary: (provided by applicant): Noise-induced hearing loss (NIHL) and related tinnitus pose significant health risks to millions of Americans. Educational interventions, based upon health communication theory, have yet to be systematically applied to NIHL and tinnitus prevention. The purpose of this project is to design, implement and evaluate intervention strategies applying current health communication and behavior theory, to increase knowledge, change attitude and behavioral intention consistent with hearing loss prevention. The target population will be 4th grade school students in Oregon and SW Washington. Four single educational interventions (some established and some new innovations) will be compared to a non-intervention, control group. Also, health communication theory predicts that certain intervention strategies will be more effective than others. Health communication research demonstrates that paired-interventions, especially in the form of a "booster" separated in time from the initial program, will be more effective than a single-intervention approach. Once
evaluation of the four interventions is complete, a second evaluation will be conducted using paired combinations of the most effective educational interventions. Subjects will receive pre- and post-intervention and follow-up questionnaires. Intervention 1: Classroom Presentation by Older-Peer Educators. High school students will present an NIHL and tinnitus prevention program. Intervention 2: Classroom Presentation by Health Professional Educators. School nurses will present an NIHL and tinnitus prevention program. Intervention 3: On-site Museum Experience. Students will visit a 12-component exhibition of noise-induced hearing loss and tinnitus prevention. The exhibit provides a novel and innovative method of communicating information to visitors, young and old. Intervention 4: Web-based Museum Experience. A web-based version of the above museum exhibit will be the vehicle to communicate information about noise-induced hearing loss and tinnitus prevention to fourth-grade students. Non-Intervention: Control groups matched for age, gender, socioeconomic and geographic (rural/urban) factors will receive pre- and post-evaluation questionnaires without receiving an educational intervention. Results from the comparison of these interventions will be used to enhance delivery methods and vehicles for public education to increase awareness, change attitudes and behavioral intentions about the dangers of noise-induced hearing loss and tinnitus. The goal is to decrease the number of cases of preventable noise induced hearing loss and tinnitus, and to promote healthy hearing and good aural communication in the population.

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- **Project Title:** IDENTIFICATION OF ACOUSTICO-LATERALIS TRANSMITTERS

Principal Investigator & Institution: Drescher, Dennis G.; Professor and Director of Molecular Rese; Otolaryngology; Wayne State University 656 W. Kirby Detroit, Mi 48202 Timing: Fiscal Year 2001; Project Start 01-MAY-1980; Project End 30-JUN-2003

Summary: (from the Applicant's abstract). The major objective of the present proposal is to identify peripheral neurotransmitters/neuromodulators and associated biochemical systems of hair-cell organs. Peripheral neurotransmitters voltage-gated calcium channels, and neurotransmitter receptors will be examined for mammalian and fish model systems. The main hypotheses address the existence and function of non-glutamate hair cell transmitter(s), non-L-type voltage-gated calcium channel(s), and recently-described efferent neurotransmitter receptors for acetylcholine and dopamine. Methods include: 1) high-resolution, high-performance liquid chromatography (HPLC) with detection by electrochemistry, fluorescence, radioactivity, and radioimmunoassay, 2) analysis of tissue content, and depolarization-induced release in vitro of presumptive neurotransmitters and neuromodulators from a saccular hair cell sheet for which the hair cell is the only intact cell type, and sound-induced release in vivo into cochlear perilymph, 3) biological assay of compounds utilizing Xenopus laevis lateral line, 4) morphological localization of molecular entities by immunohistochemical and in situ hybridization methods, 5) sequence analysis as to molecular function after RT-PC (reverse transcription polymerase chain reaction) of voltage-gated calcium channels associated with transmitter release of haircells, and 6) functional sequence analysis after RT-PCR of efferent neurotransmitter receptors for acetylcholine and dopamine. Using these methods, it is planned to identify chemically and determine the biological activity of compounds release from saccular sensory cells in a calcium-dependent manner by low level potassium depolarization and released into perilymph by sound stimulation. Biosynthesis of neuroactive monoamines and related molecules will be studied utilizing radioactive precursors and HPLC. We will demonstrate molecular characteristics and localization of a hair cell-associated, non-L-type voltage-gated calcium channel and
efferent-related a. nicotinic receptor and dopamine D2(ing) and D, receptors. This approach, utilizing methods of micro-biochemistry, should result in continued, detailed elucidation of structure and molecular function of peripheral neurotransmitter systems of hearing and balance, pointing the way to development of therapies for transmitter-related hearing loss, vertigo, and tinnitus.

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- **Project Title:** MEMBRANE PROPERTIES OF CELLS COMPRISING THE OUTER HAIR C

Principal Investigator & Institution: Santos-Sacchi, Joseph R.; Professor; Surgery; Yale University 47 College Street, Suite 203 New Haven, Ct 065208047

Timing: Fiscal Year 2001; Project Start 01-FEB-1984; Project End 31-MAR-2005

Summary: The organ of Corti is composed of a variety of cell types including sensory, supporting and neural elements. Taken together, these cells comprise a functionally intricate and cohesive electrical unit that initiates the analysis of acoustic information within our environment. This electrical unit is extremely complex and nearly anatomically inaccessible, making an analysis of the whole quite a challenge. Fortunately, during the last several years the in vitro approach, including the isolated cochlea and cell preparations, has aided in the elucidation of cell function; the strategy is to understand the cells first on an individual basis, and finally to integrate this knowledge into a complete understanding of the organ of Corti. The overall aim of this project is to analyze the membrane properties of the outer hair cell (OHC), one of the major players in auditory function, principally using variations on the whole cell voltage clamp technique. Three areas of investigation are proposed. Specifically, we intend to 1) analyze the mobility OHC sensor/motors in the lateral plasma membrane, 2) study in detail and make modifications to the electrical correlate of OHC motility, its nonlinear capacitance and analyze what such modifications will do to the high frequency mechanical activity of the OHC, and 3) study the mechanical coupling among OHCs that we have just discovered. These results will lead to a deeper understanding of inner ear function and aid in understanding auditory pathologies which may result from OHC insult and homeostatic imbalance, including sensorineural hearing loss and tinnitus.

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

- **Project Title:** MODULATION OF COCHLEAR MECHANICS

Principal Investigator & Institution: Oghalai, John S.; Otolaryngology; University of California San Francisco 500 Parnassus Ave San Francisco, Ca 94122

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

Summary: (provided by applicant): The long-term goal of these studies is to understand how drugs modulate the cochlear amplifier. The mammalian cochlea is a mechanical structure that is tuned along its length tonotopically. Outer hair cells (OHCs) within the cochlea undergo high-speed length changes in sync with sound vibrations, adding energy via a positive feedback loop. This is called the cochlear amplifier and provides exquisite hearing sensitivity and frequency selectivity. OHC motility is based upon the highly organized biomechanical structure of the cell's lateral wall, which contains a plasma membrane, a cytoskeleton, and motor proteins. The specific objective of this project is to determine whether drugs that change OHC lateral wall biomechanics in vitro will modulate cochlear mechanics in vivo. There are three categories of drugs that will be tested: amphipathic drugs which change membrane tension by causing cell
membranes to bend, drugs that affect the actin-spectrin cytoskeleton and change cell stiffness, and drugs that directly block the electromotility motor. The compound action potential (CAP), distortion product otoacoustic emissions (DPOAEs), and the medial olivocochlear (MOC) reflex will be monitored to assess cochlear function in anesthetized guinea pigs before and during the administration of these drugs. Because OHCs are the most sensitive cell in the cochlea to noise exposure, drugs that change OHC biomechanics may also modulate noise-induced hearing loss. This will be tested in the guinea pig model. Finally, the effect of these drugs on sound conditioning will be assessed. This is a protective process whereby long-term exposure to moderate-level sound can reduce permanent threshold shifts from subsequent high-level noise exposure. Overall, these studies are designed to understand how OHCs transmit forces within the cochlea and the mechanisms behind sound conditioning. Clinically, they will improve our comprehension of the generation of otoacoustic emissions, as well as the role of the efferent nerves on the cochlear amplifier in health and disease. Additionally, these studies may lead to therapeutic interventions for noise-induced hearing loss and tinnitus.

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 45229

Timing: Fiscal Year 2001; 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.

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- **Project Title: MOLECULAR MECHANISMS IN CENTRAL AUDITORY FUNCTION**, 
  Principal Investigator & Institution: Altschuler, Richard A.; Professor; Otolaryngology; University of Michigan at Ann Arbor 3003 South State, Room 1040 Ann Arbor, Mi 481091274  
  Timing: Fiscal Year 2003; Project Start 01-JUL-2003; Project End 30-JUN-2004  
  Summary: (provided by applicant): This proposal is for a third Symposium on "Molecular Mechanisms in Central Auditory Function, Plasticity and Disorders" at the Snow King Resort in Jackson Hole, Wyoming to be held in late June 2004. The central focus of the conference is the "molecular mechanisms" regulating neurotransmission. The premise of the conference is that these molecular features regulate auditory activity, shape auditory neuronal response properties, influence development and provide for central auditory plasticity. Furthermore, changes in these molecular mechanisms can underlie genetic disorders or acquired central auditory disorders such as age related hearing loss, seizures and tinnitus. The topic remains important and timely, with new and exciting results being generated from an increasing number of laboratories, generating new insights. The Symposium will present and highlight new developments and to provide a forum where they can be synthesized, integrated and correlated. This will be a three day meeting, under a similar format to our 1999 meeting, with platform presentations, posters and time for formal and informal discussions. The goals are: 1) To provide an understanding of molecular mechanisms underlying functional diversity in central auditory neurons; 2) To develop correlation between molecular mechanisms and the shaping of cell specific response characteristics; 3) To examine molecular mechanisms underlying central auditory plasticity; 4) To examine molecular mechanisms underlying disorders such as tinnitus, seizures and age related hearing loss; 5) To explore the role of genetics in central auditory system function and dysfunction; 6) To provide interaction between molecular and systems researchers The conference will consist of platform presentations by approximately 50 invited speakers from the auditory system and two additional speakers from outside the auditory field as well as a Poster Session open to contributions from all participants. Based on our previous experience and the attraction of the location, we expect to draw another 30 - 50 additional participants (including recipients of two minority fellowships) from other scientists and students interested in this topic. 
  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: NEURITE DENSITY IN SKIN AS A MARKER FOR NEUROPATHIC PAIN**  
  Principal Investigator & Institution: Oaklander, Anne L.; Massachusetts General Hospital 55 Fruit St Boston, Ma 02114  
  Timing: Fiscal Year 2002; Project Start 01-SEP-2002; Project End 31-AUG-2006
Summary: (provided by applicant): Chronic pain has been recognized as an underserved area of medicine. Clinical care and research are hampered by the lack of objective correlates for the subjective complaint of pain. This is especially a problem for neuropathic pain patients, where the pain is caused by malfunction of the pain-sensing neurons, rather than injury to the area where the pain is felt. In this translational project we will evaluate two types of objective evidence of neural damage to see whether they correlate with the complaint of pain. We will investigate the usefulness of these methods in adults with one of two common neuropathic pain conditions, postherpetic neuralgia (PHN) after shingles (herpes zoster), or painful neuropathy in the lower legs from diabetes mellitus, and in rat models of these conditions. Data from individuals with and without pain will be compared. We will evaluate the usefulness of tests of specific sensory functions, using standardized quantitative sensory stimuli, for predicting who does or does not have pain from shingles or diabetes. We will also evaluate the usefulness of a new technique, counting the density of pain-sensing (nociceptive) nerve endings within the epidermal layer of small skin punch biopsies. Surprisingly, work by our group and others show that neuropathic pain patients usually have fewer nociceptive nerve endings in painful skin. When the amount of signal coming in from the periphery decreases, pain-processing neurons in the brain and spinal cord become hyperactive. The result can be pain in the absence of tissue injury. This is similar to the development of tinnitus (ringing in the ears) when people lose hearing. Our data suggests that after shingles, PEN pain is felt by only those patients whose density of nociceptive nerve endings has been reduced below a threshold value (650 neurites/mm2 skin surface area). In Specific Aim I, we will study patients about 6 weeks after onset of shingles with quantitative sensory testing and skin biopsies, and repeat them 6 months later. We will evaluate whether data from the first set of tests, or changes between the two test sessions, can provide a marker for those who recover from pain or not. In Specific Aim II we will compare sensory testing and skin biopsy data from normal people and diabetics with and without pain to see whether there is evidence for a threshold value separating individuals with and without pain, and whether we can identify a presymptomatic state. In Specific Aim III, we plan to evaluate sensory function of the paw in rat models of pain after sciatic nerve injury. At sacrifice, biopsies will be taken from the bottom of the rat's paws as well as from the injured nerves to see whether changes in the density of nociceptive nerve endings in the foot correlate with severity of damage in the nerve and with the rat's behavior during sensory testing. The goal of this research is to improve medical care for patients with chronic neuropathic pain, and facilitate research by identifying "biomarkers" that can be used as surrogate measures for the presence of neuropathic pain.

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

- **Project Title: NEUROGENIC CONTROL OF COCHLEAR BLOOD FLOW**
  
  Principal Investigator & Institution: Wangemann, a P.; Father Flanagan's Boys' Home Boys Town, Ne 68010
  
  Timing: Fiscal Year 2001
  
  Summary: This project will focus on the neurogenic regulation of cochlear blood flow and on the interactions between neurogenic and endothelium-mediated mechanisms. Receptors controlling vascular diameter of the spiral modiolar artery and the identity of locally released vasoactive substances will be determined. Locally-released vasoactive substances will include those from neuronal elements innervating the spiral modiolar artery and those from endothelial cells lining the lumen of this vessel. The spiral modiolar artery is the main blood supply of the cochlea. Aberrations in the regulation of
Studies 37

cochlear blood flow have been suspected to play a major part in the etiology of a variety of inner ear disorders including sudden and fluctuating hearing loss, Meniere's disease, tinnitus and autoimmune-related hearing loss. Fundamental to these etiologies are the receptors present on the cochlear blood vessels and their function in the regulation of cochlear blood flow. Hypotheses pertaining to the presence of receptors and to the identity of released vasoactive substances will be tested with a functional assay based on newly-developed in vitro preparations of the isolated spiral modiolar artery. The vascular diameter and the release of vasoactive substance from neuronal elements and from the endothelium will be measured. The measurement of the vascular diameter is the most physiologically-relevant parameter since change in the vascular diameter is the single most effective means of regulating blood flow. Receptors will be determined pharmacologically utilizing selective agonists and antagonists. Release of neurotransmitter from neuronal elements which remain with the isolated spiral modiolar artery will be triggered by electric field stimulation. The identity of the released neurotransmitters will be determined by their functional effect on their respective target receptors and by a highly specific bioluminescence assay. All techniques are well established in this laboratory. This project evolved out of the previous one on isolated medial efferent nerve terminals. Common to both projects is the focus on the function of isolated nerve terminals. Whereas the experimental access was previously limited to prejunctional processes, the proposed studies include both pre- and post-junctional mechanisms and their complex interactions leading to the regulation of cochlear blood flow. The completion of the proposed studies are expected to provide a foundation for the pharmacologic management of inner ear disorders.

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

- Project Title: NEUROTRANSMITTERS IN THE AUDITORY SYSTEM
Principal Investigator & Institution: Potashner, Steven J.; Professor; Anatomy; University of Connecticut Sch of Med/Dnt Bb20, Mc 2806 Farmington, Ct 060302806
Timing: Fiscal Year 2001; Project Start 01-DEC-1990; Project End 30-JUN-2004
Summary: Our long-term goal is to understand the changes in the brain after an injury to the adult auditory system consisting of the ablation of one cochlea and sensorineural hearing loss. This injury initially destroyed the cochlear nerve, which carried cochlear excitation into the brain. Subsequently, the injury induced growth of new synapses, changes of synaptic strengths, and axonal and synaptic pruning in brain stem auditory nuclei. Since these plasticities may produce pathologic symptoms, such as tinnitus, rehabilitating the system after injury could depend on control of the mechanisms underlying plasticity. Because plastic changes and the mechanisms which generate them are poorly understood, we wish to identify more plastic changes, the signals that induce them, and the biochemical transduction pathways that link the signals to the plasticities. First, we will study synaptic rearrangements in the young adult guinea pig superior olive after cochlear ablation, using histological methods. Next, using neurochemical methods, we will study the auditory brain stem nuclei of adult guinea pigs, including the subdivisions of the cochlear nucleus, the nuclei of the superior olive, and the inferior colliculus. We will evaluate candidate signals, such as altered synaptic excitation, altered, neurotrophic support, and injury, each transduced through distinct second messenger pathways. We will determine if protein kinases, employed by second messenger pathways that transduce synaptic excitation and neuronal depolarization, can regulate synaptic activities in the brain stem auditory nuclei. We will also determine if protein kinases are involved in changes of synaptic strength after cochlear ablation. We will determine if neurotrophic support is available and can regulate synaptic
activities in the brain stem auditory nuclei, if it is altered after cochlear ablation, and if it is involved in postlesion changes of synaptic strength. We will determine if transduction of altered neuronal excitation and neurotrophic support regulate nuclear factors that may induce plasticity through regulation of gene expression. Finally, we will determine if cochlear ablation activates second messenger pathways that transduce signals of injury to regulate nuclear factors that may change gene expression and induce degenerative pruning.

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- **Project Title: NOVEL INNER EAR DRUG DELIVERY SYSTEM**
  Principal Investigator & Institution: Petelenz, Tomasz J.; Sarcos Research Corporation
  360 Wakara Wy Salt Lake City, Ut 84108
  Timing: Fiscal Year 2002; Project Start 01-SEP-2002; Project End 28-FEB-2003
  Summary: (provided by applicant): Sarcos Research Corporation proposes a novel microinfusion system for administration of medications for treatment of middle ear and cochlear diseases, such as sudden hearing loss, Menieres disease, instances of tinnitus, and for providing pharmacological hearing protection in chemotherapy. Methods that are currently in use cause systemic toxicity, do not provide sufficient dose control (injections, wicks) or are impractical (waist-mounted pumps) and expensive. The proposed system will be small size, light-weight, will fit safely and comfortably behind the patient's ear, and will deliver medications into the middle ear in precise, controlled programmable and convenient manner, increasing effectiveness, reducing side effects and improving compliance with the therapy. In the future, the system will evolve into a totally implantable unit for treatment of chronic and/or recurrent conditions. In addition to improving the existing treatment regimens, the system will enable application of chronotherapy and other temporal dose patterns to increase effectiveness and reduce side effects, and will allow administration of medications in the head-and-neck area for treatment of cancer in both hospital and at-home settings. For this application, Sarcos will adapt its microinfusion pump and microcatheter technologies to create a system that will consist of a micropump, a programmer with a wireless data link, and a drug delivery catheter. Due to the significant advancement of the already developed technology base that is available at Sarcos for this project, and in order to accelerate the development of the commercial product, Sarcos proposes a joint Phase I/II (Fast Track) effort that will result in a validated system ready for commercialization and clinical implementation. Phase I of this project will result in a definitive feasibility prototype, whereas the projected Phase II will end with a commercial product and completed regulatory submission to the FDA. The proposed system will have significant health and economic impact as it is estimated that more than 28 millions Americans suffer from preventable hearing loss, at least 3 million are affected by Menieres disease, and 40 to 45 million have life-impairing tinnitus, resulting in an estimated cost of lost productivity that exceeds 30 billion dollars per year.
  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

- **Project Title: PERIPHERAL AND CENTRAL MECHANISMS OF TINNITUS GENERATION**
  Principal Investigator & Institution: Bauer, Carol A.; Associate Professor; Surgery; Southern Illinois University Sch of Med Box 19616, 801 Rutledge St Springfield, Il 62794
  Timing: Fiscal Year 2002; Project Start 25-APR-2002; Project End 31-MAR-2007
Summary: This study is designed to investigate the aspects of peripheral and central auditory pathology that are necessary for the development of tinnitus. Tinnitus is considered to be a serious, often debilitating handicap. Chronic tinnitus is a symptom experienced by 35% of the U.S. population and 10% of people with chronic tinnitus consider the problem to be severe and to significantly interfere with activities of daily life. Although there has been increased interest in studying tinnitus over the last decade, understanding the pathophysiology of chronic tinnitus remains rudimentary. Consequently there are no uniformly effective treatments for this disorder. The current research will use an animal model of a common type of tinnitus to explore factors that may be critical to developing the phantom auditory perception. Tinnitus will be induced in animals by exposure to noise sufficient induce hearing loss. The tinnitus will be detected and characterized in individual subjects using established psychophysical behavioral techniques. The qualitative aspects of tinnitus will be measured and correlated with functional and morphological changes in the cochlea induced by the noise exposure. Cochlear function will be measured with auditory brainstem response testing and distortion product otoacoustic emissions, and the pattern of noise-induced hair cell damage evaluate with electron microscopy. This study will determine if noise-induced tinnitus is associated with a specific pattern of cochlear damage. The model will also be used to investigate the contribution of the dorsal cochlear nucleus (DCN) to the development of tinnitus. The DNA is an auditory structure in the brainstem that has been implicated as a potential tinnitus generation site. The current research will directly test this notion by examining the effect of DNA ablation on the auditory perception of tinnitus. This research intends to answer fundamental questions concerning mechanisms of tinnitus generation. Safe and efficacious therapy for this prevalent and often debilitating problem can only occur with improved understanding of the disorder.

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• Project Title: PHARMACOLOGY OF NEUROTRANSMITTERS IN HAIR CELL ORGAN: INNER EAR

Principal Investigator & Institution: Sewell, William F.; Massachusetts Institute of Technology Cambridge, Ma 02139

Timing: Fiscal Year 2001

Summary: The primary sensory cell of the inner ear (the hair cell) releases a neurotransmitter to excite auditory nerve fibers. The identification of this transmitter, which may not be one of the known neurotransmitters, is the goal of this project. We have purified, from hair cell tissue and from retina, a substance that can excite afferent nerve fibers innervating hair cells. This substance appears to be a potent, unstable, unknown excitatory amino acid with pharmacological activity similar to glutamate; however, it is clearly not glutamate or any other commonly studied substance. The goals are to identify the chemical structure of the excitatory substance, to analyze its distribution in hair cell organs and in the nervous system and to determine its role in hair cell organ function. In addition to the intrinsic intellectual importance of identifying the neurotransmitter released by hair cells, this work may have significant practical implications for otolaryngology and should have widespread importance for areas of neurobiology beyond the auditory system. If it is possible to develop drugs with some specificity for vestibular fibers, a treatment for motion sickness and intractable vertigo would likely result. Judicious use of a drug with specificity for the auditory system might alleviate some forms of peripheral tinnitus. The excitatory amino acid we have isolated from hair cell tissue and from retina is a good candidate to be a neurotransmitter in other parts of the nervous system; we already know that it is
concentrated in inner ear and in retina. If it is localized discretely within the nervous system, it will almost assuredly provide a means of selectively studying transmission and function of other regions of the nervous system.

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

• **Project Title: PLASTICITY IN THE DORSAL COCHLEAR NUCLEUS**
  Principal Investigator & Institution: Emadi, Gulamali A.; Biomedical Engineering; Johns Hopkins University 3400 N Charles St Baltimore, Md 21218
  Timing: Fiscal Year 2002; Project Start 15-SEP-2002; Project End 30-JUN-2004
  Summary: (provided by applicant): The proposed research will examine plasticity of responses in the dorsal cochlear nucleus (DCN), one of the first sites of integrative processing within the auditory system. The strengths of inputs from somatosensory brainstern nuclei into the DCN will be manipulated using variations of established protocols for inducing long-term synaptic changes in other brain regions, including but not limited to tetanic electrical stimulation of the input pathways. Input through the somatosensory pathways will be used to investigate whether plastic changes of sound-evoked responses can be induced in the DCN. Finally, the sites of plastic changes will be examined using pharmacological manipulations and stimulation at selected sites within the somatosensory-DCN pathway. This research will provide insight into the association between the somatosensory and auditory systems and into the overall function of the DCN. The work will contribute to the general understanding of the mechanisms and functional significance of plastic changes within the brain, which are relevant to normal development, to pathology (such as somatic tinnitus), and to recovery after damage.
  Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

• **Project Title: RECOVERY OF DAMAGE TO THE VESTIBULAR-AUDITORY SYSTEM**
  Principal Investigator & Institution: Barmack, Neal H.; Senior Scientist and Professor; Neurology; Oregon Health & Science University Portland, or 972393098
  Timing: Fiscal Year 2001; Project Start 01-JUL-1994; Project End 30-NOV-2003
  Summary: Partial recovery of function following a unilateral labyrinthectomy (UL), termed "vestibular compensation," has served as a model for investigations of subcellular investigations of central nervous system plasticity. Previous studies of compensation have "targeted" particular genes for study, using immunohistochemical and hybridization histochemical probes. Rather than target a particular genes, we propose to use the technique of "differential display" (DD-PCR) to screen gene products isolated from vestibular-and auditory-related regions the rabbit brain. Unlike the "targeted gene" approach, DD-PCR screens all differentially transcribed gene products. First, we will screen Scarpa's ganglion, medial vestibular nucleus, nodulus and inferior colliculus following UL. Since the primary vestibular-auditory afferent projects to the nodules and the DCN are unilateral, the structures on the side of the UL will receive a decreased primary afferent input and those on the intact side will receive a normal input. Second, we will use oligonucleotide probes identified by DD-PCR to reveal the tissue distribution and the time course of changes in tissue distribution of different mRNAs in animals that have received a UL. Third, promising molecules will be studied under more physiological conditions. Maintained static tilt will be used to provide asymmetric vestibular stimulation. Unilateral removal of the ossicular chain will be used to create asymmetric acoustic stimulation. Horizontal optokinetic stimulation will be used to provide asymmetric visual climbing fiber inputs to the nodulus. The
optokinetic inputs will allow us to screen molecules that are differential expressed in the same structure, the nodulus, under stimulus conditions mediate db two different afferent pathways. Fourth, in analogous screening experiment at the protein level we will use two-dimensional electrophoresis to screen for proteins that are differential expressed following UL. Fifth, some molecules may participate in compensation or plasticity merely by changing their distribution within a cell rather than by changing expression. We will examine such a molecule, PKC-delta, in "activated" Purkinje cells using combined physiological, immunohistochemical and ultrastructural methods. Gene products uncovered by these experiments might play a role in both vestibular and auditory adaptation and provide important clues for the pharmacological treatment of central neural disorders such as motion sickness and tinnitus.

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

• Project Title: SOURCE LOCALIZATION OF AUDITORY STEADY STATE RESPONSE
Principal Investigator & Institution: Reyes, Samuel D.; Neurology; State University of New York at Buffalo Suite 211 Ub Commons Amherst, Ny 14228
Timing: Fiscal Year 2001; Project Start 26-SEP-2000; Project End 31-AUG-2003
Summary: (from applicant's abstract): The auditory steady state response (aSSR) is an electrophysiologic measure of hearing that is gaining increased clinical use as an objective measure of audiologic threshold. Recent reports also suggest dysrhythmias in synchronizing activity related to aSSRs may be a common mechanism in chronic pain, Parkinson's disease, and tinnitus. However, the generators of this potential are not fully understood. A more thorough understanding of the neuroanatomy and dynamics of the SSRs will improve their diagnostic value and may lead to new treatment methods for these conditions. The goal of this study is to map the areas and sequence of activation in the brain generating aSSR. Specifically, we will: 1. Use positron emission tomography (PET) to determine the location and distribution of neural structures involved in generating the aSSR. 2. Construct dynamic maps of the location and temporal sequence of activation in the neural network generating the aSSR by combining PET and EEG source localization methods. The electrical activity of the brain during the aSSR will be recorded from the scalp in eight subjects using a 64 channel computerized EEG system. MRI from each subject will provide a detailed anatomic image, clearly segmenting skin, skull, CSF, white matter, and gray matter. The MRI image will be used to construct realistic head models for performing EEG source localization and will serve as a common anatomical space in which to compare PET and EEG data. PET data will be collected using the same stimulus used to elicit the aSSR in the EEG recordings. PET data will also be collected for a quiet resting condition. Comparing the PET data for the aSSR and baseline conditions for significant activations will allow the determination of the neural structures involved in generating the aSSR. EEG source localization constrained by the PET data will then be used to create dynamic maps of the aSSR. These dynamic maps will show the contribution of each structure and the sequence of activation involved in generating the aSSR.
Website: http://crisp.cit.nih.gov/crisp/Crisp_Query.Generate_Screen

• Project Title: TONOTOPIC VARIATIONS IN MECHANO-ELECTRIC TRANSDUCTION
Principal Investigator & Institution: Ricci, Anthony J.; Assistant Professor; Neuroscience Ctr of Excellence; Louisiana State Univ Hsc New Orleans New Orleans, La 70112
Timing: Fiscal Year 2003; Project Start 01-JAN-1999; Project End 31-DEC-2007
Summary: (provided by applicant): A mechanical tuning mechanism located in the sensory hair cell bundle and intimately associated with the mechano-electric transducer (MET) channels has been described. Termed fast adaptation, this calcium-dependent process has been postulated to underlie in part the cochlea active process, the mechanism responsible for the exquisite sensitivity of the auditory system. Perturbations of this system might result in elevated thresholds, temporary threshold shifts and tinnitus. Understanding the mechanisms responsible for the generation and regulation of adaptation of mechano-electric transduction is therefore critical if the long term goal is to design therapeutic treatments for these maladies. To this end, experiments are designed to quantitatively address several critical issues pertaining to the generation and regulation of the tonotopic variations in fast adaptation. The first goal is to determine if intrinsic differences in MET channels exist between high and low frequency cells, specifically focusing on channel kinetics and single channel properties. An interaction between MET channels, probably through summation of intraciliary calcium has been postulated as a mechanism underlying the tonotopic differences. Experiments are designed to directly test this hypothesis by coupling multiphoton imaging with electrophysiological recordings. A slower component of adaptation has been described that results in an increase in hair bundle compliance. This slow component may serve to prevent saturation and mechanical damage of the sensory hair bundle. Preliminary data suggests this component may be triggered by an intracellular release of stored calcium, and perhaps operate via a myosin motor, experiments are designed to characterize the mechanisms responsible for generating and the biochemical regulation of this slow form of adaptation. Hair cell calcium channels regulate membrane excitability and dictate transmitter release. Differential regulation of calcium channels based on which function the channels serves may be an important tool for signal processing. Characterization of the biophysical, pharmacological and biochemical properties of these channels is the fourth goal of this project and should yield some exciting new information regarding signal processing.

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

E-Journals: PubMed Central

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). Access to this growing archive of e-journals is free and unrestricted. To search, go to http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Pmc, and type “tinnitus” (or synonyms) into the search box. This search gives you access to full-text articles. The following is a sample of items found for tinnitus in the PubMed Central database:

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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.
• **Effectiveness of Ginkgo biloba in treating tinnitus: double blind, placebo controlled trial.** by Drew S, Davies E.; 2001 Jan 13; http://www.pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=26593

• **Long-term reductions in tinnitus severity.** by Folmer RL.; 2002; http://www.pubmedcentral.gov/articlerender.fcgi?tool=pmcentrez&artid=128822


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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. 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.

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

• **A biochemical model of peripheral tinnitus.**
  Author(s): Sahley TL, Nodar RH.

• **A critical analysis of directive counselling as a component of tinnitus retraining therapy.**
  Author(s): Wilson PH, Henry JL, Andersson G, Hallam RS, Lindberg P.

• **A protocol of study for tinnitus in childhood.**
  Author(s): Savastano M.

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  Author(s): Depauw P, Caektebeke J, Vanhoenacker P.

• **Objective tinnitus associated with essential laryngeal myoclonus: report of two cases.**
  Author(s): Bertholon P, Convers P, Antoine JC, Mayaud R, Prades JM, Michel D, Martin C.

• **Objective tinnitus caused by an aberrant internal carotid artery.**

• **Objective tinnitus in children.**
  Author(s): Fritsch MH, Wynne MK, Matt BH, Smith WL, Smith CM.

• **Objective tinnitus in patients with atherosclerotic carotid artery disease.**
  Author(s): Sismanis A, Stamm MA, Sobel M.

• **Objective tinnitus resulting from internal carotid artery stenosis.**
  Author(s): Carlin RE, McGraw DJ, Anderson CB.
• On the evidence of auditory evoked magnetic fields as an objective measure of tinnitus.
  Author(s): Colding-Jorgensen E, Lauritzen M, Johnsen NJ, Mikkelsen KB, Saermark K.

• Organization of tinnitus management in Poland.
  Author(s): Skarzynski H, Rogowski M, Bartnik G, Fabijanska A.

• Orthostatic tinnitus: an otologic presentation of spontaneous intracranial hypotension.
  Author(s): Arai M, Takada T, Nozue M.

• Otosclerosis and chronic tinnitus.
  Author(s): Gristwood RE, Venables WN.

• Outcome after microvascular decompression for typical trigeminal neuralgia, hemifacial spasm, tinnitus, disabling positional vertigo, and glossopharyngeal neuralgia (honored guest lecture).
  Author(s): Jannetta PJ.

• Outcome of using magnetic resonance imaging as an initial screen to exclude vestibular schwannoma in patients presenting with unilateral tinnitus.
  Author(s): Dawes PJ, Basiouny HE.

• Palatal myoclonus as a cause of objective tinnitus: a report of six cases and a review of the literature.
  Author(s): Seidman MD, Arenberg JG, Shirwany NA.
• **Paroxetine in the treatment of tinnitus.**  
  Author(s): Christensen RC.  

• **Pathophysiology of tinnitus.**  
  Author(s): Moller AR.  

• **Patient-based outcomes in patients with primary tinnitus undergoing tinnitus retraining therapy.**  
  Author(s): Berry JA, Gold SL, Frederick EA, Gray WC, Staecker H.  

• **Perspectives on tinnitus.**  
  Author(s): Tyler RS.  

• **Pharmacological approach of tinnitus.**  
  Author(s): Oestreicher E.  

• **Positron emission tomography of cortical centers of tinnitus.**  
  Author(s): Mirz F, Pedersen B, Ishizu K, Johannsen P, Ovesen T, Stodkilde-Jorgensen H, Gjedde A.  
  Source: Hearing Research. 1999 August; 134(1-2): 133-44.  

• **Postdural puncture tinnitus.**  
  Author(s): Wong AY, Irwin MG.  
• **Prevalence and 5-year incidence of tinnitus among older adults: the epidemiology of hearing loss study.**

• **Prevalence and characteristics of tinnitus in older adults: the Blue Mountains Hearing Study.**
  Author(s): Sindhusake D, Mitchell P, Newall P, Golding M, Rochtchina E, Rubin G.

• **Psychiatric comorbidity in a population of outpatients affected by tinnitus.**

• **Psychiatric disorders in tinnitus patients without severe hearing impairment: 24 month follow-up of patients at an audiological clinic.**
  Author(s): Zoger S, Svedlund J, Holgers KM.

• **Psychoacoustic characterization of the tinnitus spectrum: implications for the underlying mechanisms of tinnitus.**
  Author(s): Norena A, Micheyl C, Chery-Croze S, Collet L.

• **Psychological aspects of tinnitus and the application of cognitive-behavioral therapy.**
  Author(s): Andersson G.

• **Psychometric adequacy of the Tinnitus Handicap Inventory (THI) for evaluating treatment outcome.**
  Author(s): Newman CW, Sandridge SA, Jacobson GP.
• **Pulsatile and nonpulsatile tinnitus: a systemic approach.**
  Author(s): Marsot-Dupuch K.
  Source: Semin Ultrasound Ct Mr. 2001 June; 22(3): 250-70. Review.

• **Pulsatile tinnitus alleviated by contralateral neck compression: a case report.**
  Author(s): Jun BH, Choi IS, Lee GJ.

• **Pulsatile tinnitus.**
  Author(s): Corr P, Tsheole-Marishane L.

• **Pulsatile tinnitus.**
  Author(s): Sismanis A.

• **Pulsed versus continuous tones for evaluating the loudness of tinnitus.**
  Author(s): Henry JA, Meikle MB.

• **Randomized controlled trial of internet-based cognitive behavior therapy for distress associated with tinnitus.**
  Author(s): Andersson G, Stromgren T, Strom L, Lyttkens L.

• **Re: myths in neurotology, revisited: smoke and mirrors in tinnitus therapy.**
  Author(s): Seidman MD, Keate B.
• **Recent advances in the pharmacological treatment of tinnitus.**
  Author(s): Simpson JJ, Davies WE.

• **Regional cerebral blood flow during tinnitus: a PET case study with lidocaine and auditory stimulation.**
  Author(s): Andersson G, Lyttkens L, Hirvela C, Furmark T, Tillfors M, Fredrikson M.

• **Regional glucose metabolic increases in left auditory cortex in tinnitus patients: a preliminary study with positron emission tomography.**
  Author(s): Wang H, Tian J, Yin D, Jiang S, Yang W, Han D, Yao S, Shao M.

• **Relationships among psychoacoustic judgments, speech understanding ability and self-perceived handicap in tinnitus subjects.**
  Author(s): Newman CW, Wharton JA, Shivapuja BG, Jacobson GP.

• **Reliability and validity of a Danish adaptation of the Tinnitus Handicap Inventory.**
  Author(s): Zachariae R, Mirz F, Johansen LV, Andersen SE, Bjerring P, Pedersen CB.

• **Reliability of self-rated tinnitus distress and association with psychological symptom patterns.**
  Author(s): Hiller W, Goebel G, Rief W.

• **Reliability of tinnitus loudness matches under procedural variation.**
  Author(s): Henry JA, Flick CL, Gilbert A, Ellingson RM, Fausti SA.
• **Reorganization of auditory cortex in tinnitus.**
  Author(s): Muhlnickel W, Elbert T, Taub E, Flor H.

• **Results of combined low-power laser therapy and extracts of Ginkgo biloba in cases of sensorineural hearing loss and tinnitus.**
  Author(s): Plath P, Olivier J.

• **Retest stability of the tinnitus handicap questionnaire.**
  Author(s): Newman CW, Wharton JA, Jacobson GP.

• **Retraining therapy for chronic tinnitus. A critical analysis of its status.**
  Author(s): Kroener-Herwig B, Biesinger E, Gerhards F, Goebel G, Verena Greimel K, Hiller W.

• **Review of pharmacologic treatment of tinnitus.**
  Author(s): Murai K, Tyler RS, Harker LA, Stouffer JL.

• **Role of angiography in the evaluation of patients with pulsatile tinnitus.**
  Author(s): Shin EJ, Lalwani AK, Dowd CF.

• **Selective cochlear neurectomy for debilitating tinnitus.**
  Author(s): Wazen JJ, Foyt D, Sisti M.
• **Self-focused and somatic attention in patients with tinnitus.**  
  Author(s): Newman CW, Wharton JA, Jacobson GP.  

• **Self-reports about tinnitus and about cochlear implants.**  
  Author(s): Noble W.  

• **Similarities between chronic pain and tinnitus.**  
  Author(s): Moller AR.  

• **Similarities between severe tinnitus and chronic pain.**  
  Author(s): Moller AR.  

• **Sleepiness and sleep in elderly persons with tinnitus.**  
  Author(s): Asplund R.  

• **Sodium valproate for tinnitus.**  
  Author(s): Menkes DB, Larson PM.  

• **Somatic (craniocervical) tinnitus and the dorsal cochlear nucleus hypothesis.**  
  Author(s): Levine RA.  

• **Some psychological aspects of tinnitus.**  
  Author(s): Reiss M, Reiss G.  
• Sound stimulation via bone conduction for tinnitus relief: a pilot study.  
  Author(s): Holgers KM, Hakansson BE.  

• Spontaneous carotico-cavernous fistula presenting as pulsatile tinnitus.  
  Author(s): Robertson A, Nicolaides AR, Taylor RH.  

• Spontaneous dissection of the internal carotid artery presenting with pulsatile tinnitus.  
  Author(s): Vories A, Liening D.  

• Spontaneous pulsatile tinnitus secondary to a dural malformation not visualized by magnetic resonance angiography.  
  Author(s): Koenigsberg RA.  

• Standard variant venous dysplasia of the cerebellum in a patient suffering from Muenke's syndrome and tinnitus.  
  Author(s): Dunne AA, Bien S, Folz BJ, Werner JA.  

• Subjective idiopathic tinnitus.  
  Author(s): Billue JS.  

• Subjective pulsatile tinnitus associated with extensive pneumatization of temporal bone.  
  Author(s): Tuz M, Dogru H, Yesildag A.  
• **Sudden-onset tinnitus associated with arterial dissection of the vertebrobasilar system.**
  Author(s): Yokota M, Ito T, Hosoya T, Suzuki Y, Aoyagi M.

• **Support for the central theory of tinnitus generation: a military epidemiological study.**
  Author(s): Attias J, Reshef I, Shemesh Z, Salomon G.

• **Surgical treatment of the high jugular bulb in patients with Meniere's disease and pulsatile tinnitus.**
  Author(s): Couloigner V, Grayeli AB, Bouccara D, Julien N, Sterkers O.

• **Survey of the perceived benefits and shortcomings of a specialist tinnitus clinic.**
  Author(s): Sanchez L, Stephens D.

• **The effect of lidocaine on chronic tinnitus: a quantitative cerebral perfusion study.**
  Author(s): Staffen W, Biesinger E, Trinka E, Ladurner G.

• **The influence of training on tinnitus perception: an evaluation 12 months after tinnitus management training.**
  Author(s): Dineen R, Doyle J, Bench J, Perry A.
- **The management of chronic tinnitus: comparison of an outpatient cognitive-behavioral group training to minimal-contact interventions.**  
  Author(s): Kroner-Herwig B, Frenzel A, Fritsche G, Schilkowsky G, Esser G.  

- **Tinnitus after cycling.**  
  Author(s): Lanczik O, Szabo K, Gass A, Hennerici MG.  

- **Tinnitus after head injury: evidence from otoacoustic emissions.**  
  Author(s): Ceranic BJ, Prasher DK, Raglan E, Luxon LM.  

- **Tinnitus and bruxing.**  
  Author(s): Miyano K.  

- **Tinnitus and impulse noise-induced hearing loss in drop-forgs operators.**  
  Author(s): Sulkowski W, Kowalska S, Lipowczan A, Prasher D, Raglan E.  

- **Tinnitus as an early indicator of permanent hearing loss. A 15 year longitudinal study of noise exposed workers.**  
  Author(s): Griest SE, Bishop PM.  

- **Tinnitus evaluation and treatment: assessment of quality of life indicators.**  
  Author(s): H S.  
• **Tinnitus impact: three different measurement tools.**  
Author(s): Bauch CD, Lynn SG, Williams DE, Mellon MW, Weaver AL.  

• **Tinnitus in 7-year-old children.**  
Author(s): Holgers KM.  

• **Tinnitus loudness matchings in relation to annoyance and grading of severity.**  
Author(s): Andersson G.  

• **Tinnitus reduction using transcutaneous electrical stimulation.**  
Author(s): Steenerson RL, Cronin GW.  

• **Tinnitus retraining therapy.**  
Author(s): Jastreboff PJ.  

• **Tinnitus severity, loudness, and depression.**  
Author(s): Folmer RL, Griest SE, Meikle MB, Martin WH.  

• **Tinnitus. Current evaluation and management.**  
Author(s): Fortune DS, Haynes DS, Hall JW 3rd.  

• **Tinnitus: etiology and management.**  
Author(s): Peifer KJ, Rosen GP, Rubin AM.  
• **Towards an objectification by classification of tinnitus.**
  Author(s): Norena A, Cransac H, Chery-Croze S.

• **Transstympanic management of tinnitus.**
  Author(s): Hoffer ME, Wester D, Kopke RD, Weisskopf P, Gottshall K.

• **Transverse/sigmoid sinus dural arteriovenous fistulas presenting as pulsatile tinnitus.**
  Author(s): Shah SB, Lalwani AK, Dowd CF.

• **Unilateral pulsatile tinnitus relieved by contralateral carotid endarterectomy.**
  Author(s): Norman LK, West PD, Perry PM.

• **Unilateral tinnitus occurring with a peripheral vestibular disorder in the contralateral ear.**
  Author(s): Brookler KH.

• **Unique case of pulsatile tinnitus.**
  Author(s): Harris JP, Horlbeck DM, Brew KH.

• **Update on tinnitus.**
  Author(s): Seidman MD, Jacobson GP.
• **Use of alprazolam for relief of tinnitus. A double-blind study.**
  Author(s): Johnson RM, Brummett R, Schleuning A.

• **Use of homeopathy in the treatment of tinnitus.**
  Author(s): Simpson JJ, Donaldson I, Davies WE.

• **Vagal schwannoma of the cerebello-medullary cistern presenting with hoarseness and intractable tinnitus: a rare case of intra-operative bradycardia and cardiac asystole.**
  Author(s): Sharma RR, Pawar SJ, Dev E, Chackochan EK, Suri N.

• **Validation assessment of a French version of the tinnitus reaction questionnaire: a comparison between data from English and French versions.**
  Author(s): Meric C, Pham E, Chery-Croze S.

• **Valproate-induced tinnitus misinterpreted as psychotic symptoms.**
  Author(s): Reeves RR, Mustain DW, Pendarvis JE.

• **Vascular decompression surgery for severe tinnitus: selection criteria and results.**
  Author(s): Moller MB, Moller AR, Jannetta PJ, Jho HD.

• **Vascular-decompression surgery for severe tinnitus.**
  Author(s): Brookes GB.
• **Venlafaxine and severe tinnitus.**
  Author(s): Ahmad S.

• **Vertigo, hearing loss, and tinnitus.**
  Author(s): Raza SA, Phillipps JJ.

• **Vertigo, tinnitus, and hearing loss in the geriatric patient.**
  Author(s): Kessinger RC, Boneva DV.

• **Vestibular findings in a patient with a history of tinnitus before developing Meniere's disease.**
  Author(s): Brookler KH.

• **Vestibular schwannoma, tinnitus and cellular telephones.**
  Author(s): Hardell L, Hansson Mild K, Sandstrom M, Carlberg M, Hallquist A, Pahlson A.

• **Vitamin B12 deficiency in patients with chronic-tinnitus and noise-induced hearing loss.**
  Author(s): Shemesh Z, Attias J, Ornan M, Shapiro N, Shahar A.

• **What is the effect of translabyrinthine acoustic schwannoma removal upon tinnitus?**
  Author(s): Baguley DM, Moffat DA, Hardy DG.

• **What MR sequences should be used in the evaluation of pulsatile tinnitus?**
  Author(s): Brunberg JA.
CHAPTER 2. NUTRITION AND TINNITUS

Overview

In this chapter, we will show you how to find studies dedicated specifically to nutrition and tinnitus.

Finding Nutrition Studies on Tinnitus

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. 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 “tinnitus” (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 “tinnitus” (or a synonym):

- **A review of randomized clinical trials in tinnitus.**
  Author(s): Department of Otolaryngology-Head and Neck Surgery, The University of Texas Health Science Center at San Antonio, 78284-7777, USA.

- **Acupuncture in the management of tinnitus: a placebo-controlled study.**
  Author(s): Department of Audiology, Sahlgrenska University Hospital, Gothenburg, Sweden.

- **Are there any studies showing whether ginkgo biloba is effective for tinnitus (ringing in the ears)?**

- **Assessing tinnitus and prospective tinnitus therapeutics using a psychophysical animal model.**
  Author(s): Department of Surgery, Southern Illinois University School of Medicine, Springfield 62794, USA. cbauer@siumed.edu

- **Audiological and psychological characteristics of a group of tinnitus sufferers, prior to tinnitus management training.**
  Author(s): School of Communication Disorders, La Trobe University, Australia.

- **Cerebellar arteriovenous malformation with facial paralysis, hearing loss, and tinnitus: a case report.**
  Author(s): Department of Otolaryngology, Kobe City General Hospital, Japan. Masahiro.Kikuchi@ma2.seikyou.ne.jp
  Source: Kikuchi, M Funabiki, K Hasebe, S Takahashi, H Otol-Neurotol. 2002 September; 23(5): 723-6 1531-7129

- **Detrimental effects of alcohol on tinnitus.**
  Author(s): Welsh Hearing Institute, University Hospital of Wales, Heath Park, Cardiff, UK.
  Source: Stephens, D Clin-Otolaryngol. 1999 April; 24(2): 114-6 0307-7772

- **Double-blind study on the effectiveness of a bioflavonoid in the control of tinnitus in otosclerosis.**
  Author(s): Department of Otorhinolaryngology, Semmelweis University Medical School, Budapest, Hungary.

- **Effect of melatonin on tinnitus.**
  Author(s): Ear Research Foundation, Sarasota, Florida 34239, USA.

- **Effect of traditional Chinese acupuncture on severe tinnitus: a double-blind, placebo-controlled, clinical investigation with open therapeutic control.**
  Author(s): Department of Audiology, Vejle Hospital, Denmark.
• **Effectiveness of Ginkgo biloba in treating tinnitus: double blind, placebo controlled trial.**
  Author(s): Pharmacology Department, Division of Neuroscience, University of Birmingham, Birmingham B15 2TT, UK. s.j.drew@bham.ac.uk
  Source: Drew, S Davies, E BMJ. 2001 January 13; 322(7278): 73 0959-8138

• **Efficacy of oral oxpentifylline in the management of idiopathic tinnitus.**
  Author(s): ENT Department, Lewisham Hospital, London, UK.

• **Evaluation of amino-oxyacetic acid as a palliative in tinnitus.**
  Author(s): Department of Pharmacology, Tulane University School of Medicine, New Orleans, LA.

• **Evaluation of tinnitus patients by peroral multi-drug treatment.**
  Author(s): Division of Clinical Otology, University Hospital, University of Tokushima, School of Medicine, Japan.

• **Gabapentin for the treatment of tinnitus: a case report.**
  Author(s): Pain Institute of Northeast Florida, 2021 Kingsley Ave., Suite 102, Orange Park, FL 32073, USA.
  Source: Zapp, J J Ear-Nose-Throat-J. 2001 February; 80(2): 114-6 0145-5613

• **Ginkgo biloba extract for the treatment of tinnitus.**
  Author(s): Department of Audiology, Sahlgren's Hospital, Goteborg, Sweden.

• **Ginkgo biloba for tinnitus: a review.**
  Author(s): Department of Complementary Medicine, School of Postgraduate Medicine and Health Sciences, University of Exeter, UK. E.Ernst@exeter.ac.uk
  Source: Ernst, E Stevinson, C Clin-Otolaryngol. 1999 June; 24(3): 164-7 0307-7772

• **Glutamic acid in the treatment of tinnitus.**

• **Intradermal injection vs. oral treatment of tinnitus.**
  Author(s): Dept. of Medical-Surgical Specialities, Section of Otorhinolaringology, Padua University, via D. Monegario 6/c, 35127 Padova, Italie.
  Source: Savastano, M Tomaselli, F Maggiori, S Therapie. 2001 Jul-August; 56(4): 403-7 0040-5957

• **Misoprostol for tinnitus.**
  Author(s): Pharmaceutical Services, University of California, San Francisco 94143, USA.

• **Neurophysiologic mechanisms of tinnitus.**
  Author(s): Department of Otalaryngology--Head and Neck Surgery, Wayne State University, Detroit, Michigan 48201, USA.
• Progressive sensorineural hearing loss, subjective tinnitus and vertigo caused by elevated blood lipids.
  Author(s): Pulec Ear Clinic and Ear International, Los Angeles, California, USA.
  Source: Pulec, J L; Pulec, M B; Mendoza, I Ear-Nose-Throat-J. 1997 October; 76(10): 716-20, 725-6, 728 passim 0145-5613

• Quinine-induced tinnitus in rats.
  Author(s): Department of Surgery, Yale University School of Medicine, New Haven, Conn.
  Source: Jastreboff, P J; Brennan, J F; Sasaki, C T Arch-Otolaryngol-Head-Neck-Surg. 1991 October; 117(10): 1162-6 0886-4470

• Support for the central theory of tinnitus generation: a military epidemiological study.
  Author(s): Institute for Noise Hazards Research and Evoked Potentials Laboratory, Medical Corps, Petach-Tikva, Israel. attiasj@clalit.org.il
  Source: Attias, J; Reshef, I; Shemesh, Z; Salomon, G Int-J-Audiol. 2002 July; 41(5): 301-7 1499-2027

• Synthetic prostaglandin E1 misoprostol as a treatment for tinnitus.
  Author(s): House Ear Institute, Los Angeles, Calif.

• The effect of nicotinamide on tinnitus: a double-blind controlled study.

• The efficacy of Arlevert therapy for vertigo and tinnitus.
  Author(s): Department of Otolaryngology, University Hospital, Brno-Bohunice, Czech Republic.

• The efficacy of Ginkgo special extract EGb 761 in patients with tinnitus.
  Author(s): Allgemeine Krankenhaus St. Georg. Hamburg, Germany.

• The efficacy of medication on tinnitus due to acute acoustic trauma.
  Author(s): Department of Otorhinolaryngology-Head & Neck Surgery, Aristotelian University of Thessaloniki, General District Hospital AHEPA, Greece.
  Source: Markou, K; Lalaki, P; Barbetakis, N; Tsalighopoulos, M; G Daniilidis, I Scand-Audiol-Suppl. 2001; (52): 180-4 0107-8593

• The role of zinc in management of tinnitus.
  Author(s): Department of ORL and HNS, Gulhane Medical School, Etlik, 06018 Ankara, Turkey. syetiser@yahoo.com
  Source: Yetiser, S; Tosun, F; Satar, B; Arslanhan, M; Akcam, T; Ozkaptan, Y Auris-Nasus-Larynx. 2002 October; 29(4): 329-33 0385-8146

• Tinnitus-induced weight loss in rats. An animal model for tinnitus research.
  Author(s): University ENT Department, Inselospital, Bern, Switzerland.
• Transitory endolymph leakage induced hearing loss and tinnitus: depolarization, biphasic shortening and loss of electromotility of outer hair cells.
  Author(s): Department of Otolaryngology, University of Tubingen, Germany.

• Valproate-induced tinnitus misinterpreted as psychotic symptoms.
  Author(s): Department of Psychiatry, Montgomery VA Medical Center, USA.
  Source: Reeves, R R Mustain, D W Pendarvis, J E South-Med-J. 2000 October; 93(10): 1030-1 0038-4348

• Vitamin B12 deficiency in patients with chronic-tinnitus and noise-induced hearing loss.
  Author(s): Institute of Noise Hazards Research and Evoked Potentials Laboratory, IDF, Chaim-Sheba Medical Center, Ramat-Gan, Israel.

• Zinc and diet for tinnitus.

• Zinc in the management of tinnitus. Placebo-controlled trial.
  Author(s): Audiological and ENT Department, University Hospital of Aarhus, Denmark.

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/
- 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

The following is a specific Web list relating to tinnitus; 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:

- **Vitamins**
  - **Folic Acid/Vitamin B**
    Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
    Hyperlink:
    http://www.wholehealthmd.com/refshelf/substances_view/0,1525,936,00.html
  - **Niacin**
    Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
    Hyperlink:
    http://www.wholehealthmd.com/refshelf/substances_view/0,1525,892,00.html
  - **Vitamin B**
    Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
    Hyperlink:
    http://www.wholehealthmd.com/refshelf/substances_view/0,1525,10067,00.html
  - **Vitamin B12**
    Source: Healthnotes, Inc.; www.healthnotes.com
  - **Vitamin B12**
    Source: Prima Communications, Inc.;www.personalhealthzone.com

- **Minerals**
  - **Magnesium**
    Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Manganese
Source: Integrative Medicine Communications; www.drkoop.com

Vinpocetine
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,10065,00.html

Zinc
Source: Healthnotes, Inc.; www.healthnotes.com

Zinc
Source: Prima Communications, Inc.; www.personalhealthzone.com

Zinc
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,10071,00.html

Zinc/Copper
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,938,00.html

• Food and Diet

Wheat
Source: Healthnotes, Inc.; www.healthnotes.com
CHAPTER 3. ALTERNATIVE MEDICINE AND TINNITUS

Overview

In this chapter, we will begin by introducing you to official information sources on complementary and alternative medicine (CAM) relating to tinnitus. 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 tinnitus 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 “tinnitus” (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 tinnitus:

• A comparison of reaction times to tinnitus and nontinnitus frequencies.
  Author(s): Goodwin PE, Johnson RM.

• A consideration of the effect of ear canal resonance and hearing loss upon white noise generators for tinnitus retraining therapy.
  Author(s): Baguley DM, Beynon GJ, Thornton F.

• A controlled trial of acupuncture in tinnitus.
  Author(s): Marks NJ, Emery P, Onisiphorou C.
• **A controlled trial of hypnotherapy in tinnitus.**
  Author(s): Marks NJ, Karl H, Onisiphorou C.

• **A meta-analytic review of psychological treatments for tinnitus.**
  Author(s): Andersson G, Lyttkens L.

• **A multiple-baseline evaluation of the treatment of subjective tinnitus with relaxation training and biofeedback.**
  Author(s): Kirsch CA, Blanchard EB, Parnes SM.

• **A new method of managing subjective tinnitus.**
  Author(s): Pang LQ, Pang MK, Takumi MM.

• **A practical approach to the treatment of subjective tinnitus.**
  Author(s): Michel RG, Drawbaugh EJ, Pope TH.

• **A review of evidence in support of a role for 5-HT in the perception of tinnitus.**
  Author(s): Simpson JJ, Davies WE.

• **A review of randomized clinical trials in tinnitus.**
  Author(s): Dobie RA.

• **A tinnitus synthesizer physiological considerations.**
  Author(s): Hazell JW.
• **A trial of tinnitus therapy with ear-canal magnets.**  
  Author(s): Coles R, Bradley P, Donaldson I, Dingle A.  

• **Acoustic correlates of tonal tinnitus.**  
  Author(s): Wilson JP, Sutton GJ.  

• **Acupuncture for the alleviation of tinnitus.**  
  Author(s): Thomas M, Laurell G, Lundeberg T.  

• **Acupuncture for tinnitus management.**  
  Author(s): Nilsson S, Axelsson A, Li De G.  

• **Acupuncture for tinnitus: time to stop?**  
  Author(s): Andersson G, Lyttkens L.  

• **Acupuncture in the management of tinnitus: a placebo-controlled study.**  
  Author(s): Axelsson A, Andersson S, Gu LD.  

• **Acupuncture treatment of chronic unilateral tinnitus—a double-blind cross-over trial.**  
  Author(s): Hansen PE, Hansen JH, Bentzen O.  

• **Alterations in average spectrum of cochleoneural activity by long-term salicylate treatment in the guinea pig: a plausible index of tinnitus.**  
  Author(s): Cazals Y, Horner KC, Huang ZW.
• Alternative medications and other treatments for tinnitus: facts from fiction.
  Author(s): Seidman MD, Babu S.

• An alternative method of treating tinnitus: relaxation-hypnotherapy primarily through the home use of a recorded audio cassette.
  Author(s): Brattberg G.

• An approach to the audit of tinnitus management.
  Author(s): Sadlier M, Stephens SD.

• An auditory negative after-image as a human model of tinnitus.
  Author(s): Norena A, Micheyl C, Chery-Croze S.

• An evaluation of relaxation training in the treatment of tinnitus.
  Author(s): Ireland CE, Wilson PH, Tonkin JP, Platt-Hepworth S.

• An experimental evaluation of the effects of transcutaneous nerve stimulation (TNS) and applied relaxation (AR) on hearing ability, tinnitus and dizziness in patients with Meniere's disease.
  Author(s): Scott B, Larsen HC, Lyttkens L, Melin L.

• An investigation of the effect of structured teaching on a group of tinnitus patients after vestibular schwannoma removal.
  Author(s): Baguley DM, Beynon GJ, Moffat DA.
• **Animal models of tinnitus.**
  Author(s): Evans EF, Wilson JP, Borgerwe TA.

• **Are there any studies showing whether ginkgo biloba is effective for tinnitus (ringing in the ears)?**
  Author(s): Feinberg AW.

• **Assessment and treatment of tinnitus patients using a “masking approach.”.**
  Author(s): Schechter MA, Henry JA.

• **Attempts to suppress tinnitus with transcutaneous electrical stimulation.**
  Author(s): Vernon JA, Fenwick JA.

• **Attenuation of salicylate-induced tinnitus by Ginkgo biloba extract in rats.**
  Author(s): Jastreboff PJ, Zhou S, Jastreboff MM, Kwapisz U, Gryczynska U.

• **Audiological and psychological characteristics of a group of tinnitus sufferers, prior to tinnitus management training.**
  Author(s): Dineen R, Doyle J, Bench J.

• **Auditory cortical basis of tinnitus.**
  Author(s): Hoke M, Pantev C, Lutkenhoner B, Lehnertz K.
  Source: Acta Otolaryngol Suppl. 1991; 491: 176-81; Discussion 182.

• **Auditory event related potentials in chronic tinnitus patients with noise induced hearing loss.**
  Author(s): Attias J, Urbach D, Gold S, Shemesh Z.
• **Auditory event related potentials in simulated tinnitus.**  
Author(s): Attias J, Bresloff I, Furman V, Urbach D.  

• **Auditory evoked responses in control subjects and in patients with problem-tinnitus.**  
Author(s): Gerken GM, Hesse PS, Wiorkowski JJ.  

• **Behavioral model of chronic tinnitus in rats.**  
Author(s): Bauer CA, Brozoski TJ, Rojas R, Boley J, Wyder M.  

• **Biofeedback therapy in the treatment of tinnitus.**  
Author(s): Ogata Y, Sekitani T, Moriya K, Watanabe K.  

• **Brain imaging of the effects of lidocaine on tinnitus.**  
Author(s): Reyes SA, Salvi RJ, Burkard RF, Coad ML, Wack DS, Galantowicz PJ, Lockwood AH.  

• **Celebrating a decade of evaluation and treatment: the University of Maryland Tinnitus & Hyperacusis Center.**  
Author(s): Gold SL, Formby C, Gray WC.  

• **Central tinnitus and lateral inhibition: an auditory brainstem model.**  
Author(s): Gerken GM.  

• **Characteristics of patients with gaze-evoked tinnitus.**  
Author(s): Coad ML, Lockwood A, Salvi R, Burkard R.
• **Children's experience of tinnitus: a preliminary survey of children presenting to a psychology department.**  
  Author(s): Kentish RC, Crocker SR, McKenna L.  

• **Client centred hypnotherapy in the management of tinnitus—is it better than counselling?**  
  Author(s): Mason JD, Rogerson DR, Butler JD.  

• **Client-centered hypnotherapy for tinnitus: who is likely to benefit?**  
  Author(s): Mason J, Rogerson D.  

• **Comparison between self-hypnosis, masking and attentiveness for alleviation of chronic tinnitus.**  
  Author(s): Attias J, Shemesh Z, Sohmer H, Gold S, Shoham C, Faraggi D.  

• **Comparison of pulsed and continuous tone thresholds in patients with tinnitus.**  
  Author(s): Hochberg I, Waltzman S.  

• **Comparison of tinnitus masking and tinnitus retraining therapy.**  
  Author(s): Henry JA, Schechter MA, Nagler SM, Fausti SA.  

• **Comprehensive behavioral management of complex tinnitus: a case illustration.**  
  Author(s): Duckro PN, Pollard CA, Bray HD, Scheiter L.
• **Contralateral suppression of transient evoked otoacoustic emissions: intra-individual variability in tinnitus and normal subjects.**
  Author(s): Graham RL, Hazell JW.

• **Contralateral suppression of transiently evoked otoacoustic emissions and tinnitus.**
  Author(s): Chery-Croze S, Truy E, Morgon A.

• **Covariation of tinnitus pitch and the associated emission: a case study.**
  Author(s): Penner MJ, Glotzbach L.

• **Current concepts in the clinical management of patients with tinnitus.**
  Author(s): Parnes SM.

• **Descending auditory system/cerebellum/tinnitus.**
  Author(s): Shulman A, Strashun A.

• **Double-blind study on the effectiveness of a bioflavonoid in the control of tinnitus in otosclerosis.**
  Author(s): Sziklai I, Komora V, Ribari O.

• **Effect of hyperbaric oxygen therapy in comparison to conventional or placebo therapy or no treatment in idiopathic sudden hearing loss, acoustic trauma, noise-induced hearing loss and tinnitus. A literature survey.**
  Author(s): Lamm K, Lamm H, Arnold W.
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  Author(s): Haginomori S, Makimoto K, Araki M, Kawakami M, Takahashi H.

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  Author(s): Vilholm OJ, Moller K, Jorgensen K.

• Effective treatment of tinnitus through hypnotherapy.
  Author(s): Marlowe Fl.

• Effectiveness of Ginkgo biloba in treating tinnitus: double blind, placebo controlled trial.
  Author(s): Drew S, Davies E.

• Effects of (-)-baclofen, clonazepam, and diazepam on tone exposure-induced hyperexcitability of the inferior colliculus in the rat: possible therapeutic implications for pharmacological management of tinnitus and hyperacusis.
  Author(s): Szczepaniak WS, Moller AR.

• Effects of EMG and thermal feedback training on tinnitus: a case study.
  Author(s): Elfiier LF, May JG, Moore JD, Mendelson JM.

• Efficacy of acupuncture as a treatment for tinnitus: a systematic review.
  Author(s): Park J, White AR, Ernst E.
Efficacy of biofeedback in the treatment of tinnitus: some considerations.
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Author(s): Aran JM, Cazals Y.

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Author(s): Hazell JW, Meerton LJ, Conway MJ.

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Author(s): Dobie RA, Hoberg KE, Rees TS.
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Author(s): Jacobson GP, Calder JA, Newman CW, Peterson EL, Wharton JA, Ahmad BK.

Elevated fusiform cell activity in the dorsal cochlear nucleus of chinchillas with psychophysical evidence of tinnitus.
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EMG biofeedback in the treatment of tinnitus: an experimental evaluation.
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Evidence for a cochlear origin for acoustic re-emissions, threshold fine-structure and tonal tinnitus.
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External electrical tinnitus suppression: a review.
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Author(s): Arnold W, Bartenstein P, Oestreicher E, Romer W, Schweiger M.

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  Author(s): Ernst E, Stevinson C.  

• **Ginkgo ineffective for tinnitus.**  
  Author(s): DeBisschop M.  

• **Health and Nutrition Examination Survey of 1971-75: Part II. Tinnitus, subjective hearing loss, and well-being.**  
  Author(s): Cooper JC Jr.  

• **Homolateral and contralateral masking of tinnitus by noise-bands and by pure tones.**  
  Author(s): Feldmann H.  

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  Author(s): Kaltenbach JA, Afman CE.  

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• **Hypnosis for tinnitus.**  
  Author(s): GUILD J.  

• **Idiopathic Subjective Tinnitus Treated by Amitriptyline Hydrochloride/Biofeedback.**  
  Author(s): Podoshin L, Ben-David Y, Fradis M, Malatskey S, Hafner H.  

• **Idiopathic subjective tinnitus treated by biofeedback, acupuncture and drug therapy.**  
  Author(s): Podoshin L, Ben-David Y, Fradis M, Gerstel R, Felner H.  

• **Impact of a relaxation training on psychometric and immunologic parameters in tinnitus sufferers.**  
  Author(s): Weber C, Arck P, Mazurek B, Klapp BF.  

• **Incurrence and alterations in contralateral tinnitus following monaural exposure to a pure tone.**  
  Author(s): Young IM, Lowry LD.  

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  Author(s): Letowski TR, Thompson MV.  

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  Author(s): Dauman R, Tyler RS, Aran JM.  
  Source: Acta Oto-Laryngologica. 1993 May; 113(3): 291-5.  

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  Author(s): Landis B, Landis E.

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  Author(s): Penner MJ.

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  Author(s): Kadner A, Viirre E, Wester DC, Walsh SF, Hestenes J, Vankov A, Pineda JA.

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  Author(s): Melcher JR, Sigalovsky IS, Guinan JJ Jr, Levine RA.
  Source: Journal of Neurophysiology. 2000 February; 83(2): 1058-72.

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  Author(s): Ince LP, Greene RY, Alba A, Zaretsky HH.

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  Author(s): Tan J, Tange RA, Dreschler WA, vd Kleij A, Tromp EC.

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  Author(s): House JW.
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  Author(s): Shea JJ, Harell M.
  Source: The Laryngoscope. 1978 September; 88(9 Pt 1): 1477-84.

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  Author(s): Penner MJ.

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  Author(s): Vernon JA.

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  Author(s): Penner MJ, Klafter EJ.

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  Author(s): Mitchell CR, Vernon JA, Creedon TA.
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  Author(s): Howard ML.
  Source: Otology & Neurotology : Official Publication of the American Otological
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  Author(s): Eichhammer P, Langguth B, Marienhagen J, Kleinjung T, Hajak G.
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  Author(s): Ambrosino SV.
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  Author(s): Eggermont JJ.

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  Author(s): Wilson JP.

• Personality of the tinnitus patient.
  Author(s): House PR.

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  Author(s): Kemp DT.

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  Author(s): Andersson G.
• **Psychological aspects of tinnitus and the application of cognitive-behavioral therapy.**
  Author(s): Andersson G.

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  Author(s): Collet L, Moussu MF, Dubreuil C, Disant F, Chanal JM, Morgon A.
  Source: Arch Otorhinolaryngol. 1987; 244(1): 20-2.

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  Author(s): Attias J, Shemesh Z, Bleich A, Solomon Z, Bar-Or G, Alster J, Sohmer H.

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  Author(s): Scott B, Lindberg P, Lyttkens L, Melin L.

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  Author(s): White TP, Hoffman SR, Gale EN.

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  Author(s): Andersson G, Lyttkens L, Hirvela C, Furmark T, Tillfors M, Fredrikson M.

• **Relaxation-biofeedback in the treatment of tinnitus.**
  Author(s): Carmen R, Svihovec D.

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  Author(s): Henry JA, Flick CL, Gilbert A, Ellingson RM, Fausti SA.
• **Reorganization of auditory cortex in tinnitus.**  
  Author(s): Muhlnickel W, Elbert T, Taub E, Flor H.  

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  Author(s): Plath P, Olivier J.  

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  Author(s): Beard AW.  

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  Author(s): Kroener-Herwig B, Biesinger E, Gerhards F, Goebel G, Verena Greimel K, Hiller W.  

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  Author(s): House JW, Miller L, House PR.  

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  Author(s): Penner MJ, Saran A.
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  Author(s): House JW.

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  Author(s): Walsh WM, Gerley PP.

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  Author(s): Ceranic BJ, Prasher DK, Raglan E, Luxon LM.

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  Author(s): Oliveira CA, Venosa A, Araujo MF.  

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• **Treatment of subjective tinnitus with biofeedback.**  
  Author(s): Grossan M.
• Treatment of tinnitus by intratympanic instillation of lignocaine (lidocaine) 2 per cent through ventilation tubes.
  Author(s): Podoshin L, Fradis M, David YB.

• Treatment of tinnitus with alternative therapy.
  Author(s): Bentzen O.

• Treatment of tinnitus with electrical stimulation.
  Author(s): Steenerson RL, Cronin GW.

• Treatment of tinnitus.
  Author(s): Busis SN.

• Trial of an extract of Ginkgo biloba (EGB) for tinnitus and hearing loss.
  Author(s): Coles R.

• Use of homeopathy in the treatment of tinnitus.
  Author(s): Simpson JJ, Donaldson I, Davies WE.

• Variability in matches to subjective tinnitus.
  Author(s): Penner MJ.

• Vascular decompression of the cochlear nerve in tinnitus sufferers.
  Author(s): Meyerhoff WL, Mickey BE.

- Vertigo, tinnitus, and hearing loss in the geriatric patient.
  Author(s): Kessinger RC, Boneva DV.

Additional Web Resources

A number of additional Web sites offer encyclopedic information covering CAM and related topics. The following is a representative sample:

- AOL: http://search.aol.com/cat.adp?id=169&layer=&from=subcats
- Chinese Medicine: http://www.newcenturynutrition.com/
- Family Village: http://www.familyvillage.wisc.edu/med_altn.htm
- Google: http://directory.google.com/Top/Health/Alternative/
- Healthnotes: http://www.healthnotes.com/
- 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

The following is a specific Web list relating to tinnitus; 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

  Iron-Deficiency Anemia
  Source: Healthnotes, Inc.; www.healthnotes.com

  Tinnitus
  Source: Healthnotes, Inc.; www.healthnotes.com
Vertigo
Source: Healthnotes, Inc.; www.healthnotes.com

- Alternative Therapy

  Acupuncture
  Source: Healthnotes, Inc.; www.healthnotes.com

  Acupuncture
  Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
  Hyperlink:
  http://www.wholehealthmd.com/refshelf/substances_view/0,1525,663,00.html

  Biofeedback
  Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
  Hyperlink:
  http://www.wholehealthmd.com/refshelf/substances_view/0,1525,675,00.html

  Craniosacral Therapy
  Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
  Hyperlink:
  http://www.wholehealthmd.com/refshelf/substances_view/0,1525,685,00.html

- Mind & Body Medicine
  Source: Integrative Medicine Communications; www.drkoop.com

- Chinese Medicine

  Anshen Buxin Wan
  Alternative names: Anshen Buxin Pills
  Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

  Bushen Yinao Pian
  Alternative names: Bushen Yinao Tablets
  Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

  Cishi
  Alternative names: Magnetite; Magnetitum
  Source: Chinese Materia Medica

  Dabuyin Wan
  Alternative names: Dabuyin Pills
  Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

  Daige San
  Alternative names: Daige Powder
  Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China
**Danggui Longhui Wan**  
Alternative names: Danggui Longhui Pills  
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Dihuang**  
Alternative names: Digitalis Leaf; Yangdihuangye; Folium Digitalis  
Source: Chinese Materia Medica

**Erlong Zuoci Wan**  
Alternative names: Erlong Zuoci Pills; Erlong Zuoci Wan (Er Long Zuo Ci Wan)  
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Erzhi Wan**  
Alternative names: Erzhi Pills; Erzhi Wan (Er Zhi Wan)  
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Gengnian'an Pian**  
Alternative names: Gengnian'an Tablets  
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Gouqizi**  
Alternative names: Barbary Wolfberry Fruit; Fructus Lycii  
Source: Chinese Materia Medica

**Gusuibu**  
Alternative names: Fortune’s Drynaria Rhizome; Rhizoma Drynariae  
Source: Chinese Materia Medica

**Heizhima**  
Alternative names: Black Sesame; Semen Sesami Nigrum  
Source: Chinese Materia Medica

**Heizhongcaozi**  
Alternative names: Fennelflower Seed; Semen Nigellae  
Source: Chinese Materia Medica

**Heshi**  
Alternative names: Wild Carrot Fruit; Nanheshi; Fructus Carotae  
Source: Chinese Materia Medica

**Heshouwu**  
Alternative names: Fleeceflower Root; Radix Polygoni Multiflori  
Source: Chinese Materia Medica
**Longdan Xiegan Wan**
Alternative names: Longdan Xiegan Pills
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Lurong**
Alternative names: Hairy Deer-horn (Hairy Antler); Cornu Cervi Pantotrichum
Source: Chinese Materia Medica

**Maiwei Dihuang Wan**
Alternative names: Maiwei Dihuang Pills
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Mohanlian**
Alternative names: Yerbadetajo Herb; Herba Ecliptae
Source: Chinese Materia Medica

**Muli**
Alternative names: Oyster Shell; Concha Ostreae
Source: Chinese Materia Medica

**Nuzhenzi**
Alternative names: Glossy Privet Fruit; Fructus Ligustri Lucidi
Source: Chinese Materia Medica

**Qingning Wan**
Alternative names: Qingning Pills
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Sangshen**
Alternative names: Mulberry Fruit; Fructus Mori
Source: Chinese Materia Medica

**Shan Zhu Yu**
Alternative names: Asiatic Cornelian Cherry Fruit; Fructus Corni
Source: Chinese Materia Medica

**Shenrong Guben Pian**
Alternative names: Shenrong Guben Tablets; Shenrong Guben Pian<br>(Shen Rong Gu Ben Pi An)
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

**Shouwu Wan**
Alternative names: Shouwu Pills; Shouwu Wan<br>(Shou Wu Wan)
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China
Shudihuang
Alternative names: Prepared Rehmannia Root; Radix Rehmanniae Preparata
Source: Chinese Materia Medica

Suoyang Gujing Wan
Alternative names: Suoyang Gujing Pills; Suoyang Gujing Wan<br>(Suo Yang Gu Jing Wan)
Source: Pharmacopoeia Commission of the Ministry of Health, People's Republic of China

Tusizi
Alternative names: Dodder Seed; Semen Cuseutae
Source: Chinese Materia Medica

Zhiheshouwu
Alternative names: Prepared FLeeceflower Root; Radix Polygoni Multiflori Preparata
Source: Chinese Materia Medica

- Homeopathy

Actaea Racemosa
Source: Healthnotes, Inc.; www.healthnotes.com

Calcarea Carbonica
Source: Healthnotes, Inc.; www.healthnotes.com

Carbo Vegetabilis
Source: Healthnotes, Inc.; www.healthnotes.com

China (Chinchona)
Source: Healthnotes, Inc.; www.healthnotes.com

Chininum Sulphuricum
Source: Healthnotes, Inc.; www.healthnotes.com

Cimicifuga
Source: Healthnotes, Inc.; www.healthnotes.com

Graphites
Source: Healthnotes, Inc.; www.healthnotes.com

Kali Carbonicum
Source: Healthnotes, Inc.; www.healthnotes.com

Lycopodium
Source: Healthnotes, Inc.; www.healthnotes.com

Natrum Salicylicum
Source: Healthnotes, Inc.; www.healthnotes.com
Salicylic Acid
Source: Healthnotes, Inc.; www.healthnotes.com

• Herbs and Supplements

Black Cohosh
Source: Prima Communications, Inc.www.personalhealthzone.com

Devil's Claw
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,970,00.html

Feverfew
Source: The Canadian Internet Directory for Holistic Help, WellNet, Health and Wellness Network; www.wellnet.ca

Ginkgo
Alternative names: Ginkgo biloba
Source: Alternative Medicine Foundation, Inc.; www.amfoundation.org

Ginkgo
Source: Prima Communications, Inc.www.personalhealthzone.com

Ginkgo
Source: The Canadian Internet Directory for Holistic Help, WellNet, Health and Wellness Network; www.wellnet.ca

Ginkgo Biloba
Source: Healthnotes, Inc.; www.healthnotes.com

Ginkgo Biloba
Source: Integrative Medicine Communications; www.drkoop.com

Ginkgo Biloba
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,788,00.html

Ligustrum
Alternative names: Ligustrum lucidum
Source: Healthnotes, Inc.; www.healthnotes.com

Maidenhair Tree
Source: Integrative Medicine Communications; www.drkoop.com

Melatonin
Source: Healthnotes, Inc.; www.healthnotes.com

Melatonin
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com
Hyperlink:
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,804,00.html

**Plantago Psyllium**  
Alternative names: Psyllium, Ispaghula; Plantago psyllium/ovata  
Source: Alternative Medicine Foundation, Inc.; www.amfoundation.org

**Salsalate**  
Source: Healthnotes, Inc.; www.healthnotes.com

**Uncaria Asian**  
Alternative names: Asian species; Uncaria sp.  
Source: Alternative Medicine Foundation, Inc.; www.amfoundation.org

**Uva Ursi**  
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com  
Hyperlink:  
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,10063,00.html

**White Willow Bark**  
Source: WholeHealthMD.com, LLC.; www.wholehealthmd.com  
Hyperlink:  
http://www.wholehealthmd.com/refshelf/substances_view/0,1525,10069,00.html

**Willow Bark**  
Alternative names: There are several species of willow including Salix alba, Salix nigra, Salix fragilis, Salix purpurea, Salix babylonica, White Willow, European Willow, Black Willow, Pussy Willow, Crack Willow, Purple Willow, Weeping Willow, Liu-zhi  
Source: Integrative Medicine Communications; www.drkoop.com

**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](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 TINNITUS

Overview

In this chapter, we will give you a bibliography on recent dissertations relating to tinnitus. 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 “tinnitus” (or a synonym) in their titles. To accurately reflect the results that you might find while conducting research on tinnitus, we have not necessarily excluded non-medical dissertations in this bibliography.

Dissertations on Tinnitus

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 tinnitus. 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:

- An Investigation of the Prevalence of Tinnitus in College Music Majors and Nonmusic Majors by Zeigler, Mark Calvin, PhD from The Florida State University, 1997, 244 pages
  http://wwwlib.umi.com/dissertations/fullcit/9735829

- Efficacy of Tinnitus Retraining Therapy by Alexander, Brian Wayne; AUD from Central Michigan University, 2002, 72 pages
  http://wwwlib.umi.com/dissertations/fullcit/3046086

- Incidence of Tinnitus on School-aged Children by White, Stacy Lynn; Aud from Central Michigan University, 2002, 38 pages
  http://wwwlib.umi.com/dissertations/fullcit/3021505

- Psychological Aspects of Tinnitus the Effects of Attentional Focus, Anxiety and Fatigue by Leader, Leslie G; PhD from The University of British Columbia (Canada), 1986
  http://wwwlib.umi.com/dissertations/fullcit/NL36676
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. CLINICAL TRIALS AND TINNITUS

Overview

In this chapter, we will show you how to keep informed of the latest clinical trials concerning tinnitus.

Recent Trials on Tinnitus

The following is a list of recent trials dedicated to tinnitus. Further information on a trial is available at the Web site indicated.

• Epidemiology of Hearing Loss in Diabetic and Non-Diabetic Veterans

  Condition(s): Diabetes; Tinnitus; Hearing Loss

  Study Status: This study is currently recruiting patients.

  Sponsor(s): Department of Veterans Affairs Medical Research Service

  Purpose - Excerpt: The purpose of this study is to determine if individuals with diabetes are at increased risk of hearing impairment or tinnitus (the perception of ringing or noises in the ears or head). An important goal of this research is also to obtain a better understanding of possible interactions between hearing disorders and other chronic conditions, such as diabetes. Participation in this research will be for a few hours only, to be scheduled at the participant's convenience and according to the testing schedules of the different clinics involved.

  Study Type: Observational

  Contact(s): see Web site below

  Web Site: http://clinicaltrials.gov/ct/show/NCT00018486

• Evaluation of Treatment Methods for Clinically Significant Tinnitus

  Condition(s): Tinnitus

  Study Status: This study is no longer recruiting patients.

  Sponsor(s): Department of Veterans Affairs

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8 These are listed at www.ClinicalTrials.gov.
Purpose - Excerpt: The investigators propose to evaluate two different approaches to the alleviation of tinnitus symptoms by comparing changes from baseline performance on the Tinnitus Severity Index. They propose to provide an unbiased evaluation of competing methodologies. The design is one in which pairs of prospective subjects are randomly assigned to one of two treatment groups. Changes in group performance will be compared for selected measures.

Phase(s): Phase II
Study Type: Interventional
Contact(s): see Web site below
Web Site: http://clinicaltrials.gov/ct/show/NCT00013390

Keeping Current on Clinical Trials

The U.S. National Institutes of Health, through the National Library of Medicine, has developed ClinicalTrials.gov to provide current information about clinical research across the broadest number of diseases and conditions.

The site was launched in February 2000 and currently contains approximately 5,700 clinical studies in over 59,000 locations worldwide, with most studies being conducted in the United States. ClinicalTrials.gov receives about 2 million hits per month and hosts approximately 5,400 visitors daily. To access this database, simply go to the Web site at http://www.clinicaltrials.gov/ and search by “tinnitus” (or synonyms).

While ClinicalTrials.gov is the most comprehensive listing of NIH-supported clinical trials available, not all trials are in the database. The database is updated regularly, so clinical trials are continually being added. The following is a list of specialty databases affiliated with the National Institutes of Health that offer additional information on trials:

- For clinical studies at the Warren Grant Magnuson Clinical Center located in Bethesda, Maryland, visit their Web site: http://clinicalstudies.info.nih.gov/
- For clinical studies conducted at the Bayview Campus in Baltimore, Maryland, visit their Web site: http://www.jhbmc.jhu.edu/studies/index.html
- For cancer trials, visit the National Cancer Institute: http://cancertrials.nci.nih.gov/
- For eye-related trials, visit and search the Web page of the National Eye Institute: http://www.nei.nih.gov/neitrials/index.htm
- For heart, lung and blood trials, visit the Web page of the National Heart, Lung and Blood Institute: http://www.nhlbi.nih.gov/studies/index.htm
- For trials on aging, visit and search the Web site of the National Institute on Aging: http://ord.aspensys.com/asp/resources/rsch_trials.asp
- For alcoholism, visit the National Institute on Alcohol Abuse and Alcoholism: http://www.niaaa.nih.gov/intramural/Web_dicbr_hp/particip.htm
- For trials on infectious, immune, and allergic diseases, visit the site of the National Institute of Allergy and Infectious Diseases: http://www.niaid.nih.gov/clini
• For trials on arthritis, musculoskeletal and skin diseases, visit newly revised site of the National Institute of Arthritis and Musculoskeletal and Skin Diseases of the National Institutes of Health: http://www.niams.nih.gov/hi/studies/index.htm

• For hearing-related trials, visit the National Institute on Deafness and Other Communication Disorders: http://www.nidcd.nih.gov/health/clinical/index.htm

• For trials on diseases of the digestive system and kidneys, and diabetes, visit the National Institute of Diabetes and Digestive and Kidney Diseases: http://www.niddk.nih.gov/patient/patient.htm

• For drug abuse trials, visit and search the Web site sponsored by the National Institute on Drug Abuse: http://www.nida.nih.gov/CTN/Index.htm

• For trials on mental disorders, visit and search the Web site of the National Institute of Mental Health: http://www.nimh.nih.gov/studies/index.cfm

• For trials on neurological disorders and stroke, visit and search the Web site sponsored by the National Institute of Neurological Disorders and Stroke of the NIH: http://www.ninds.nih.gov/funding/funding_opportunities.htm#Clinical_Trials
CHAPTER 6. PATENTS ON TINNITUS

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. 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 “tinnitus” (or a synonym) in their titles. To accurately reflect the results that you might find while conducting research on tinnitus, we have not necessarily excluded non-medical patents in this bibliography.

Patents on Tinnitus

By performing a patent search focusing on tinnitus, 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

Adapted from the United States Patent and Trademark Office:
will tell you how to obtain this information later in the chapter. The following is an example of the type of information that you can expect to obtain from a patent search on tinnitus:

- **Apparatus and method for an open ear auditory pathway stimulator to manage tinnitus and hyperacusis**
  
  Inventor(s): Bauman; Natan (New Haven, CT), Juneau; Roger P. (Destrehan, LA)
  
  Assignee(s): Natan Bauman (New Haven, CT)
  
  Patent Number: 6,048,305
  
  Date filed: August 7, 1998
  
  Abstract: An open-in-the-ear auditory pathway stimulator device includes a noise generator in the device for generating noise and controls in the device for adjusting the volume of the noise. The device is preferably open ear. The device is preferably programmable. The device can also include a hearing aid for amplifying ambient sounds.

  Excerpt(s): The present invention relates to an Auditory Pathway Stimulator for management through central habituation of patients suffering from Tinnitus or Hyperacusis, or both. More particularly, the present invention relates to a system and method for reducing the debilitating effects of tinnitus by means of an all-in-the-canal, open-ear, noise stimulus of the auditory pathway. Over 300 research projects funded by public and private agencies have been conducted to address tinnitus and its harmful effects during the last two decades. A cure is still unforeseen in the near future. This invention is an important step to a systematic solution with long-term significant results. The concept of tinnitus is difficult to convey since it is a "Phantom Auditory Perception" representing lack of certain neuro activity in the auditory system rather than an increased activity. It is also a symptom associated with many auditory and non auditory pathologies.


- **Apparatus and method for the treatment of disorders of tissue and/or the joints**
  
  Inventor(s): Markoll; Richard (Boca Raton, FL)
  
  Assignee(s): Bio-Magnetic Therapy Systems, Inc. (West Palm Beach, FL)
  
  Patent Number: 6,447,440
  
  Date filed: February 8, 2000
  
  Abstract: In this apparatus and method a U-shaped hollow housing containing a plurality of electromagnets with their cores directed inward is placed with its arms on the opposite sides of the patient's head. The magnets are energized to treat paradentosis, TMJ arthrosis, tinnitus, etc. A power supply connected to the magnets provides pulsed D.C. current pulsing at 1-30 cps to generate a pulsing field of less than 20 Gauss.

  Excerpt(s): This invention relates to an apparatus for the treatment of tissue disorders and/or disorders of tissue and joints in the area of a patient's head, particularly the jaw, neck or ears, using one or more electromagnetic fields. The application of an electromagnetic field for the treatment of chronic disorders of the locomotor system, such as the joints, ligaments and back, is known in principle. Such disorders include, for example, arthroses, i.e. degenerative joint trouble, as well as tendinoses, degenerative
ligamentary and tendinous trouble, rheumatic disorders, such as inflammatory disorders of the joints, and acute injuries caused by sports-related or industrial accidents. In this way, the Applicant's patents U.S. Pat. No. 5,131,94 or U.S. Pat. No. 5,453,07, for example, show an apparatus for the application of an electromagnetic field in order to treat inflammatory or degenerative disorders of the joints, especially arthrosis.


- **Apparatus for producing alternating magnetic fields for inducing eddy currents in an organism**

  Inventor(s): Neuwirth; Gerald (Ponauer Str. 35/VI/3, Spittal/Drau 9800, AT)
  
  Assignee(s): none reported
  
  Patent Number: 6,162,166
  
  Date filed: March 17, 1999

  Abstract: In an apparatus for producing alternating magnetic fields for inducing eddy currents in an organism, wherein the apparatus (1) is designed to produce and deliver alternating magnetic fields of an adjustable, low frequency at pulses having steep pulse edges with harmonic wave portions, it is provided that the magnetic field strength of the alternating magnetic fields delivered by the apparatus (1) is chosen to be smaller than 300 A/m and, in particular, between 100 and 250 A/m, preferably in an adjustable manner, in order to induce eddy currents in organisms by such alternating magnetic fields by way of a simple system, for instance, for treating ear noises, tinnitus or the like.

  Excerpt(s): The present invention relates to an apparatus for producing alternating magnetic fields for inducing eddy currents in an organism as well as the use of such an apparatus, wherein the apparatus is designed to produce and deliver alternating magnetic fields of an adjustable, low frequency at pulses having steep pulse edges with harmonic wave portions. Various apparatus for producing and delivering alternating electromagnetic waves for treating and examining organisms are known, wherein it is to be generally anticipated that the depth of penetration of such alternating electromagnetic fields is a function of the frequency. An apparatus of the initially defined kind has become known, for instance, from EP-A 0 084 019. In general, the electric field may be neglected as long as the frequency is within a very low range, i.e., in the range of what is called an extremely low frequency. By contrast, an alternating magnetic field induces eddy currents in the whole organism, which result in charge transfers in the cell membranes, thereby provoking stimulations of the vegetative nervous system capable of, for instance, reducing blockages present in the organism.

  The present invention aims at providing an apparatus for producing alternating magnetic fields for inducing eddy currents in an organism, which enables the concerted and dangerless production of eddy currents in an organism in a structurally simple manner so as to cause the purposeful influence of potential charge transfers in the cell membranes and eliminate or relax existing blockages by aid of the thus induced stimulation of the vegetative nervous system. To solve these objects, the apparatus according to the invention essentially is characterized in that the magnetic field strength of the alternating magnetic fields delivered by the apparatus is chosen to be smaller than 300 A/m and, in particular, between 100 and 250 A/m, preferably in an adjustable manner. Since alternating magnetic fields of an adjustable, low frequency are delivered by the apparatus according to the invention, simple adaptation to the varying sensitivities of different organisms is feasible, it having been found that the sensitivity is
maximal at the frequency that corresponds with the EEG.alpha. rhythm of the person to be treated. The low field strengths selected according to the invention, moreover, ensure that the desired effects with a view to inducing eddy currents in an organism are achieved by problem-free and absolutely dangerless handling. Pulses are produced and delivered in the form of waves having pulsating steep edges with harmonic wave portions, wherein the pulses inherent in an organism are incited and assisted to the optimum degree by such induced pulses delivered to the organism, if the frequency of the alternating magnetic field externally applied is synchronous with the pulses inherent in the organism, thereby assisting in the vegetative nervous system stimulations sought.


- **Apparatus for treating people afflicted with tinnitus**

  Inventor(s): Upham; George W. (2 Williams Rd., Lynnfield, MA 01940)

  Assignee(s): none reported

  Patent Number: 5,628,330

  Date filed: March 15, 1995

  Abstract: Methods and means of treating a person afflicted with Tinnitus in order to relieve the discomfort and aggravation of the affliction uses apparatus that includes: a metal shell of generally hemispherical shape and diameter about the same as a person's head, nested in a similarly shaped larger shell, the space between the nested shells being filled with a natural, soft, flexible, thermally insulating material that may be animal or plant, the two shells being figures of revolution about a common axis and attached together along the common axis with the material in between, compressed somewhat by the attachment, and a handle, whereby the afflicted person can hold the apparatus against his afflicted ear for repeated intervals to relief is noted by the user after several days of these treatments in order to relieve the discomfort and aggravation of the affliction.

  Excerpt(s): This invention relates to apparatus for treating a person afflicted with Tinnitus in order to relieve the discomfort and aggravation of the affliction. Tinnitus is the sound one hears when there is no external cause for that sound. The most common description of tinnitus is "ringing", but sounds such as roaring, hissing, whistling, music, steam, and numerous others have been reported by those afflicted with tinnitus. There are many causes of tinnitus. The most frequent cause recognized by all authorities is exposure to loud sounds. Tinnitus-like symptoms are associated with just about every thing which can go wrong in the human auditory system. If arteriosclerosis produces obstructions to blood flow in vessels near the ear, a special form of tinnitus-like otoacoustic emissions, called pulsatile emissions (also improperly called pulsatile tinnitus), may result. Pulsatile emissions are a noise in the ear that is synchronous with the heart beat. People with pulsatile should probably see a cardiovascular specialist. Pulsatile tinnitus has been treated with some success with Masking techniques (described hereinbelow).

• **Charging system for implantable hearing aids and tinnitus maskers**

Inventor(s): Baumann; Joachim (Munich, DE), Hortmann; Guenter (Neckartenzlingen, DE), Leysieffer; Hans (Taufkirchen, DE)

Assignee(s): Implex GmbH (Neckartenzlingen, DE)

Patent Number: 5,279,292

Date filed: February 13, 1992

Abstract: Charging system for implantable hearing aids and tinnitus maskers with a repeatedly rechargeable direct voltage source. The charging system comprises an implantable receiving resonant circuit as the electrical energy source for the direct voltage source to be charged and a transmitting resonant circuit located outside the body that can be inductively coupled with the receiving resonant circuit for power transmission from outside the body to inside the body. Embodiments are provided for transcutaneous and for percutaneous power transmission between the implantable receiving resonant circuit and the external transmitting resonant circuit.

Excerpt(s): The invention relates to a charging system for implantable hearing aids and tinnitus maskers with a repeatedly rechargeable direct voltage source. Charging systems for the batteries of pacemakers are known, for example, from German Offenlegungsschrift No. 19 40 803 or U.S. Pat. No. 4,134,408. The process used in these systems for inductive power transmission is based on two coupled coils, similar to a transformer, one of the coils being implanted and the other coil being brought externally near the implanted coil. The implanted coil directly supplies, in a broadband way, a rectifier circuit. Because of the poor coil coupling, this type of power transmission allows only relatively limited charging currents for the battery. These were sufficient for the batteries of pacemakers since, for the operation of a pacemaker, only a small amount of power is needed, and thus, one can make do with limited battery ampere-hour capacities. In contrast, the operation of a hearing aid or a tinnitus masker has a significantly higher power requirement, since these devices are permanently active. An implantable hearing device with a repeatedly rechargeable direct voltage source is known from German Patent 39 18 086 C1. But, the charging system for the direct voltage source is not explained there.


• **Composition to treat ear disorders**

Inventor(s): Petrus; Edward J. (Austin, TX)

Assignee(s): Advanced Medical Instruments (Austin, TX)

Patent Number: 6,093,417

Date filed: January 11, 1999

Abstract: A topical ear composition that uses penetration enhancers to diffuse the therapeutic agents through the tympanic membrane into the middle and inner ear for the purpose of reducing the inflammation of ear tissues, providing pain relief, and introducing agents with antimicrobial activity to combat infection. The composition reduces swelling of the lining membranes of the middle and inner ear, prevent the destructive effects of inflammation, inhibit the production of prostaglandins, reduce symptoms of tinnitus and vertigo, improve and prevent paralysis of the facial nerve, relieve labyrinthitis, and prevent hearing loss.
Excerpt(s): A therapeutic composition for the relief and prevention of symptoms associated with ear disorders in humans and animals. Most ear disorders are the result of an inflammatory response to infections, allergic reactions, or trauma. The infection may be of bacterial, fungal or viral origin and determination of the precise etiology is not practical since the causative organism is often difficult to isolate and culture. The determination of a viral cause is even more difficult to establish. Trauma, as a cause of ear disorders is made on the basis of a medical history and radiological confirmation. It is important to treat the inflammation as soon as possible to reduce the sequella of hearing loss, tinnitus, facial nerve palsy, mastoiditis, labyrinthitis, vertigo, and possible encephalitis. Otitis is a non-specific term that describes a symptom and indicates an inflammation of the ear. The ear is anatomically divided into the external, middle and inner ear.


- **Computer implemented methods for reducing the effects of tinnitus**
  Inventor(s): Calhoun; Barbara (Berkeley, CA), Merzenich; Michael M. (San Francisco, CA), Peterson; Bret E. (Lafayette, CA)
  Assignee(s): Scientific Learning Corporation (Berkeley, CA)
  Patent Number: 6,155,971
  Date filed: January 29, 1999

  Abstract: A computer-implemented method for diagnosing and/or treating tinnitus in a human subject is disclosed. The method includes generating tonal stimuli for characterizing the intensity and frequency range of the tinnitus. The method further includes generating a set of tonal stimuli used in tests comprised of tasks designed to treat the tinnitus of the human subject. The tests may be readministered at varying levels of difficulty based on the performance of the human subject. The computer-implemented method further includes providing the set of tests to the human being and receiving a response from the human being. The response from the human subject is compared to a performance threshold before potential modification of the tests. The computer-implemented method includes administration using at least two computers where at least one is local and the other is remote.

  Excerpt(s): The present invention relates generally to techniques for treating hearing disorders in people. More particularly, the present invention relates to computer implemented methods for characterizing and treating tinnitus. Tinnitus is commonly referred to as "ringing of the ear." It is a perceived sound that cannot be attributed to an external source. One cause of tinnitus, common in hearing loss, is believed to be damage to the hair cells of the cochlea responsible for reception of sound. As an example, damage can be to the hair cells responsible for reception in the 4 kHz to 8 kHz range. As a result, sound in this frequency range may not be transformed adequately into voltage potentials that can be conducted by neurons and processed by the central auditory system. In general, tinnitus will commonly occur at the lower frequency end of the malfunctioning range, or 4 kHz in the above example. Tinnitus can vary in intensity and, as an example, may be perceived as an intensity from 5 to 10 dB, although some tinnitus sufferers have reported a higher intensity level. Most people have experienced tinnitus, for example, after hearing a traumatically loud noise or series of loud noises over time. The effects of tinnitus have been associated with hearing loss; approximately one third of elderly people experience the problem on a regular basis. Of greater concern is the one-half to one percent of people who are considered disabled by tinnitus. For
these people, **tinnitus** impairs their ability to lead a normal and healthy lifestyle. As a result, numerous techniques have been used to reduce the effects of **tinnitus**.


- **Computerized method and device for remediating exaggerated sensory response in an individual with an impaired sensory modality**

  Inventor(s): Merzenich; Michael M. (San Francisco, CA)

  Assignee(s): Scientific Learning Corporation (Berkeley, CA)

  Patent Number: 6,234,979

  Date filed: March 31, 1998

  Abstract: The present invention provides a method and apparatus for implementing a training regimen which alleviates exaggerated sensory, perceptual, cognitive and/or emotional response problems. For example, in the aural domain, some autistic individuals are hypersensitive to one of the senses, e.g., sound. As discussed above, sounds at the specific frequency can cause discomfort to these autistic individuals even when presented at an intensity level which normally is not perceived as being too loud by most individuals. Similarly, **tinnitus** afflicted individuals also suffer from disconcerting perceived ringing sensations in their ears. The present invention hypothesizes that a catastrophic cascade of responses within a "supergroup" of auditory neurons is triggered by a hypersensitive response to a particular frequency or range of frequencies. The self sustaining cascade is very much like an epileptic seizure in which the sudden involuntary response of a relatively small group of neurons trigger responses in a supergroup of neurons located in the motor control region of the brain. In accordance with the present invention, the abnormally sensitive response problem associated with supergroups can be substantially alleviated via a remedial training regimen which emphasizes the redevelopment of the afflicted individual's ability to make fine sensory distinctions and/or the improvement of the individual's differential sensory acuteness. Providing the regimen to the individual consistently over a period of time increases the likelihood of normal or near normal sensory ability returning.

  Excerpt(s): The present invention relates to alleviation of abnormal response problems. More particularly, the present invention relates to a computerized method for the remediation of exaggerated responses, such as in sensory, perceptual, cognitive and/or emotional domains of an individual. Some integrated such as sensory, perceptual, cognitive and/or emotional response problems in individuals are associated with neural dysfunction. Examples include autism, epilepsy, dyslexia, PDD, attention deficit disorder (ADD) including ADD with hyperactivity disorder (ADD/HD), focal dystonias and obsessive/compulsive disorders (OCD). For example, in some autistic individuals, an exaggerated integrated sensory response problem manifests itself as a hypersensitivity to a specific audible frequency (or frequencies). Sounds at the specific frequency can cause discomfort to these autistic individuals even when presented at a sound level not perceived as being too loud by most individuals. Unfortunately these frequencies belong within the frequency spectrum of normal speech. As a result, these autistic individuals consciously avoid exposure to the "painful" sounds. In the case of a young autistic child, the conscious avoidance of "painful" sounds greatly impedes the child's development of spoken language skills, and hence delays the child's acquisition of social skills.

• **Dextromethorphan and an oxidase inhibitor for treating intractable conditions**
  
  Inventor(s): Licht; Jonathan M. (San Diego, CA), Smith; Richard Alan (La Jolla, CA)
  
  Assignee(s): Center for Neurologic Study (La Jolla, CA)
  
  Patent Number: 5,863,927
  
  Date filed: September 19, 1996
  
  Abstract: Methods are disclosed for increasing the effectiveness of dextromethorphan in treating chronic or intractable pain, for treating **tinnitus** and for treating sexual dysfunction comprising administering dextromethorphan in combination with a therapeutically effective dosage of a debrisoquin hydroxylase inhibitor. A preferred combination is dextromethorphan and the oxidative inhibitor quinidine.

  Excerpt(s): This application is a 371 of PCT/US94/10771, filed Sep. 22, 1994. This invention relates to pharmacology. More specifically, the invention relates to compositions of matter useful for preparing medicaments for the treatment of various disorders. A number of chronic disorders have symptoms which are known to be very difficult to treat, and often fail to respond to safe, non-addictive, and non-steroid medications. Such disorders, such as intractable coughing, fail to respond to conventional medicines and must be treated by such drugs as codeine, morphine, or the anti-inflammatory steroid prednisone. These drugs are unacceptable for long-term treatment due to dangerous side-effects, long-term risks to the patient's health, or the danger of addiction. Other disorders, such as dermatitis, have no satisfactory treatment for the severe itching and rash at this time. Drugs such as prednisone and even tricyclic antidepressants, as well as topical applications, have been tried, but do not appear to offer substantial and consistent relief.


• **Electronic stimulation system for treating tinnitus disorders**
  
  Inventor(s): Mino; Alfonso Di (15 Arcadia Rd., Woodcliff Lake, NJ 07675)
  
  Assignee(s): none reported
  
  Patent Number: 5,788,656
  
  Date filed: February 28, 1997
  
  Abstract: An electronic stimulation system for treating a patient suffering from a **tinnitus** disorder in which the patient hears ringing or other sounds originating in the ear. The system includes an electronically actuated probe to which is applied a complex signal in the auditory range to cause the probe to vibrate in accordance with the signal. The probe is placed at a site on the patient in proximity to the cochlea of the inner ear whereby the probe vibrations are transmitted to the cochlea to stimulate this organ and thereby alleviate the **tinnitus** disorder. In this system, use is made of two adjustable audio-frequency oscillators, one operating in a low frequency range whose upper limit is about 400 Hz, the other operating in a high-frequency whose upper limit is about 1000 Hz. The outputs of these oscillators are combined and amplified to produce the complex signal applied to the probe. The mechanical vibrations transmitted by the probe in accordance with the complex signal must be properly related to the sonic frequencies of the **tinnitus** sounds being heard by the patient.
Excerpt(s): This invention relates generally to the treatment of tinnitus disorders, and more particularly to an electronic stimulation system in which a complex signal in the audio range is applied to an electromagnetically actuated probe to cause the probe to vibrate in accordance with the signal, the vibrations of the probe being transmitted to the cochlea of the inner ear of a patient to stimulate this organ and thereby alleviate the tinnitus disorder suffered by the patient. The human ear functions as an auditory system for converting incoming sound vibrations into electrical energy which triggers nerve impulses in the auditory nerve connected to the brain. In this auditory system, sounds picked up by the outer ear (auricle) are conducted through an auditory canal to a tympanic membrane or eardrum. The middle ear which is separated from the outer ear by the eardrum, contains three small bones which as sounds strike the eardrum are then caused to vibrate. These bone vibrations set up corresponding vibrations in an oval window from which the vibrations are conveyed to the three fluid-filled canals contained in the cochlea of the inner ear. At the base of the central canal of the cochlea is a basilar membrane, and supported on this membrane is the organ of Corti and its hair cells. These cells are the true receptors of hearing, for proliferations from the fibers of the auditory nerve extend up the center of the cochlea and connect with these hair cells.


• External ear canal pressure regulating device and tinnitus suppression device

Inventor(s): Stypulkowski; Paul H. (North Oaks, MN), van den Honert; Christopher (Maplewood, MN)
Assignee(s): Minnesota Mining and Manufacturing Company (St. Paul, MN)
Patent Number: 5,024,612
Date filed: May 30, 1989

Abstract: A tinnitus suppression device using an in-the-canal external ear canal pressure regulating device to alter the pressure of the fluid of the external ear canal interior of the pressure regulating device. The device has a body which can be inserted into the external ear canal and which seals the canal from ambient pressure. An adjustably sized body such as a collapsible bulbous portion or a bellows type wall provides a mechanism for altering the pressure in the canal. Either a valve or a mechanical displacement device maintains the pressure differential created.

Excerpt(s): The present invention relates generally to auditory prostheses and, more particularly, to auditory prostheses for use in the external ear canal. Many individuals have suffered and currently do suffer from tinnitus. Tinnitus, simply defined, is the perception of sound in the ear which does not, in fact, exist, i. e., is not present in the external environment. These sounds typically may be characterized as a ringing, whistling, roaring or buzzing. Tinnitus has been reported to affect up to thirty percent (30%) of the United States population. Individuals with tinnitus may have symptoms ranging from mild to severe and ranging from chronic to intermittent. Several million people in the United States suffer debilitating tinnitus which interferes with everyday activities. In some cases, tinnitus can be chronic and severe, debilitating the individual. Several attempts have been made in the past to mask or "cure" tinnitus. Some of these attempts have involved treating the tinnitus by the administration of drugs. An example of these attempts is disclosed in U.S. Pat. No. 4,735,968, Guth.

• **Herbal composition for treatment of tinnitus**

Inventor(s): Neville, II; Delmar S. (1300 Bernita Rd., El Cajon, CA 92020), Ozog, III; Stanley T. (4651 Pico St., #111, San Diego, CA 92109)

Assignee(s): none reported

Patent Number: 6,358,540

Date filed: November 7, 2000

Abstract: A method for treating tinnitus comprising the step of administering to a subject requiring such treatment a therapeutically effective amount of an herbal composition comprising Radix Puerariae, Radix Platycodi Grandiflori, Radix Angelicae Dahuricae, Semen Coicis Lachryma-jobi, Rhizoma Zigiberis Officinalis Recens, Radix Ligustici Chuanxiong, Radix Paeoniae Lactiflorae, Folium Perillae Frutescentis, Flos Magnoliae, Herba cum Radice Asari, Ramulus Cinnamomi Cassiae, Radix Scutellariae Baicalensis, and Radix Glycyrrhizae Uralensis.

Excerpt(s): This invention relates to new medicinal compositions and methods for treating ear disorders, in particular the treatment of tinnitus. Tinnitus, or ringing in the ears, is the sensation of hearing ringing, buzzing, hissing, chirping, whistling or other sounds. The noise can be intermittent or continuous, and can vary in loudness. It is often worse when background noise is low, so you may be most aware of it at night when you're trying to fall asleep in a quiet room. In rare cases, the sound beats in sync with your heart. Tinnitus is very common, affecting an estimated 50 million adults in the United States. For most people the condition is merely an annoyance. In severe cases, however, tinnitus can cause people to have difficulty concentrating and sleeping. It may eventually interfere with work and personal relationships, resulting in psychological distress. About 12 million people seek medical help for severe tinnitus every year. A wide variety of conditions and illnesses can lead to tinnitus. Blockages of the ear due to a buildup of wax, an infection, or rarely, a tumor of the auditory nerve can cause the unwanted sounds, as can a perforated eardrum. But perhaps the most common source of chronic tinnitus is prolonged exposure to loud sounds. The noise causes permanent damage to the sound-sensitive cells of the cochlea, a spiral-shaped organ in the inner ear. Carpenters, pilots, rock musicians and street-repair workers are among those whose jobs put them at risk, as are people who work with chain saws, guns or other loud devices or who repeatedly listen to loud music. A single exposure to a sudden extremely loud noise can also cause tinnitus.


• **Human drug delivery device for tinnitus**

Inventor(s): Bauer; Carol A. (Houston, TX), Howard, III; Matthew A. (Iowa City, IA), McCulloch; Timothy M. (Iowa City, IA)

Assignee(s): The University of Iowa Research Foundation (Iowa City, IA)

Patent Number: 5,713,847

Date filed: February 6, 1996

Abstract: A neural prosthetic drug delivery apparatus for reducing or eliminating the effects of tinnitus. The apparatus includes a catheter which is inserted into the patient's auditory cortex or thalamus. The catheter microinfuses drugs which suppress or eliminate abnormal neural activity into geometrically separate locations of the patient's
In one embodiment the apparatus includes a stimulation device for outputting processed electrical signals and an electrode having a plurality of electrical contacts which is arranged in a target zone of the patient's brain. Each of the plurality of electrical contacts independently outputs electrical discharges in accordance with the electrical signals.

Excerpt(s): This invention relates generally to an apparatus for treating tinnitus, and in particular, to a prosthetic drug delivery device for microinfusing portions of drugs at geometrically separate locations of the patient's primary auditory cortex or the patient's thalamus. Tinnitus is a disorder where a patient experiences a sound sensation within the head ("a ringing in the ears") in the absence of an external stimulus. This uncontrolled ringing can be extremely uncomfortable and often results in severe disability. Tinnitus is a very common disorder affecting an estimated 15% of the U.S. population according to the National Institutes for Health, 1989 National Strategic Research Plan. Hence, approximately 9 million Americans have clinically significant tinnitus with 2 million of those being severely disabled by the disorder. There are no treatments currently available that consistently eliminate tinnitus although many different types of treatments have been attempted. This wide variety of attempted treatments attests to the unsatisfactory state of current tinnitus therapy. Several more common attempts will be discussed below.


- **Implantable device for treatment of tinnitus**

Inventor(s): Leysieffer; Hans (Taufkirchen, DE)
Assignee(s): IMPLEX Aktiengesellschaft Hearing Technology (Ismaning, DE)
Patent Number: 6,251,062
Date filed: August 11, 1999

Abstract: An implantable device for treatment of tinnitus is provided comprising an electronic signal generation unit and a power source for supplying power. A hermetically gas-tight, biocompatible and implantable electroacoustic transducer is also provided as the sound-delivering output transducer which, after an at least partial mastoidectomy, can be positioned in the mastoid cavity such that the sound emitted from the electroacoustic transducer travels from the mastoid to the tympanic cavity via the natural passage of the aditus ad antrum.

Excerpt(s): The invention relates to an implantable device for treatment of tinnitus which includes an electronic signal generation unit and a power source for power supply of the device. Many individuals suffer from intermittent or permanent tinnitus which cannot be cured by surgery. Also, to date, there have been no approved drug forms of treatment for tinnitus. However, so-called tinnitus maskers are known, such as disclosed in published PCT application 90/07251. These maskers are small, battery-operated devices which are worn like a hearing aid behind or in the ear and cover (mask) the tinnitus psychoacoustically by artificial sounds which are emitted, for example, via a hearing aid speaker into the auditory canal and which reduce the disturbing tinnitus as far as possible below the threshold of perception. The artificial sounds are often narrowband noise (for example, third octave noise) which in its spectral position and its loudness level can be adjusted via a programming device to enable the maximum possible adaptation to the individual tinnitus situation. Moreover, recently the so-called "retraining method" has been provided according to which, by
combination of a metal training program and presentation of broadband sound (noise) near the hearing threshold, the perceptibility of the tinnitus is supposed to be largely suppressed (see the journal "Hoerakustik" 2/97, pages 26 and 27).


- **Implantable hearing aid with tinnitus masker or noiser**
  Inventor(s): Leysiefer; Hans (Taufkirchen, DE)
  Assignee(s): Cochlear Limited (Lane Cove NSW, AU)
  Patent Number: 6,394,947
  Date filed: December 21, 1999
  Abstract: Partially or fully implantable hearing aid for rehabilitation of an inner ear hearing disorder, with a microphone (10) which delivers an audio signal, an electronic signal processing and amplification unit (40, 50, 80, 140, 141) which is located in an audio signal-processing electronic hearing aid path, an implantable electromechanical output converter (20) and a unit (60) for power supply of the implant. The hearing aid is provided with an electronic module (90, 140, 141) for rehabilitation of tinnitus and it generates the signals necessary for a tinnitus masking or noiser function and feeds them into the audio signal processing path of the hearing implant.
  Excerpt(s): The present invention relates to partially or fully implantable hearing aids for rehabilitation of an inner ear hearing disorder, which have a microphone which delivers an audio signal, an electronic signal processing and amplification unit which is located in an audio signal processing electronic hearing aid path, an implantable electromechanical output converter and a unit for supplying power to the hearing aid. Partially and fully implantable hearing aids for rehabilitation of inner ear damage with mechanical stimulation of the damaged inner ear have recently been available or will soon be available on the market journal HNO 46:844-852, 10-1998, H. P. Zenner et al., "Initial implantations of a completely implantable electronic hearing system in patients with an inner ear hearing disorder"; journal HNO 46:853-863, 10-1998, Leysieffer et al., "A completely implantable hearing system for inner ear hearing handicapped: TICA LZ 3001"; U.S. Pat. Nos. 5,277,694; 5,788,711; 5,814,095; 5,554,096; and 5,624,376. Especially in fully implantable systems is the visibility of the system not an issue, so that in addition to the advantages of high sound quality, the open auditory canal and full suitability for everyday use, high future patient acceptance can be assumed.

- **Method and apparatus for treatment of monofrequency tinnitus utilizing sound wave cancellation techniques**
  Inventor(s): Choy; Daniel S. J. (170 E. 77th St., New York, NY 10021)
  Assignee(s): Choy; Daniel S. J. (New York, NY)
  Patent Number: 6,610,019
  Date filed: March 1, 2002
  Abstract: Tinnitus is defined as sound(s) heard by an individual when no external sound is present and often takes the form of a hissing, ringing, chirping or clicking sound which may be either intermittent or constant. According to the American Tinnitus
Association, tinnitus affects tens of millions of Americans and many suffer so severely from tinnitus they are not able to function normally on a daily basis. Unfortunately the exact cause or causes of tinnitus are not understood by the medical community and thus many tinnitus sufferers are told by their doctors to "learn to live with it". In accordance with novel aspects of Applicant's monofrequency tinnitus patient treatment apparatus and process, phase cancellation effects are achieved by utilizing an externally generated sound which is subjectively selected by the monofrequency tinnitus patient to match in both tone and loudness his or her tinnitus sound. This subjectively selected externally generated sound wave which matches in tone and loudness the patient's tinnitus sound, is either (i) sequentially phase shifted through a plurality of phase shift sequence steps totaling at least 180 degrees or (ii) alternatively is directly phase shifted in essentially a single step motion into a 180 degree, out-of-phase reciprocal, canceling relationship with the patient determined tinnitus tone. The sequential steps of the phase shifted tone or the directly phase shifted tone are applied to the tinnitus patient to effect cancellation or diminishment of the patient's tinnitus.

Excerpt(s): Applicant's inventions are related to the treatment of tinnitus patients and more particularly to improved methods and apparatus for treatment of monofrequency tinnitus patients utilizing phase shift cancellation principles. Tinnitus is defined as the perception of sound by an individual when no external sound is present, and often takes the form of a hissing, ringing, roaring, chirping or clicking sound which may be intermittent or constant. According to the American Tinnitus Association, tinnitus afflicts more than 50 million Americans and more than 12 million of those suffer so severely from tinnitus that they seek medical attention and many cannot function normally on a day-to-day basis. Tinnitus, often referred to as ringing in the ears, is estimated to be present in approximately 50% of the US population over 65 years of age. In general, tinnitus takes many and varied forms which may be related to its underlying cause. Tinnitus may be caused by or related to such diverse factors as trauma, drugs, hearing loss, the normal aging process or other unknown causes.


- Method and composition of a topical treatment of inner ear and labyrinth symptoms
  Inventor(s): Liedtke; Rainer K. (Postfach 306 D-82027 Gruenwald b., Munich, DE)
  Assignee(s): none reported
  Patent Number: 5,863,941
  Date filed: July 8, 1996

  Abstract: Periauricularly administered topical therapy with a carrier system containing local anesthetics is a new and effective treatment of disorders of the inner ear and labyrinth, which has a low incidence of side effects. The use of this type of therapy applies especially to a non-invasive topical treatment of tinnitus, vertigo, lack of balance, and nausea.

  Excerpt(s): The subject of this invention relates to a method and composition of a non-invasive, topical treatment and prevention of pathological symptoms of the inner ear and labyrinth, in particular of tinnitus, vertigo, lack of balance, and nausea. It is known that in the majority of cases, persistent tinnitus and vertigo, accompanied by a lack of balance and nausea, are due to a disorder or disease of the organs of the inner ear or of the auditory nerves. Tinnitus may occur both in the low-frequency and in the high-frequency range; in the low-frequency range, it occurs especially in the presence of
disorders of the auditory canal and the middle ear, in the high-frequency, mainly in the presence of disorders of the labyrinth. These persistent symptoms have an extremely negative effect on those affected. One characteristic complex of symptoms, which includes tinnitus, vertigo and lack of balance, possibly in association with nystagmus, hearing impairment and vomiting, is seen, for example, in Meniere's disease. The sudden attacks of the symptoms may be attributable to vasomotor disorders of labyrinth vessels or temporary disorders of the secretion and composition of the labyrinthine liquor. Under the influence of permanent tinnitus and impaired hearing, the persons affected often become irritable, they suffer from anxiety, and, in some cases, develop considerable psychosomatic problems as this illness proceeds. The therapeutic methods used so far to treat these problems are not sufficiently effective. If it is not possible to identify an underlying disease, only symptomatic measures, such as stimulus deprivation, rest and pharmacological sedation, can be taken. The pharmacological principle frequently used for this purpose is the orally administered dimenhydrinate which has a sedative effect. Scopolamine, a parasympatholytic agent, may also be used; however, this agent is primarily used to treat the pathophysiological associated phenomenon of motion-induced nausea, i.e., kinetosis, which develops on exposure to externally moving objects. This sickness is also known as motion or sea sickness and is associated with vegetative phenomena, mainly with nausea. In systemic therapy, scopolamine is also administered by transdermal route (Y. W. Chien, Novel Drug Delivery Systems, Drugs and the Pharmaceutical Sciences, Vol. 14, 1982, Marcel Decker, New York), which, when compared to the intramuscular administration of scopolamine, results in a lower and more uniform blood concentration in the body. In spite of this, however, the typical undesirable side effects of scopolamine, in particular, impaired vision, very dry mouth, changes in the ability to concentrate, and somnolence, are observed. The undesirable side effect mentioned last is, among other things, also present after an oral administration of dimenhydrinate which is also used to treat kinetoses but which is less effective. Thus, overall, the administration of scopolamine as a therapeutic principle is very restricted indeed.


- **Method for coupling an electromechanical transducer of an implantable hearing aid or tinnitus masker to a middle ear ossicle**

  Inventor(s): Leysieffer; Hans (Taufkirchen, DE)

  Assignee(s): Implex GmbH Spezialhorgerate (Ismaning, DE)

  Patent Number: 6,077,215

  Date filed: October 8, 1998

  Abstract: A method for coupling an electromechanical transducer of a partially or totally implantable hearing aid and/or tinnitus masker to a middle ear ossicle of a hearing impaired person which is to be stimulated. The hearing aid and/or tinnitus masker includes the electromechanical transducer, a transducer positioning and fixing device, and an elongated coupling rod driven by the transducer, the elongated coupling rod having a tip. The method of the present invention includes performing a mastoidectomy to provide a mastoid cavity adapted for receiving the hearing aid and/or tinnitus masker transducer, passing the coupling rod through the natural passage of the aditus ad antrum, positioning and fixing the hearing aid and/or tinnitus masker transducer within the mastoid cavity with the elongated coupling rod passing through the aditus
ad antrum, and contacting the tip of the elongated coupling rod with the ossicle to be stimulated.

Excerpt(s): The invention relates to a method for coupling an electromechanical transducer of a hearing aid or a tinnitus masker to a middle ear ossicle of a hearing impaired person. Disorders of the inner or middle ear comprise the most common reason for impairments of hearing. In addition thereto, an increasing number of patients complain about a ringing, whistling or buzzing noise in the head which has no external source, a condition known as tinnitus. In recent years, it has been found that tinnitus may be alleviated or even overcome by providing the patient with a noise signal, for example white narrow band noise, which masks the noise caused by tinnitus. One approach to overcome the above problems is to provide the patient with a hearing aid and/or tinnitus masker that is fixed to the external ear. However, this approach has several fundamental disadvantages, amongst which are to be named: (1) stigmatization of the patient; (2) the sound is often found to be unsatisfactory due to the limited frequency range and undesired distortion; (3) in many patients the ear canal fitting device leads to an occlusion effect; (4) acoustic feedback when amplification is high.


**Method for treating hyper-excited sensory nerve functions in humans**

Inventor(s): Leung; Edward (Cary, NC)
Assignee(s): King Pharmaceuticals Research & Development, Inc. ()
Patent Number: 6,248,774
Date filed: September 5, 2000

Abstract: A method of and a formulation for treating hyper-excited sensory nerve functions are provided. The method comprises administering to a patient in need of treatment thereof a pharmaceutical composition comprising an effective amount of 2-Amino-4,5,6,7-tetrahydrobenzo[b]thiophen-3-yl)(4-chlorophenyl) methanone or a pharmaceutically acceptable salt thereof. The disorder treated include hyperesthesia, dysesthesia, allodynia, hyperalgesia, tinnitus, ganglionic dysfunction and combinations thereof. The co-administration of adenosine is not needed. The pharmaceutical preparation is suitable for oral administration. The pharmaceutical preparation is useful in the reduction of neuropathic pain in a conscious human. The use of the pharmaceutical preparation does not result in medically adverse cardiovascular symptoms associated with administration of adenosine.

Excerpt(s): The present invention relates to normalization of a pathologically hyper-excited sensory nerve function in a conscious human subject. In particular, the invention relates to a treatment method for reducing or eliminating hyper-excited sensory symptoms such as neuropathic pain. Some examples of neuropathic pain are diabetic neuropathy, post-herpetic neuralgia (shingles), trigeminal neuralgia, pain associated with AIDS infection and treatment, whip-lash pain, pain due to cancer treatment, phantom limb pain, traumatic injury, complex regional pain syndrome and pain due to peripheral vascular disease. The development of hyper-excited sensory nerve function has been described by Sollevi 1997 (1). These symptoms are often manifested as neuropathic pain. Neuropathic pain is a persistent, chronic pain usually described as a burning, shooting or lancinating sensation without an obvious cause. These symptoms are often associated with damage to nerves or nerve fibers. Such pain is associated with the transmission of abnormal pain signals from injured peripheral nerves to neurons in
the brain and spinal cord. Briefly, the sensory nervous system projects signals to the central nervous system (CNS), mediating information from the periphery to the brain. These comprise signals from sensors in peripheral tissues and other organs, sensitive for qualities like touch, temperature changes, vibration, painful stimuli, pressure, vision, hearing, smell, taste and balance. This sensory nervous system is an important physiological control in the subject's relation to the environment. The sensory nervous system can be damaged by various types of trauma, such as infections and mechanical lesions including whip-lash injury, diseases such as diabetes and HIV infection, cancer or HIV treatments. This can result in disturbance in the signal transmission into the CNS, leading to reduced perception of sensory signals (hypoesthesia) as well as hyperfunction (more excited signals in the CNS) due to some largely unknown changes in the nerve transmission process (neuropathic damage). The neuropathic condition with hyper-excitation is described as a "wind-up" phenomenon and often involves several of the above mentioned sensory functions. This may therefore be associated with decreased thresholds for touch and temperature (hyperesthesia), discomfort in the perception for touch and temperature (dysesthesia), discomfort or pain with touch, pressure and/or temperature stimulation (alldynia), and hypersensitivity to pain stimuli (hyperalgesia), balance disturbance, disturbance of auditory type (tinnitus) as well as ganglionic dysfunction. These types of hyper-reactive sensory nerves may develop after various types of trauma, and are called chronic when persistent for more than 3-6 months. Adenosine, administered intravenously or intrathecally, has been proposed as a treatment for this sensory nerve hyper-reactivity (1, 2, 3). The objective of the treatment is to restore a normal perception of pain, as well as other sensory functions, in patients suffering from pathological hyper-excitation due to nerve damage.


- **Method for treating otic disorders**

Inventor(s): Donovan; Stephen (Capistrano Beach, CA)

Assignee(s): Allergan Sales, Inc. (Irvine, CA)

Patent Number: 6,265,379

Date filed: October 13, 1999

Abstract: Methods for treating otic disorders by local administration of a neurotoxin. A botulinum toxin can be administered to myoclonic middle ear muscles and to inner ear efferent and/or afferent nerves to alleviate otic disorders such as tinnitus, cochlear nerve dysfunction and Meniere's disease.

Excerpt(s): The present invention relates to methods for treating otic disorders. In particular the present invention relates to methods for treating otic disorders by local administration of a neurotoxin to a human ear. The human ear can be divided into an outer ear, a middle ear and an inner ear. The outer ear comprises the auricle (commonly referred to as the ear) and the external acoustic meatus (the auditory canal). The tympanic membrane (commonly called the eardrum) separates the auditory canal from the middle ear (the tympanic cavity). Three small, mobile bones, the incus, malleus and stapes make up an ossicular system which conducts sound through the middle ear to the cochlea. The handle of the malleus is attached to the center of the tympanic membrane. At its opposite end, the malleus is bound to the incus by ligaments, so that movement of the malleus causes the incus to also move. The opposite end of the incus articulates with the stem of the stapes. The faceplate of the stapes rests against the membranous labyrinth in the opening of the oval window, where sound waves are
conducted into the inner ear. In the cochlea the sound waves are transduced into coded patterns of impulses transmitted along the afferent cochlear fibers of the vestibulocochlear nerve for analysis in the central auditory pathways of the brain. The air filled tympanic cavity contains various muscles including the tensor tympani and stapedius muscles. The tensor tympani is a long slender muscle which occupies the bony canal above the osseous pharyngotympanic tube, from which it is separated by a thin bony septum. The tensor tympani muscle receives both motor and proprioceptive innervation. A motor branch derived from the nerve to the medial pterygoid (mandibular division of the V, parasympathetic, trigeminal nerve) passes through the otic (a peripheral, parasympathetic cholinergic) ganglion to the tensor tympani. The stapedius muscle extends from the wall of a conical cavity in the pyramidal eminence, located on the posterior wall of the tympanic cavity. The stapedius is innervated by a branch of the (VII, parasympathetic) facial nerve.


- **Method for treating severe tinnitus**
  
  Inventor(s): Hildebrand; Keith Robert (Houlton, WI)
  
  Assignee(s): Medtronic, Inc. (Minneapolis, MN)
  
  Patent Number: 6,656,172
  
  Date filed: September 27, 2002
  
  Abstract: A method for treating severe tinnitus is disclosed. The method of the present invention comprises implanting a catheter into a patient and administering a therapeutic agent intrathecally into the patient's cerebrospinal fluid.
  
  Excerpt(s): This invention relates to a method for treating severe tinnitus. Tinnitus is the perception of ringing, hissing, or other sounds in the ears or head when no external sound is present. For some people, tinnitus is just a nuisance. For others, it is a life-altering condition. According to the American Tinnitus Association, over 50 million Americans experience tinnitus to some degree and of these, approximately 12 million people have tinnitus to a distressing degree. Approximately 2 million Americans have tinnitus to the point where they are so seriously debilitated that they cannot function on a "normal" day-to-day basis and some may commit suicide. Lewis, J. E., S. D. G. Stephens, et al. (1993). "Tinnitus and suicide." Clin Otolaryngol 19: 50-54. It is this severely affected population, which is only poorly managed with therapies available today, that may benefit from intrathecal pharmacotherapy proposed in the current investigation.
  

- **Methods for the treatment of tinnitus and other disorders using R(-)ketoptofen**
  
  Inventor(s): Jerussi; Thomas P. (Framingham, MA), Rubin; Paul D. (Sudbury, MA)
  
  Assignee(s): Sepracor, Inc. (Marlborough, MA)
  
  Patent Number: 6,362,227
  
  Date filed: February 22, 2000
  
  Abstract: Methods of treating neuropathic pain, tinnitus, and related disorders are disclosed. These methods comprise the administration of optically pure R(-)-ketoprofen.
Also disclosed are pharmaceutical compositions useful in the treatment of neuropathic pain and **tinnitus** which comprise optically pure R(-)-ketoprofen.

Excerpt(s): The invention relates to methods of treating neuropathic pain, **tinnitus**, and other disorders, and to pharmaceutical compositions useful in the treatment of neuropathic pain and **tinnitus**. Racemic ketoprofen (a mixture of the R(-) and S(+) enantiomers) is sold under the tradenames Orudis.RTM. and Oruvail.RTM. for the treatment of inflammation. Physicians Desk Reference 52.sup.nd Ed., p. 3092 (1998). Generally, ketoprofen is considered to be a nonsteroidal anti-inflammatory agent ("NSAID"). NSAIDs are believed to exhibit activity as COX-1 or COX-2 enzyme inhibitors. Most NSAIDs are believed to cause gastrointestinal irritation. The S(+) enantiomer of ketoprofen has long been thought to possess most, if not all, of the pharmacological activity of the racemate. See, e.g., Yamaguchi et al., Nippon Yakurigaku Zasshi. 90:295-302 (1987); Abas et al., J. Pharmacol. Exp. Ther., 240:637-641 (1987); and Caldwell et al., Biochem. Pharmacol. 37:105-114 (1988). Indeed, U.S. Pat. Nos. 4,868,214, 4,962,124, and 4,927,854 each allege that the analgesic activity of ketoprofen resides exclusively in the S(+) enantiomer.


- **Minimum energy tinnitus masker**

Inventor(s): Gooch; Timothy D. (Cordova, TN)
Assignee(s): Microtek Medical, Inc. (Columbus, MS)
Patent Number: 5,403,262
Date filed: March 9, 1993

Abstract: A **tinnitus** masking device and method for producing a masking signal with a selected center frequency, selected bandwidth, and selected volume is provided. A random noise generator and a clock circuit are employed in conjunction with a switched capacitance filter bank to produce a masking signal with the selected center frequency and selected bandwidth. The masking signal is then received by a volume control unit and then amplified for delivery to the **tinnitus** sufferer's ear or ears by speakers or headphones. Additionally, the **tinnitus** masking device may include a timer and fade out unit.

Excerpt(s): This invention relates to masking devices, and more particularly, but not by way of limitation, to a minimum energy masker for use by sufferers of subjective **tinnitus**. Tinnitus describes a perceived sound, e.g., ringing, buzzing, whistling, or roaring, that is experienced by a **tinnitus** sufferer and that does not exist as a physical sound. The condition can be annoying or very painful, and the discomfort caused by **tinnitus** frequently interferes with a sufferer's sleep. **Tinnitus** often occurs at a specific frequency or over a small frequency range and is frequently constant; however, the specific frequency or small frequency range varies from patient to patient. Most of the relatively recent efforts to treat **tinnitus** have involved attempts to mask the perceived sound. Masking is the interference of one sound on another. Perfect **tinnitus** masking involves providing a masking signal that exactly overrules the perceived sound in terms of psychoacoustics without supplying unnecessary energy to the **tinnitus** sufferer. See e.g., Tinnitus: Diagnosis/Treatment 55 (Abraham Shulman ed. 1991).

• **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 stage. 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.


• **Protected complex of procaine for the treatment of symptoms from narcotics addiction, tinnitus and Alzheimer's disease**

Inventor(s): Sapse; Alfred T. (Miami Beach, FL)

Assignee(s): Spectrum Pharmaceutical Corporation (Aventura, FL)

Patent Number: 5,064,858

Date filed: September 5, 1990

Abstract: The invention presented is a composition for the treatment of individuals addicted to narcotics or individuals having age-related conditions such as **tinnitus** and Alzheimer's disease, comprising a protected complex of procaine and a complexing
agent for procaine in an amount effective to reduce the withdrawal symptoms of individuals addicted to narcotics or the symptoms of tinnitus and Alzheimer's disease.

Excerpt(s): The present invention relates to a composition which comprises a protected complex of procaine (4-aminobenzoic acid 2-(diethylamino)ethyl ester) and complexing agent, and its use in the treatment of narcotics addiction and age-related conditions such as tinnitus and Alzheimer's disease. Narcotics addiction has become a worldwide societal problem of tremendous proportions. Current programs for the reduction of addiction in individuals involve either so-called "cold turkey" (complete cessation of narcotic use without suitable replacement), or the treatment with substitutes such as methadone. These programs are disadvantageous and have many drawbacks and critics, especially due to the fact that "cold turkey" is viewed as an ineffective means of breaking an addiction and methadone itself is an addicting narcotic. Accordingly, a composition which can be used to treat narcotics addictions by reducing the withdrawal symptoms of recovering addicts will be invaluable in aiding in the breaking of narcotics addictions. Problems associated with aging have long been studied without effective preventative treatments being developed. Conditions such as tinnitus, which is generally perceived as a ringing, buzzing or whistling in the ear caused by a defect in the auditory nerve and is common in elderly individuals, and Alzheimer's disease, which is a senile dementia believed to be brought about by the aging process, are two such problems for which no known treatment has been shown to be effective. A composition which can ease sufferers of these conditions, therefore, is being widely sought since they affect so many elderly individuals and will be of great benefit.


- **Pseudospontaneous neural stimulation system and method**

  Inventor(s): Abbas; Paul J. (Iowa City, IA), Brown; Carolyn J. (Iowa City, IA), Rubinstein; Jay T. (Solon, IA), Tyler; Richard S. (West Branch, IA)

  Assignee(s): The University of Iowa Research Foundation (Iowa City, IA)

  Patent Number: 6,295,472

  Date filed: August 13, 1999

  Abstract: A system and method for application of pseudospontaneous neural stimulation is provided that can generate stochastic independent activity across an excited nerve or neural population without an additional disadvantageous sensations. High rate pulse trains, for example, can produce random spike patterns in auditory nerve fibers that are statistically similar to those produced by spontaneous activity in the normal ear. This activity is called "pseudospontaneous activity". Varying rates of pseudospontaneous activity can be created by varying the intensity of a fixed amplitude, high rate pulse train stimulus, e.g., 5000 pps. The pseudospontaneous activity can further desynchronize the nerve fiber population as a treatment for tinnitus but if indiscriminately applied can generate potentially uncomfortable biological and somatosensory sensations over intervals of time. A method for generating pseudospontaneous activity in an auditory nerve according to the present invention can include generating an electrical signal, and modifying the electrical signal to a sustained effective level while the electrical signal remains substantially physiologically imperceptible to the patient. The applied electrical signal can generate pseudospontaneous activity in the auditory nerve to suppress tinnitus.
Excerpt(s): This invention relates generally to an apparatus and method for providing stochastic independent neural stimulation, and in particular, a neural stimulation system and method for initiating pseudospontaneous activity in the auditory nerve, which can be used to treat tinnitus. Fundamental differences currently exist between electrical stimulation and acoustic stimulation of the auditory nerve. Electrical stimulation of the auditory nerve, for example, via a cochlear implant, generally results in more cross-fiber synchrony, less within fiber jitter, and less dynamic range, as compared with acoustic stimulation which occurs in individuals having normal hearing. Loss of spontaneous activity in the auditory nerve is one proposed mechanism for tinnitus. Proposed biological mechanisms for the loss of spontaneous activity in the auditory nerve include loss of hair cells in the cochlea. In addition, the loss of hair cells over time is a proposed mechanism for the loss of auditory neurons likely caused by related activities at synapses connecting the hair cells to the auditory neurons in the cochlea.


- Tinnitus masking and suppressor using pulsed ultrasound

Inventor(s): Lenhardt; Martin L. (Hayes, VA)
Assignee(s): Sound Techniques Systems LLC (Arlington, VA)
Patent Number: 6,394,969
Date filed: October 14, 1999

Abstract: A system and method for tinnitus masking. Ultrasound noise is provided to a head of a patient as a vibration by way of a transducer, to thereby stimulate the auditory cortex. Once stimulated, the auditory cortex will suppress tinnitus. The ultrasound noise may be provided as an ultrasound frequency tone or as a range of frequencies that have been multiplied with an audio frequency. Pulsed ultrasound is utilized for ultrasound noise in the MHz range.

Excerpt(s): The present invention relates to a system and method for masking tinnitus. In particular, the present invention relates to a system and method for masking tinnitus using high frequency signals that affect the cortical auditory neurons in the brain. Tinnitus is defined as any ringing in the ears for which there is no external source. For example, a ringing, buzzing, whistling, or roaring sound may be heard as a result of tinnitus. Tinnitus can be continuous or intermittent, and in either case can be very irritating to one who has such an affliction. Prior to the present invention, there has been no consistently effective way to counter, or mask, tinnitus. Most of the attempts to date have focused on masking the perceived sound. For example, U.S. Pat. No. 4,222,393, issued to Robert Hocks et al., describes a tinnitus masker that provides sounds in the range of from 1000 Hz to 5000 Hz, with a peak around 3000 or 4000 Hz. The patient is provided with sounds of varying pitch, one after another, so that the patient can identify the particular external sound having the same pitch as the tinnitus that the patient is experiencing. Once this is done, a power operated sound is applied to the ear of the patient, with that sound including a range of frequencies extending in a range above and below the perceived pitch.

**Tinnitus masker**
Inventor(s): Westermann; Soren E. (Hellerup, DK)
Assignee(s): Topholm & Westermann ApS (Vaerloese, DK)
Patent Number: 5,325,872
Date filed: August 31, 1992
Abstract: The invention relates to a **tinnitus** masker with one or more signal generators, a controllable amplifier (2), one or two electroacoustic transducers (3) for conversion of electrical signals into acoustic signals and a voltage source, whereby at least one of the signal generators (1) generates a continuously repeated, sinusoidal pure tone signal which slowly moves through the audio frequency range and whose cycle duration can be adjusted between 0.1 and 1000 seconds.

Excerpt(s): The invention relates to a **tinnitus** masker with one or more signal generators, a controllable amplifier section, one or two electroacoustic transducers for conversion of electrical signals into acoustic signals as well as a voltage source. Such devices are already known in principle. More than half of the world's population suffers from **tinnitus** in one form or the other. It is a phenomenon which occurs in the hearing system whose causes are still unclear. It may consist of anything from a weak tone which occurs only several times a year up to a continuously audible loud noise, hissing, buzzing or even a very loud tone which is never interrupted.


**Tinnitus masker for direct drive hearing devices**
Inventor(s): Ball; Geoffrey R. (Sunnyvale, CA), Katz; Bob H. (Los Gatos, CA)
Assignee(s): Symphonix Devices, Inc. (San Jose, CA)
Patent Number: 5,795,287
Date filed: September 30, 1996
Abstract: Tinnitus maskers for direct drive hearing devices are provided. A circuit generates signals corresponding to sounds to mask **tinnitus** a user perceives. A direct drive hearing device which is coupled to a structure in the user vibrates in response to the signals. The vibrating direct drive hearing device stimulates hearing by vibrating the structure to which it is coupled. A user may select the frequency, intensity and phase of a tone generated. Additionally, a second tone or a background sound may be selected.

Excerpt(s): The present invention is related to hearing systems and, more particularly, to **tinnitus** masker systems for use with direct drive hearing devices. Tinnitus is the perception of sound when there is none present. It is most often described as "ringing in the ears" but varies from person to person. Some people hear hissing, buzzing, whistling, roaring, high-pitched screeches, or a sound like steam escaping from a radiator. Still others hear one tone or several tones. Twelve million Americans suffer from a severe case of **tinnitus** and it has been estimated that 20% of the population experiences **tinnitus** at some time in their lives. Initially, a person suffering from **tinnitus** may be worried or frightened because she is unsure what is wrong or how serious is the condition. Although **tinnitus** itself is not life threatening, some **tinnitus** sufferers describe the constant noise as irritating while others describe it as maddening. The actual medical cause of **tinnitus** is not clear but it is believed that some factors such as exposure to loud noise may produce or worsen **tinnitus**.
**Tinnitus masking using ultrasonic signals**

Inventor(s): Lippa; Arnold S. (Tucson, AZ), Nunley; James A. (Scottsdale, AZ)

Assignee(s): Hearing Innovations Incorporated (Tucson, AZ)

Patent Number: 6,377,693

Date filed: June 23, 1994

Abstract: A method and apparatus for treating tinnitus involves generating a noise signal to mask the ringing or buzzing in the ears caused by tinnitus and transposing the noise signal into the ultrasonic frequency range. As such, the masking signal effectively masks the tinnitus noise without interfering with the subject's perception of normal sounds such as human speech. In an alternative embodiment, human speech is transduced into electrical signals, transposed to the ultrasonic frequency range, and physically applied to the patient while tinnitus masking signals in the auditory range are applied to the patient.

Excerpt(s): The present invention relates generally to methods and apparatus for improving the hearing sensory response of human subjects and more specifically relates to methods and apparatus for treating the symptoms of tinnitus. Tinnitus is an affliction of the human sensory system which causes a persistent buzzing, ringing or whistling sound in the ears or head. One possible cause of tinnitus is a defect in the auditory nerve, although all possible causes of tinnitus are not fully known. In an effort to relieve the annoyance caused by tinnitus, one known treatment is to apply variable preferred bands of white noise to the patient in the auditory range, which serves to mask the tinnitus ringing or buzzing. However, this treatment is usually unsatisfactory because the masking noise can interfere with the patient's normal hearing perception.


**Tinnitus-masker**

Inventor(s): Junker; Franz (Entengasse 10, 7505 Ettlingen, DE)

Assignee(s): none reported

Patent Number: 5,167,236

Date filed: June 6, 1991

Abstract: A tinnitus masker having an electric circuit arranged in a housing and an earpiece which produces a sound spectrum that masks the tinnitus is disclosed. The electronic circuit is designed so that the sound spectrum produced by the earpiece contains a line spectrum with a fundamental tone.

Excerpt(s): This invention refers to a tinnitus-masker with an electronic circuit arranged in a housing, an earphone to produce a spectrum of sound in order to mask the tinnitus of the patient and with a volume control to adjust the sound intensity. Tinnitus defines a disease in which the patient notices noise in his ears or his head for which no external sources can be traced. This can be extremely annoying and possibly leads in difficult cases to severe psychic and physiological symptoms. H. Feldmann: "Homolaterale und kontralaterale Verdeckung von subjektiven Ohrgerauschen durch Breitbandgerausche,
Use of a composition
Inventor(s): Gidlund; Bo (Marmorvagen 11 D, S-752 44 Uppsala, SE)
Assignee(s): none reported
Patent Number: 6,436,449
Date filed: March 2, 2001

Abstract: Use of an extract derived from the fruits, leaves, the bark or the roots of Morinda citrifolia L. for the manufacture of a medicament for the treatment of a mammal suffering from **tinnitus**. The extract may be a liquid present in the medicament in an amount such as to give a daily dosage of 0.1-2 ml, or 0.2-1 ml, e.g. 0.4-0.7 ml, per kg body weight of the patient. The extract also may be a solid present in the medicament in an amount such as to give a daily dosage of 5-200 mg, or 10-100 mg, e.g. 20-70 mg, per kg body weight of the patient. Optionally, the medicament also may comprise lycopene, vitamine C, coenzyme Q10 and an extract from the leaves of Ginkgo biloba. The medicament may be given e.g. by oral, rectal, transdermal or inhalation administration.

Excerpt(s): The present invention relates to the manufacture of a medicament for the treatment of a mammal suffering from **tinnitus**. More specifically the present invention relates to the use of a composition comprising an extract from Morinda citrifolia L. (Rubiaceae) for the manufacture of such a medicament. Morinda citrifolia L. (Rubiaceae), the Indian mulberry, also called noni, is an evergreen shrub tree which is native to Asia, Australia and some Pacific Islands. Its botanical description is given e.g. in Levand O. (Part I Some chemical constituents of Morinda citrifolia L (noni), thesis, University of Hawaii, 1963). The roots, bark, stem, leaves and fruits thereof have traditionally been used in medicine, in food and as a dye in different cultures, e.g. on Hawaii and in the French Polynesia. As an example, a plurality of indications of use is reported in the indigenous Samoan medicine, (Dittmar A. "Morinda citrifolia L.--Use in Indigenous Samoan Medicine", J. of Herbs, Spices & Medicinal Plants, Vol. 1(3) pp 77-91 (1993)), covering a wide range of ailments, such as tooth ache (roots), septicemia (leaf), diarrhea of infants (bark) and eye complaints (fruit). just to mention a few.


Use of DL-(+/-)-alpha.-lipoic acid, D-(-)-alpha.-lipoic acid,.alpha.-lipoic acid in reduced or oxidized form or salts for treating circulatory disorders
Inventor(s): Conrad; Frank (Frankfurt, DE), Geise; Wolfgang (Dipbach, DE), Henrich; Hermann-August (Wurzburg, DE), Ulrich; Heinz (Niedernberg, DE)
Assignee(s): Asta Medica Aktiengesellschaft (Dresden, DE)
Patent Number: 5,650,429
Date filed: November 8, 1995

Abstract: The invention relates to the use of DL- (+/-)-alpha.-lipoic acid, D-(-)-alpha.-lipoic acid,.alpha.-lipoic acid in reduced or oxidized form or of the metabolites and salts, esters, amides thereof for the preparation of medicines for the treatment of
disorders caused by changes or disturbances in the rheological properties of the blood such as blood viscosity, erythrocyte flexibility and the aggregation of erythrocytes, in particular for the treatment of microangiopathy with disturbed microcirculation. It can also be used in the treatment of diabetics and of dialysis patients for protection of the erythrocytes, in central and peripheral circulatory disturbances and in tinnitus and hearing loss.

Excerpt(s): In circulatory disturbances therapy using rheologically active substances is gaining in importance, especially when a retrogression of rheological blockages is no longer possible. Rheologically active substances improve the blood flow. If the rheological component predominates as compared with other effects on the circulatory system, these substances which stimulate the circulation are referred to as "rheologica" (Radke et al., 1983). An increased flow capacity increases the flow of blood through the flow paths (microcirculation) and thereby also the oxygen supply to the tissues. This is particularly the case when the blood vessels can no longer continue to be supplied at the pathological initiation site and therefore the vasmotor reserve is exhausted. alpha.-lipoic acid is referred to chemically as 1,2-dithiolane-3-pentanoic acid, 5-(1,2-dithiolane-3-yl)-valeric acid or 5-3-(1,2-dithioanyl)pentanoic acid. alpha.-lipoic acid possesses a chiral C atom, occurs in two enantiomeric forms and is found physiologically in plants, in bacteria and in the mammalian organism. It has the function of a coenzyme in mitochondrial multienzyme complexes such as, for example, those of pyruvate dehydrogenase, of alpha.-ketoglutarate dehydrogenase and of the dehydrogenase of the branched-chain amino acids. During metabolism alpha.-lipoic acid can be converted from the oxidized form (disulphide bridge) to the reduced dihydro form having two free --SH groups. Both forms have a distinct antioxidizing action (for example, Kuklinski et al., 1991; Packer, 1993). The redox pair dihydrolipoic acid/alpha.-lipoic acid moreover has metal-chelating properties. In the Federal Republic of Germany alpha.-lipoic acid has been in use since 1966 as a medicine for the treatment of diseases of the liver, in fungal poisoning and in peripheral polyneuropathies. From knowledge of this antioxidizing action, general reference is made in DE-OS 41 38 040 A1 to a compound which catches free radicals and possesses thiol functions. The claim relates to solutions for the perfusion, conservation and reperfusion of organs and does not relate to the present invention, because here a new action in a new application has been found over and above the known antioxidizing property. The SU Patent 1 769 865 A1 relates to the use of compounds including alpha.-lipoic acid for the phenomenological improvement of the blood circulation and, more precisely, to the enlargement of the blood stream through the large vessels of the uterus and to the decrease of the volumetric variables in the region of the chorion in placental insufficiency.


- Use of morphine derivatives as medicaments for the treatment of neuropathic problems

Inventor(s): Buschmann; Helmut (Aachen, DE), Krueger; Thomas (Langerwehe-Schlich, DE), Reiss-Mueller; Elke (Bielefeld, DE), Strassburger; Wolfgang (Wuerselen, DE), Wnendt; Stephan (Aachen, DE)

Assignee(s): Gruenenthal GmbH (Aachen, DE)

Patent Number: 6,476,044

Date filed: February 15, 2002
Abstract: A method for agonizing or antagonizing the ORL1 (opioid receptor-like) receptor of the nociceptin/orphanin FQ ligand ORL1 receptor system using a morphinan compound of the general formula I or derivatives thereof. Also disclosed are methods for treating neuropathic pain and/or anxiolysis and/or depression and/or diuresis and/or urinary incontinence and/or hypotension and/or hypertension and/or senile dementia and/or Alzheimer's disease and/or general cognitive disfunctions and tinnitus and/or impaired hearing and/or epilepsy and/or obesity and/or cachexia.

Excerpt(s): The present invention relates to the use of morphinan derivatives as well as their bases or salts of physiologically compatible acids as regulators for the nociceptin/orphanin FQ ligand ORL1 receptor system and for the production of a medicament. The heptadecapeptide nociceptin/orphanin FQ is an endogenous ligand of the ORL1 (opioid receptor-like) receptor (Meunier et al., Nature 377, 1995, pp. 532-535) that belongs to the family of opioid receptors and can be found in many regions of the brain and spinal cord (Mollereau et al., FEBS Letters, 341, 1994, pp. 33-38, Darland et al., Trends in Neurosciences, 21, 1998, pp. 215-221). The peptide is characterised by a high affinity, with a Kd value of around 56 pM (Ardati et al., Mol. Pharmacol. 51, pp. 816-824), and by a high selectivity for the ORL1 receptor. The ORL1 receptor is homologous to the mu, kappa, and delta opioid receptors, and the amino acid sequence of the nociceptin/orphanin FQ peptide has a strong similarity to those of the known opioid peptides. The activation of the receptor induced by nociceptin/orphanin FQ leads via the coupling with G protein proteins to an inhibition of adenylate cyclase (Meunier et al., Nature 377, 1995, pp. 532-535). Also, at the cellular level there are functional similarities between the mu, kappa, and delta opioid receptors and the ORL1 receptor as regards the activation of the potassium channel (Matthes et al., Mo. Pharmacol. 50, 1996, pp. 447-450; Vaughan et al., Br. J. Pharmacol. 117, 1996, pp. 1609-1611) and the inhibition of the L, N and P/Q type calcium channels (Conner et al., Br. J. Pharmacol. 118, 1996, pp. 205-207; Knoflach et al., J. Neuroscience 16, 1996, pp. 6657-6664). The nociceptin/orphanin FQ peptide exhibits after intercerebroventricular application a pronociceptive and hyperalgesic activity in various animal models (Reinscheid et al., Science 270, 1995, pp. 792-794; Hara et al., Br. J. Pharmacol. 121, 1997, pp. 401-408). These results may be explained as inhibition of stress-induced analgesia (Mogil et al., Neurosci. Letters 214, 1996, pp. 131-134, as well as Neuroscience 75, 1996, pp. 333-337). In this connection an anxiolytic activity of the nociceptin/orphanin FQ peptide was also detected (Jenck et al., Proc. Natl. Acad. Sci. USA 94, 1997, 14854-14858).


Use of riluzole in the treating acoustic traumas

Inventor(s): Randle; John (Bookline, MA), Stutzmann; Jean-Marie (Villecresnes, FR)
Assignee(s): Aventis Pharmaceuticals Inc. (Bridgewater, NJ)
Patent Number: 6,660,757
Date filed: June 15, 2001
Abstract: The invention concerns the use of riluzole or one of its pharmaceutically acceptable salts for preventing and/or treating acoustic traumas and, in particular, different types of deafness and tinnitus.

Excerpt(s): This application is a continuation of International application No. PCT/FR99/03108, filed Dec. 13, 1999; which claims the benefit of priority of French


Patent Applications on Tinnitus

As of December 2000, U.S. patent applications are open to public viewing. 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 tinnitus:

- **Dosage forms useful for modifying conditions and functions associated with hearing loss and/or tinnitus**

  Inventor(s): Pearson, Don C.; (Lakewood, WA), Richardson, Kenneth T.; (Anchorage, AK)

  Correspondence: M. Henry Heines; Townsend And Townsend And Crew Llp; Two Embarcadero Center, 8th Floor; San Francisco; CA; 94111-3834; US

  Patent Application Number: 20020061870

  Date filed: January 19, 2001

  Abstract: The invention defines interdependent biofactors and biomolecules, and clinically useful formulations that are comprised of them. The active agents are demonstrated to be complementary in their physiologic functions especially as these relate to the quenching of free radicals and to the support of endothelial physiology, the reduction of hyperinsulinemia and improvements in vascular health. The active components of the invention are selected for inclusion in precise combinations specifically because they improve these various conditions and physiological functions, and by so doing reduce a variety of risks associated with hearing loss and tinnitus. The resulting enhancement of general systemic vascular health, improvement in local VIII.sup.th nerve vascular health, modulation of conditions surrounding blood fluid dynamics, the consequences of hyperinsulinemia, and improvements in free radical defenses, all reduce the potential for cochlear hair cell death and VIII.sup.th nerve atrophy, and the hearing loss and possible deafness that accompany them.

  Excerpt(s): This application is related to United States Provisional Patent Application No. 60/178,487, filed Jan. 27, 2000, and claims all benefits legally available therefrom. Provisional Patent Application No. 60/178,487 is hereby incorporated by reference for

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10 This has been a common practice outside the United States prior to December 2000.
all purposes capable of being served thereby. This invention is in the field of pharmacology and relates specifically to the improvement of clinical conditions associated with symptomatic or presymptomatic hearing loss and/or tinnitus and the reduction of risks associated with their onset. The ear of humans consists of three parts: the outer, middle and inner ear. The outer ear consists of the external ear and the auditory canal. The external ear modifies sound waves and the air-filled auditory canal conducts the sound waves to the middle ear, which consists of the tympanic membrane, or eardrum; the eustachian tube; and three tiny bones called the hammer, anvil, and stirrup. Membranes and bone surround the middle ear with the eustachian tube connecting it to the pharynx, equalizing the air pressure between the middle ear and the atmosphere.


- **Method and apparatus for treatment of mono-frequency tinnitus**

Inventor(s): Choy, Daniel S.J.; (New York, NY)

Correspondence: Steven L. Nichols; Rader, Fishman & Graver PLLC; 10653 S. River Front Parkway; Suite 150; South Jordan; UT; 84095; US

Patent Application Number: 20030114728

Date filed: December 12, 2002

Abstract: Reciprocal noise cancellation of a patient's mono-frequency tinnitus tone is achieved utilizing an externally generated tone which is subjectively defined by a mono-frequency tinnitus patient to match his/her tinnitus tone in frequency and amplitude. An externally generated sound wave, selectively designated by subjective observations of a patient to match the patient's tinnitus tone is first applied to the tinnitus patient via earphones or a speaker system and then the same externally generated sound wave is sequentially phase shifted through a plurality of angularly shifted sequence steps to shift or slide the external sound wave through at least a 180 degree phase shift of the generated signal as it is applied to the patient to achieve a series of reductions of the patient's tinnitus tone and in one of such shifted steps a reciprocal, canceling relationship with the patient's tinnitus tone. The tinnitus treatment sequence of an externally generated sound wave and then the phase shifted externally generated tone achieve cancellation of the tinnitus tone of the patient as the sequential steps of the generated tone in effect slide across the tinnitus sound wave resulting in cancellation of the tinnitus tone. By replaying the sequential phase shifted segments of the patient treatment process a patient may utilize the previously recorded sequences in a patient self-treatment process.

Excerpt(s): This application claims the benefit of the earlier filing date of U.S. Provisional Application No. 60/340,271, filed Dec. 18, 2001 and further relates to U.S. application Ser. No. 10/083,088 filed Mar. 1, 2002. The specification and disclosure of both of these related Applications are incorporated herein in their entirety by this reference. The present inventions relate to the treatment of tinnitus patients and more particularly to improved clinical methods and apparatus for treatment of mono-frequency tinnitus patients utilizing phase shift cancellation principles. Tinnitus is defined as the perception of sound by an individual when no external sound is present, and often takes the form of a hissing, ringing, roaring, chirping or clicking sound which may be intermittent or constant. According to the American Tinnitus Association, tinnitus afflicts more than 50 million Americans, and more than 12 million of those suffer so
severely from tinnitus that they seek medical attention and many cannot function normally on a day-to-day basis.


- **Method of treating tinnitus**
  Inventor(s): Dooley, David James; (South Lyon, MI), Wustrow, David Juergen; (Ann Arbor, MI)
  Correspondence: Warner-lambert Company; 2800 Plymouth RD; Ann Arbor; MI; 48105; US
  Patent Application Number: 20030176504
  Date filed: January 29, 2003
  Abstract: The invention relates to a method of treating tinnitus by administering an alpha2delta ligand such as, for example, a compound of Formula 1and pharmaceutically acceptable salts thereof, wherein R.sub.1 is hydrogen or straight or branched lower alkyl, and n is an integer of from 4 to 6.
  Excerpt(s): This invention relates to a method of preventing or treating tinnitus by administering a compound that exhibits activity as an alpha2delta ligand (alpha.2.delta. ligand). These compounds have affinity for the alpha.2.delta. subunit of a calcium channel. Such compounds have also been referred to in the literature as gamma-aminobutyric acid (GABA) analogs. Tinnitus is a medical disorder affecting between 10 and 13 percent of the population. Thus, approximately 36 million Americans and 40 million Europeans suffer from this disorder. Tinnitus can be defined as the sensation of sound perceived in the head or the ear without an evident external stimulus. It is subjective in nature and is a manifestation of malfunction in the processing of auditory signals involving both perceptual and psychological components. Tinnitus can be triggered anywhere along the auditory pathway. The emergence of persistent annoying tinnitus is usually considered to have psychological components. Tinnitus can be associated with any form of sensorineural hearing impairment, especially difficulty in hearing, ageing and exposure to noise. Middle ear surgery, myringoplasty, chronic suppurative otitis media and otosclerosis can all give rise to conductive hearing impairment and tinnitus.

- **Methods and compositions for the treatment of neuropathic pain, tinnitus, and other disorders using R(-)-ketoprofen**
  Inventor(s): Jerussi, Thomas P.; (Framingham, MA), Rubin, Paul D.; (Sudbury, MA)
  Correspondence: Pennie & Edmonds Llp; 1667 K Street NW; Suite 1000; Washington; DC; 20006
  Patent Application Number: 20020147238
  Date filed: February 5, 2002
  Abstract: Methods of treating neuropathic pain, tinnitus, and related disorders are disclosed. These methods comprise the administration of optically pure R(-)-ketoprofen. Also disclosed are pharmaceutical compositions useful in the treatment of neuropathic pain and tinnitus which comprise optically pure R(-)-ketoprofen.
Excerpt(s): The invention relates to methods of treating neuropathic pain, tinnitus, and other disorders, and to pharmaceutical compositions useful in the treatment of neuropathic pain and tinnitus. Racemic ketoprofen (a mixture of the R(-) and S(+) enantiomers) is sold under the tradenames Orudis™ and Oruvail™, for the treatment of inflammation. Physicians' Desk Reference 52nd Ed., p. 3092 (1998). Generally, ketoprofen is considered to be a nonsteroidal anti-inflammatory agent (“NSAID”). NSAIDs are believed to exhibit activity as COX-1 or COX-2 enzyme inhibitors. Most NSAIDs are believed to cause gastrointestinal irritation. The S(+) enantiomer of ketoprofen has long been thought to possess most, if not all, of the pharmacological activity of the racemate. See, e.g., Yamaguchi et al., Nippon Yakurigaku Zasshi. 90:295-302 (1987); Abas et al., J. Pharmacol. Exp. Ther., 240:637-641(1987); and Caldwell et al., Biochem. Pharmacol. 37:105-114 (1988). Indeed, U.S. Pat. Nos. 4,868,214, 4,962,124, and 4,927,854 each allege that the analgesic activity of ketoprofen resides exclusively in the S(+) enantiomer.


• **System and method for diagnosing and/or reducing tinnitus**

Inventor(s): Brown, Carolyn J.; (Iowa City, IA), Rubinstein, Jay T.; (Solon, IA), Tyler, Richard S.; (West Branch, IA)

Correspondence: Fleshner & Kim, Llp; P.O. Box 221200; Chantilly; VA; 20153-1200; US

Patent Application Number: 20020091423

Date filed: September 25, 2001

Abstract: A system and method for application of pseudospontaneous neural stimulation is provided that can generate stochastic independent activity across an excited nerve or neural population without an additional disadvantageous sensations. High rate pulse trains, for example, can produce random spike patterns in auditory nerve fibers that are statistically similar to those produced by spontaneous activity in the normal ear. This activity is called "pseudospontaneous activity". Varying rates of pseudospontaneous activity can be created by varying the intensity of a fixed amplitude, high rate pulse train stimulus, e.g., 5000 pps. A method and apparatus for diagnosing treatment for tinnitus with neural prosthetic devices according to the present invention that can use, for example, physiological responses to pseudospontaneous activity in an auditory nerve prior to the implementation of the neural prosthetic. Monitored patient response to the generated pseudospontaneous activity in the auditory nerve, even if temporary, can produce successful reduction or elimination in perceived tinnitus by subsequent treatment.

Excerpt(s): This application is a continuation-in-part application of U.S. Pat. No. 6,295,472 that issued on Sep. 25, 2001, which is a continuation-in-part application of U.S. Pat. No. 6,078,838 that issued on Jun. 20, 2000, and claims priority to U.S. Provisional Application, Attorney Docket No. UIOWA-0045PR, filed Sep. 24, 2001, the entire disclosure of each is incorporated herein by reference. This invention relates generally to an apparatus and method for providing stochastic independent neural stimulation, and in particular, a neural stimulation system and method for identifying candidates for intervention and treatment of tinnitus by initiating pseudospontaneous activity in the auditory nerve. Fundamental differences currently exist between electrical stimulation and acoustic stimulation of the auditory nerve. Electrical stimulation of the auditory nerve, for example, via a cochlear implant, generally results in more cross-fiber
synchrony, less within fiber jitter, and less dynamic range, as compared with acoustic stimulation which occurs in individuals having normal hearing.


- **Tinnitus masker/suppressor**

  Inventor(s): Lenhardt, Martin L.; (Hayes, VA)

  Correspondence: George E. Quillin; Foley & Lardner; Washington Harbour; 3000 K Street, NW., Suite 500; Washington; DC; 20007-5109; US

  Patent Application Number: 20010051776

  Date filed: April 2, 2001

  Abstract: A system and method for **tinnitus** masking or suppression. At least one upper audio frequency is provided to a head of a patient, to thereby stimulate the auditory cortex. The upper audio frequency is preferably applied by way of air conduction. At least one ultrasound frequencies can also be applied by way of bone conduction. Once stimulated, the auditory cortex will mask or suppress **tinnitus**.

  Excerpt(s): This application is a continuation in part of U.S. patent application Ser. No. 09/417,772, filed Oct. 14, 1999 which itself claims priority to U.S. provisional patent application Ser. No. 60/104,233, filed Oct. 14, 1998, both of which are incorporated in their entirety herein by reference. The present invention relates to a system and method for masking or suppressing **tinnitus**. In particular, the present invention relates to a system and method for masking or suppressing **tinnitus** using high frequency signals, such as upper audio signals in one embodiment and ultrasound and higher range signals in other embodiments, that affect the cortical auditory and other neurons in the brain. Tinnitus is defined as any **ringing in the ears** for which there is no external source. **Tinnitus** is considered a phantom sound, which arises in the brain and not actually in the ears as it appears to subjectively. For example, a ringing, buzzing, whistling, or roaring sound may be perceived as **tinnitus**. **Tinnitus** can be continuous or intermittent, and in either case can be very irritating to one who has such an affliction.


- **Topical application of muscarinic and opioid agents for treatment of tinnitus**

  Inventor(s): El Khoury, George F.; (Long Beach, CA)

  Correspondence: Millen, White, Zelano & Branigan, P.C.; 2200 Clarendon BLVD.; Suite 1400; Arlington; VA; 22201; US

  Patent Application Number: 20020010191

  Date filed: July 17, 2001

  Abstract: The present invention relates to a compositions and methods for treating **tinnitus**. In preferred embodiments of the invention, muscurinic and/or opioid agents are administered to the affected ear in amount effective to relieve one or more **tinnitus** symptoms. A preferred agent is an anticholinesterase inhibitor, such as neoostigmine.

  Excerpt(s): This application is a continuation-in-part of application Ser. No. 09/318,573, filed May 27, 1999, which is hereby incorporated by reference in its entirety. The present invention relates to compositions and methods for treating **tinnitus**. **Tinnitus** can be
described as "ringing" and other head noises that are perceived in the absence of any external noise source. It is estimated that 1 out of every 5 people experience some degree of tinnitus. Tinnitus can be classified into two forms: objective and subjective. Objective tinnitus, the rarer form, consists of head noises audible to other people in addition to the sufferer. The noises are usually caused by vascular anomalies, repetitive muscle contractions, or inner ear structural defects. The sounds are heard by the sufferer and are generally external to the auditory system. This form of tinnitus means that an examiner can hear the sound heard by the sufferer by using a stethoscope. Benign causes, such as noise from TMJ, openings of the eustachian tubes, or repetitive muscle contractions may be the cause of subjective tinnitus. The sufferer might hear the pulsatile flow of the carotid artery or the continuous hum of normal venous outflow through the jugular vein when in a quiet setting. It can also be an early sign of increased intracranial pressure and is often overshadowed by other neurologic abnormalities. The sounds may arise from a turbulent flow through compressed venous structures at the base of the brain.


Keeping Current

In order to stay informed about patents and patent applications dealing with tinnitus, 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 “tinnitus” (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 tinnitus.

You can also use this procedure to view pending patent applications concerning tinnitus. 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 7. BOOKS ON TINNITUS

Overview

This chapter provides bibliographic book references relating to tinnitus. In addition to online booksellers such as www.amazon.com and www.bn.com, excellent sources for book titles on tinnitus 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 “tinnitus” (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 tinnitus:

- Tinnitus Handbook
  Summary: This audiology textbook offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). The author includes information on tinnitus, insomnia, physiological mechanisms and neural models, medical and surgical evaluation and management, tinnitus and children, and an historical perspective on tinnitus. Specific topics include psychoacoustical measurement, spontaneous otoacoustic emissions and tinnitus, and the psychological measurement of tinnitus. The author reviews the options for therapy and treatment, including hearing aids, maskers, cognitive behavior modification, electrical stimulation, habituation therapy, counseling,
and biofeedback. Additional chapters address the medicolegal issues of tinnitus and resources including the American Tinnitus Association and self help groups. Each chapter includes a list of references and the textbook concludes with a subject index.

• **Tinnitus: What is That Noise in My Head?**
  
  **Source:** Auckland, New Zealand: Sandalwood Enterprises. 1994. 104 p.
  
  **Contact:** Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. PRICE: $14.50 for members; $18.00 for nonmembers. ISBN: 0473015625.
  
  **Summary:** This book familiarizes readers with the common causes and symptoms of tinnitus and explains how people with tinnitus can take steps toward relieving the condition. Written in non-technical language, the book features eight chapters covering a definition of tinnitus, pathology of the ear, medical treatments, non-medical treatments, the role of stress, the role of nutrition, self-help groups, and research and future trends. The book includes a bibliography, glossary of terms, and addresses for resource organizations (primarily in New Zealand and Australia). 15 references.

• **Tinnitus: Advances in Diagnosis and Management**
  
  
  **Contact:** Available from American Academy of Otolaryngology-Head and Neck Surgery. One Prince Street, Alexandria, VA 22314-3357. (703) 836-4444. Fax (703) 683-5100. E-mail: orders@entnet.org. Website: www.entnet.org. PRICE: $12.00 plus shipping and handling for members; $15.00 plus shipping and handling for nonmembers. ISBN: 1567720269.
  
  **Summary:** This educational booklet offers otolaryngologists an update on the diagnosis and management of tinnitus (ringing or other noises in the ears). The author notes that, in the past, because of poor understanding of tinnitus, many patients had been condemned to live with this very disturbing symptom for the rest of their lives. Recent developments in tinnitus research, however, have led to a more optimistic approach for the management of these patients. The booklet separates tinnitus into nonpulsatile (subjective) and pulsatile categories. Topics in the first section including pathophysiology; components of evaluation, including patient history, neurootologic examination, audiologic evaluation, electrophysiologic testing, radiologic evaluation, metabolic and allergy testing, and tinnitus analysis (pitch matching, loudness matching, minimum masking level, residual inhibition); and management issues, including masking, habituation technique, electrical stimulation, biofeedback, medical treatment, and surgical treatment. In the section on pulsatile tinnitus, the author discusses pathophysiology and classification; arterial etiologies, including atherosclerotic carotid artery disease, venous etiologies (idiopathic intracranial hypertension syndrome), nonvascular etiologies (palatal, stapedial, and tensor tympani muscle myoclonus), patient evaluation, radiologic evaluation, and patient management. 3 figures. 11 tables. 144 references.

• **Proceedings of the Fifth International Tinnitus Seminar**
  
Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. PRICE: $10.00 plus shipping and handling.

Summary: This lengthy document presents the proceedings of the 5th Annual Tinnitus Seminar, held in 1995 in Portland, Oregon. The book, a compilation of the papers, posters, and workshops that were part of the Seminar, presents both scientific information and personal viewpoints from a broad spectrum of people interested in tinnitus. After a reprinting of the Special Speakers' presentations, the book categorizes the proceedings into 13 sections: etiology, alternative treatments, animal models and object measures, assessment measures, drugs, epidemiology and demographics, instrumentation, legal and noise issues, mechanisms, medical and clinical considerations, psychological and rehabilitation issues, the role of self-help, and temporomandibular joint disorders. Most presentations include references. (AA-M).

- **Tinnitus. A Self-Management Guide for the Ringing in Your Ears**
  Summary: This self-help book for people with tinnitus describes practical strategies for coping with the condition. Step-by-step guidelines are provided for psychological techniques such as relaxation, stress management, and attentional control. Emphasis is placed on the effect of attitude on the perception of tinnitus as a problem. The text reviews the causes of tinnitus, typical medical and audiological treatments, and common problems related to tinnitus. Self-assessment exercises are provided throughout discussions about the impact of tinnitus on daily activities, emotional reactions, the control of negative thought processes, problem-solving, and preparation for high-risk situations. Lifestyle modifications, distress, anger, sleep problems, and coping techniques in quiet and noisy environments are addressed.

- **Tinnitus: New Hope for a Cure**
  Contact: Available from Mr. Paul VanValkenburgh. Box 3611, Seal Beach, CA 90740. PRICE: $15.00 each. ISBN: 0961742526.
  Summary: This self-published book provides information on tinnitus, its causes, and how to manage the condition. The author writes in a casual style, but uses technical language. He cites passages from medical journals and responds to these passages with his own comments and speculations. Topics covered include the dynamics of perception and the importance of psychosocial factors and attitude; the filter-bank theory and how the cochlea works; everyday sub-conscious causes of ringing sounds; filter overload; biological ear defenses; the physiology of the ear and the jaw bone; middle ear anatomy and resonance; the olivo-cochlear crossover; the blood supply of the cochlea; human filter dynamics; and future developments, including in hearing aids, maskers, hair cell regeneration, and treating the cause, not the symptoms. The book is illustrated with diagrams and black and white photographs and concludes with a subject index. 31 figures. 56 references. (AA-M).

- **Dizziness, Hearing Loss, and Tinnitus**

Summary: This textbook presents a concise approach to evaluating patients with dizziness, hearing loss, and tinnitus. In the first section, the author briefly reviews clinically relevant anatomy and physiology to provide a framework for understanding the pathophysiology of vestibular and auditory symptoms. The second section outlines the important features in the patient's history and examination that determine the probable site of a lesion. Separate chapters provide a systematic approach to evaluating patients with different types of dizziness and tinnitus. Numerous tables and flowcharts guide the reader through the diagnostic workup. The section on diagnosis and treatment covers the key differential diagnosis points that help the clinician decide the cause of the patient's problem and how to treat it. The description of each disease begins with an outline of symptoms, signs, laboratory findings, and treatment options. Each chapter includes references and a subject index concludes the volume.

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 “tinnitus” at online booksellers’ Web sites, you may discover non-medical books that use the generic term “tinnitus” (or a synonym) in their titles. The following is indicative of the results you might find when searching for “tinnitus” (sorted alphabetically by title; follow the hyperlink to view more details at Amazon.com):

• **Living With Tinnitus (Living With Series)** by David W. Rees, Simon D. Smith (1991); ISBN: 0719033667; 
  http://www.amazon.com/exec/obidos/ASIN/0719033667/icongroupinterna

• **Mechanisms of Tinnitus** by Jack A. Vernon (Author), Aage R. Moller (Author); ISBN: 0205140831; 
  http://www.amazon.com/exec/obidos/ASIN/0205140831/icongroupinterna

• **Natural Relief from Tinnitus** by Paul, Jr. Yanick, Paul Yannick; ISBN: 0879836555; 
  http://www.amazon.com/exec/obidos/ASIN/0879836555/icongroupinterna

  http://www.amazon.com/exec/obidos/ASIN/0722513054/icongroupinterna

  http://www.amazon.com/exec/obidos/ASIN/0205313655/icongroupinterna

• **Sensorineural Hearing Loss, Vertigo, and Tinnitus** by Meyerhof (1981); ISBN: 0683067508; 
  http://www.amazon.com/exec/obidos/ASIN/0683067508/icongroupinterna

• **Stop Your Tinnitus: Causes, Preventatives, and Alternatives** by Phyllis Avery (1993); ISBN: 1880598221; 
  http://www.amazon.com/exec/obidos/ASIN/1880598221/icongroupinterna

  http://www.amazon.com/exec/obidos/ASIN/1887053069/icongroupinterna

• **Tinnitus** (1988); ISBN: 999801199X; 
  http://www.amazon.com/exec/obidos/ASIN/999801199X/icongroupinterna

• **Tinnitus** by Richard Hallam; ISBN: 0722518013; 
  http://www.amazon.com/exec/obidos/ASIN/0722518013/icongroupinterna

• **Tinnitus** by Jonathan W.P. Hazell (Editor); ISBN: 0443021562; 
  http://www.amazon.com/exec/obidos/ASIN/0443021562/icongroupinterna

• **Tinnitus (Human Horizons Series)**; ISBN: 0285632833; 
  http://www.amazon.com/exec/obidos/ASIN/0285632833/icongroupinterna

• **Tinnitus 85**; ISBN: 0272796395; 
  http://www.amazon.com/exec/obidos/ASIN/0272796395/icongroupinterna

• **Tinnitus 91** by J. M. Aran (Editor); ISBN: 9062990878; 
  http://www.amazon.com/exec/obidos/ASIN/9062990878/icongroupinterna

• **Tinnitus and Its Management: A Clinical Text for Audiologists** by John Greer Clark, 
  Paul Yanick (Editor); ISBN: 0398050430; 
  http://www.amazon.com/exec/obidos/ASIN/0398050430/icongroupinterna

• **Tinnitus Handbook** by Richard Tyler (Editor); ISBN: 1565939220; 
  http://www.amazon.com/exec/obidos/ASIN/1565939220/icongroupinterna

• **Tinnitus New Hope for a Cure** by Paul V. Valkenburgh, Paul Van Valkenburgh (1995); 
  ISBN: 0961742526; 
  http://www.amazon.com/exec/obidos/ASIN/0961742526/icongroupinterna

• **Tinnitus Rehabilitation by Retraining: A Workbook for Sufferers, Their Doctors, and Other Health Care Professionals** by Bernhard Kellerhals, Regula Zogg (1999); ISBN:


Tinnitus: Facts, Theories and Treatments by Dennis McFadden (Editor); ISBN: 030903284; http://www.amazon.com/exec/obidos/ASIN/030903284/icongroupinterna


Tinnitus: Pathophysiology and Management by Masaaki Kitahara (Editor); ISBN: 0318400790; http://www.amazon.com/exec/obidos/ASIN/0318400790/icongroupinterna


Tinnitus: Questions and Answers by Jack A. Vernon (Author), Barbara Tabachnick Sanders (Author); ISBN: 0205326854; http://www.amazon.com/exec/obidos/ASIN/0205326854/icongroupinterna


Vertigo, Nausea, Tinnitus, and Hypoacusia Due to Head and Neck Trauma: Proceedings of the Xviith Scientific Meeting of the Neurootological and Equil by Claus-Frenz Claussen, Milind V. Kirtane (Editor); ISBN: 0444811508; http://www.amazon.com/exec/obidos/ASIN/0444811508/icongroupinterna


The National Library of Medicine Book Index

The National Library of Medicine at the National Institutes of Health has a massive database of books published on healthcare and biomedicine. Go to the following Internet site, http://locatorplus.gov/, and then select “Search LOCATORplus.” Once you are in the search area, simply type “tinnitus” (or synonyms) into the search box, and select “books only.” From there, results can be sorted by publication date, author, or relevance. The following was recently catalogued by the National Library of Medicine:

- **Deafness, tinnitus, and vertigo.** Author: Kopetzky, Samuel Joseph; Year: 1954; New York, Nelson, 1948
- **Proceedings of the Fifth International Tinnitus Seminar: July 12-15, 1995, Portland Oregon, USA** Author: Reich, Gloria E.; Year: 1991; Portland, Or.: American
- **Proceedings of the II International Tinnitus Seminar, New York, 10-11 June 1983** Author: Shulman, Abraham; Year: 1968; Ashford, Kent: Headley Brothers, 1984
- **Proceedings of the Seventh International Tinnitus Seminar: March 5th-9th, 2002: hosted by the Physiology Department, University of Western Australia** Author: Patuzzi, Robert; Year: 1982; Perth, Australia: Physiology Dept., University of Western Australia, c2002; ISBN: 0958047405
- **Sound waves in the treatment of deafness and tinnitus aurium.** Author: Maloney, James A.; Year: 1998; Washington, 1892
- **Tinnitus, proceedings of the First International Tinnitus, Seminar: New York, 8-9 June 1979** Author: Downstate Medical Center (N.Y.). Division of Otolaryngology and Communication Sciences; Year: 1981; Ashford, Kent: Headley Brothers, 1981

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11 In addition to LOCATORPlus, in collaboration with authors and publishers, the National Center for Biotechnology Information (NCBI) is currently adapting biomedical books for the Web. The books may be accessed in two ways: (1) by searching directly using any search term or phrase (in the same way as the bibliographic database PubMed), or (2) by following the links to PubMed abstracts. Each PubMed abstract has a “Books” button that displays a facsimile of the abstract in which some phrases are hypertext links. These phrases are also found in the books available at NCBI. Click on hyperlinked results in the list of books in which the phrase is found. Currently, the majority of the links are between the books and PubMed. In the future, more links will be created between the books and other types of information, such as gene and protein sequences and macromolecular structures. See http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=Books.
Chapters on Tinnitus

In order to find chapters that specifically relate to tinnitus, an excellent source of abstracts is the Combined Health Information Database. You will need to limit your search to book chapters and tinnitus 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 “tinnitus” (or synonyms) into the “For these words:” box. The following is a typical result when searching for book chapters on tinnitus:

- **Tinnitus After Acute Acoustic Trauma**
  

  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: Acute acoustic trauma (AAT) from firearm shooting is a common cause of tinnitus. The natural history and long term effects of AAT induced tinnitus are not well known. This article reports on a study undertaken to investigate the duration and long term annoyance of AAT induced tinnitus in 418 conscripts who had suffered AAT during their service in the Finnish Defense Forces 11 to 15 years earlier. The article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. Results showed that tinnitus was a prominent symptom immediately after AAT in all cases. In most cases, it disappeared or was attenuated to an undisturbing level within a few weeks following trauma so that in more than two thirds of the cases, tinnitus was no longer present three months after the AAT. Thirty percent of the patients (122 conscripts) stated that they still had tinnitus when they finished their military service. The authors contacted this group of patients for a long term follow up, successfully reaching 101 cases (83 percent). Of these 101 patients, 42 claimed that they still suffered considerably from tinnitus (11 to 15 years after the AAT) and were interested in any new treatment possibility if available. 4 tables.

- **Tinnitus in Children**
  


  Summary: Children rarely complain of tinnitus, and when they do it does not appear to have the debilitating effects it has on adults. However, when children do complain of tinnitus, they should be taken seriously. This chapter on tinnitus in children is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the authors discuss tinnitus in
children with normal hearing; tinnitus in children with different levels of hearing loss; differences between the tinnitus experienced by children and adults; the etiology of sensorineural tinnitus in children, including ototoxic drugs, Meniere's disease, perilymph fistula, noise exposure, and pharmacologic agents; more rare causes of tinnitus in children, including acoustic neuromas, congenital neurosyphilis, blood dyscrasias, middle ear tinnitus, venous hums, transmitted bruit (vascular abnormalities), glomus tumors (a growth in the middle ear), and hydrocephalus (increased intracranial pressure); vascular malformations of the middle ear, including dural arteriovenous fistulae, dehiscent jugular bulb, aberrant carotid artery, and persistent stapedial artery; the causes of nonpulsatile middle ear tinnitus, including palatal myoclonus (rhythmic, involuntary contractions of the soft palate), middle ear myoclonus, patulous Eustachian tube, temporomandibular joint disorders, and familial tinnitus; and the evaluation of the child with complaints of tinnitus, including history, physical examination, audiologic evaluation, radiologic evaluation, and counseling and treatment options for children. The authors stress that since tinnitus is most often a symptom of an underlying disease, an accurate diagnosis must first be established before attempting treatment. 1 figure. 1 table. 102 references.

- Hyperacusis Assessment: Relationships with Tinnitus


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, WIN 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: Clinical hyperacusis consists of a marked intolerance to ordinary environmental sounds while hearing thresholds are normal. This article on the interrelationship between hyperacusis and tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors note that the incidence of hyperacusis in individuals with tinnitus has been reported to be as high as 40 to 45 percent. Moreover, it seems that a peripheral auditory system, the medial-olivo cochlear system, is less efficient among patients with tinnitus. The authors report on a study undertaken to explore this efferent system functioning in hyperacusic patients with no other pathology (like tinnitus) to study the involvement of those fibers in auditory hypersensitivity itself. Hyperacusic individuals tend to isolate themselves (according to patient self report). The authors performed psychoacoustical tests, including loudness discomfort level measurements and loudness growth assessments, to quantify the auditory hypersensitivity of these patients. Results showed that the auditory dynamic ranges were lower in hyperacusic persons compared to control subjects. The medial-olivo cochlear system appeared to be more efficient in control than in hyperacusic subjects, but this tendency was not systematic. 4 figures. 23 references.

- Patterns of Audiologic Findings for Tinnitus Patients


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, WIN 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website:
Summary: Comprehensive diagnostic audiologic assessment is a critical step in the professional management of tinnitus patients. Within recent years, otoacoustic emissions (OAEs) have assumed an important role in the diagnostic audiologic test battery. OAEs offer an objective and highly sensitive clinical measure of cochlear (outer hair cell) function. The article on patterns of audiologic findings for tinnitus patients is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this study, the authors report audiologic findings for a series of 225 patients presenting to a medical center audiology clinic with the complaint of tinnitus. In addition to OAEs, the audiologic test battery included measurement of aural immittance, pure tone hearing thresholds, word recognition scores, loudness discomfort levels (LDLs) and, in selected patients, ultra high frequency pure tone audiometry. Tinnitus pitch, loudness, and maskability were also determined for all patients. Findings from a comprehensive diagnostic audiologic test battery not only serve to confirm cochlear hearing loss, they also contribute to patient counseling and education and thus constitute a definitive step toward successful management of tinnitus. One figure offers a simplified patient care algorithm for tinnitus assessment and management. 3 figures.

- **Musicians and Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: Legislation concerning noise-exposed workers may exclude musicians. As a group, they are not often considered as noise-exposed workers. However, as trained listeners exposed to high levels of noise and dependent on hearing for the performance and enjoyment of their profession, musicians represent a unique noise-exposed group. This article on musicians and tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the author describes a study covering a five year period of a group of symphony orchestra players. Hearing loss, tinnitus, and hearing protection of musicians are discussed. The author concludes that Distortion Product Otoacoustic Emissions (DPOAEs) are a useful screening tool, that tinnitus can be an early indicator of hearing problems, and that using an industrial hearing conservation framework may be inadequate for the performing arts. Otoacoustic emissions should be part of regular hearing screening for musicians and hearing screening should take place more frequently than in industry. 18 figures. 13 references.

- **Local Drug Delivery Systems for the Treatment of Tinnitus: Principles, Surgical Techniques and Results**

Local treatment of inner ear diseases involves the direct application of pharmacological substances and or electrical stimulation of the inner ear structures. This article on local drug delivery systems for the treatment of tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors note that, in contrast to systemic pharmacotherapy, these local delivery systems present no dosage problems, result in no systemic side effects, and bypass the blood cochlea barrier. The round window membrane is the preferred access. The basic precondition is a stable coupling element, which allows a controlled drug release into the perilymphatic space. While technical difficulties do not allow direct access to the perilymphatic space, a catheter possessing a certain shape may be inserted into the round window niche. Among the disadvantages of these local drug delivery systems are the necessity of a surgical procedure, local side effects in the inner ear, only short term benefits from treatment, and the lack of coupling elements and implantable microdosage systems. The authors report on their clinical experiences using this type of local drug delivery system with lidocaine, glutamate, glutamic acid, diethylaesther, caroverine, and gentamycin. 8 references.

• **Outcome for Tinnitus Patients After Consultation with an Audiologist**


Summary: Patients seeking professional care for tinnitus naturally expect the initial consultation to be the first step toward successful management of their health problem. Unfortunately, they are often rather quickly dismissed with an inaccurate summary of their audiologic status, a poor prognosis for tinnitus treatment, or inappropriate professional guidance. This article reports outcome for an unselected series of over 200 patients presenting to a medical center audiology clinic for a formal tinnitus consultation by an audiologist with more than 20 years of clinical experience. The article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. The data showed that more the 90 percent of the patients had previously sought, without success, medical treatment for their tinnitus. Prior to the tinnitus consultation, patients completed the Tinnitus Handicap Inventory (THI) and a comprehensive survey questioning the nature of their tinnitus and the effect it had on their daily activities. During an hour consultation, patients were given detailed, current information on the causes of and treatments for tinnitus. Patients also had ample opportunity to ask questions about tinnitus and discuss their problem with the audiologist. The initial group was subsequently subdivided into patients who declined management following the consultation versus those who chose to pursue a formal treatment plan, such as Tinnitus Retraining Therapy (TRT). Then, 6 to 18 months after the initial consultation, outcome for all patients was measured using the THI and baseline survey. The majority of patients declined formal tinnitus management. This
decision was inversely related to tinnitus severity. Outcome for this subgroup was significantly improved by the consultation. The authors conclude that either the consultation itself, and or the patient's compliance with simple recommendations made during this visit can improve outcome and minimize the requirement for extended tinnitus treatment. 3 figures. 1 table.

- **Tinnitus and Insomnia**
  
  
  
  Summary: Sleep disturbance is a frequent complaint of people with tinnitus; indeed some patients regard it as an integral element of the experience of tinnitus. This chapter on tinnitus and insomnia is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the author discusses the prevalence and definitions of insomnia (a range of sleep related complaints, including sleep of insufficient duration, of poor quality or effectiveness); the nature and function of sleep; the characteristics of insomnia; the extent of the problem of tinnitus related insomnia; assessment methods, including clinical interview, sleep diaries, assessment of mood, sleep questionnaires, polysomnographic recordings, and other behavioral assessments; models of insomnia; the mechanisms of tinnitus related insomnia; the management of insomnia, including medication, behavioral treatment, relaxation therapy, stimulus control techniques, paradoxical intention, sleep restriction, and approaches to the management of intrusive cognition (thoughts); and the management of tinnitus related insomnia. The author concludes that the high prevalence of sleep disorders in populations with tinnitus, and vice versa, requires that researchers and clinicians in the tinnitus field have a responsibility to investigate tinnitus related insomnia more carefully and to seek solutions to the problem. 1 figure. 73 references.

- **Subjective Tinnitus: Its Mechanisms and Treatment**
  
  
  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: Subjective tinnitus is defined as the perception of an acoustic like sensation (sounds) for which no external generation can be found; tinnitus can include buzzing or ringing in the ears or head, or other types of noise sensations. This chapter on the mechanisms and treatment of subjective tinnitus 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 historical overview of tinnitus; the cause and prevalence of tinnitus; sounds of tinnitus; mechanisms of tinnitus; the assessment and evaluation of tinnitus, including medical evaluation and case history, audiometric evaluation, pitch matching, loudness matching, minimum masking level, residual inhibition, loudness discomfort level, and subjective assessment; treatment modalities, including drug therapy, antianxiety drugs, antidepressant drugs, laser therapy, psychological intervention, biofeedback, masker
therapy, and habituation therapy (Tinnitus Retraining Therapy); other therapeutic approaches; and hyperacusis (heightened sensitivity to sound). 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. 2 figures. 57 references.

- **Quality Management in the Therapy of Chronic Tinnitus**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: The assessment of psychological complaint patterns has become increasingly important during the past years for studies of chronic tinnitus patients. Unlike research in the area of chronic pain, only about nine scientifically relevant questionnaires designed to evaluate the degree of tinnitus severity exist worldwide. This article on quality management in the therapy of chronic tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, all available questionnaires for the assessment of psychological tinnitus severity are summarized, and their individual advantages and disadvantages are compared and discussed critically. The authors found an acceptable psychometric stability only in four questionnaires. The authors conclude that tinnitus questionnaires are important diagnostic instruments for assessing various complaints from different fields of life in connection with tinnitus. By distribution and growing acceptance of valid instruments in science, in medical appraisals, and in certain therapeutic areas, the problems associated with tinnitus will become clearer, and clinicians will be able to guide patients to individually suitable therapeutic options with more efficiency. The authors make their conclusions based on experiences collected in German speaking countries. 4 tables. 34 references.

- **Tinnitus in the Federal Republic of Germany: A Representative Epidemiological Study**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report on their epidemiological study on tinnitus in Germany, which evaluated the prevalence and incidence rate of the symptom. In a random sample of persons aged more than ten years, 3,049 telephone interviews were performed. The sample was stratified by the state in order to realize an exhaustive reflection of the country. The main results showed that 18.7 million citizens (24.9 percent of the population) have or have once had noise in the ear; 2.9 million citizens (3.9 percent of the population) had
noise in the ear at the time of the study; and 2.7 million citizens (3.6 percent of the population) have ear noise that has lasted longer than one month. Each year there are 250,000 citizens (0.33 percent of the population) as new chronic patients. Of patients with chronic tinnitus, 53 percent report a hearing impairment, but only 7.5 percent of these patients have been supplied with a hearing aid. Thirteen percent of the patients regarded the medical assistance as very helpful; 20 percent as completely inadequate. Fifty-five percent of patients replied that no therapy had helped. The authors list many other results in this article. 10 references.

• **Neurophysiological Model of Tinnitus and Hyperacusis**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on a neurophysiological model of tinnitus and hyperacusis (heightened sensitivity to sound) is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. The neurophysiological model of tinnitus and hyperacusis resulted from analyses of clinical and research data on tinnitus from the perspective of the basic functional properties of the central nervous system (CNS). Tinnitus induces distress in only about 25 percent of the people perceiving it, with no correlation between the distress and the psychoacoustical characterization of the tinnitus. In addition, the characterization of tinnitus in the population of people suffering from it is not related to the severity of tinnitus and to the treatment outcome. These findings support the hypothesis that the auditory system is only a secondary system, and other systems in the brain are dominant in clinically relevant tinnitus. Other evidence to support this hypothesis is the fact that essentially everyone experiences tinnitus when put in a sufficiently quiet environment (94 percent of people without tinnitus experience tinnitus when isolated for several minutes in an echo free chamber). 2 figures. 21 references.

• **Developing a Structured Interview to Assess Audiological, Aetiological and Psychological Variables of Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on a new diagnostic instrument for tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors introduce and describe the Structured Tinnitus Interview (STI). The STI represents a multidisciplinary diagnostic approach whereby major biomedical, audiological, and psychological characteristics of tinnitus are assessed in a systematic and standardized form. Separate sections of the instrument cover the patient's tinnitus history, etiological factors, and psychosocial tinnitus related
complaints. Good to excellent test-retest reliability is demonstrated on both item and scale level. The dimensional scales of the STI refer to different areas of psychosocial functioning. They were found to be valid and sensitive to changes induced during cognitive behavioral treatment. The interview is very well accepted by both clinicians and patients. 1 figure. 4 tables. 14 references.

- **Children's Experience of Tinnitus**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article on children's experience of tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report a small scale study of 24 children (half with normal hearing and half with a hearing loss) who presented to the Psychology Department of the authors with troublesome tinnitus. Similar to findings in adult studies, results suggest that tinnitus can have as marked an impact on children's lives as it is reported to have on adults. Insomnia, emotional distress, listening and attention difficulties, are the main psychological factors associated with tinnitus in children. These in turn may have an effect on their school performances. Differences were found between children with normal hearing and those with some degree of hearing loss. Overall, children with normal hearing found tinnitus more troublesome, and presented with higher levels of anxiety than those with some level of hearing impairment. The authors conclude that children who complain of tinnitus should be taken seriously. In terms of management, individual intervention packages tailored to the needs of each child and family were found to be useful in alleviating anxiety and other associated factors. 7 tables. 10 references.

- **Gender Aspects Related to Tinnitus Complaints**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article on gender aspects related to tinnitus complaints is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors stress that when speaking with patients whose tinnitus gives rise to emotional distress, it is essential to focus on relevant gender related factors. Males, in general, tend to ignore psychological ill health more than females. The authors report on a study in which the Nottingham Health Profile (NHP), designed for the measurement of health related quality of life in medical conditions, was used in a tinnitus population including 57 females and 129 males. The severity rate for four out of six dimensions of the NHP was higher among the females. Younger women reported significantly more health problems compared to a normal female control group in four
Dimensions: lack of energy, pain, emotional reactions, and sleep disturbances. 6 references.

**Effects of Publicity on Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on the effects of publicity regarding tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report on their study which looked at the effects of publicity, self reported by new patients presenting at tinnitus clinics. The questionnaire study includes data from 316 patients, taken from 4 centers (two private and two of the British National Health Service). Results showed that of the 85 percent who had experienced publicity, more patients found publicity helpful than upsetting, while some found it both helpful and upsetting. The authors report that some types of publicity presents the worst case scenarios of tinnitus, perhaps to encourage more financial support for research and clinical services, and sympathy for those afflicted. However, medical advisors contend that this approach simply feeds the vicious cycle (symptoms causing distress which worsens the symptoms) and increase the distress of many people with tinnitus. The authors summarize the explanatory comments that patients made, and discuss what styles of publicity should be avoided. The questionnaire used in the study is reprinted at the end of the article. 8 tables. 2 references.

**Effects of Insomnia on Tinnitus Severity: A Follow-Up Study**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on the interplay between insomnia and tinnitus severity is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors describe their study undertaken to investigate the effects of insomnia on tinnitus severity and to determine how this relationship may evolve with the passage of time. Questionnaires were mailed to patients prior to their initial appointment at the Oregon Health Sciences University Tinnitus Clinic between 1994 and 1997. These questionnaires requested information pertaining to insomnia, tinnitus severity, and loudness. During their initial appointment, patients received counseling, education, and reassurance about tinnitus; audiometric and tinnitus evaluations; and treatment recommendations. Follow up questionnaires were mailed to 350 patients one to four years (mean of 2.3 years) after their initial appointment at the Clinic. Questionnaires were returned by 174 patients (130 males, 44 females; mean age 55.9 years). Even though many of these patients improved in both sleep interference and tinnitus severity, a significant number (43 patients)
reported on the follow up questionnaire that they continued to have difficulty sleeping. Reported loudness and severity of tinnitus were significantly greater for this group than for groups of patients who reported that they never or only sometimes have difficulty sleeping. The relationship between sleep disturbance and tinnitus severity became more pronounced with the passage of time. The authors conclude that their findings underscore the importance of identification and successful treatment of insomnia for patients with tinnitus. One appendix offers the follow up questionnaire used in the study. 6 tables. 18 references.

- **Pathophysiology of Severe Tinnitus and Chronic Pain**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article on the pathophysiology of severe tinnitus and chronic pain is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the author defines severe tinnitus as that which interferes with sleep, work, and social life. In most cases, severe tinnitus is believed to be caused by changes in the function of the central auditory nervous system. However, some forms are caused by changes in the function of the cochlea, as evidenced from the fact that severing the auditory nerve can relieve tinnitus in some individuals. Topics include a comparison of symptoms and signs of tinnitus and chronic pain, current hypotheses about the generation of pain and tinnitus, the generation of central tinnitus, and similarities with other hyperactive disorders. The author concludes that the changes in the function of the central nervous system that cause chronic pain and severe tinnitus are not associated with morphologic changes that can be detected by known imaging techniques, but the areas of the brain that are activated can be identified by functional imaging tests. Few electrophysiologic or behavioral tests are abnormal in individuals with chronic tinnitus and chronic pain, which complicates the diagnosis of tinnitus and the ability to monitor progress of treatment. The clinician mainly has to rely on the patients reported symptoms. 2 figures. 25 references.

- **Prevalence and Problems of Tinnitus in the Elderly**


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article on the prevalence and problems of tinnitus in the elderly is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report on the Australian Longitudinal Study of Ageing (ALSA) which provides self report and performance based measures of sensory function and selected sociodemographic, physical, cognitive, and psychosocial information in a large sample of elderly urban Australians (n = 2087),
aged 70 to 103 years. The authors' study examined tinnitus in 1,453 ALSO respondents, who provided data about tinnitus at baseline and at follow up 2 years later. Of the 1,453 respondents, 258 (17.6 percent) reported tinnitus on both occasions; 64.8 percent reported no tinnitus on either occasion; and the remainder reported tinnitus only at baseline (10.6 percent), or only at follow up (7 percent). Overall, respondents with tinnitus performed more poorly on tests of measured hearing, and appear to experience a lower quality of life in several domains than respondents who do not report tinnitus. 4 tables. 13 references.

• **Quality of Family Life of People Who Report Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on the quality of family life of people who report tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report on their study which was undertaken to evaluate the effectiveness of the rehabilitation protocols used by the Nottingham Tinnitus Clinic by measuring how tinnitus affects the quality of life of the person reporting tinnitus and their family. The authors assessed the health related quality of life using the SF 36 Aspects of Health Questionnaire and the wider impact of tinnitus using a new Quality of Family Life Questionnaire in two groups of patients: the first awaiting a specialist appointment (group A) and the second a group of people who have attended for a specialist appointment and been discharged (group B). The results showed statistically significant better scores for individuals in group B, when controlling for other factors that might influence the measure of quality of life. Furthermore, there were systematic differences between those on the waiting list and those who had been discharged with respect to aspects of quality of family life, particularly in the areas of understanding tinnitus and allaying fears. 1 figure. 3 tables. 7 references.

• **Systematic Classification of Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article on the systematic classification of tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors offer a framework that divides tinnitus into three types, based on function and anatomy: conductive tinnitus, sensorineural tinnitus, and central tinnitus. Sensorineural tinnitus can be further subdivided into four subtypes: motor tinnitus (Type I), transduction tinnitus (Type II), transformation tinnitus (Type III), and extrasensory tinnitus (Type IV). One figure schematically illustrates the
individual functional and anatomical steps involved in sound processing with the middle ear, inner ear, and brain. One table classifies some common tinnitus disorders into this new classification. 1 figure. 1 table. 21 references.

- **Use of Science to Find Successful Tinnitus Treatments**
  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.
  Summary: This article on the use of science to find successful tinnitus treatments is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the author contends that discovering successful treatments will be facilitated by the scientific method. The author outlines a framework for clinical trials for tinnitus treatment. Patient expectations dramatically influence treatment outcomes, and therefore require careful consideration in selecting control conditions. The population under study requires careful definition of recruitment and exclusion practice, duration and severity of tinnitus, hyperacusis (heightened sensitivity to noise), and hearing loss. It is also desirable to document ear disease, psychological and psychoacoustical characteristics, treatment history, otoacoustic emissions, whether tactile or motor stimulation affects tinnitus, and whether the tinnitus is likely consistent with a peripheral or central mechanism. The author notes that the most challenging aspect is designing the appropriate control condition. A comprehensive description of the protocol is needed to facilitate replication. Benefit should be measured with established questionnaires and with measures of the magnitude of the tinnitus. A persuasive tinnitus treatment will be one that shows a large treatment effect, can be generalized across patients and clinicians, is specific and credible, and changes the way clinicians and patients think about tinnitus. 3 figures. 17 references.

- **Early Identification of Therapy Resistant Tinnitus**
  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.
  Summary: This article on therapy resistant tinnitus is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report on their research study which investigated risk factors for therapy resistant tinnitus (as measured by absence from work, related to tinnitus, abbreviated at AWT). The study included 172 consecutive tinnitus patients consulting an audiological physician during a 6 month period at a university hospital in Goteborg, Sweden (54 women and 118 men). The patients were reassessed 18 months later in order to identify and investigate the therapy resistant patients. In the study, 18 out of the 79 patients who completed the study were absent from work due to tinnitus. There were
significant correlations between the tinnitus severity questionnaire (TSQ) and AWT, including questions concerning how much tinnitus reduces the overall quality of life, how often tinnitus is noticed during the waking hours or impairs concentration, and how often tinnitus makes the patients feel anxious or worried, tense or irritable, or depressed and miserable. The main predictors influencing AWT were the questions concerning depression and reduced mobility, but also physical exercise on a regular basis and hearing thresholds over both ears for the low and mid frequencies. The authors conclude that it is of great importance to identify and treat depression and anxiety disorders initially, so the risks for the progression of tinnitus are minimized. 1 figure. 2 tables. 11 references.

**Effects of Hearing Loss on Tinnitus**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article reports on a study in which tinnitus perception and reaction were measured in 182 individuals who received five sessions of tinnitus retraining therapy (TRT) in a 12 month period, and 159 individuals followed up after a further 12 months. The article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this study, the participants were divided into three groups on the basis of hearing status: normal hearing (NORM), mild high frequency hearing loss (HF), and moderate to severe hearing loss (MOD SEV). The MOD SEV group reported that their tinnitus had worsened prior to the study, whereas the NORM and HF had started to habituate to their tinnitus. At the start of the study, the MOD SEV group had significantly greater loudness and percentage awareness, tinnitus pitch was significantly lower, and number of tinnitus sounds significantly higher than the NORM and HF groups. After 12 months of TRT, tinnitus annoyance, effect on life quality, loudness, and percentage awareness in each hearing status group improved by a similar amount. Psychological status was measured in a representative subgroup of 118 individuals. Phobic anxiety in both males and females, and depression in males were positively correlated with hearing threshold at 4000 Hz. The authors conclude that it is possible that hearing threshold influences tinnitus reaction, perception, and psychological status but it does not appear to influence response to TRT significantly. 4 figures. 3 tables. 18 references.

**Role Psychological and Social Variables Play in Predicting Tinnitus Impairments**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: This article reports on a study undertaken to investigate whether tinnitus impairments can be predicted by psychological and or social variables. The article is from a lengthy document that reprints the proceedings of the Sixth International
Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this study, a sample of 153 patients with tinnitus (75 females and 78 males) were recruited from various treatment facilities in Austria and Germany. Patients were evaluated using the following instruments: Tinnitus Handicap Inventory (THI-12), Depression Scale (ADS-L), Quality of Life (WHOQOL-BREF), List of General and Somatic Complaints (BL), and Health Related Locus of Control Scale (KKG). The effects of depression, various dimensions of quality of life, somatic and general complaints, locus of control, as well as sleeping disorders, were assessed on emotional cognitive and functional communicative tinnitus impairments using a canonical correlation analysis. The results showed that severity of depression is the most significant predictor of emotional cognitive impairments due to tinnitus. Somatic and general complaints, physical and social domains on the quality of life scale, and depression predict the functional communicative impairments. The authors conclude that, of the variables studied, depression seems to be a general dimension influencing tinnitus related impairments. 1 table. 11 references.

- Combining Elements of Tinnitus Retraining Therapy (TRT) and Cognitive-Behavioral Therapy: Does It Work?


  Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

  Summary: This article reports on an ongoing controlled treatment study in which elements of cognitive behavioral therapy (CBT) and tinnitus retraining therapy (TRT) were combined to provide different group treatments for different target populations of patients depending on the degree of tinnitus distress. The article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this study, half of the subjects in each treatment also received sound therapy by behind the ear (BTE) broadband noise generators to examine a possible therapeutic effect of additional auditory stimulation. Preliminary results show the effectiveness of both treatments, but no effect of sound therapy. The authors conclude that they find no basic contradictions between TRT and the already established cognitive behavioral treatments for chronic tinnitus. It seems very useful to combine elements of these two approaches in order to treat specific subgroups of patients. 1 figure. 3 tables. 11 references.

- What is Tinnitus?


  Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. PRICE: $14.50 for members; $18.00 for nonmembers. ISBN: 0473015625.

  Summary: This chapter is from a book that familiarizes readers with the common causes and symptoms of tinnitus and explains how people with tinnitus can take steps toward relieving the condition. Written in non-technical language, the chapter defines tinnitus
and gives readers an overview of the condition. Topics covered include the five main stages in the auditory pathway, the history of tinnitus and its treatments, the classifications of tinnitus, and some of the more common causes of the condition.

- **How to Evaluate Treatments for Tinnitus**


  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: $26.95 plus shipping and handling. ISBN: 0205182690.

  Summary: This chapter is from a book that offers information about treatment options for tinnitus. This chapter offers suggestions for evaluating treatments for tinnitus. The author notes that few patients with tinnitus can be completely cured; however, patients with tinnitus from many causes can definitely be improved by different measures, even if they are not completely cured. The author describes the differences between open studies and controlled studies when examining the effectiveness of different treatment options. From a statistical perspective, open studies have a tendency to report results that are too positive (because of participant or observer bias, for example); while controlled studies tend to give results that are too negative. The author recommends that tinnitus treatments continue to receive open studies and that those treatments that appear promising under subjective review should receive controlled trials. The ethical issues involved in treatments offered for tinnitus are discussed and there is a section of advice for the individual tinnitus patient. The ethical issues involved in treatment available for tinnitus is discussed and there is a section of advice for the individual tinnitus patient.

- **Psychological Profiles of Tinnitus Patients**


  Summary: This chapter is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the author describes psychological profiles of tinnitus patients. Topics include the relevance of investigating psychological factors in tinnitus patients, getting beyond the initial reaction of crisis, gender aspects of the subjective experience of tinnitus, tinnitus distress symptoms in different patient groups seeking medical consultation, dimensions of complaints that are appropriate for study, habituation to tinnitus and reasons for dishabituation, chronic tinnitus in comparison with chronic pain, personality patterns of people with tinnitus, perceived character and quality aspects of the tinnitus sound, anxiety as an underestimated factor in tinnitus annoyance, similarities between cognitive and emotional aspects of depression and tinnitus, how tinnitus can affect a patient's lifestyle and personal relationships, tinnitus and sleep disturbances, and causal explanations of tinnitus distress in relation to mental illness. The author concludes by emphasizing the impact of time on tinnitus and on the patient's psychosocial response to the condition. Instead of considering tinnitus a chronic condition, the author hypothesizes that tinnitus may be a signal of severe distress that interacts with crucial circumstances in the life of the individual. This model of multiple causes creates a need
for repeated diagnostic and treatment methods as the condition fluctuates. 2 figures. 1
\table. 121 references.

- **History of Tinnitus**
  

  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: $65.95 plus

  Summary: This chapter is the final chapter in an audiology textbook that offers clinicians
  and recent graduates information on tinnitus (ringing or other sounds in the ears). In the
  chapter, the author provides a history of tinnitus and its treatments. Tinnitus, being
  essentially a reflection of abnormal function of the ear, has presumably occurred in
  humans since evolution began. From the earliest written medical records, individuals
  have been consulting healers for help with this symptom. The author addresses the
  attitudes and approaches of such healers over the millennia towards the symptom and
  their subsequent approach adopted. The author concentrates on a number of
  representative writings, usually by well known authors and authorities of the period
  that reflect the then current attitudes towards the symptom. The author includes ancient
  Babylon, Celsus and Graeco Roman medicine, Islamic and medieval medicine, the
  seventeenth century and Duverney, Jean Marie Gaspard Itard, the late nineteenth
  century, and the Folwers and the beginning of the modern approach. 5 figures. 3 tables.
  24 references.

- **Epidemiology of Tinnitus**
  

  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: $65.95 plus

  Summary: This chapter on the epidemiology of tinnitus is from an audiology textbook
  that offers clinicians and recent graduates information on tinnitus (ringing or other
  sounds in the ears). In the chapter, the authors review the prevalence of tinnitus in
  different populations, together with those demographic, systemic, and environmental
  factors that influence the prevalence. Hearing impairment and age were found to be
  strongly related to the prevalence of tinnitus. The effect of gender was not that clear,
  although some studies showed a slight increase in the proportion of females
  complaining of tinnitus. The effect of socioeconomic and occupational group on the
  prevalence of tinnitus was found to be positive. The effect of noise on the auditory
  system is clearly related to the prevalence of tinnitus. The authors discuss the public
  health and clinical implications of these data, which show that tinnitus is a widespread
  problem that causes considerable disability or handicap for which systematic
  intervention should have a high priority. Noise must have a big role in determining
  priorities for public health. The integration of epidemiological data into patient
  counseling is very important. The authors stress that patients need to be told about the
  causes, possible progression of the condition, and a realistic picture of the future. 67
  references.
• **Psychological Management of Tinnitus**


Summary: This chapter on the psychological management of tinnitus is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the authors provide an overview of the contributions that psychological approaches can offer in the assessment and management of tinnitus. Tinnitus is both a medical and a psychological phenomenon, in some ways similar to the experience of chronic pain. The consequences of chronic pain and tinnitus are similar: emotional effects, reduced involvement in work related activities, interpersonal problems, and decreased opportunities to engage in previously enjoyable activities. The aim of psychological treatment is to improve the ability of the individual to reduce the impact of tinnitus on their well being and lifestyle. The authors present a format of a comprehensive patient interview, including the range of available self report measures. The authors then discuss psychological treatment options, including relaxation methods, cognitive therapy, and attention control techniques. A final section discusses what can be expected as outcome of therapy. The authors conclude that multiple treatment components, such as combined cognitive therapy, attention control and relaxation training, appear to produce the most consistent positive results. Relaxation training may be useful as a vehicle for teaching some of the cognitive attention control methods, for helping people with sleep problems, or for reducing general reactivity to stress. 3 tables. 59 references.

• **Electrical Stimulation for Tinnitus Suppression**


Summary: This chapter on the use of electrical stimulation for tinnitus suppression is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the author discusses the two forms of external electricity, the electrical potentials in the auditory system, some characteristics of biological electricity, AC potentials in the cochlea, brain electrical potentials, first attempts to alleviate tinnitus with flow of electric charges, unexpected tinnitus suppression with electricity used for other purposes, tinnitus suppression according to the site of electrical stimulation, extracochlear stimulation with transcutaneous electrodes, extracochlear implants, and intracochlear stimulation (single and multichannel cochlear implants). The author concludes by reviewing the areas where additional research is needed. 1 figure. 4 tables. 72 references.

• **Tinnitus Masking**

Summary: This chapter on the use of masking in the treatment of tinnitus is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the authors provide a summary of the methods needed to perform tinnitus masking effectively, as well as an overview of the experience upon which those methods are based. Topics include a background and history of tinnitus masking, development of wearable masking devices, tinnitus relief from a hearing aid, bedside maskers and other nonwearable devices, initial studies of tinnitus masking, the development of the clinical procedures for masking, importance of tinnitus pitch and loudness measures, the importance of residual inhibition tests, how tinnitus masking differs from conventional masking, the effective clinical use of tinnitus masking, multiple tinnitus sounds, the efficacy of tinnitus masking, specific masking programs in the United States and in England, tinnitus and hyperacusis (over sensitivity to sound), and future directions for tinnitus research and development. One appendix offers sources of masking devices and some ideas for tapes and CDS that can be used for masking. 12 figures. 1 table. 103 references.

- **Tinnitus Habituation Therapy (THT) and Tinnitus Retraining Therapy (TRT)**


  Summary: This chapter on the use of Tinnitus Habituation Therapy (THT) and Tinnitus Retraining Therapy (TRT) in the treatment of tinnitus is from an audiology textbook that offers clinicians and recent graduates information on tinnitus (ringing or other sounds in the ears). In the chapter, the authors first provide an outline of the neurophysiological model of tinnitus, a prerequisite for understanding how THT and TRT work. Topics include the functions of the limbic and autonomic nervous systems, the theory of discordant damage (dysfunction), hypersensitivity of the auditory pathways, and hypersensitivity to sound (hyperacusis and phonophobia). The next section explains how the habituation approach works. The author stresses that THT is not a cure for tinnitus; when perceived, the tinnitus will have the same loudness and pitch as before the treatment. However, the habituation of tinnitus is achieved by filtering out and blocking tinnitus related neuronal activity from the conscious brain area responsible for perceiving this activity. The remainder of the chapter describes TRT, including the role of counseling, sound therapy, masking, managing sleep problems, categories of the patients, and the effectiveness of TRT. The author concludes that TRT, the simplest form of THT, seems to be effective for about 80 percent of the general tinnitus population. While it requires about 18 months to achieve a stable level of control of tinnitus, positive results are typically observed within the first six months. 2 figures. 1 table. 41 references.

- **Tinnitus: For Whom the Bell Tolls-and Tolls, and Tolls**

Summary: This chapter on tinnitus is from a book that offers practical strategies and healthy living advice for people who want to slow down their own aging process. The book is written in casual language with an emphasis on explaining medical and health issues for the general public. The chapter first defines tinnitus (ringing or other sounds in the ears) and describes how it can occur. The author describes two types of tinnitus, objective tinnitus (someone else can hear the sounds) and subjective tinnitus (only the patient can hear the sounds). Causes of tinnitus can include wax in the ear canal, high blood pressure, prolonged bouts of high blood glucose (sugar), arthritis, neurological processes, emotional stress, drug therapy, food allergies, alcohol use, marijuana, caffeine, nicotine, Meniere's disease, otosclerosis (a bone disease), repeated exposure to loud noise, hypothyroidism (underfunction of the thyroid gland), infections, tooth grinder, and high cholesterol. The author also reviews the treatment options for the tinnitus of aging. The chapter concludes with a brief summary of the points covered, focusing on the ways to reduce the negative impact of tinnitus.

**Chronic Tinnitus Following Electroconvulsive Therapy**


Contact: Available from Tinnitus and Hyperacusis Centre. 32 Devonshire Place, London, W1N 1PE, United Kingdom. Fax 44 + (0) 207 486 2218. E-mail: thc@dr.com. Website: www.tinnitus.org. PRICE: Contact publisher for price. ISBN: 0953695700. Also available on CD-ROM.

Summary: Tinnitus can be caused by almost any pathology involving the auditory system and can also result from head trauma, a variety of medications, and electrical shock, including lightning strikes. This article is from a lengthy document that reprints the proceedings of the Sixth International Tinnitus Seminar, held in Cambridge, United Kingdom, in September 1999 and hosted by the British Society of Audiology. In this article, the authors report a case study of chronic tinnitus that began immediately following electroconvulsive therapy (ECT). A 43 year old female with a 27 year history of obsessive compulsive disorder and major depression had previously been treated with psychotherapy, antidepressant and antipsychotic medications. Because these treatments were minimally effective and because the frequency and duration of her depressive episodes continued to increase, the patient was scheduled to undergo a series of ECT procedures. The patient received four ECT treatments during one week. Stimulating current was delivered through a unilateral electrode to the right frontotemporal region of the head. EEG seizures occurred during each of the ECT procedures. After the patient recovered from anesthesia, she complained of headaches, muscle pain, amnesia, and, after the fourth ECT, she reported a ringing sound in her right ear. Audiometric testing the day after the fourth ECT revealed a slight increase in threshold for 8000 Hz tones in her right ear. The authors conclude that it is likely that current delivered during the fourth ECT treatment triggered the perception of tinnitus for this patient. The unique organization of this patient's central nervous and auditory systems combined with her particular pharmacological history might have predisposed her to developing this symptom.
• **Approach to the Patient with Tinnitus**


  Summary: Tinnitus is a noise in the ear that is usually audible only to the patient, although occasionally the sound can be heard by the examining physician (objective tinnitus). The pathophysiology of tinnitus is largely unknown. This chapter on tinnitus is from a textbook that presents a concise approach to evaluating patients with dizziness, hearing loss, and tinnitus. The author emphasizes that key features in the patient's history can help with an accurate diagnosis of tinnitus. Particularly important is whether the tinnitus is localized to one ear or both ears or is nonlocalizable. The author outlines the causes of tinnitus, including those for objective, subjective, and drug-induced tinnitus; and reviews the workup of common presentations of tinnitus, including unilateral pulsatile tinnitus, chronic unilateral subjective tinnitus, and chronic bilateral subjective tinnitus. Numerous tables and flowcharts guide the reader through the diagnostic workup. Important points are highlighted and presented in the margins of the text. 3 figures. 1 table. 20 references.

**Directories**

In addition to the references and resources discussed earlier in this chapter, a number of directories relating to tinnitus 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:  

• **Brain Connections: Your Source Guide to Information on Brain Diseases and Disorders. 5th ed**


  Summary: This guide lists organizations that assist people with a brain-related disorder or disease as well as those organizations that assist caregivers and health care providers in these areas. The guide lists more than 275 organizations alphabetically by disease or disorder. Listings of particular relevance to communication disorders include: acoustic neuroma, aphasia, ataxia, attention deficit hyperactivity disorder, autism, deafness and hearing loss, disability and rehabilitation, dizziness, dyslexia, dystonia, head injury, learning disabilities, neurofibromatosis, smell and taste (chemosensory) disorders, spasmodic dysphonia, stuttering, tinnitus, Tourette syndrome, and vestibular disorders. Emphasis is placed on organizations that have a national focus, however, many of these

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12 You will need to limit your search to “Directory” and “tinnitus” using the “Detailed Search” option. Go directly to the following hyperlink: [http://chid.nih.gov/detail/detail.html](http://chid.nih.gov/detail/detail.html). To find directories, use the drop 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 “tinnitus” (or synonyms) into the “For these words:” box. You should check back periodically with this database as it is updated every three months.
groups sponsor local chapters or affiliates and make referrals to local medical professionals and organizations. For each organization listed, the guide notes mailing address, telephone numbers, e-mail and web sites; also provided are symbols which indicate that the organization offers support groups, referrals to doctors, referrals to other sources of information, regional chapters, availability of literature, availability of speakers, and volunteer opportunities. The guide also describes the publishing body, the Dana Alliance for Brain Initiatives, and provides a list of ways in which readers can support and further brain research.

  


  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.
CHAPTER 8. MULTIMEDIA ON TINNITUS

Overview

In this chapter, we show you how to keep current on multimedia sources of information on tinnitus. 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 tinnitus is the Combined Health Information Database. You will need to limit your search to “Videorecording” and “tinnitus” 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 “tinnitus” (or synonyms) into the “For these words;” box. The following is a typical result when searching for video recordings on tinnitus:

- **Living With Tinnitus**
  

  Contact: Available from Milner-Fenwick, Inc. 2125 Greenspring Drive, Timonium, MD 21093. (800) 432-8433. PRICE: $250.00; discounts available. Order Number OT-15.

  Summary: Designed for use in patient education, this videotape provides guidelines for living with tinnitus. The author reassures patients that tinnitus is a common problem shared by millions. Treatable causes are covered, and the association of tinnitus with sensorineural hearing loss is discussed. The author details measures that help reduce the impact of tinnitus, including hearing aids, types of masking, and changes in diet. The beneficial role of support groups and counseling is also addressed. The importance of using hearing protection to prevent the condition from worsening is also emphasized. (AA-M).
• **1996-1997 Marquam Hill Lectures. Tinnitus: Ringing in the Ears**

Source: Portland, OR: Oregon Health Sciences University. 1996. (videocassette).

Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. PRICE: $20.00 for members; $25.00 for nonmembers.

Summary: This videotape captures a lecture presented by Dr. Jack A. Vernon, an otorhinolaryngologist who specializes in researching and treating tinnitus. Dr. Vernon emphasizes that the information provided to him by patients has been the key to understanding and treating tinnitus. Dr. Vernon begins his talk with a brief description of masking and where the idea for masking came from; he also encourages listeners and patients to join the American Tinnitus Association. He then shows a series of slides, mostly audiograms, from specific patients. He presents their case studies, describes how each case was treated, and how each case furthered his understanding of tinnitus. Topics covered include the role of the patient in controlling when the tinnitus is treated (self-control of masking, for example), residual inhibition, noise-induced tinnitus (the need to be wary of noise exposure in a tinnitus affected ear), hearing loss and tinnitus experienced by dentists exposed to high-pitched noise from dental equipment, the interrelationship of tinnitus and hearing loss, and how to read an audiogram. Dr. Vernon's presentation is one in a series of Marquam Hill Lectures at the Oregon Health Sciences University (OHSU).

**Bibliography: Multimedia on Tinnitus**

The National Library of Medicine is a rich source of information on healthcare-related multimedia productions including slides, computer software, and databases. To access the multimedia database, go to the following Web site: [http://locatorplus.gov/](http://locatorplus.gov/). Select “Search LOCATORplus.” Once in the search area, simply type in tinnitus (or synonyms). Then, in the option box provided below the search box, select “Audiovisuals and Computer Files.” From there, you can choose to sort results by publication date, author, or relevance. The following multimedia has been indexed on tinnitus:

- **Tinnitus masking [videorecording]** Source: sponsored by Ear Research Institute; Year: 1980; Format: Videorecording; [Los Angeles]: The Institute, 1981, c1980

- **Tinnitus, patient management [videorecording]** Source: sponsored by the Ear Research Institute; Year: 1981; Format: Videorecording; [Los Angeles]: The Institute, [1981]

- **Tinnitus, treatment with biofeedback [videorecording]** Source: sponsored by the Ear Research Institute; Year: 1980; Format: Videorecording; [Los Angeles]: The Institute, [1980]
CHAPTER 9. PERIODICALS AND NEWS ON TINNITUS

Overview

In this chapter, we suggest a number of news sources and present various periodicals that cover tinnitus.

News Services and Press Releases

One of the simplest ways of tracking press releases on tinnitus 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 “tinnitus” (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 tinnitus. 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 “tinnitus” (or synonyms). The following was recently listed in this archive for tinnitus:

- Retraining therapy shows promise as treatment for tinnitus
  Source: Reuters Medical News
  Date: October 18, 2002

- Pilot study suggests most chronic pain patients have tinnitus
  Source: Reuters Medical News
  Date: September 26, 2002
• **Hearing Innovations gets FDA nod for tinnitus treatment system**  
  Source: Reuters Industry Briefing  
  Date: April 16, 2002

• **Patients with tinnitus as a sequela of head and neck injury need special care**  
  Source: Reuters Medical News  
  Date: May 08, 2001

• **Ginkgo does not quiet ringing in the ears**  
  Source: Reuters Health eLine  
  Date: January 12, 2001

• **Tinnitus not improved with Ginkgo biloba treatment**  
  Source: Reuters Industry Briefing  
  Date: January 11, 2001

• **Valproate-induced tinnitus may be mistaken for psychotic symptoms**  
  Source: Reuters Medical News  
  Date: November 22, 2000

• **Tinnitus relieved by lidocaine perfusion to inner ear plus IV lidocaine**  
  Source: Reuters Medical News  
  Date: May 19, 2000

• **Lidocaine helps relieve ringing in the ears**  
  Source: Reuters Health eLine  
  Date: May 19, 2000

• **Acupuncture apparently not an effective treatment for tinnitus**  
  Source: Reuters Medical News  
  Date: April 26, 2000

• **Studies do not back acupuncture for tinnitus**  
  Source: Reuters Health eLine  
  Date: April 18, 2000

• **Neuroanatomy Of Tinnitus Discovered**  
  Source: Reuters Medical News  
  Date: January 22, 1998

• **Brain May Play Role In Tinnitus**  
  Source: Reuters Health eLine  
  Date: January 22, 1998

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**The NIH**

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 “tinnitus” (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 “tinnitus” (or synonyms). If you know the name of a company that is relevant to tinnitus, 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 “tinnitus” (or synonyms).

Newsletters on Tinnitus

Find newsletters on tinnitus 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 “tinnitus.” 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 “tinnitus” (or synonyms) into the “For these words:” box. The following list was generated using the options described above:

- **Steady**
  
Contact: Available from Ear Foundation. 2000 Church Street, Box 111, Nashville, TN 37236. (800) 545-HEAR; (615) 329-7809; TTY (615) 329-7849.

Summary: The newsletter, STEADY, is a quarterly publication of the Meniere's Network designed to provide patients with Meniere's disease with information and resources. This issue is devoted to diet, particularly sodium intake. This issue has an article on limiting sodium intake while dining out, including at fast food restaurants; nutrient exchange lists for dining out; and an article on smart low-sodium food shopping and cooking. The newsletter also includes letters to the editor; an update on the Meniere's Network members and chapters; and a brief article describing Meniere's disease. A membership form with which readers can also order reprints of earlier issues is included. Earlier issues focused on topics such as vestibular suppressants; a spouse's perspective to living with Meniere's; current research studies; allergies and Meniere's; stress; Meniere's disease in childhood; tinnitus; vestibular compensation; and diagnosing Meniere's disease.

- **TMJ News 'n Views: Offering Education, Support and Hope**


  Contact: Available from MyoData-TMJ and Stress Center. P.O. Box 803394, Dallas, TX 75380, (972) 416-7676 (information). PRICE: $20.00 for one-year subscription (6 issues); $35.00 for two-year subscription; back issues $4.00 each.

  Summary: 'TMJ News 'N Views' is a bi-monthly newsletter written specifically for people who suffer from temporomandibular joint disorders (TMD). The 2-color newsletter is written by a person with TMD and is edited by a medical professional. Sections in each issue include: an article by a health professional; an article by Sharon Carr, the founder of the TMJ and Stress Center; a Question and Answer section for patients to write in and receive printed answers; Pain Pointers; and a Recipe Corner with recipes for soft, easy-to-chew food. Specific topics have included surgery for TMD; the use of acupressure for pain; the role of posture; biofeedback; caffeine; tinnitus and TMD; whiplash and TMD; new treatment; swallowing disorders; and stress reduction. (AA-M).

**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](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 “tinnitus” (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 tinnitus:

- **Tinnitus and Vestibular Schwannoma (Acoustic Neuroma)**


  Contact: Available from Royal National Institute for Deaf People (RNID). RNID Helpline, P.O. Box 16464, London EC1Y8TT, United Kingdom. Fax 0171 296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk.
Summary: This newsletter article discusses tinnitus and vestibular schwannoma (VS, also called an acoustic neuroma), which is a benign tumor arising from the Schwann cells of the nerve sheath of the vestibular nerve. The author discusses the prevalence and natural history of VS; the symptoms, including tinnitus (ringing, buzzing, or other sounds in the ears); the mechanisms by which VS may generate tinnitus; the diagnostic significance of VS; tinnitus that appears after surgery for VS; gaze evoked tinnitus; and the management of tinnitus in vestibular schwannoma. The authors note that while it is important to eliminate VS when seeking the cause of tinnitus, some patients may have problems with the noise of the MRI scanner. The authors conclude that individuals with a VS and in whom tinnitus is distressing can be identified with the Tinnitus Handicap Inventory or similar instrument at both pre and postoperative stages. If such distress is present, then tinnitus management should be considered using modern techniques for reducing tinnitus distress. 1 figure.

Academic Periodicals covering Tinnitus

Numerous periodicals are currently indexed within the National Library of Medicine’s PubMed database that are known to publish articles relating to tinnitus. In addition to these sources, you can search for articles covering tinnitus 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:

- 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 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 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/

13 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); various information directories available at http://www.ncrr.nih.gov/publications.asp
• National Center for Complementary and Alternative Medicine (NCCAM); health information available at http://nccam.nih.gov/health/
• 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.14 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:15

- **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](http://www.nlm.nih.gov/databases/databases_bioethics.html)


- **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](http://www.nlm.nih.gov/databases/databases_population.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](http://www.nlm.nih.gov/databases/alerts/clinical_alerts.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](http://www.nlm.nih.gov/databases/databases_medline.html)

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The Combined Health Information Database

A comprehensive source of information on clinical guidelines written for professionals is the Combined Health Information Database. You will need to limit your search to one of the following: Brochure/Pamphlet, Fact Sheet, or Information Package, and “tinnitus” using the “Detailed Search” option. Go directly to the following hyperlink: 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 the publication date, select “All Years.” Select your preferred language and the format option “Fact Sheet.” Type “tinnitus” (or synonyms) into the “For these words:” box. The following is a sample result:

Join the National Campaign for Hearing Health Today!


Contact: Available from Deafness Research Foundation. 575 Fifth Avenue, 11th Floor, New York, NY 10017. (800) 829-5934 or (212) 599-0027. TDD (800) 535-3323. Fax (212) 599-0039. Website: www.drf.org. PRICE: Single copy free.

Summary: This brochure describes the National Campaign for Hearing Health (NCHH), a five year, public outreach, professional education, government relations and advocacy initiative established to ensure that every American, especially children, can benefit from recent breakthroughs in research on hearing and hearing loss. The goals of the NCHH are fourfold: for babies and children, to assure that the hearing of all newborns is tested and that prompt intervention can be received; in the area of toxic noise, to educate the public and government to control toxic noise and other threats to hearing; in hearing recovery, to teach people about the hearing devices available; and in research, to fund the search to end all forms of hearing impairment, including tinnitus (ringing or other sounds in the ears). The brochure includes a form with which readers can request additional information about the NCHH and its activities. This form can also be used to donate to the NCHH. The back cover of the brochure describes the work of the Deafness Research Foundation (DRF), the sponsor of the NCHH. The contact information, including website (www.drf.org), is provided.

Audiology: Position Statements, Practice Guidelines, Definitions, Technical Reports, Relevant Papers, Index


Summary: This Desk Reference (Volume 2 of 4) is published by the American Speech-Language-Hearing Association to advance high quality standards and practice for the
professions of audiology and speech-language pathology. Volume 2 focuses on audiology. Position Statements are included on acoustics in educational settings, the audiologist's role in occupational hearing conservation, balance system assessment, cochlear implant selection and rehabilitation, infant hearing, cerumen management, and the use of FM-amplification instruments for infants and children. Guidelines are presented on topics including audiologic assessment, management and screening, audiology services in the schools, audiometric symbols, determining threshold level for speech, audiology practice management, fitting and monitoring FM systems, graduate education in amplification, and audiometry. The Reference also includes Technical Reports and Relevant Papers on topics such as acoustic-immittance measures, central auditory processing, aural rehabilitation, cochlear implants, sound measurement, tympanometry, tinnitus maskers, and professionalism in audiology. This Volume includes an index to the 4-volume set.

- **Multicenter Comparative Study of Cochlear Implants: Final Reports of the Department of Veterans Affairs Cooperative Studies Program**


  Contact: Available from Annals Publishing Company. 4507 Laclede Avenue, St. Louis, MO 63108.

  Summary: This document presents additional and final reports of the Department of Veterans Affairs Cooperative Studies Program 304: A Prospective Randomized Cooperative Study of Advanced Cochlear Implants. Initiated in January 1987, the study compared the efficacy and safety of the 3M-Vienna single-channel and two multichannel cochlear implants: Ineraid and Nucleus, all of which were chosen for inclusion because published data showed them to be capable of producing open-set speech understanding without lipreading. Criteria for the study were that the patient be age 18 years or older, have bilateral profound sensorineural hearing loss with no benefit from amplification (no open-set speech discrimination), have been postlingually deafened, and be English speaking. This publication includes six reports: surgical results, the influence of processing strategies on cochlear implant performance, predictors of postoperative performance with cochlear implants, performance as a function of time, tinnitus in the profoundly hearing impaired and the effects of cochlear implants, and change in the quality of life of adult patients with cochlear implants. The last report includes a copy of the quality of life measurement instruments used. All reports include charts and graphs, as well as relevant references.

- **MUMS National Parent-To-Parent Network: 1995 List of Disorders**


  Summary: This listing of disorders represents the diagnoses of the children of families who are registered with the MUMS (Mothers United for Moral Support) National Parent-to-Parent Network. After each named disorder, a number in parentheses indicates the number of children in the MUMS group with that specific disorder or condition. An asterisk after the disorder name means that there is a national or international support group for that specific disorder or related disorders. The disorders are listed alphabetically and some appear under more than one medical name. It is
MUMS’ hope that by matching families, parents can mutually support one another emotionally, exchange valuable medical information they have gathered, and alleviate the feelings of being alone. Among some of the communication disorders related conditions, the listing lists aphasia, cleft lip and palate, craniofacial anomalies, deafness, dystonia, Ehlers-Danlos syndrome, hemifacial microsomia, Landau-Kleffner Syndrome, oral-facial-digital Syndrome, tinnitus, vocal cord paralysis, and Waardenburg Syndrome.

- **Hearing Loss: A Guide to Prevention and Treatment**
  
  **Source:** Boston, MA: Harvard Health Publications. 2000. 41 p.
  
  **Contact:** Available from Harvard Health Publications. P.O. Box 421073, Palm Coast, FL 32142-1073. Website: www.health.harvard.edu. PRICE: $16.00 plus shipping and handling.

  **Summary:** This report from the Harvard Medical School offers an overview of the prevention and treatment of hearing loss. The report begins with a review of the anatomy and physiology of hearing, then describes the diagnostic tests that may be used to evaluate hearing. The next section discusses the use of hearing aids, including the new technology, hearing aid dispensing, choosing hearing aid circuitry, deciding between one hearing aid (monaural) or two (binaural), fitting a hearing aid, and adjusting to a hearing aid. Surgical options for hearing loss, including cochlear implants and other surgeries, are also considered. Additional sections cover current research and technology directions, coping with hearing loss, and preventing hearing loss. The booklet concludes with a list of resources (organizations and publications) and a glossary of related terms. Various sidebars include a do it yourself five minute hearing test, a definition of the roles of hearing professionals, a description of tinnitus (ringing in the ears), assistive listening devices (besides hearing aids), hearing loss and the law, and noise induced hearing loss. The report is illustrated with black and white photographs. 6 figures. Hearing.

**The NLM Gateway**16

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.17 To use the NLM Gateway, simply go to the search site at http://gateway.nlm.nih.gov/gw/Cmd. Type “tinnitus” (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.

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17 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).
Results Summary

<table>
<thead>
<tr>
<th>Category</th>
<th>Items Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journal Articles</td>
<td>4633</td>
</tr>
<tr>
<td>Books / Periodicals / Audio Visual</td>
<td>101</td>
</tr>
<tr>
<td>Consumer Health</td>
<td>24</td>
</tr>
<tr>
<td>Meeting Abstracts</td>
<td>3</td>
</tr>
<tr>
<td>Other Collections</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4761</strong></td>
</tr>
</tbody>
</table>

HSTAT is a free, Web-based resource that provides access to full-text documents used in healthcare decision-making. 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. Simply search by “tinnitus” (or synonyms) at the following Web site: [http://text.nlm.nih.gov](http://text.nlm.nih.gov).

Coffee Break: Tutorials for Biologists

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. 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. 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/](http://www.ncbi.nlm.nih.gov/Coffeebreak/).

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20 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.
22 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.
23 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.
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/](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/](http://www.mwsearch.com/).
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 tinnitus 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 tinnitus. 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 tinnitus. 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 “tinnitus”: 

• Other guides

  **Dizziness and Vertigo**

  **Ear Disorders**

  **Hearing Disorders & Deafness**

Within the health topic page dedicated to tinnitus, the following was listed:

• Treatment

  **Tinnitus Management**
  Source: American Speech-Language-Hearing Association
  http://www.asha.org/hearing/rehab/tinnitus_manage.cfm

  **Tinnitus Treatment Options**
  Source: American Tinnitus Association
  http://www.ata.org/about_tinnitus/consumer/treatment.html

• Specific Conditions/Aspects

  **Tinnitus: Questions to Ask Your Healthcare Provider**
  Source: American Tinnitus Association
  http://www.ata.org/about_tinnitus/consumer/questions.html

• From the National Institutes of Health

  **Noise in Your Ears: Facts About Tinnitus**
  Source: National Institute on Deafness and Other Communication Disorders

• Organizations

  **American Academy of Otolaryngology—Head and Neck Surgery**
  http://www.entnet.org/

  **American Tinnitus Association**
  http://www.ata.org/

  **National Institute on Deafness and Other Communication Disorders**
  http://www.nidcd.nih.gov/

• Pictures/Diagrams

  **Inner Ear Anatomy**
  Source: Vestibular Disorders Association
  http://www.vestibular.org/gallery.html
• Prevention/Screening

**Healthy Hearing**
Source: American Tinnitus Association
http://www.ata.org/about_tinnitus/consumer/healthy_hearing1.html

• Research

**Tinnitus Research**
Source: National Institute on Deafness and Other Communication Disorders

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 tinnitus. 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:

• **Clinical Psychologists and Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rndi.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinntushelpline@btinternet.com. PRICE: Single copy free.

Summary: Anxiety, depression, irritability, anger, tension, and insomnia are all common complaints of patients with tinnitus (ringing or other noises in the ear). These may be the effects of tinnitus itself, or they may have existed before it started and be made worse by the reaction to it. This fact sheet from the Royal National Institute for Deaf People (RNID) discusses the role of clinical psychologists in treating tinnitus. A clinical psychologist works within a clinical context, usually a hospital or medical setting, and deals primarily with alleviating people's psychological problems. The fact sheet reviews the strategies that clinical psychologists may offer to help people overcome or learn to deal better with the effects of tinnitus. A patient may see a clinical psychologist on a one to one basis or in group therapy sessions with other patients. The fact sheet describes the work of four different clinical psychologists, including their publications and concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinntushelpline@btinternet.com. The RNID website is at www.rnid.org.uk.
• **Counselling for Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinnitushelpline@btinternet.com. PRICE: Single copy free.

Summary: Counseling has been described as the most important single component in the management of tinnitus (ringing or other noises in the ears). Being able to talk to somebody who takes an interest and is prepared to listen can help a person understand tinnitus and learn to deal with it more effectively. This fact sheet from the Royal National Institute for Deaf People (RNID) discusses the use of counseling for patients with tinnitus. Topics include private, medical, and lay counseling (including support groups). The fact sheet reviews the strategies that counseling may offer to help people overcome or learn to deal better with the effects of tinnitus and concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinnitushelpline@btinternet.com. The RNID website is at www.rnid.org.uk. 8 references.

• **Underwater Diving and Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. PRICE: Single copy free.

Summary: Ear injuries and disorders are the most common occupational diseases of people who dive. This fact sheet offers information about underwater diving and tinnitus (ringing or other noises in the ears). The fact sheet, from the British based Royal National Institute for Deaf People (RNID), first discusses how pressure affects the ears when one dives, including middle ear squeeze, alternobaric vertigo (dizziness due to different pressures in the left and right middle ears), barotrauma, and decompression sickness (Caisson disease). The fact sheet then describes strategies that can be used to reduce the risks associated with diving. The fact sheet concludes with information about the British Sub Aqua Association (www.scubadiving.com) and about the RNID Tinnitus Helpline (www.rnid.org.uk). 6 references.

• **Diet and Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinnitushelpline@btinternet.com. PRICE: Single copy free.

Summary: Many people have suggested that a wide variety of foods and drinks may cause or aggravate tinnitus (noise or ringing in the ears). This fact sheet from the Royal National Institute for Deaf People (RNID) discusses the relationship between diet and tinnitus by briefly examining the evidence for cheese and chocolate, coffee, tea, cola, salt, tonic water, alcohol, red wine, and spirits. Historical notes are provided for some of
these categories. The fact sheet recommends that readers try keeping a detailed diary of their food and beverage intake and tinnitus levels for a few days, to see whether a particular food or drink is having any effect. If a suspicious food or drink becomes apparent, the fact sheet suggests no ingesting of that item for a few days to see whether the tinnitus improves but notes that, in general, the healthier and more balanced the diet, the better. The fact sheet concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinnitus@btinternet.com. The RNID website is at www.rnid.org.uk.

• **Pulsatile Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinnitus@btinternet.com. PRICE: Single copy free.

Summary: Most people with tinnitus (ringing or noises in the ears) experience it as a constant or steady sound, a rushing, whistling, buzzing, or humming. However, up to 10 percent of those who hear tinnitus noises describe them as rhythmic, beating, pounding, throbbing, or swooshing, a condition known as pulsatile tinnitus. This fact sheet from the Royal National Institute for Deaf People (RNID) discusses the causes of pulsatile tinnitus, including benign intracranial hypertension, atherosclerotic carotid artery disease, and glomus tumors; the diagnosis of PT, including tests that may be used to confirm the condition; and the treatment options, including counseling, sound therapy (masking), cognitive therapy, or tinnitus retraining therapy. The fact sheet concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinnitus@btinternet.com. The RNID website is at www.rnid.org.uk. 7 references.

• **Dental Drilling and Tinnitus**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. PRICE: Single copy free.

Summary: People with tinnitus (ringing or other noises in the ears) have reason to be concerned about exposing themselves to any loud noise that may aggravate their tinnitus. Similarly, people who do not have tinnitus should take care to avoid too much loud noise, as it can cause hearing loss or tinnitus. This fact sheet from the Royal National Institute for Deaf People (RNID, London, England) reviews the problem of dental drilling and tinnitus. The author notes that research into the noise levels of dental drills and their potential for hearing damage has produced conflicting conclusions. Dentists themselves are at risk for noise-induced hearing loss and or tinnitus. And although dental patients are exposed to dental drill noise for short periods of time, the noise is conducted directly to the ears through the bones of the jaw and skull, as well as through the air. The fact sheet reviews strategies that can reduce the risk of dental drill noise exacerbating tinnitus. The fact sheet concludes with information about the RNID tinnitus helpline, including the website and email address of the organization. 7 references.
• Malaria and Tinnitus
Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinnitushelpline@btinternet.com. PRICE: Single copy free.

Summary: Some antimalarial drugs have the potential to produce tinnitus or to aggravate existing tinnitus. This fact sheet from the Royal National Institute for Deaf People (RNID) discusses the fact some drugs used to prevent and treat malaria cause tinnitus (ringing or other noises in the ears). The fact sheet offers a chart that lists the main antimalarial drugs and the reporting of tinnitus as a possible side effect in two publications, the British National Formulary or Hearing and Medicines. These drugs are chloroquine, halofantrine hydrochloride, mefloquine, primaquine, proguanil hydrochloride, pyrimethamine, and quinine. The fact sheet notes that the risks of any side effect from antimalarials may be greater with the much higher doses given to treat the disease, than with the lower doses given for prevention before traveling. The overriding consideration is to balance the likely risks of experiencing a (probably temporary) generation of or increase in tinnitus against the chances of suffering from malaria. The fact sheet concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinnitushelpline@btinternet.com. The RNID website is at www.rnid.org.uk. 6 references.

• Children and Tinnitus
Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171 296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. PRICE: Single copy free.

Summary: The incidence of tinnitus (a ringing or buzzing noise in the ears) may be greater among children than in adults, particularly among children with some degree of hearing loss. This fact sheet offers information about children and tinnitus. The fact sheet, from the British based Royal National Institute for Deaf People (RNID), first discusses the prevalence rates of tinnitus in children, the symptoms in children (which tend to be intermittent), risk factors for becoming aware of or bothered by the tinnitus, the need to reassure parents of children with tinnitus (children are often not bothered by their own tinnitus), and the association of tinnitus with otitis media with effusion (middle ear infection, called ‘glue ear’ in the British literature). The fact sheet then details the causes of tinnitus, including Meniere's disease, spontaneous emissions of tones, temporary conductive deafness, noise-induced tinnitus, and hearing loss with recruitment; and treatment options, including tinnitus maskers, hearing aids, and tinnitus retraining therapy (TRT). 1 reference.

• 15 Facts About Tinnitus
Summary: This brief article provides 15 facts about tinnitus (ringing or other sounds in the ear or ears). Tinnitus is defined as the perception of head noise when none is present externally. Tinnitus can be intermittent or constant, with single or multiple tones and its perceived volume can range from subtle to shattering. Up to 90 percent of all people who seek treatment for tinnitus have some level of sensorineural hearing loss, usually noise induced. However, hearing loss and tinnitus have an unpredictable relationship. Exposure to loud noises is the primary cause of tinnitus; other causative factors can be aging, ototoxic drugs, stress and hypertension, wax buildup in the ear canal, ear or sinus infections, jaw misalignment, cardiovascular disease, tumors affecting the auditory system, thyroid disorders, and head and neck trauma. Hearing aids and ear level maskers are sometimes helpful in drowning out the sounds of tinnitus; stress reduction and relaxation therapy are often successful in tinnitus management strategies. The article includes the contact information for the American Tinnitus Association (800-634-8978 or www.ata.org).

• 'Doctor, What Causes the Noise in My Ears?': Ten Common Questions About Tinnitus


Contact: American Academy of Otolaryngology-Head and Neck Surgery Foundation, Inc. (AAO-HNS). One Prince Street, Alexandria, VA 22314. (703) 836-4444. Fax (703) 683-5100. PRICE: Single copy free (send self-addressed, stamped envelope); $20.00 for members; $25.00 for non-members per 100. Item Number 4763020.

Summary: This brochure addresses ten common questions that patients often have about tinnitus. Topics covered include the causes of tinnitus; the difference between objective and subjective tinnitus; the epidemiology of tinnitus; the most common cause of tinnitus; treatment modalities; how to lessen tinnitus, even when the cause cannot be determined; biofeedback and its application in tinnitus; masking and tinnitus maskers; and the potential impact of hearing aids on tinnitus. The brochure concludes with a brief description of the specialty of otolaryngology-head and neck surgery.

• American Speech-Language-Hearing Association Answers Questions About Tinnitus


Summary: This brochure answers common questions about tinnitus, or hearing sounds coming from inside the head. Written in a question and answer format, the brochure addresses the incidence of tinnitus, the causes of tinnitus, tinnitus as a symptom rather than a disease entity, the interrelationship between tinnitus and hearing loss, diagnostic tests used to evaluate tinnitus, and treatment options, including the use of a tinnitus masker and hearing aids. The brochure briefly discusses resources for people who think they may have a hearing problem; the contact information for the American Speech Language Hearing Association (ASHA) is provided.
- **Tinnitus (Ringing in the Ears)**

  Source: Seattle, WA: University of Washington Virginia Merrill Bloedel Hearing Research Center. 199x. [4 p.].

  Contact: Available from Virginia Merrill Bloedel Hearing Research Center. University of Washington, Box 357923, Seattle, WA 98195-7923. (206) 616-4105. E-mail: bloedel@u.washington.edu. Website: weber.u.washington.edu/~hearing. PRICE: Single copy free.

  Summary: This brochure describes tinnitus (ringing in the ears). Tinnitus may be intermittent or constant in character, mild or severe in intensity, and vary from a low hiss to a high pitched tinkling or ringing type of sound. It may be subjective (audible only to the patient) or objective (audible to others). The brochure describes the anatomy of the ear and the physiology of normal hearing, the causes of tinnitus (by type: external, middle, or inner ear tinnitus), the pathology of the nerve pathways that may contribute to tinnitus or brain tinnitus, the presence of hearing impairment associated with tinnitus, and treatment options. The brochure concludes that treatment of tinnitus, while perhaps not curing the condition, is usually successful in helping people adapt and cope better. A thorough understanding of the problem helps patients to gain control over their reactions to the tinnitus. One illustration depicts the anatomy of the middle and inner ear. 1 figure.

- **Tinnitus, or Head Noises**


  Contact: Available from Better Hearing Institute (BHI). P.O. Box 1840, Washington, DC 20013. (800) EAR-WELL or (703) 684-3391. Fax (703) 750-9302. E-mail: mail@betterhearing.org. Website: www.betterhearing.org. PRICE: Single copy free; bulk orders available.

  Summary: This brochure describes tinnitus, sound heard in one or both ears that cannot be heard by others. Topics include a definition of tinnitus; its causes in the outer, middle, and inner ear; and treatment options, including correcting some causes of tinnitus (allergy, infection, syphilis) and masking. The brochure concludes that because tinnitus may be symptomatic of a more serious disorder, it is important to try to find the cause before treating the head noises with masking. 1 figure.

- **Discussion of Head Noise or Tinnitus**


  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-5.

  Summary: This brochure discusses head noise or tinnitus. The booklet begins with a discussion of the five divisions of the hearing mechanism: the external ear, the middle ear, the inner ear, the nerve pathways, and the brain. Additional topics include objective tinnitus, including muscular tinnitus and vascular tinnitus; external ear tinnitus; middle and inner ear tinnitus; nerve pathway tinnitus; brain tinnitus; hearing impairment; the role of stress and depression; and treatment options, including general suggestions, noise maskers, hearing aids, biofeedback, and tinnitus maskers.
• **Ototoxic Medications: Drugs That Can Cause Hearing Loss and Tinnitus**


Contact: Available from League for the Hard of Hearing, 71 West 23rd Street, New York, NY 10010-4162. Voice (917) 305-7700. TTY (917) 305-7999. Fax (917) 305-7888. Website: www.lhh.org. PRICE: $2.00 plus shipping and handling.

Summary: This brochure discusses which commonly used medications could potentially cause damage to one's hearing, or aggravate an already existing problem. Ototoxic medications are drugs that can cause hearing loss and tinnitus. The brochure notes that usually any hearing problem will only be caused by exceeding the recommended dosage of the medications. Often these problems are reversible upon discontinuation of the drug. Occasionally there are times when the change in hearing can be permanent. The bulk of the brochure includes lists and brief descriptions of drugs that can cause hearing loss, including salicylates, nonsteroidal antiinflammatory drugs (NSAIDs), antibiotics, diuretics, chemotherapeutic agents, quinine, mucosal protectant, and narcotic analgesics; and drugs that can cause tinnitus, including vapors, solvents, antibiotics, anti-neoplastic, diuretics, cardiac medications, psychopharmacologic agents, NSAIDs, glucocorticosteroids, anesthetics, antimalarials, and miscellaneous toxic substances. In the lists, the generic name of the drug is given first, with the trade name, if available, followed in parentheses and capitalized. Many times a particular generic drug is manufactured under several trade names. The brochure concludes with information about the activities of the League for the Hard of Hearing (www.lhh.org).

• **Information You Can Order: American Tinnitus Association (ATA)**


Contact: Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. PRICE: Single copy free.

Summary: This brochure lists the publications available from the American Tinnitus Association (ATA). The brochure includes books, brochures, videos, and other information sources related to tinnitus and hearing loss. Also included are four items designed for professionals to use in educating their clients and patients. Books and brochures are described with a brief abstract; other items are only listed. The brochure includes pricing information and an order form.

• **Doctor, What Causes Tinnitus? Insight into Tinnitus, the Noise in Your Ears**


Summary: This brochure provides information about tinnitus, noises inside the head and ears that cannot be heard by other people. The brochure describes the many causes of tinnitus, including middle ear infection, eardrum perforation, fluid accumulation, otosclerosis of the middle ear, allergy, high or low blood pressure, diabetes, thyroid problems, injury to the head or neck, excessive noise, and drug side effects. The brochure lists seven suggestions to help lessen the severity of tinnitus: avoid exposure to loud sounds and noises; get blood pressure checked; decrease the intake of salt; avoid
stimulants such as coffee, tea, cola and tobacco; exercise daily (to improve circulation); get adequate rest; and stop worrying about the noise. The brochure concludes with recommendations to help readers cope with the noise of tinnitus. These recommendations include concentration and relaxation exercises, masking, and the use of hearing aids. The brochure also includes a brief description of the specialty of otolaryngology-head and neck surgery. 2 figures.

- **American Tinnitus Association: Ringing in the Ears? There is Help and Hope**
  
  **Source:** Portland, OR: American Tinnitus Association (ATA). 1997. [2 p.]
  
  **Contact:** Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. **PRICE:** Single copy free; bulk orders available.
  
  **Summary:** This brochure provides readers with information about tinnitus, or ringing in the ears, and the American Tinnitus Association (ATA). The brochure describes tinnitus and the steps readers can take to address the problem; the foundation of the ATA; medical research in the area of tinnitus; and the benefits of belonging to the ATA. The brochure includes a postage-paid postcard with which readers can join the ATA or request additional information. The brochure concludes with a list of the members of the ATA's Scientific Advisory Committee and Board of Directors.

- **Noise: Its Effects on Hearing and Tinnitus**
  
  **Source:** Portland, OR: American Tinnitus Association (ATA). 1999. [2 p.]
  
  **Contact:** Available from American Tinnitus Association (ATA). P.O. Box 5, Portland, OR 97207-0005. (800) 634-8978 or (503) 248-9985. Fax (503) 248-0024. E-mail: tinnitus@ata.org. Website: www.ata.org. **PRICE:** $0.35 each for members; $1.00 each for nonmembers.
  
  **Summary:** This brochure reviews noise-induced hearing loss and noise-induced tinnitus. Topics covered include the importance of protecting one's ears from environmental sounds, an overview of noise-induced hearing loss, common noise sources and their approximate sound pressure levels, noise-induced tinnitus, symptoms, Hearing Conservation Programs and OSHA guidelines, how tinnitus can impact on one's social activities, and other health consequences of noise exposure. The brochure concludes with a list of three reminders for readers to help reduce noise-induced hearing loss and tinnitus. It is available in English or Spanish. 2 figures. 1 table.

- **Preventing Hearing Loss and Tinnitus**
  
  **Source:** Rockville, MD: American Speech-Language-Hearing Association (ASHA). 199x. [2 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:** $3.95 for 10 brochures plus shipping and handling.
  
  **Summary:** This brochure, from the American Speech-Language-Hearing Association (ASHA), describes the problem of hearing loss and the importance of lifestyle and health strategies to delay or prevent its occurrence. The brochure emphasizes that prevention and early identification of and intervention for hearing loss are crucial for developing, maintaining, or improving communication and quality of life. The brochure outlines
three major factors that can cause hearing loss (noise, physical trauma, and disease, heredity and medications); in each category, the brochure describes the source of the problem and then outlines specific prevention strategies. A second section describes tinnitus (ringing or buzzing in the ears) and notes its causes and prevention strategies. The brochure concludes with a description of the work that audiologists perform in evaluating and treating hearing loss, the professional education that audiologists have completed, and how to find an ASHA certified audiologist. The brochure is illustrated with full color photographs of a variety of people engaged in activities of everyday life. 5 figures.

- **Aspirin and Tinnitus**


  Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. Also available from RNID Tinnitus Helpline. Castle Cavendish Works, Norton Street, Radford, Nottingham NG7 5PN, United Kingdom. 0345 090210. Fax 0115-978 5012. E-mail: tinnitushelpline@btinternet.com. PRICE: Single copy free.

  Summary: This fact sheet from the Royal National Institute for Deaf People (RNID) considers the impact of aspirin on tinnitus (ringing or other noises in the ears). Aspirin has been used for over 80 years as an analgesic to relieve pain, reduce fever, and alleviate arthritis symptoms; it can also help prevent blood clots from forming. Aspirin contains salicylate which temporarily aggravates or causes tinnitus. This effect has been known for many years. Salicylate can cause reversible hearing loss and tinnitus, probably by its action on the outer hair cell system of the cochlea (inner ear). The fact sheet encourages readers to consult their health care providers about any concerns over the impact of aspirin on their tinnitus. The fact sheet discusses the use of aspirin as a treatment for a small number of people with tinnitus who have spontaneous otoacoustic emissions; aspirin may be useful in these cases. The fact sheet concludes with information on the RNID Tinnitus Helpline (in Nottingham, UK), which is also accessible online at tinnitushelpline@btinternet.com. The RIND website is at 5www.rnid.org.uk.

- **Noise in Your Ears: Facts About Tinnitus**


  Contact: Available from NIDCD Information Clearinghouse. 1 Communication Avenue, Bethesda, MD 20892-3456. Voice (800) 241-1044. TTY (800) 241-1055. Fax (301) 907-8830. E-mail: nidcdinfo@nidcd.nih.gov. Website: www.nidcd.nih.gov. PRICE: Single copy free.

  Summary: This fact sheet offers basic information about tinnitus, a ringing, buzzing, or roaring sound in the ears. Tinnitus is a symptom associated with many forms of hearing loss; it can also be a symptom of other health problems. The causes of tinnitus include hearing loss, loud noise, certain medications, and other health problems such as allergies, tumors, and problems in the heart and blood vessels, jaws, and neck. The fact sheet emphasizes the importance of having tinnitus diagnosed and reviews some of the treatments that may be used. Treatments can include hearing aids, maskers, medicine or drug therapy, tinnitus retraining therapy (TNT), counseling, and relaxation methods. Self care strategies are also outlined, including the importance of avoiding activities or behaviors that make the tinnitus worse (such as noise exposure or smoking or alcohol

• **Tinnitus Retraining Therapy**


Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171 296 8199. E-mail: helpline@rnd.org.uk. Website: www.rnid.org.uk. PRICE: Single copy free.

Summary: This fact sheet offers information about the Tinnitus Retraining Therapy (TRT) methods developed by Jonathan Hazell and Pawel Jastreboff, and about the Neurophysiologically based Management (NBM) approach; both methods are used to manage tinnitus (a ringing or buzzing noise in the ears). The fact sheet, from the British based Royal National Institute for Deaf People (RNID), first discusses the development of TRT, including the natural process of habituation and how TRT attempts to speed up this natural process. TRT is based on a neurophysiological view of how the brain processes sound. This view suggests that tinnitus is more than just the passive sending of noise from the ear to the brain using the auditory system. This view says that two other systems come into play when tinnitus becomes troublesome: the limbic system (emotions and learning) and the autonomic nervous system. Hazell and Jastreboff’s methods follow strict guidelines that first categorize patients according to the relative importance of tinnitus, hearing loss, and hyperacusis (sensitivity to noise), and then suggest different treatment programs. The fact sheet concludes with information about resources and programs that use TRT; most are based in Great Britain, but Jastreboff is also associated with Emory University in Atlanta, Georgia (in the United States).

• **Tinnitus: Fact Sheet**


Contact: Available from Sight and Hearing Association. 674 Transfer Road, St. Paul, MN 55114. (800) 992-0424 or (612) 992-0424. Fax (612) 645-2742. E-mail: sha@mtn.org. Website: www.sightandhearing.org. PRICE: Single copy free; $20.00 per 100 copies.

Summary: This fact sheet outlines tinnitus, the sensation of sound heard by one or both ears when no external physical sound is present. The sound varies from person to person, but may be described as a high-pitched ringing, whining, or hissing, or a low roaring noise. It can range from very mild (only heard in a quiet place) to a constant loud, annoying sound. The fact sheet reviews the causes of tinnitus, theories regarding the mechanisms responsible for tinnitus, treatment options, and statistics about tinnitus. Noise is by far the most probable cause of tinnitus. The fact sheet emphasizes that tinnitus does not cause hearing loss, and hearing loss does not cause tinnitus, although the two often exist together. One line drawing illustrates the anatomy of the ear. 1 figure.
• **Cochlear Implants and Tinnitus**


  **Contact:** Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. **PRICE:** Single copy free.

  **Summary:** This fact sheet, from the British Royal National Institute for Deaf People (RNID), describes the use of cochlear implants to help people with tinnitus (ringing or other sounds in the ears). A cochlear implant is an electronic device designed for people with profound or severe hearing loss who get little or no benefit from hearing aids. A small part of the cochlear implant is surgically implanted in the cochlea (inner ear), and an externally worn microphone and processor pick up sound and convert it into electrical signals which stimulate the auditory nerve. The fact sheet notes that a number of cochlear implant users have found that their tinnitus has been reduced or even abolished when their implants are switched on. The fact sheet briefly reviews research that supports these subjective impressions and then offers two lengthy quotations from personal experiences with cochlear implants and tinnitus. The fact sheet includes a list of resource organizations and references through which readers can obtain additional information.

• **Tinnitus Research**

  **Source:** Bethesda, MD: National Institute on Deafness and Other Communication Disorders (NIDCD). 1998. 2 p.

  **Contact:** Available from NIDCD Information Clearinghouse. National Institute on Deafness and Other Communications Disorders, National Institutes of Health, 1 Communication Avenue, Bethesda, MD 20892-3456. Voice (800) 241-1044. TTY (800) 241-1055. Fax (301) 907-8830. E-mail: nidcdinfo@nidcd.nih.gov. Website: www.nidcd.nih.gov. **PRICE:** Single copy free.

  **Summary:** This fact sheet, produced by the National Institute on Deafness and Other Communication Disorders (NIDCD), addresses tinnitus research. The fact sheet highlights tinnitus research conducted by Dr. Alan H. Lockwood of the University of New York at Buffalo and his colleagues. The research involved locating an area in the brain that is involved in the production of tinnitus. Researchers believe that the study, which included positron-emission tomography (PET) to map brain regions in individuals who had tinnitus in only one ear, will lead to further research and treatment options. The fact sheet notes that while tinnitus is a symptom that accompanies many kinds of hearing loss, the mechanisms that produce it are not fully understood. With its biomedical research projects and non-invasive imaging studies, the NIDCD hopes to provide data that will allow scientists to better understand tinnitus. The fact sheet concludes with a list of six organizations to contact for additional information. (AA-M).

• **Tinnitus Retraining Therapy (TRT) and Neurophysiologically-Based Management (NBM)**


  **Contact:** Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171 296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. **PRICE:** Single copy free.
Summary: This lengthy fact sheet offers information about the Tinnitus Retraining Therapy (TRT) methods developed by Jonathan Hazell and Pawel Jastreboff, and about the Neurophysiologically based Management (NBM) approach; both methods are used to manage tinnitus (a ringing or buzzing noise in the ears). The fact sheet, from the British based Royal National Institute for Deaf People (RNID), first discusses the development of TRT, including the natural process of habituation and how TRT attempts to speed up this natural process. TRT is based on a neurophysiological view of how the brain processes sound. This view suggests that tinnitus is more than just the passive sending of noise from the ear to the brain using the auditory system. This view says that two other systems come into play when tinnitus becomes troublesome: the limbic system (emotions and learning) and the autonomic nervous system. Hazell and Jastreboff’s methods follow strict guidelines that first categorize patients according to the relative importance of tinnitus, hearing loss, and hyperacusis (sensitivity to noise), and then suggest different treatment programs. The fact sheet describes some of the controversies over describing the role and value of TRT, including whether TRT works, or is that much better than counseling or other current mixes of therapies. 7 references.

- **Ear and Head Noises: Tinnitus**
  
  
  Contact: Available from Krames Communications. Order Department, 100 Grundy Lane, San Bruno, CA 94066-3030. (800) 333-3032; Fax (415) 244-4512. PRICE: Single copy free; $0.40 each for multiple copies; bulk discounts available. Order Number 1103.
  
  Summary: This patient education brochure discusses the problem of tinnitus (ear and head noises) in adults. After a description of the problem, the brochure discusses the anatomy of the ear and the etiology of tinnitus; the importance of a thorough patient history and examination; diagnostic tests conducted to confirm tinnitus, including hearing tests, balance tests, nerve conduction tests, and computed tomography (CT scan) or magnetic resonance imaging (MRI); and treatment options, including the use of masking. The brochure concludes that the key to successful treatment of tinnitus is getting the most accurate diagnosis possible.

- **Questions About Tinnitus**
  
  
  Contact: Available from RNID Helpline. P.O. Box 16464, London EC1Y 8TT, United Kingdom. 0870 60 50 123. Fax 0171-296 8199. E-mail: helpline@rnid.org.uk. Website: www.rnid.org.uk. PRICE: Single copy free.
  
  Summary: Tinnitus is the word for noises that some people hear 'in the ears' or 'in the head,' including buzzing, ringing, whistling, hissing, and other sounds that do not come from an external source. This brochure, from the British Royal National Institute for Deaf People (RNID), answers common questions about tinnitus. Topics include the causes of tinnitus, the types of tinnitus that are treatable, treatment options (counseling, hearing aids or maskers, Tinnitus Retraining Therapy, relaxation therapy, medication), self help strategies (including the importance of a positive attitude), activities or behaviors that can make tinnitus worse (including certain drugs, loud noise), and how to get additional information. The brochure includes a list of related materials available from RNID and a mail in form with which readers can request additional information. The inside back cover of the brochure summarizes the activities of the RNID. The brochure is illustrated with black and white photographs and line drawings.
• **Tinnitus**


Summary: Tinnitus often is described by sufferers as a hissing, roaring, or ringing in the ears. This brochure includes detailed information on what causes tinnitus, who suffers from it, what treatments are currently available, and what one can do to minimize its effects. Geared toward patients and their families, the brochure encourages tinnitus sufferers to consult an audiologist who is knowledgeable about tinnitus to help develop a management program. 8-page fold-out.

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**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](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

• **Tinnitus**

Summary: This fact sheet provides information about the causes of and treatments for tinnitus.

Source: National Institute on Deafness and Other Communication Disorders Information Clearinghouse

http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=6696

• **Tinnitus Patient Information**

Summary: This patient education fact sheet contains basic information about tinnitus, its causes, diagnosis and treatment.

Source: American Academy of Otolaryngology--Head and Neck Surgery

http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2675
Vestibular Schwannoma (Acoustic Neurinoma) and Neurofibromatosis

Summary: This fact sheet provides consumers with basic facts about acoustic neurinoma—a benign tumor which often causes gradual hearing loss, tinnitus or ringing in the ears, and dizziness.

Source: National Institute on Deafness and Other Communication Disorders Information Clearinghouse

http://www.healthfinder.gov/scripts/recordpass.asp?RecordType=0&RecordID=2066

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 tinnitus. 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.

NORD (The National Organization of Rare Disorders, Inc.)

NORD provides an invaluable service to the public by publishing short yet comprehensive guidelines on over 1,000 diseases. NORD primarily focuses on rare diseases that might not be covered by the previously listed sources. NORD’s Web address is http://www.rarediseases.org/. A complete guide on tinnitus can be purchased from NORD for a nominal fee.

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/
- Yahoo.com: http://dir.yahoo.com/Health/Diseases_and_Conditions/
- WebMD® Health: http://my.webmd.com/health_topics
 Associations and Tinnitus

The following is a list of associations that provide information on and resources relating to tinnitus:

- **American Tinnitus Association**
  - Telephone: (503) 248-9985 Toll-free: (800) 634-8978
  - Fax: (503) 248-0024
  - Email: tinnitus@ata.org
  - Web Site: [http://www.ata.org](http://www.ata.org)

  Background: The American Tinnitus Association is a national not-for-profit self-help organization dedicated to helping people with tinnitus and their health care providers. Tinnitus is a condition characterized by sensation of sound for which there is no external source. Such perceived sounds are often described as a buzzing, ringing, whistling, or clicking sensation. The Association's activities include research for a cure and management of the condition; production and distribution of public awareness materials; educational programs for the professional and lay communities; establishment of and guidance for self-help groups and their leaders; and promotion of community hearing protection programs. Founded in 1979, the organization maintains a bibliographic service and publishes a variety of informational brochures and a quarterly journal entitled 'Tinnitus Today.'

  Relevant area(s) of interest: Tinnitus

Finding Associations

There are several Internet directories that provide lists of medical associations with information on or resources relating to tinnitus. By consulting all of associations listed in this chapter, you will have nearly exhausted all sources for patient associations concerned with tinnitus.

**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 tinnitus. For more information, see the NHIC’s Web site at [http://www.health.gov/NHIC/](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](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 “tinnitus” (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 “tinnitus”. 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 “tinnitus” (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 “tinnitus” (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.24

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

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):

- **Alabama**: Health InfoNet of Jefferson County (Jefferson County Library Cooperative, Lister Hill Library of the Health Sciences), [http://www.uab.edu/infonet/](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](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](http://www.humboldt1.com/~kkhic/index.html)
- **California**: Community Health Library of Los Gatos, [http://www.healthlib.org/orgresources.html](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](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/](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](http://sfghdean.ucsf.edu/barnett/PERC/default.asp)
- **California**: Redwood Health Library (Petaluma Health Care District), [http://www.phcd.org/cdwl.html](http://www.phcd.org/cdwl.html)
- **California**: Los Gatos PlaneTree Health Library, [http://planetreesanjose.org/](http://planetreesanjose.org/)
- **California**: Sutter Resource Library (Sutter Hospitals Foundation, Sacramento), [http://suttermedicalcenter.org/library/](http://suttermedicalcenter.org/library/)
- **California**: Health Sciences Libraries (University of California, Davis), [http://www.lib.ucdavis.edu/healthsci/](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.lib/gbal/east/vchl.html](http://gaelnet.stmarys-ca.edu/other.lib/gbal/east/vchl.html)
- **California**: Washington Community Health Resource Library (Fremont), [http://www.healthlibrary.org/](http://www.healthlibrary.org/)
- **Connecticut**: Hartford Hospital Health Science Libraries (Hartford Hospital), [http://www.harthosp.org/library/](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/](http://library.uchc.edu/departm/hnet/)

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• 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_pmrp_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.cmcmc.org/library/library.html
• 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, Worcester),
  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 Resource 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](http://www.lvccld.org/special_collections/medical/index.htm)
- **New Hampshire:** Dartmouth Biomedical Libraries (Dartmouth College Library, Hanover), [http://www.dartmouth.edu/~biomed/resources.htmlld/conshealth.htmlld/](http://www.dartmouth.edu/~biomed/resources.htmlld/conshealth.htmlld/)
- **New Jersey:** Consumer Health Library (Rahway Hospital, Rahway), [http://www.rahwayhospital.com/library.htm](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](http://www.Englewoodhospital.com/links/index.htm)
- **New Jersey:** Meland Foundation (Englewood Hospital and Medical Center, Englewood), [http://www.geocities.com/ResearchTriangle/9360/](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](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/](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](http://www.lij.edu/library/library.html)
- **New York:** ViaHealth Medical Library (Rochester General Hospital), [http://www.nyam.org/library/](http://www.nyam.org/library/)
- **Ohio:** Consumer Health Library (Akron General Medical Center, Medical & Consumer Health Library), [http://www.akrongeneral.org/hwllibrary.htm](http://www.akrongeneral.org/hwllibrary.htm)
- **Oklahoma:** The Health Information Center at Saint Francis Hospital (Saint Francis Health System, Tulsa), [http://www.sfh-tulsa.com/services/healthinfo.asp](http://www.sfh-tulsa.com/services/healthinfo.asp)
- **Oregon:** Planetree Health Resource Center (Mid-Columbia Medical Center, The Dalles), [http://www.mcmc.net/phrc/](http://www.mcmc.net/phrc/)
- **Pennsylvania:** Community Health Information Library (Milton S. Hershey Medical Center, Hershey), [http://www.hmc.psu.edu/commhealth/](http://www.hmc.psu.edu/commhealth/)
- **Pennsylvania:** Community Health Resource Library (Geisinger Medical Center, Danville), [http://www.geisinger.edu/education/commlib.shtml](http://www.geisinger.edu/education/commlib.shtml)
- **Pennsylvania:** HealthInfo Library (Moses Taylor Hospital, Scranton), [http://www.mth.org/healthwellness.html](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](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/koopp1.shtml](http://www.collphyphil.org/koopp1.shtml)
- **Pennsylvania:** Learning Resources Center - Medical Library (Susquehanna Health System, Williamsport), [http://www.shscare.org/services/lrc/index.asp](http://www.shscare.org/services/lrc/index.asp)
- **Pennsylvania:** Medical Library (UPMC Health System, Pittsburgh), [http://www.upmc.edu/passavant/library.htm](http://www.upmc.edu/passavant/library.htm)
- **Quebec, Canada:** Medical Library (Montreal General Hospital), [http://www.mghlib.mcgill.ca/](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](http://www.rcrh.org/Services/Library/Default.asp)

• **Texas:** Houston HealthWays (Houston Academy of Medicine-Texas Medical Center Library), [http://hhw.library.tmc.edu/](http://hhw.library.tmc.edu/)

• **Washington:** Community Health Library (Kittitas Valley Community Hospital), [http://www.kvch.com/](http://www.kvch.com/)

• **Washington:** Southwest Washington Medical Center Library (Southwest Washington Medical Center, Vancouver), [http://www.swmedicalcenter.com/body.cfm?id=72](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:

- **MedicineNet.com Medical Dictionary** (MedicineNet, Inc.):

- **Merriam-Webster Medical Dictionary** (Inteli-Health, Inc.):

- **Multilingual Glossary of Technical and Popular Medical Terms in Eight European Languages** (European Commission) - Danish, Dutch, English, French, German, Italian, Portuguese, and Spanish:

- **On-line Medical Dictionary** (CancerWEB): [http://cancerweb.ncl.ac.uk/omd/](http://cancerweb.ncl.ac.uk/omd/)

- **Rare Diseases Terms** (Office of Rare Diseases):

- **Technology Glossary** (National Library of Medicine) - Health Care Technology:

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](http://www.nlm.nih.gov/medlineplus/encyclopedia.html). ADAM is also available on commercial Web sites such as drkoop.com ([http://www.drkoop.com/](http://www.drkoop.com/)) and Web MD ([http://my.webmd.com/adam/asset/adam_disease_articles/a_to_z/a](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](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](http://mel.lib.mi.us/health/health-dictionaries.html)

- **Patient Education: Glossaries** (DMOZ Open Directory Project):
  [http://dmoz.org/Health/Education/Patient_Education/Glossaries/](http://dmoz.org/Health/Education/Patient_Education/Glossaries/)

- **Web of Online Dictionaries** (Bucknell University):
  [http://www.yourdictionary.com/diction5.html#medicine](http://www.yourdictionary.com/diction5.html#medicine)
TINNITUS DICTIONARY

The definitions below are derived from official public sources, including the National Institutes of Health [NIH] and the European Union [EU].

4-Aminobenzoic Acid: A member of the vitamin B complex. It is also employed as a sunscreening agent. The potassium salt is used therapeutically in fibrotic skin disorders. [NIH]

Abdomen: That portion of the body that lies between the thorax and the pelvis. [NIH]

Aberrant: Wandering or deviating from the usual or normal course. [EU]

Ablation: The removal of an organ by surgery. [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]

Action Potentials: The electric response of a nerve or muscle to its stimulation. [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]

Adenine: A purine base and a fundamental unit of adenine nucleotides. [NIH]

Adenosine: A nucleoside that is composed of adenine and d-ribose. Adenosine or adenosine derivatives play many important biological roles in addition to being components of DNA and RNA. Adenosine itself is a neurotransmitter. [NIH]

Adenylate Cyclase: An enzyme of the lyase class that catalyzes the formation of cyclic AMP and pyrophosphate from ATP. EC 4.6.1.1. [NIH]

Adjustment: The dynamic process wherein the thoughts, feelings, behavior, and biophysiological mechanisms of the individual continually change to adjust to the environment. [NIH]

Adrenergic: Activated by, characteristic of, or secreting epinephrine or substances with similar activity; the term is applied to those nerve fibres that liberate norepinephrine at a synapse when a nerve impulse passes, i.e., the sympathetic fibres. [EU]

Adverse Effect: An unwanted side effect of treatment. [NIH]

Afferent: Concerned with the transmission of neural impulse toward the central part of the nervous system. [NIH]
**Affinity:** 1. Inherent likeness or relationship. 2. A special attraction for a specific element, organ, or structure. 3. Chemical affinity; the force that binds atoms in molecules; the tendency of substances to combine by chemical reaction. 4. The strength of noncovalent chemical binding between two substances as measured by the dissociation constant of the complex. 5. In immunology, a thermodynamic expression of the strength of interaction between a single antigen-binding site and a single antigenic determinant (and thus of the stereochemical compatibility between them), most accurately applied to interactions among simple, uniform antigenic determinants such as haptens. Expressed as the association constant (K litres mole⁻¹), which, owing to the heterogeneity of affinities in a population of antibody molecules of a given specificity, actually represents an average value (mean intrinsic association constant). 6. The reciprocal of the dissociation constant. [EU]

**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]

**Aggravation:** An increasing in seriousness or severity; an act or circumstance that intensifies, or makes worse. [EU]

**Agonist:** In anatomy, a prime mover. In pharmacology, a drug that has affinity for and stimulates physiologic activity at cell receptors normally stimulated by naturally occurring substances. [EU]

**Akathisia:** 1. A condition of motor restlessness in which there is a feeling of muscular quivering, an urge to move about constantly, and an inability to sit still, a common extrapyramidal side effect of neuroleptic drugs. 2. An inability to sit down because of intense anxiety at the thought of doing so. [EU]

**Alertness:** A state of readiness to detect and respond to certain specified small changes occurring at random intervals in the environment. [NIH]

**Alexia:** The inability to recognize or comprehend written or printed words. [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]

**Alkaloid:** A member of a large group of chemicals that are made by plants and have nitrogen in them. Some alkaloids have been shown to work against cancer. [NIH]

**Alleles:** Mutually exclusive forms of the same gene, occupying the same locus on homologous chromosomes, and governing the same biochemical and developmental process. [NIH]

**Alpha-1:** A protein with the property of inactivating proteolytic enzymes such as leucocyte collagenase and elastase. [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]

**Alveoli:** Tiny air sacs at the end of the bronchioles in the lungs. [NIH]

**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]

**Amino Acids:** Organic compounds that generally contain an amino (-NH₂) and a carboxyl (-COOH) group. Twenty alpha-amino acids are the subunits which are polymerized to form
proteins. [NIH]

**Amino Acids:** Organic compounds that generally contain an amino (-NH2) and a carboxyl (-COOH) group. Twenty alpha-amino acids are the subunits which are polymerized to form proteins. [NIH]

**Amitriptyline:** Tricyclic antidepressant with anticholinergic and sedative properties. It appears to prevent the re-uptake of norepinephrine and serotonin at nerve terminals, thus potentiating the action of these neurotransmitters. Amitriptyline also appears to antagonize cholinergic and alpha-1 adrenergic responses to bioactive amines. [NIH]

**Amnesia:** Lack or loss of memory; inability to remember past experiences. [EU]

**Amplification:** The production of additional copies of a chromosomal DNA sequence, found as either intrachromosomal or extrachromosomal DNA. [NIH]

**Amygdala:** Almond-shaped group of basal nuclei anterior to the inferior horn of the lateral ventricle of the brain, within the temporal lobe. The amygdala is part of the limbic system. [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. [EU]

**Analgesic:** An agent that alleviates pain without causing loss of consciousness. [EU]

**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]

**Anaphylatoxins:** The family of peptides C3a, C4a, C5a, and C5a des-arginine produced in the serum during complement activation. They produce smooth muscle contraction, mast cell histamine release, affect platelet aggregation, and act as mediators of the local inflammatory process. The order of anaphylatoxin activity from strongest to weakest is C5a, C3a, C4a, and C5a des-arginine. The latter is the so-called "classical" anaphylatoxin but shows no spasmogenic activity though it contains some chemotactic ability. [NIH]

**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]

**Anesthetics:** Agents that are capable of inducing a total or partial loss of sensation, especially tactile sensation and pain. They may act to induce general anesthesia, in which an unconscious state is achieved, or may act locally to induce numbness or lack of sensation at a targeted site. [NIH]

**Aneurysm:** A sac formed by the dilatation of the wall of an artery, a vein, or the heart. [NIH]

**Angina:** Chest pain that originates in the heart. [NIH]

**Angiography:** Radiography of blood vessels after injection of a contrast medium. [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]
**Annealing:** The spontaneous alignment of two single DNA strands to form a double helix. [NIH]

**Anomalies:** Birth defects; abnormalities. [NIH]

**Antagonism:** Interference with, or inhibition of, the growth of a living organism by another living organism, due either to creation of unfavorable conditions (e.g., exhaustion of food supplies) or to production of a specific antibiotic substance (e.g., penicillin). [NIH]

**Anterograde:** Moving or extending forward; called also antegrade. [EU]

**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]

**Anticholinergic:** An agent that blocks the parasympathetic nerves. Called also parasympatholytic. [EU]

**Anticoagulant:** A drug that helps prevent blood clots from forming. Also called a blood thinner. [NIH]

**Anticonvulsant:** An agent that prevents or relieves convulsions. [EU]

**Antidepressant:** A drug used to treat depression. [NIH]

**Antiemetic:** An agent that prevents or alleviates nausea and vomiting. Also antinauseant. [EU]

**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]

**Antigen-Antibody Complex:** The complex formed by the binding of antigen and antibody molecules. The deposition of large antigen-antibody complexes leading to tissue damage causes immune complex diseases. [NIH]

**Antihypertensive:** An agent that reduces high blood pressure. [EU]

**Anti-inflammatory:** Having to do with reducing inflammation. [NIH]

**Anti-Inflammatory Agents:** Substances that reduce or suppress inflammation. [NIH]

**Antimetabolite:** A chemical that is very similar to one required in a normal biochemical reaction in cells. Antimetabolites can stop or slow down the reaction. [NIH]

**Antimicrobial:** Killing microorganisms, or suppressing their multiplication or growth. [EU]

**Antineoplastic:** Inhibiting or preventing the development of neoplasms, checking the maturation and proliferation of malignant cells. [EU]
**Antineoplastic Agents:** Substances that inhibit or prevent the proliferation of neoplasms. [NIH]

**Antipsychotic:** Effective in the treatment of psychosis. Antipsychotic drugs (called also neuroleptic drugs and major tranquilizers) are a chemically diverse (including phenothiazines, thioxanthenes, butyrophenones, dibenzoxazepines, dibenzodiazepines, and diphenylbutylpiperidines) but pharmacologically similar class of drugs used to treat schizophrenic, paranoid, schizoaffective, and other psychotic disorders; acute delirium and dementia, and manic episodes (during induction of lithium therapy); to control the movement disorders associated with Huntington's chorea, Gilles de la Tourette's syndrome, and ballismus; and to treat intractable hiccups and severe nausea and vomiting. Antipsychotic agents bind to dopamine, histamine, muscarinic cholinergic, a-adrenergic, and serotonin receptors. Blockade of dopaminergic transmission in various areas is thought to be responsible for their major effects: antipsychotic action by blockade in the mesolimbic and mesocortical areas; extrapyramidal side effects (dystonia, akathisia, parkinsonism, and tardive dyskinesia) by blockade in the basal ganglia; and antiemetic effects by blockade in the chemoreceptor trigger zone of the medulla. Sedation and autonomic side effects (orthostatic hypotension, blurred vision, dry mouth, nasal congestion and constipation) are caused by blockade of histamine, cholinergic, and adrenergic receptors. [EU]

**Antipsychotic:** An agent that relieves or reduces fever. Called also antifebrile, antithermic and febrifuge. [EU]

**Antispasmodic:** An agent that relieves spasm. [EU]

**Antitussive:** An agent that relieves or prevents cough. [EU]

**Antiviral:** Destroying viruses or suppressing their replication. [EU]

**Anus:** The opening of the rectum to the outside of the body. [NIH]

**Anxiety:** Persistent feeling of dread, apprehension, and impending disaster. [NIH]

**Anxiety Disorders:** Disorders in which anxiety (persistent feelings of apprehension, tension, or uneasiness) is the predominant disturbance. [NIH]

**Anxiolytic:** An anxiolytic or antianxiety agent. [EU]

**Aphasia:** A cognitive disorder marked by an impaired ability to comprehend or express language in its written or spoken form. This condition is caused by diseases which affect the language areas of the dominant hemisphere. Clinical features are used to classify the various subtypes of this condition. General categories include receptive, expressive, and mixed forms of aphasia. [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]

**Approximate:** Approximal [EU]

**Aqueous:** Having to do with water. [NIH]

**Arachidonic Acid:** An unsaturated, essential fatty acid. It is found in animal and human fat as well as in the liver, brain, and glandular organs, and is a constituent of animal phosphatides. It is formed by the synthesis from dietary linoleic acid and is a precursor in the biosynthesis of prostaglandins, thromboxanes, and leukotrienes. [NIH]

**Arterial:** Pertaining to an artery or to the arteries. [EU]

**Arteries:** The vessels carrying blood away from the heart. [NIH]

**Arterioles:** The smallest divisions of the arteries located between the muscular arteries and the capillaries. [NIH]

**Arteriolosclerosis:** Sclerosis and thickening of the walls of the smaller arteries (arterioles).
Hyaline arteriolosclerosis, in which there is homogeneous pink hyaline thickening of the arteriolar walls, is associated with benign nephrosclerosis. Hyperplastic arteriolosclerosis, in which there is a concentric thickening with progressive narrowing of the lumina may be associated with malignant hypertension, nephrosclerosis, and scleroderma. [EU]

**Arteriosclerosis:** Thickening and loss of elasticity of arterial walls. Atherosclerosis is the most common form of arteriosclerosis and involves lipid deposition and thickening of the intimal cell layers within arteries. Additional forms of arteriosclerosis involve calcification of the media of muscular arteries (Monkeberg medial calcific sclerosis) and thickening of the walls of small arteries or arterioles due to cell proliferation or hyaline deposition (arteriolosclerosis). [NIH]

**Arteriovenous:** Both arterial and venous; pertaining to or affecting an artery and a vein. [EU]

**Arteriovenous Fistula:** An abnormal communication between an artery and a vein. [NIH]

**Arthrosis:** A disease of a joint. [EU]

**Articular:** Of or pertaining to a joint. [EU]

**Aspartate:** A synthetic amino acid. [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]

**Asystole:** Cardiac standstill or arrest; absence of a heartbeat; called also Beau's syndrome. [EU]

**Ataxia:** Impairment of the ability to perform smoothly coordinated voluntary movements. This condition may affect the limbs, trunk, eyes, pharynx, larynx, 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]

**Atherectomy:** Endovascular procedure in which atheromatous plaque is excised by a cutting or rotating catheter. It differs from balloon and laser angioplasty procedures which enlarge vessels by dilation but frequently do not remove much plaque. If the plaque is removed by surgical excision under general anesthesia rather than by an endovascular procedure through a catheter, it is called endarterectomy. [NIH]

**Atmospheric Pressure:** The pressure at any point in an atmosphere due solely to the weight of the atmospheric gases above the point concerned. [NIH]

**Atrial:** Pertaining to an atrium. [EU]

**Atrophy:** Decrease in the size of a cell, tissue, organ, or multiple organs, associated with a variety of pathological conditions such as abnormal cellular changes, ischemia, malnutrition, or hormonal changes. [NIH]

**Atropine:** A toxic alkaloid, originally from Atropa belladonna, but found in other plants, mainly Solanaceae. [NIH]

**Attenuated:** Strain with weakened or reduced virulence. [NIH]

**Attenuation:** Reduction of transmitted sound energy or its electrical equivalent. [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]

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]

Aural: Pertaining to or perceived by the ear, as an aural stimulus. [EU]

Autonomic: Self-controlling; functionally independent. [EU]

Autonomic Nervous System: The enteric, parasympathetic, and sympathetic nervous systems taken together. Generally speaking, the autonomic nervous system regulates the internal environment during both peaceful activity and physical or emotional stress. Autonomic activity is controlled and integrated by the central nervous system, especially the hypothalamus and the solitary nucleus, which receive information relayed from visceral afferents; these and related central and sensory structures are sometimes (but not here) considered to be part of the autonomic nervous system itself. [NIH]

Autoradiography: A process in which radioactive material within an object produces an image when it is in close proximity to a radiation sensitive emulsion. [NIH]

Axonal: Condition associated with metabolic derangement of the entire neuron and is manifest by degeneration of the distal portion of the nerve fiber. [NIH]

Axons: Nerve fibers that are capable of rapidly conducting impulses away from the neuron cell body. [NIH]

Babesiosis: A group of tick-borne diseases of mammals including zoonoses in humans. They are caused by protozoans of the genus babesia, which parasitize erythrocytes, producing hemolysis. In the U.S., the organism's natural host is mice and transmission is by the deer tick ixodes scapularis. [NIH]

Back Pain: Acute or chronic pain located in the posterior regions of the trunk, including the thoracic, lumbar, sacral, or adjacent regions. [NIH]

Baclofen: A GABA derivative that is a specific agonist at GABA-B receptors. It is used in the treatment of spasticity, especially that due to spinal cord damage. Its therapeutic effects result from actions at spinal and supraspinal sites, generally the reduction of excitatory transmission. [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]

Barotrauma: Injury following pressure changes; includes injury to the eustachian tube, ear drum, lung and stomach. [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 cranio-cerebral trauma. [NIH]

**Base:** In chemistry, the nonacid part of a salt; a substance that combines with acids to form salts; a substance that dissociates to give hydroxide ions in aqueous solutions; a substance whose molecule or ion can combine with a proton (hydrogen ion); a substance capable of donating a pair of electrons (to an acid) for the formation of a coordinate covalent bond. [EU]

**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]

**Behavior Therapy:** The application of modern theories of learning and conditioning in the treatment of behavior disorders. [NIH]

**Benign:** Not cancerous; does not invade nearby tissue or spread to other parts of the body. [NIH]

**Benign tumor:** A noncancerous growth that does not invade nearby tissue or spread to other parts of the body. [NIH]

**Benzene:** Toxic, volatile, flammable liquid hydrocarbon biproduct of coal distillation. It is used as an industrial solvent in paints, varnishes, lacquer thinners, gasoline, etc. Benzene causes central nervous system damage acutely and bone marrow damage chronically and is carcinogenic. It was formerly used as parasiticide. [NIH]

**Benzodiazepines:** A two-ring heterocyclic compound consisting of a benzene ring fused to a diazepine ring. Permitted is any degree of hydrogenation, any substituents and any H-isomer. [NIH]

**Bereavement:** Refers to the whole process of grieving and mourning and is associated with a deep sense of loss and sadness. [NIH]

**Betahistine:** N-Methyl-2-pyridineethanamine. A physiological histamine analog vasodilator agent that also acts as a histamine H1 receptor agonist. It is used in Meniere's disease and in vascular headaches but may exacerbate bronchial asthma and peptic ulcers. [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]

**Binaural:** Used of the two ears functioning together. [NIH]

**Bioassay:** Determination of the relative effective strength of a substance (as a vitamin, hormone, or drug) by comparing its effect on a test organism with that of a standard preparation. [NIH]

**Biochemical:** Relating to biochemistry; characterized by, produced by, or involving chemical reactions in living organisms. [EU]

**Biological Assay:** A method of measuring the effects of a biologically active substance using an intermediate in vivo or in vitro tissue or cell model under controlled conditions. It includes virulence studies in animal fetuses in utero, mouse convulsion bioassay of insulin,
quantitation of tumor-initiator systems in mouse skin, calculation of potentiating effects of a hormonal factor in an isolated strip of contracting stomach muscle, etc. [NIH]

**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]

**Bioluminescence:** The emission of light by living organisms such as the firefly, certain mollusks, beetles, fish, bacteria, fungi and protozoa. [NIH]

**Biomarkers:** Substances sometimes found in an increased amount in the blood, other body fluids, or tissues and that may suggest the presence of some types of cancer. Biomarkers include CA 125 (ovarian cancer), CA 15-3 (breast cancer), CEA (ovarian, lung, breast, pancreas, and GI tract cancers), and PSA (prostate cancer). Also called tumor markers. [NIH]

**Biomechanics:** The study of the application of mechanical laws and the action of forces to living structures. [NIH]

**Biopsy:** Removal and pathologic examination of specimens in the form of small pieces of tissue from the living body. [NIH]

**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]

**Biotin:** Hexahydro-2-oxo-1H-thieno(3,4-d)imidazole-4-pentanoic acid. Growth factor present in minute amounts in every living cell. It occurs mainly bound to proteins or polypeptides and is abundant in liver, kidney, pancreas, yeast, and milk. The biotin content of cancerous tissue is higher than that of normal tissue. [NIH]

**Biphasic:** Having two phases; having both a sporophytic and a gametophytic phase in the life cycle. [EU]

**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 Glucose:** Glucose in blood. [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]

**Blot:** To transfer DNA, RNA, or proteins to an immobilizing matrix such as nitrocellulose. [NIH]

**Body Fluids:** Liquid components of living organisms. [NIH]
Body Mass Index: One of the anthropometric measures of body mass; it has the highest correlation with skinfold thickness or body density. [NIH]

Bone Conduction: Sound transmission through the bones of the skull to the inner ear. [NIH]

Bone scan: A technique to create images of bones on a computer screen or on film. A small amount of radioactive material is injected into a blood vessel and travels through the bloodstream; it collects in the bones and is detected by a scanner. [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]

Bowel Movement: Body wastes passed through the rectum and anus. [NIH]

Brachial: All the nerves from the arm are ripped from the spinal cord. [NIH]

Brachial Artery: The continuation of the axillary artery; it branches into the radial and ulnar arteries. [NIH]

Brachytherapy: A collective term for interstitial, intracavity, and surface radiotherapy. It uses small sealed or partly-sealed sources that may be placed on or near the body surface or within a natural body cavity or implanted directly into the tissues. [NIH]

Bradycardia: Excessive slowness in the action of the heart, usually with a heart rate below 60 beats per minute. [NIH]

Brain Ischemia: Localized reduction of blood flow to brain tissue due to arterial obstruction or systemic hypoperfusion. This frequently occurs in conjunction with brain hypoxia. Prolonged ischemia is associated with brain infarction. [NIH]

Brain Neoplasms: Neoplasms of the intracranial components of the central nervous system, including the cerebral hemispheres, basal ganglia, hypothalamus, thalamus, brain stem, and cerebellum. Brain neoplasms are subdivided into primary (originating from brain tissue) and secondary (i.e., metastatic) forms. Primary neoplasms are subdivided into benign and malignant forms. In general, brain tumors may also be classified by age of onset, histologic type, or presenting location in the brain. [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]

Branch: Most commonly used for branches of nerves, but applied also to other structures. [NIH]

Breakdown: A physical, metal, or nervous collapse. [NIH]

Broadband: A wide frequency range. Sound whose energy is distributed over a broad range of frequency (generally, more than one octave). [NIH]

Bronchial: Pertaining to one or more bronchi. [EU]

Bronchiseptica: A small, gram-negative, motile bacillus. A normal inhabitant of the respiratory tract in man, dogs, and pigs, but is also associated with canine infectious tracheobronchitis and atrophic rhinitis in pigs. [NIH]

Bruit: An abnormal sound heard over an artery, related to the cardiac cycle but unrelated to the respiratory cycle or to muscle, joint, or swallowing activity. [NIH]

Buffers: A chemical system that functions to control the levels of specific ions in solution. When the level of hydrogen ion in solution is controlled the system is called a pH buffer. [NIH]

Bupivacaine: A widely used local anesthetic agent. [NIH]

Bypass: A surgical procedure in which the doctor creates a new pathway for the flow of body fluids. [NIH]
Cachexia: General ill health, malnutrition, and weight loss, usually associated with chronic disease. [NIH]

Caffeine: A methylxanthine naturally occurring in some beverages and also used as a pharmacological agent. Caffeine's most notable pharmacological effect is as a central nervous system stimulant, increasing alertness and producing agitation. It also relaxes smooth muscle, stimulates cardiac muscle, stimulates diuresis, and appears to be useful in the treatment of some types of headache. Several cellular actions of caffeine have been observed, but it is not entirely clear how each contributes to its pharmacological profile. Among the most important are inhibition of cyclic nucleotide phosphodiesterases, antagonism of adenosine receptors, and modulation of intracellular calcium handling. [NIH]

Calcification: Deposits of calcium in the tissues of the breast. Calcification in the breast can be seen on a mammogram, but cannot be detected by touch. There are two types of breast calcification, macrocalcification and microcalcification. Macrocalcifications are large deposits and are usually not related to cancer. Microcalcifications are specks of calcium that may be found in an area of rapidly dividing cells. Many microcalcifications clustered together may be a sign of cancer. [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]

Calcium Channels: Voltage-dependent cell membrane glycoproteins selectively permeable to calcium ions. They are categorized as L-, T-, N-, P-, Q-, and R-types based on the activation and inactivation kinetics, ion specificity, and sensitivity to drugs and toxins. The L- and T-types are present throughout the cardiovascular and central nervous systems and the N-, P-, Q-, & R-types are located in neuronal tissue. [NIH]

Canonical: A particular nucleotide sequence in which each position represents the base more often found when many actual sequences of a given class of genetic elements are compared. [NIH]

Capillary: Any one of the minute vessels that connect the arterioles and venules, forming a network in nearly all parts of the body. Their walls act as semipermeable membranes for the interchange of various substances, including fluids, between the blood and tissue fluid; called also vas capillare. [EU]

Capital Financing: Institutional funding for facilities and for equipment which becomes a part of the assets of the institution. [NIH]

Carbamazepine: An anticonvulsant used to control grand mal and psychomotor or focal seizures. Its mode of action is not fully understood, but some of its actions resemble those of phenytoin; although there is little chemical resemblance between the two compounds, their three-dimensional structure is similar. [NIH]

Carbimazole: An imidazole antithyroid agent. Carbimazole is metabolized to methimazole, which is responsible for the antithyroid activity. [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]

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]

Carrier Proteins: Transport proteins that carry specific substances in the blood or across cell membranes. [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]

Case series: A group or series of case reports involving patients who were given similar treatment. Reports of case series usually contain detailed information about the individual patients. This includes demographic information (for example, age, gender, ethnic origin) and information on diagnosis, treatment, response to treatment, and follow-up after treatment. [NIH]

Catecholamine: A group of chemical substances manufactured by the adrenal medulla and secreted during physiological stress. [NIH]

Caudal: Denoting a position more toward the cauda, or tail, than some specified point of reference; same as inferior, in human anatomy. [EU]

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 Cycle: The complex series of phenomena, occurring between the end of one cell division and the end of the next, by which cellular material is divided between daughter cells. [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 membrane: Cell membrane = plasma membrane. The structure enveloping a cell, enclosing the cytoplasm, and forming a selective permeability barrier; it consists of lipids, proteins, and some carbohydrates, the lipids thought to form a bilayer in which integral proteins are embedded to varying degrees. [EU]

Cell proliferation: An increase in the number of cells as a result of cell growth and cell division. [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]

Cellulose: A polysaccharide with glucose units linked as in cellobiose. It is the chief constituent of plant fibers, cotton being the purest natural form of the substance. As a raw material, it forms the basis for many derivatives used in chromatography, ion exchange materials, explosives manufacturing, and pharmaceutical preparations. [NIH]

Central Nervous System: The main information-processing organs of the nervous system,
consisting of the brain, spinal cord, and meninges. [NIH]

**Central Nervous System Infections:** Pathogenic infections of the brain, spinal cord, and meninges. DNA virus infections; RNA virus infections; bacterial infections; mycoplasma infections; Spirochaetales infections; fungal infections; protozoan infections; helminthiasis; and prion diseases may involve the central nervous system as a primary or secondary process. [NIH]

**Cerebellar:** Pertaining to the cerebellum. [EU]

**Cerebellopontine:** Going from the cerebellum (the part of the brain responsible for coordinating movement) to the pons (part of the central nervous system located near the base of the brain.) [NIH]

**Cerebellopontine Angle:** Junction between the cerebellum and the pons. [NIH]

**Cerebellum:** Part of the metencephalon that lies in the posterior cranial fossa behind the brain stem. It is concerned with the coordination of movement. [NIH]

**Cerebral:** Of or pertaining of the cerebrum or the brain. [EU]

**Cerebral Angiography:** Radiography of the vascular system of the brain after injection of a contrast medium. [NIH]

**Cerebral Arteries:** The arteries supplying the cerebral cortex. [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]

**Cerebral Infarction:** The formation of an area of necrosis in the cerebrum caused by an insufficiency of arterial or venous blood flow. Infarcts of the cerebrum are generally classified by hemisphere (i.e., left vs. right), lobe (e.g., frontal lobe infarction), arterial distribution (e.g., infarction, anterior cerebral artery), and etiology (e.g., embolic infarction). [NIH]

**Cerebrospinal:** Pertaining to the brain and spinal cord. [EU]

**Cerebrospinal fluid:** CSF. The fluid flowing around the brain and spinal cord. Cerebrospinal fluid is produced in the ventricles in the brain. [NIH]

**Cerebrovascular:** Pertaining to the blood vessels of the cerebrum, or brain. [EU]

**Cerebrovascular Disorders:** A broad category of disorders characterized by impairment of blood flow in the arteries and veins which supply the brain. These include cerebral infarction; brain ischemia; hypoxia, brain; intracranial embolism and thrombosis; intracranial arteriovenous malformations; and vasculitis, central nervous system. In common usage, the term cerebrovascular disorders is not limited to conditions that affect the cerebrum, but refers to vascular disorders of the entire brain including the diencephalon; brain stem; and cerebellum. [NIH]

**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
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]

Chemoreceptor: A receptor adapted for excitation by chemical substances, e.g., olfactory and gustatory receptors, or a sense organ, as the carotid body or the aortic (supracardial) bodies, which is sensitive to chemical changes in the blood stream, especially reduced oxygen content, and reflexly increases both respiration and blood pressure. [EU]

Chemotactic Factors: Chemical substances that attract or repel cells or organisms. The concept denotes especially those factors released as a result of tissue injury, invasion, or immunologic activity, that attract leukocytes, macrophages, or other cells to the site of infection or insult. [NIH]

Chemotherapy: Treatment with anticancer drugs. [NIH]

Choice Behavior: The act of making a selection among two or more alternatives, usually after a period of deliberation. [NIH]

Cholera: An acute diarrheal disease endemic in India and Southeast Asia whose causative agent is vibrio cholerae. This condition can lead to severe dehydration in a matter of hours unless quickly treated. [NIH]

Cholera Toxin: The enterotoxin from Vibrio cholerae. It is a protein that consists of two major components, the heavy (H) or A peptide and the light (L) or B peptide or choleraagenoid. The B peptide anchors the protein to intestinal epithelial cells, while the A peptide, enters the cytoplasm, and activates adenylate cyclase, and production of cAMP. Increased levels of cAMP are thought to modulate release of fluid and electrolytes from intestinal crypt cells. [NIH]

Cholesterol: The principal sterol of all higher animals, distributed in body tissues, especially the brain and spinal cord, and in animal fats and oils. [NIH]

Cholinergic: Ressembling acetylcholine in pharmacological action; stimulated by or releasing acetylcholine or a related compound. [EU]

Chorea: Involuntary, forcible, rapid, jerky movements that may be subtle or become confluent, markedly altering normal patterns of movement. Hypotonia and pendular reflexes are often associated. Conditions which feature recurrent or persistent episodes of chorea as a primary manifestation of disease are referred to as choreatic disorders. Chorea is also a frequent manifestation of basal ganglia diseases. [NIH]

Chorion: The outermost extraembryonic membrane. [NIH]

Choroid: The thin, highly vascular membrane covering most of the posterior of the eye between the retina and sclera. [NIH]

Chromosomal: Pertaining to chromosomes. [EU]

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]

Chronotherapy: The adaptation of the administration of drugs to circadian rhythms. The concept is based on the response of biological functions to time-related events, such as the low point in epinephrine levels between 10 p.m. and 4 a.m. or the elevated histamine levels between midnight and 4 a.m. The treatment is aimed at supporting normal rhythms or modifying therapy based on known variations in body rhythms. While chronotherapy is commonly used in cancer chemotherapy, it is not restricted to cancer therapy or to chemotherapy. [NIH]

Cinchona: A genus of rubiaceous South American trees that yields the toxic cinchona...
alkaloids from their bark; quinine, quinidine, chinconine, cinchonidine and others are used to treat malaria and cardiac arrhythmias. [NIH]

**Circadian:** Repeated more or less daily, i.e. on a 23- to 25-hour cycle. [NIH]

**Circadian Rhythm:** The regular recurrence, in cycles of about 24 hours, of biological processes or activities, such as sensitivity to drugs and stimuli, hormone secretion, sleeping, feeding, etc. This rhythm seems to be set by a 'biological clock' which seems to be set by recurring daylight and darkness. [NIH]

**Circulatory system:** The system that contains the heart and the blood vessels and moves blood throughout the body. This system helps tissues get enough oxygen and nutrients, and it helps them get rid of waste products. The lymph system, which connects with the blood system, is often considered part of the circulatory system. [NIH]

**Cisplatin:** An inorganic and water-soluble platinum complex. After undergoing hydrolysis, it reacts with DNA to produce both intra and interstrand crosslinks. These crosslinks appear to impair replication and transcription of DNA. The cytotoxicity of cisplatin correlates with cellular arrest in the G2 phase of the cell cycle. [NIH]

**Clamp:** A u-shaped steel rod used with a pin or wire for skeletal traction in the treatment of certain fractures. [NIH]

**Clavicle:** A long bone of the shoulder girdle. [NIH]

**Clear cell carcinoma:** A rare type of tumor of the female genital tract in which the inside of the cells looks clear when viewed under a microscope. [NIH]

**Cleft Palate:** Congenital fissure of the soft and/or hard palate, due to faulty fusion. [NIH]

**Clinical Protocols:** Precise and detailed plans for the study of a medical or biomedical problem and/or plans for a regimen of therapy. [NIH]

**Clinical study:** A research study in which patients receive treatment in a clinic or other medical facility. Reports of clinical studies can contain results for single patients (case reports) or many patients (case series or clinical trials). [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]

**Clonazepam:** An anticonvulsant used for several types of seizures, including myotonic or atonic seizures, photosensitive epilepsy, and absence seizures, although tolerance may develop. It is seldom effective in generalized tonic-clonic or partial seizures. The mechanism of action appears to involve the enhancement of gaba receptor responses. [NIH]

**Clonic:** Pertaining to or of the nature of clonus. [EU]

**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 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]

**Codeine:** An opioid analgesic related to morphine but with less potent analgesic properties and mild sedative effects. It also acts centrally to suppress cough. [NIH]

**Coenzyme:** An organic nonprotein molecule, frequently a phosphorylated derivative of a water-soluble vitamin, that binds with the protein molecule (apoenzyme) to form the active enzyme (holoenzyme). [EU]

**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 behavior therapy:** A system of psychotherapy based on the premise that distorted or dysfunctional thinking, which influences a person's mood or behavior, is common to all psychosocial problems. The focus of therapy is to identify the distorted thinking and to replace it with more rational, adaptive thoughts and beliefs. [NIH]

**Cognitive restructuring:** A method of identifying and replacing fear-promoting, irrational beliefs with more realistic and functional ones. [NIH]

**Cognitive Therapy:** A direct form of psychotherapy based on the interpretation of situations (cognitive structure of experiences) that determine how an individual feels and behaves. It is based on the premise that cognition, the process of acquiring knowledge and forming beliefs, is a primary determinant of mood and behavior. The therapy uses behavioral and verbal techniques to identify and correct negative thinking that is at the root of the aberrant behavior. [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]

**Comorbidity:** The presence of co-existing or additional diseases with reference to an initial diagnosis or with reference to the index condition that is the subject of study. Comorbidity may affect the ability of affected individuals to function and also their survival; it may be used as a prognostic indicator for length of hospital stay, cost factors, and outcome or survival. [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]

**Complete remission:** The disappearance of all signs of cancer. Also called a complete response. [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]

**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]

**Conduction:** The transfer of sound waves, heat, nervous impulses, or electricity. [EU]

**Congenita:** Displacement, subluxation, or malposition of the crystalline lens. [NIH]

**Congestion:** Excessive or abnormal accumulation of blood in a part. [EU]

**Conjunctiva:** The mucous membrane that lines the inner surface of the eyelids and the anterior part of the sclera. [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]

**Consciousness:** Sense of awareness of self and of the environment. [NIH]

**Constipation:** Infrequent or difficult evacuation of feces. [NIH]

**Constitutional:** 1. Affecting the whole constitution of the body; not local. 2. Pertaining to the constitution. [EU]

**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]

**Contralateral:** Having to do with the opposite side of the body. [NIH]

**Contrast Media:** Substances used in radiography that allow visualization of certain tissues. [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]

**Controlled clinical trial:** A clinical study that includes a comparison (control) group. The comparison group receives a placebo, another treatment, or no treatment at all. [NIH]

**Controlled study:** An experiment or clinical trial that includes a comparison (control) group. [NIH]

**Convulsion:** A violent involuntary contraction or series of contractions of the voluntary muscles. [EU]

**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]

**Cortisone:** A natural steroid hormone produced in the adrenal gland. It can also be made in the laboratory. Cortisone reduces swelling and can suppress immune responses. [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]

**Craniomandibular Disorders:** Diseases or disorders of the muscles of the head and neck, with special reference to the masticatory muscles. The most notable examples are temporomandibular joint disorders and temporomandibular joint dysfunction syndrome. [NIH]

**Crossing-over:** The exchange of corresponding segments between chromatids of homologous chromosomes during meiosia, forming a chiasma. [NIH]

**Crowns:** A prosthetic restoration that reproduces the entire surface anatomy of the visible natural crown of a tooth. It may be partial (covering three or more surfaces of a tooth) or complete (covering all surfaces). It is made of gold or other metal, porcelain, or resin. [NIH]

**Cutaneous:** Having to do with the skin. [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]

**Cyst:** A sac or capsule filled with fluid. [EU]

**Cysteine:** A thiol-containing non-essential amino acid that is oxidized to form cystine. [NIH]

**Cystine:** A covalently linked dimeric nonessential amino acid formed by the oxidation of cysteine. Two molecules of cysteine are joined together by a disulfide bridge to form cystine. [NIH]

**Cytochrome:** Any electron transfer hemoprotein having a mode of action in which the transfer of a single electron is effected by a reversible valence change of the central iron atom of the heme prosthetic group between the +2 and +3 oxidation states; classified as cytochromes a in which the heme contains a formyl side chain, cytochromes b, which contain protoheme or a closely similar heme that is not covalently bound to the protein, cytochromes c in which protoheme or other heme is covalently bound to the protein, and cytochromes d in which the iron-tetrapyrrole has fewer conjugated double bonds than the hemes have. Well-known cytochromes have been numbered consecutively within groups and are designated by subscripts (beginning with no subscript), e.g. cytochromes c, c1, C2, . New cytochromes are named according to the wavelength in nanometres of the absorption maximum of the a-band of the iron (II) form in pyridine, e.g., c-555. [EU]

**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]

**Cytotoxic:** Cell-killing. [NIH]

**Cytotoxicity:** Quality of being capable of producing a specific toxic action upon cells of special organs. [NIH]

**Databases, Bibliographic:** Extensive collections, reputedly complete, of references and citations to books, articles, publications, etc., generally on a single subject or specialized subject area. Databases can operate through automated files, libraries, or computer disks. The concept should be differentiated from factual databases which is used for collections of
Debrisoquin: An adrenergic neuron-blocking drug similar in effects to guanethidine. It is also noteworthy in being a substrate for a polymorphic cytochrome P-450 enzyme. Persons with certain isoforms of this enzyme are unable to properly metabolize this and many other clinically important drugs. They are commonly referred to as having a debrisoquin 4-hydroxylase polymorphism.

Decompression: Decompression external to the body, most often the slow lessening of external pressure on the whole body (especially in caisson workers, deep sea divers, and persons who ascend to great heights) to prevent decompression sickness. It includes also sudden accidental decompression, but not surgical (local) decompression or decompression applied through body openings.

Decompression Sickness: A condition occurring as a result of exposure to a rapid fall in ambient pressure. Gases, nitrogen in particular, come out of solution and form bubbles in body fluid and blood. These gas bubbles accumulate in joint spaces and the peripheral circulation impairing tissue oxygenation causing disorientation, severe pain, and potentially death.

Degenerative: Undergoing degeneration: tending to degenerate; having the character of or involving degeneration; causing or tending to cause degeneration.

Deglutition: The process or the act of swallowing.

Dehydration: The condition that results from excessive loss of body water.

Deletion: A genetic rearrangement through loss of segments of DNA (chromosomes), bringing sequences, which are normally separated, into close proximity.

Delirium: (DSM III-R) an acute, reversible organic mental disorder characterized by reduced ability to maintain attention to external stimuli and disorganized thinking as manifested by rambling, irrelevant, or incoherent speech; there are also a reduced level of consciousness, sensory misperceptions, disturbance of the sleep-wakefulness cycle and level of psychomotor activity, disorientation to time, place, or person, and memory impairment. Delirium may be caused by a large number of conditions resulting in derangement of cerebral metabolism, including systemic infection, poisoning, drug intoxication or withdrawal, seizures or head trauma, and metabolic disturbances such as hypoxia, hypoglycaemia, fluid, electrolyte, or acid-base imbalances, or hepatic or renal failure. Called also acute confusional state and acute brain syndrome.

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.

Denaturation: Rupture of the hydrogen bonds by heating a DNA solution and then cooling it rapidly causes the two complementary strands to separate.

Dendrites: Extensions of the nerve cell body. They are short and branched and receive stimuli from other neurons.

Dendritic: 1. Branched like a tree. 2. Pertaining to or possessing dendrites.

Density: The logarithm to the base 10 of the opacity of an exposed and processed film.

Dental Care: The total of dental diagnostic, preventive, and restorative services provided to meet the needs of a patient (from Illustrated Dictionary of Dentistry, 1982).

Dentists: Individuals licensed to practice dentistry.
**Deoxyglucose:** 2-Deoxy-D-arabino-hexose. An antimetabolite of glucose with antiviral activity. [NIH]

**Depolarization:** The process or act of neutralizing polarity. In neurophysiology, the reversal of the resting potential in excitable cell membranes when stimulated, i.e., the tendency of the cell membrane potential to become positive with respect to the potential outside the cell. [EU]

**Deprivation:** Loss or absence of parts, organs, powers, or things that are needed. [EU]

**Dermatitis:** Any inflammation of the skin. [NIH]

**DES:** Diethylstilbestrol. A synthetic hormone that was prescribed from the early 1940s until 1971 to help women with complications of pregnancy. DES has been linked to an increased risk of clear cell carcinoma of the vagina in daughters of women who used DES. DES may also increase the risk of breast cancer in women who used DES. [NIH]

**Deuterium:** Deuterium. The stable isotope of hydrogen. It has one neutron and one proton in the nucleus. [NIH]

**Dextromethorphan:** The d-isomer of the codeine analog of levorphanol. Dextromethorphan shows high affinity binding to several regions of the brain, including the medullary cough center. This compound is a NMDA receptor antagonist (receptors, N-methyl-D-aspartate) and acts as a non-competitive channel blocker. It is used widely as an antitussive agent, and is also used to study the involvement of glutamate receptors in neurotoxicity. [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]

**Diarrhea:** Passage of excessively liquid or excessively frequent stools. [NIH]

**Diastolic:** Of or pertaining to the diastole. [EU]

**Diencephalon:** The paired caudal parts of the prosencephalon from which the thalamus, hypothalamus, epithalamus, and subthalamus are derived. [NIH]

**Digestion:** The process of breakdown of food for metabolism and use by the body. [NIH]

**Digestive system:** The organs that take in food and turn it into products that the body can use to stay healthy. Waste products the body cannot use leave the body through bowel movements. The digestive system includes the salivary glands, mouth, esophagus, stomach, liver, pancreas, gallbladder, small and large intestines, and rectum. [NIH]

**Dilatation:** The act of dilating. [NIH]

**Dilation:** A process by which the pupil is temporarily enlarged with special eye drops (mydriatic); allows the eye care specialist to better view the inside of the eye. [NIH]

**Dimenhydrinate:** A drug combination that contains diphenhydramine and theophylline. It is used for treating vertigo, motion sickness, and nausea associated with pregnancy. It is not effective in the treatment of nausea associated with cancer chemotherapy. [NIH]

**Dimethyl:** A volatile metabolite of the amino acid methionine. [NIH]

**Diphenhydramine:** A histamine H1 antagonist used as an antiemetic, antitussive, for dermatoses and pruritus, for hypersensitivity reactions, as a hypnotic, an antiparkinson, and as an ingredient in common cold preparations. It has some undesired antimuscarinic and sedative effects. [NIH]

**Diploid:** Having two sets of chromosomes. [NIH]

**Direct:** 1. Straight; in a straight line. 2. Performed immediately and without the intervention of subsidiary means. [EU]

**Discrimination:** The act of qualitative and/or quantitative differentiation between two or
more stimuli. [NIH]

**Disorientation:** The loss of proper bearings, or a state of mental confusion as to time, place, or identity. [EU]

**Dissection:** Cutting up of an organism for study. [NIH]

**Dissociation:** 1. The act of separating or state of being separated. 2. The separation of a molecule into two or more fragments (atoms, molecules, ions, or free radicals) produced by the absorption of light or thermal energy or by solvation. 3. In psychology, a defense mechanism in which a group of mental processes are segregated from the rest of a person's mental activity in order to avoid emotional distress, as in the dissociative disorders (q.v.), or in which an idea or object is segregated from its emotional significance; in the first sense it is roughly equivalent to splitting, in the second, to isolation. 4. A defect of mental integration in which one or more groups of mental processes become separated off from normal consciousness and, thus separated, function as a unitary whole. [EU]

**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]

**Disulphide:** A covalent bridge formed by the oxidation of two cysteine residues to a cystine residue. The -S-S- bond is very strong and its presence confers additional stability. [NIH]

**Diuresis:** Increased excretion of urine. [EU]

**Diving:** An activity in which the organism plunges into water. It includes scuba and bell diving. Diving as natural behavior of animals goes here, as well as diving in decompression experiments with humans or animals. [NIH]

**Dizziness:** An imprecise term which may refer to a sense of spatial disorientation, motion of the environment, or lightheadedness. [NIH]

**Domesticated:** Species in which the evolutionary process has been influenced by humans to meet their needs. [NIH]

**Dopamine:** An endogenous catecholamine and prominent neurotransmitter in several systems of the brain. In the synthesis of catecholamines from tyrosine, it is the immediate precursor to norepinephrine and epinephrine. Dopamine is a major transmitter in the extrapyramidal system of the brain, and important in regulating movement. A family of dopaminergic receptor subtypes mediate its action. Dopamine is used pharmacologically for its direct (beta adrenergic agonist) and indirect (adrenergic releasing) sympathomimetic effects including its actions as an inotropic agent and as a renal vasodilator. [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 Delivery Systems:** Systems of administering drugs through controlled delivery so that an optimum amount reaches the target site. Drug delivery systems encompass the carrier, route, and target. [NIH]

**Drug Interactions:** The action of a drug that may affect the activity, metabolism, or toxicity of another drug. [NIH]

**Drug Tolerance:** Progressive diminution of the susceptibility of a human or animal to the effects of a drug, resulting from its continued administration. It should be differentiated
from drug resistance wherein an organism, disease, or tissue fails to respond to the intended
effectiveness of a chemical or drug. It should also be differentiated from maximum tolerated
dose and no-observed-adverse-effect level. [NIH]

**Dynorphins**: A class of opioid peptides including dynorphin A, dynorphin B, and smaller
fragments of these peptides. Dynorphins prefer kappa-opioid receptors (receptors, opioid,
kappa) and have been shown to play a role as central nervous system transmitters. [NIH]

**Dyskinesia**: Impairment of the power of voluntary movement, resulting in fragmentary or
incomplete movements. [EU]

**Dyslexia**: Partial alexia in which letters but not words may be read, or in which words may
be read but not understood. [NIH]

**Dysphonia**: Difficulty or pain in speaking; impairment of the voice. [NIH]

**Dysplasia**: Cells that look abnormal under a microscope but are not cancer. [NIH]

**Dystonia**: Disordered tonicity of muscle. [EU]

**Earache**: Pain in the ear. [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]

**Edema**: Excessive amount of watery fluid accumulated in the intercellular spaces, most
commonly present in subcutaneous tissue. [NIH]

**Effector**: It is often an enzyme that converts an inactive precursor molecule into an active
second messenger. [NIH]

**Effector cell**: A cell that performs a specific function in response to a stimulus; usually used
to describe cells in the immune system. [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]

**Elasticity**: Resistance and recovery from distortion of shape. [NIH]

**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]

**Electrochemistry**: The study of chemical changes resulting from electrical action and
electrical activity resulting from chemical changes. [NIH]

**Electroconvulsive Therapy**: Electrically induced convulsions primarily used in the
treatment of severe affective disorders and schizophrenia. [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]

**Electromagnetic Fields**: Fields representing the joint interplay of electric and magnetic
forces. [NIH]

**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]

**Electrophoresis**: An electrochemical process in which macromolecules or colloidal particles
with a net electric charge migrate in a solution under the influence of an electric current. [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]

**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]

**Encephalitis:** Inflammation of the brain due to infection, autoimmune processes, toxins, and other conditions. Viral infections (see encephalitis, viral) are a relatively frequent cause of this condition. [NIH]

**Encephalitis, Viral:** Inflammation of brain parenchymal tissue as a result of viral infection. Encephalitis may occur as primary or secondary manifestation of Togaviridae infections; Herpesviridae infections; Adenoviridae infections; Flaviviridae infections; Bunyaviridae infections; Picornaviridae infections; Paramyxoviridae infections; Orthomyxoviridae infections; Retroviridae infections; and Arenaviridae infections. [NIH]

**Endarterectomy:** Surgical excision, performed under general anesthesia, of the atheromatous tunica intima of an artery. When reconstruction of an artery is performed as an endovascular procedure through a catheter, it is called atherectomy. [NIH]

**Endemic:** Present or usually prevalent in a population or geographical area at all times; said of a disease or agent. Called also endemical. [EU]

**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]

**Endorphins:** One of the three major groups of endogenous opioid peptides. They are large peptides derived from the pro-opiomelanocortin precursor. The known members of this group are alpha-, beta-, and gamma-endorphin. The term endorphin is also sometimes used to refer to all opioid peptides, but the narrower sense is used here; opioid peptides is used for the broader group. [NIH]

**Endothelial cell:** The main type of cell found in the inside lining of blood vessels, lymph vessels, and the heart. [NIH]

**Endothelium:** A layer of epithelium that lines the heart, blood vessels (endothelium, vascular), lymph vessels (endothelium, lymphatic), and the serous cavities of the body. [NIH]

**Endothelium, Lymphatic:** Unbroken cellular lining (intima) of the lymph vessels (e.g., the high endothelial lymphatic venules). It is more permeable than vascular endothelium, lacking selective absorption and functioning mainly to remove plasma proteins that have filtered through the capillaries into the tissue spaces. [NIH]

**Endothelium, Vascular:** Single pavement layer of cells which line the luminal surface of the entire vascular system and regulate the transport of macromolecules and blood components
from interstitium to lumen; this function has been most intensively studied in the blood capillaries. [NIH]

**Endotoxins**: Toxins closely associated with the living cytoplasm or cell wall of certain microorganisms, which do not readily diffuse into the culture medium, but are released upon lysis of the cells. [NIH]

**Enhancers**: Transcriptional element in the virus genome. [NIH]

**Enkephalins**: One of the three major families of endogenous opioid peptides. The enkephalins are pentapeptides that are widespread in the central and peripheral nervous systems and in the adrenal medulla. [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]

**Enzyme Inhibitors**: Compounds or agents that combine with an enzyme in such a manner as to prevent the normal substrate-enzyme combination and the catalytic reaction. [NIH]

**Epidemiological**: Relating to, or involving epidemiology. [EU]

**Epinephrine**: The active sympathomimetic hormone from the adrenal medulla in most species. It stimulates both the alpha- and beta-adrenergic systems, causes systemic vasoconstriction and gastrointestinal relaxation, stimulates the heart, and dilates bronchi and cerebral vessels. It is used in asthma and cardiac failure and to delay absorption of local anesthetics. [NIH]

**Epithalamus**: The dorsal posterior subdivision of the diencephalon. The epithalamus is generally considered to include the habenular nuclei (habenula) and associated fiber bundles, the pineal body, and the epithelial roof of the third ventricle. The anterior and posterior paraventricular nuclei of the thalamus are included with the thalamic nuclei although they develop from the same pronuclear mass as the epithalamic nuclei and are sometimes considered part of the epithalamus. [NIH]

**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]

**Equalization**: The reduction of frequency and/or phase distortion, or modification of gain and or phase versus frequency characteristics of a transducer, by the use of attenuation circuits whose loss or delay is a function of frequency. [NIH]

**Erythrocytes**: Red blood cells. Mature erythrocytes are non-nucleated, biconcave disks containing hemoglobin whose function is to transport oxygen. [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]

**Eustachian tube**: The middle ear cavity is in communication with the back of the nose through the Eustachian tube, which is normally closed, but opens on swallowing, in order to maintain equal air pressure. [NIH]

**Evoke**: The electric response recorded from the cerebral cortex after stimulation of a peripheral sense organ. [NIH]
Excitability: Property of a cardiac cell whereby, when the cell is depolarized to a critical level (called threshold), the membrane becomes permeable and a regenerative inward current causes an action potential. [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]

Exhaustion: The feeling of weariness of mind and body. [NIH]

External-beam radiation: Radiation therapy that uses a machine to aim high-energy rays at the cancer. Also called external radiation. [NIH]

Extracellular: Outside a cell or cells. [EU]

Extrapyramidal: Outside of the pyramidal tracts. [EU]

Extremity: A limb; an arm or leg (membrum); sometimes applied specifically to a hand or foot. [EU]

Eye Movements: Voluntary or reflex-controlled movements of the eye. [NIH]

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]

Facial Paralysis: Severe or complete loss of facial muscle motor function. This condition may result from central or peripheral lesions. Damage to CNS motor pathways from the cerebral cortex to the facial nuclei in the pons leads to facial weakness that generally spares the forehead muscles. Facial nerve diseases generally results in generalized hemifacial weakness. Neuromuscular junction diseases and muscular diseases may also cause facial paralysis or paresis. [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]

Fatty acids: A major component of fats that are used by the body for energy and tissue development. [NIH]

Fetus: The developing offspring from 7 to 8 weeks after conception until birth. [NIH]

Fibrosis: Any pathological condition where fibrous connective tissue invades any organ, usually as a consequence of inflammation or other injury. [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]

Fistula: Abnormal communication most commonly seen between two internal organs, or between an internal organ and the surface of the body. [NIH]

Flatus: Gas passed through the rectum. [NIH]
**Fluorescence**

The property of emitting radiation while being irradiated. The radiation emitted is usually of longer wavelength than that incident or absorbed, e.g., a substance can be irradiated with invisible radiation and emit visible light. X-ray fluorescence is used in diagnosis. [NIH]

**Fold**

A plication or doubling of various parts of the body. [NIH]

**Foramen**

A natural hole of perforation, especially one in a bone. [NIH]

**Forearm**

The part between the elbow and the wrist. [NIH]

**Fossa**

A cavity, depression, or pit. [NIH]

**Frontal Lobe**

The anterior part of the cerebral hemisphere. [NIH]

**Functional magnetic resonance imaging**

A noninvasive tool used to observe functioning in the brain or other organs by detecting changes in chemical composition, blood flow, or both. [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 multicellular colonies (mushrooms and molds). [NIH]

**GABA**

The most common inhibitory neurotransmitter in the central nervous system. [NIH]

**Gallbladder**

The pear-shaped organ that sits below the liver. Bile is concentrated and stored in the gallbladder. [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 knottlike 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]

**Gas**

Air that comes from normal breakdown of food. The gases are passed out of the body through the rectum (flatus) or the mouth (burp). [NIH]

**Gas exchange**

Primary function of the lungs; transfer of oxygen from inhaled air into the blood and of carbon dioxide from the blood into the lungs. [NIH]

**Gastrointestinal**

Refers to the stomach and intestines. [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]

**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 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]

**Genotype**: The genetic constitution of the individual; the characterization of the genes. [NIH]

**Geriatric**: Pertaining to the treatment of the aged. [EU]

**Gestation**: The period of development of the young in viviparous animals, from the time of fertilization of the ovum until birth. [EU]

**Ginkgo biloba**: Exclusive species of the genus Ginkgo, family Ginkgoaceae. It produces extracts of medicinal interest. Ginkgo may refer to the genus or species. [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]

**Glottis**: The vocal apparatus of the larynx, consisting of the true vocal cords (plica vocalis) and the opening between them (rima glottidis). [NIH]

**Glucocorticoid**: A compound that belongs to the family of compounds called corticosteroids (steroids). Glucocorticoids affect metabolism and have anti-inflammatory and immunosuppressive effects. They may be naturally produced (hormones) or synthetic (drugs). [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]

**Glutamate**: Excitatory neurotransmitter of the brain. [NIH]

**Glutamic Acid**: A non-essential amino acid naturally occurring in the L-form. Glutamic acid (glutamate) is the most common excitatory neurotransmitter in the central nervous system. [NIH]

**Gonadal**: Pertaining to a gonad. [EU]

**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]

**Grading**: A system for classifying cancer cells in terms of how abnormal they appear when examined under a microscope. The objective of a grading system is to provide information about the probable growth rate of the tumor and its tendency to spread. The systems used to grade tumors vary with each type of cancer. Grading plays a role in treatment decisions. [NIH]

**Grafting**: The operation of transfer of tissue from one site to another. [NIH]

**Granule**: A small pill made from sucrose. [EU]

**Granulocytes**: Leukocytes with abundant granules in the cytoplasm. They are divided into
three groups: neutrophils, eosinophils, and basophils. [NIH]

**Gravis:** Eruption of watery blisters on the skin among those handling animals and animal products. [NIH]

**Growth:** The progressive development of a living being or part of an organism from its earliest stage to maturity. [NIH]

**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]

**Guanethidine:** An antihypertensive agent that acts by inhibiting selectively transmission in post-ganglionic adrenergic nerves. It is believed to act mainly by preventing the release of norepinephrine at nerve endings and causes depletion of norepinephrine in peripheral sympathetic nerve terminals as well as in tissues. [NIH]

**Guinea Pigs:** A common name used for the family Caviidae. The most common species is Cavia porcellus which is the domesticated guinea pig used for pets and biomedical research. [NIH]

**Gyrus Cinguli:** One of the convolutions on the medial surface of the cerebral hemisphere. It surrounds the rostral part of the brain and interhemispheric commissure and forms part of the limbic system. [NIH]

**Habitat:** An area considered in terms of its environment, particularly as this determines the type and quality of the vegetation the area can carry. [NIH]

**Habitual:** Of the nature of a habit; according to habit; established by or repeated by force of habit, customary. [EU]

**Habituate:** Eventual cessation of response to a repeated sound. [NIH]

**Habituation:** Decline in response of an organism to environmental or other stimuli with repeated or maintained exposure. [NIH]

**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]

**Hammer:** The largest of the three ossicles of the ear. [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]

**Haploid:** An organism with one basic chromosome set, symbolized by n; the normal condition of gametes in diploids. [NIH]

**Haptens:** Small antigenic determinants capable of eliciting an immune response only when coupled to a carrier. Haptens bind to antibodies but by themselves cannot elicit an antibody response. [NIH]

**Headache:** Pain in the cranial region that may occur as an isolated and benign symptom or as a manifestation of a wide variety of conditions including subarachnoid hemorrhage; craniocerebral trauma; central nervous system infections; intracranial hypertension; and other disorders. In general, recurrent headaches that are not associated with a primary disease process are referred to as headache disorders (e.g., migraine). [NIH]

**Headache Disorders:** Common conditions characterized by persistent or recurrent headaches. Headache syndrome classification systems may be based on etiology (e.g.,
vascular headache, post-traumatic headaches, etc.), temporal pattern (e.g., cluster headache, paroxysmal hemicrania, etc.), and precipitating factors (e.g., cough headache). [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]

**Heart attack:** A seizure of weak or abnormal functioning of the heart. [NIH]

**Heartbeat:** One complete contraction of the heart. [NIH]

**Hemoglobin:** One of the fractions of glycosylated hemoglobin A1c. Glycosylated hemoglobin is formed when linkages of glucose and related monosaccharides bind to hemoglobin A and its concentration represents the average blood glucose level over the previous several weeks. HbA1c levels are used as a measure of long-term control of plasma glucose (normal, 4 to 6 percent). In controlled diabetes mellitus, the concentration of glycosylated hemoglobin A is within the normal range, but in uncontrolled cases the level may be 3 to 4 times the normal concentration. Generally, complications are substantially lower among patients with Hb levels of 7 percent or less than in patients with HbA1c levels of 9 percent or more. [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]

**Hippocampus:** A curved elevation of gray matter extending the entire length of the floor of the temporal horn of the lateral ventricle (Dorland, 28th ed). The hippocampus, subiculum, and dentate gyrus constitute the hippocampal formation. Sometimes authors include the entorhinal cortex in the hippocampal formation. [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]

**Hoarseness:** An unnaturally deep or rough quality of voice. [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]

**Hormonal:** Pertaining to or of the nature of a hormone. [EU]
**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]

**Hybridization:** The genetic process of crossbreeding to produce a hybrid. Hybrid nucleic acids can be formed by nucleic acid hybridization of DNA and RNA molecules. Protein hybridization allows for hybrid proteins to be formed from polypeptide chains. [NIH]

**Hydrocephalus:** Excessive accumulation of cerebrospinal fluid within the cranium which may be associated with dilation of cerebral ventricles, intracranial hypertension; headache; lethargy; urinary incontinence; and ataxia (and in infants macrocephaly). This condition may be caused by obstruction of cerebrospinal fluid pathways due to neurologic abnormalities, intracranial hemorrhages; central nervous system infections; brain neoplasms; cranioencephalic trauma; and other conditions. Impaired resorption of cerebrospinal fluid from the arachnoid villi results in a communicating form of hydrocephalus. Hydrocephalus ex-vacuo refers to ventricular dilation that occurs as a result of brain substance loss from cerebral infarction and other conditions. [NIH]

**Hydrogen:** The first chemical element in the periodic table. It has the atomic symbol H, atomic number 1, and atomic weight 1. It exists, under normal conditions, as a colorless, odorless, tasteless, diatomic gas. Hydrogen ions are protons. Besides the common H1 isotope, hydrogen exists as the stable isotope deuterium and the unstable, radioactive isotope tritium. [NIH]

**Hydrolysis:** The process of cleaving a chemical compound by the addition of a molecule of water. [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]

**Hyperalgesia:** Excessive sensitiveness or sensibility to pain. [EU]

**Hyperbaric:** Characterized by greater than normal pressure or weight; applied to gases under greater than atmospheric pressure, as hyperbaric oxygen, or to a solution of greater specific gravity than another taken as a standard of reference. [EU]

**Hyperbaric oxygen:** Oxygen that is at an atmospheric pressure higher than the pressure at sea level. Breathing hyperbaric oxygen to enhance the effectiveness of radiation therapy is being studied. [NIH]

**Hyperesthesia:** Increased sensitivity to cutaneous stimulation due to a diminished threshold or an increased response to stimuli. [NIH]

**Hyperlipoproteinemia:** Metabolic disease characterized by elevated plasma cholesterol and/or triglyceride levels. The inherited form is attributed to a single gene mechanism. [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]

**Hypnotherapy:** Sleeping-cure. [NIH]

**Hypnotic:** A drug that acts to induce sleep. [EU]

**Hypotension:** Abnormally low blood pressure. [NIH]
Hypothalamus: Ventral part of the diencephalon extending from the region of the optic chiasm to the caudal border of the mammillary bodies and forming the inferior and lateral walls of the third ventricle. [NIH]

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]

Ibuprofen: A nonsteroidal anti-inflammatory agent with analgesic properties used in the therapy of rheumatism and arthritis. [NIH]

Id: The part of the personality structure which harbors the unconscious instinctive desires and strivings of the individual. [NIH]

Idiopathic: Describes a disease of unknown cause. [NIH]

Illusion: A false interpretation of a genuine percept. [NIH]

Imaging procedures: Methods of producing pictures of areas inside the body. [NIH]

Imidazole: C3H4N2. The ring is present in polybenzimidazoles. [NIH]

Immune system: The organs, cells, and molecules responsible for the recognition and disposal of foreign ('non-self') material which enters the body. [NIH]

Immunogenic: Producing immunity; evoking an immune response. [EU]

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]

Implant radiation: A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near the tumor. Also called [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]

Incision: A cut made in the body during surgery. [NIH]

Incontinence: Inability to control the flow of urine from the bladder (urinary incontinence) or the escape of stool from the rectum (fecal incontinence). [NIH]

Incubation: The development of an infectious disease from the entrance of the pathogen to the appearance of clinical symptoms. [EU]
**Incubation period:** The period of time likely to elapse between exposure to the agent of the disease and the onset of clinical symptoms. [NIH]

**Incus:** One of three ossicles of the middle ear. It conducts sound vibrations from the malleus to the stapes. [NIH]

**Indicative:** That indicates; that points out more or less exactly; that reveals fairly clearly. [EU]

**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]

**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]

**Infiltration:** The diffusion or accumulation in a tissue or cells of substances not normal to it or in amounts of the normal. Also, the material so accumulated. [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]

**Ingestion:** Taking into the body by mouth [NIH]

**Inhalation:** The drawing of air or other substances into the lungs. [EU]

**Initiation:** Mutation induced by a chemical reactive substance causing cell changes; being a step in a carcinogenic process. [NIH]

**Initiator:** A chemically reactive substance which may cause cell changes if ingested, inhaled or absorbed into the body; the substance may thus initiate 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]

**Inorganic:** Pertaining to substances not of organic origin. [EU]

**Inositol:** An isomer of glucose that has traditionally been considered to be a B vitamin although it has an uncertain status as a vitamin and a deficiency syndrome has not been identified in man. (From Martindale, The Extra Pharmacopoeia, 30th ed, p1379) Inositol phospholipids are important in signal transduction. [NIH]

**Inotropic:** Affecting the force or energy of muscular contractions. [EU]

**Inpatients:** Persons admitted to health facilities which provide board and room, for the purpose of observation, care, diagnosis or treatment. [NIH]

**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]

**Insomnia:** Difficulty in going to sleep or getting enough sleep. [NIH]
**Instillation**: [EU]

**Insulin**: A protein hormone secreted by beta cells of the pancreas. Insulin plays a major role in the regulation of glucose metabolism, generally promoting the cellular utilization of glucose. It is also an important regulator of protein and lipid metabolism. Insulin is used as a drug to control insulin-dependent diabetes mellitus. [NIH]

**Intermittent**: Occurring at separated intervals; having periods of cessation of activity. [EU]

**Internal radiation**: A procedure in which radioactive material sealed in needles, seeds, wires, or catheters is placed directly into or near the tumor. Also called brachytherapy, implant radiation, or interstitial radiation therapy. [NIH]

**Interstitial**: Pertaining to or situated between parts or in the interspaces of a tissue. [EU]

**Intestinal**: Having to do with the intestines. [NIH]

**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 Embolism**: The sudden obstruction of a blood vessel by an embolus. [NIH]

**Intracranial Embolism and Thrombosis**: Embolism or thrombosis involving blood vessels which supply intracranial structures. Emboli may originate from extracranial or intracranial sources. Thrombosis may occur in arterial or venous structures. [NIH]

**Intracranial Hemorrhages**: Bleeding within the intracranial cavity, including hemorrhages in the brain and within the cranial epidural, subdural, and subarachnoid spaces. [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]

**Intracranial Hypotension**: A condition in which there is a diminution or loss of muscular tonicity, in consequence of which the muscles may be stretched beyond their normal limits. [NIH]

**Intracranial Pressure**: Pressure within the cranial cavity. It is influenced by brain mass, the circulatory system, CSF dynamics, and skull rigidity. [NIH]

**Intramuscular**: IM. Within or into muscle. [NIH]

**Intrathecal**: Describes the fluid-filled space between the thin layers of tissue that cover the brain and spinal cord. Drugs can be injected into the fluid or a sample of the fluid can be removed for testing. [NIH]

**Intravenous**: IV. Into a vein. [NIH]

**Intrinsic**: Situated entirely within or pertaining exclusively to a part. [EU]

**Invalidate**: To weaken or make valueless: to discredit. [EU]

**Invasive**: 1. Having the quality of invasiveness. 2. Involving puncture or incision of the skin or insertion of an instrument or foreign material into the body; said of diagnostic techniques. [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]

**Ionophores**: Chemical agents that increase the permeability of biological or artificial lipid
membranes to specific ions. Most ionophores are relatively small organic molecules that act as mobile carriers within membranes or coalesce to form ion permeable channels across membranes. Many are antibiotics, and many act as uncoupling agents by short-circuiting the proton gradient across mitochondrial membranes. [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]

**Irradiation:** The use of high-energy radiation from x-rays, neutrons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy) or from materials called radioisotopes. Radioisotopes produce radiation and can be placed in or near the tumor or in the area near cancer cells. This type of radiation treatment is called internal radiation therapy, implant radiation, interstitial radiation, or brachytherapy. Systemic radiation therapy uses a radioactive substance, such as a radiolabeled monoclonal antibody, that circulates throughout the body. Irradiation is also called radiation therapy, radiotherapy, and x-ray therapy. [NIH]

**Ischemia:** Deficiency of blood in a part, due to functional constriction or actual obstruction of a blood vessel. [EU]

**Joint:** The point of contact between elements of an animal skeleton with the parts that surround and support it. [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]

**Ketoprofen:** An ibuprofen-type anti-inflammatory analgesic and antipyretic. It is used in the treatment of rheumatoid arthritis and osteoarthritis. [NIH]

**Kinetics:** The study of rate dynamics in chemical or physical systems. [NIH]

**Labile:** 1. Gliding; moving from point to point over the surface; unstable; fluctuating. 2. Chemically unstable. [EU]

**Labyrinth:** The internal ear; the essential part of the organ of hearing. It consists of an osseous and a membranous portion. [NIH]

**Labyrinthine:** A vestibular nystagmus resulting from stimulation, injury, or disease of the labyrinth. [NIH]

**Labyrinthitis:** Inflammation of the inner ear. [NIH]

**Lacrimal:** Pertaining to the tears. [EU]

**Language Disorders:** Conditions characterized by deficiencies of comprehension or expression of written and spoken forms of language. These include acquired and developmental disorders. [NIH]

**Large Intestine:** The part of the intestine that goes from the cecum to the rectum. The large intestine absorbs water from stool and changes it from a liquid to a solid form. The large intestine is 5 feet long and includes the appendix, cecum, colon, and rectum. Also called colon. [NIH]

**Laryngeal:** Having to do with the larynx. [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]

**Laser therapy:** The use of an intensely powerful beam of light to kill cancer cells. [NIH]
Latency: The period of apparent inactivity between the time when a stimulus is presented and the moment a response occurs. [NIH]

Lesion: An area of abnormal tissue change. [NIH]

Lethargy: Abnormal drowsiness or stupor; a condition of indifference. [EU]

Leukocytes: White blood cells. These include granular leukocytes (basophils, eosinophils, and neutrophils) as well as non-granular leukocytes (lymphocytes and monocytes). [NIH]

Levorphanol: A narcotic analgesic that may be habit-forming. It is nearly as effective orally as by injection. [NIH]

Library Services: Services offered to the library user. They include reference and circulation. [NIH]

Lidocaine: A local anesthetic and cardiac depressant used as an antiarrhythmia agent. Its actions are more intense and its effects more prolonged than those of procaine but its duration of action is shorter than that of bupivacaine or prilocaine. [NIH]

Life cycle: The successive stages through which an organism passes from fertilized ovum or spore to the fertilized ovum or spore of the next generation. [NIH]

Ligaments: Shiny, flexible bands of fibrous tissue connecting together articular extremities of bones. They are pliant, tough, and inextensile. [NIH]

Ligation: Application of a ligature to tie a vessel or strangulate a part. [NIH]

Limbic: Pertaining to a limbus, or margin; forming a border around. [EU]

Limbic System: A set of forebrain structures common to all mammals that is defined functionally and anatomically. It is implicated in the higher integration of visceral, olfactory, and somatic information as well as homeostatic responses including fundamental survival behaviors (feeding, mating, emotion). For most authors, it includes the amygdala, epithalamus, gyrus cinguli, hippocampal formation (see hippocampus), hypothalamus, parahippocampal gyrus, septal nuclei, anterior nuclear group of thalamus, and portions of the basal ganglia. (Parent, Carpenter's Human Neuroanatomy, 9th ed, p744; NeuroNames, http://rprcsgi.rprc.washington.edu/neuronames/index.html (September 2, 1998)). [NIH]

Lip: Either of the two fleshy, full-blooded margins of the mouth. [NIH]

Lipid: Fat. [NIH]

Lipreading: The process by which an observer comprehends speech by watching the movements of the speaker's lips without hearing the speaker's voice. [NIH]

Liquor: 1. A liquid, especially an aqueous solution containing a medicinal substance. 2. A general term used in anatomical nomenclature for certain fluids of the body. [EU]

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]

Liver scan: An image of the liver created on a computer screen or on film. A radioactive substance is injected into a blood vessel and travels through the bloodstream. It collects in the liver, especially in abnormal areas, and can be detected by the scanner. [NIH]

Lobe: A portion of an organ such as the liver, lung, breast, or brain. [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]

**Locomotion:** Movement or the ability to move from one place or another. It can refer to humans, vertebrate or invertebrate animals, and microorganisms. [NIH]

**Locomotor:** Of or pertaining to locomotion; pertaining to or affecting the locomotive apparatus of the body. [EU]

**Loneliness:** The state of feeling sad or dejected as a result of lack of companionship or being separated from others. [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]

**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]

**Lumbar:** Pertaining to the loins, the part of the back between the thorax and the pelvis. [EU]

**Lumen:** The cavity or channel within a tube or tubular organ. [EU]

**Lycopene:** A red pigment found in tomatoes and some fruits. [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]

**Lymphocyte:** A white blood cell. Lymphocytes have a number of roles in the immune system, including the production of antibodies and other substances that fight infection and diseases. [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]

**Magnetic Resonance Angiography:** Non-invasive method of vascular imaging and determination of internal anatomy without injection of contrast media or radiation exposure. The technique is used especially in cerebral angiography as well as for studies of other vascular structures. [NIH]

**Magnetic Resonance Imaging:** Non-invasive method of demonstrating internal anatomy based on the principle that atomic nuclei in a strong magnetic field absorb pulses of radiofrequency energy and emit them as radiowaves which can be reconstructed into computerized images. The concept includes proton spin tomographic techniques. [NIH]

**Malaria:** A protozoan disease caused in humans by four species of the genus Plasmodium (P. falciparum (malaria, falciparum), P. vivax (malaria, vivax), P. ovale, and P. malariae) and transmitted by the bite of an infected female mosquito of the genus Anopheles. Malaria is endemic in parts of Asia, Africa, Central and South America, Oceania, and certain Caribbean islands. It is characterized by extreme exhaustion associated with paroxysms of high fever,
sweating, shaking chills, and anemia. Malaria in animals is caused by other species of plasmodia. [NIH]

**Malaria, Falciparum:** Malaria caused by Plasmodium falciparum. This is the severest form of malaria and is associated with the highest levels of parasites in the blood. This disease is characterized by irregularly recurring febrile paroxysms that in extreme cases occur with acute cerebral, renal, or gastrointestinal manifestations. [NIH]

**Malaria, Vivax:** Malaria caused by Plasmodium vivax. This form of malaria is less severe than malaria, falciparum, but there is a higher probability for relapses to occur. Febrile paroxysms often occur every other day. [NIH]

**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]

**Malnutrition:** A condition caused by not eating enough food or not eating a balanced diet. [NIH]

**Mandibular Nerve:** A branch of the trigeminal (5th cranial) nerve. The mandibular nerve carries motor fibers to the muscles of mastication and sensory fibers to the teeth and gingivae, the face in the region of the mandible, and parts of the dura. [NIH]

**Manic:** Affected with mania. [EU]

**Manifest:** Being the part or aspect of a phenomenon that is directly observable: concretely expressed in behaviour. [EU]

**Mastication:** The act and process of chewing and grinding food in the mouth. [NIH]

**Mastoiditis:** Inflammation of the cavity and air cells in the mastoid part of the temporal bone. [NIH]

**Maxillary:** Pertaining to the maxilla: the irregularly shaped bone that with its fellow forms the upper jaw. [EU]

**Maxillary Nerve:** The intermediate sensory division of the trigeminal (5th cranial) nerve. The maxillary nerve carries general afferents from the intermediate region of the face including the lower eyelid, nose and upper lip, the maxillary teeth, and parts of the dura. [NIH]

**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 midsagittal plane of the body; opposed to lateral. [NIH]

**Mediate:** Indirect; accomplished by the aid of an intervening medium. [EU]

**Mediator:** An object or substance by which something is mediated, such as (1) a structure of the nervous system that transmits impulses eliciting a specific response; (2) a chemical substance (transmitter substance) that induces activity in an excitable tissue, such as nerve or muscle; or (3) a substance released from cells as the result of the interaction of antigen with antibody or by the action of antigen with a sensitized lymphocyte. [EU]

**Medical Assistance:** Financing of medical care provided to public assistance recipients. [NIH]

**Medical Records:** Recording of pertinent information concerning patient’s illness or illnesses. [NIH]

**Medicament:** A medicinal substance or agent. [EU]
MEDLINE: An online database of MEDLARS, the computerized bibliographic Medical Literature Analysis and Retrieval System of the National Library of Medicine. [NIH]

Medullary: Pertaining to the marrow or to any medulla; resembling marrow. [EU]

Mefloquine: A phospholipid-interacting antimalarial drug (antimalarials). It is very effective against Plasmodium falciparum with very few side effects. [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]

Melanocytes: Epidermal dendritic pigment cells which control long-term morphological color changes by alteration in their number or in the amount of pigment they produce and store in the pigment containing organelles called melanosomes. Melanophores are larger cells which do not exist in mammals. [NIH]

Melanoma: A form of skin cancer that arises in melanocytes, the cells that produce pigment. Melanoma usually begins in a mole. [NIH]

Membrane: A very thin layer of tissue that covers a surface. [NIH]

Membrane Glycoproteins: Glycoproteins found on the membrane or surface of cells. [NIH]

Membrane Proteins: Proteins which are found in membranes including cellular and intracellular membranes. They consist of two types, peripheral and integral proteins. They include most membrane-associated enzymes, antigenic proteins, transport proteins, and drug, hormone, and lectin receptors. [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]

Mental Disorders: Psychiatric illness or diseases manifested by breakdowns in the adaptational process expressed primarily as abnormalities of thought, feeling, and behavior producing either distress or impairment of function. [NIH]

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]

Mesolimbic: Inner brain region governing emotion and drives. [NIH]

Metabotropic: A glutamate receptor which triggers an increase in production of 2 intracellular messengers: diacylglycerol and inositol 1, 4, 5-triphosphate. [NIH]

Methimazole: A thioureylene antithyroid agent that inhibits the formation of thyroid hormones by interfering with the incorporation of iodine into tyrosyl residues of thyroglobulin. This is done by interfering with the oxidation of iodide ion and iodotyrosyl groups through inhibition of the peroxidase 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]

**Microcirculation:** The vascular network lying between the arterioles and venules; includes capillaries, metarterioles and arteriovenous anastomoses. Also, the flow of blood through this network. [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]

**Microscopy:** The application of microscope magnification to the study of materials that cannot be properly seen by the unaided eye. [NIH]

**Microspheres:** Small uniformly-sized spherical particles frequently labeled with radioisotopes or various reagents acting as tags or markers. [NIH]

**Mineralization:** The action of mineralizing; the state of being mineralized. [EU]

**Mitochondria:** Parts of a cell where aerobic production (also known as cell respiration) takes place. [NIH]

**Mobility:** Capability of movement, of being moved, or of flowing freely. [EU]

**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]

**Molecular Structure:** The location of the atoms, groups or ions relative to one another in a molecule, as well as the number, type and location of covalent bonds. [NIH]

**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]

**Morphine:** The principal alkaloid in opium and the prototype opiate analgesic and narcotic. Morphine has widespread effects in the central nervous system and on smooth muscle. [NIH]

**Morphine Derivatives:** Analogs or derivatives of morphine. [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]

**Motion Sickness:** Sickness caused by motion, as sea sickness, train sickness, car sickness, and air sickness. [NIH]

**Movement Disorders:** Syndromes which feature dyskinesias as a cardinal manifestation of the disease process. Included in this category are degenerative, hereditary, post-infectious, medication-induced, post-inflammatory, and post-traumatic conditions. [NIH]

**Mucinous:** Containing or resembling mucin, the main compound in mucus. [NIH]
**Multienzyme Complexes:** Systems of enzymes which function sequentially by catalyzing consecutive reactions linked by common metabolic intermediates; may involve simply a transfer of water molecules of hydrogen atoms or be associated with large supramolecular structures such as mitochondria or ribosomes. [NIH]

**Muscle Contraction:** A process leading to shortening and/or development of tension in muscle tissue. Muscle contraction occurs by a sliding filament mechanism whereby actin filaments slide inward among the myosin filaments. [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 Diseases:** Acquired, familial, and congenital disorders of skeletal muscle and smooth muscle. [NIH]

**Mutism:** Inability or refusal to speak. [EU]

**Myasthenia:** Muscular debility; any constitutional anomaly of muscle. [EU]

**Mydriatic:** 1. Dilating the pupil. 2. Any drug that dilates the pupil. [EU]

**Myocardium:** The muscle tissue of the heart composed of striated, involuntary muscle known as cardiac muscle. [NIH]

**Myoclonus:** Involuntary shock-like contractions, irregular in rhythm and amplitude, followed by relaxation, of a muscle or a group of muscles. This condition may be a feature of some central nervous systems diseases (e.g., epilepsy, myoclonic). Nocturnal myoclonus may represent a normal physiologic event or occur as the principal feature of the nocturnal myoclonus syndrome. (From Adams et al., Principles of Neurology, 6th ed, pp102-3). [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]

**Myotonia:** Prolonged failure of muscle relaxation after contraction. This may occur after voluntary contractions, muscle percussion, or electrical stimulation of the muscle. Myotonia is a characteristic feature of myotonic disorders. [NIH]

**Naive:** Used to describe an individual who has never taken a certain drug or class of drugs (e.g., AZT-naive, antiretroviral-naive), or to refer to an undifferentiated immune system cell. [NIH]

**Narcosis:** A general and nonspecific reversible depression of neuronal excitability, produced by a number of physical and chemical aspects, usually resulting in stupor. [NIH]

**Narcotic:** 1. Pertaining to or producing narcosis. 2. An agent that produces insensibility or stupor, applied especially to the opioids, i.e. to any natural or synthetic drug that has morphine-like actions. [EU]

**Nausea:** An unpleasant sensation in the stomach usually accompanied by the urge to vomit. Common causes are early pregnancy, sea and motion sickness, emotional stress, intense pain, food poisoning, and various enteroviruses. [NIH]

**NCI:** National Cancer Institute. NCI, part of the National Institutes of Health of the United States Department of Health and Human Services, is the federal government's principal agency for cancer research. NCI conducts, coordinates, and funds cancer research, training, health information dissemination, and other programs with respect to the cause, diagnosis, prevention, and treatment of cancer. Access the NCI Web site at http://cancer.gov. [NIH]

**Neck Injuries:** General or unspecified injuries to the neck. It includes injuries to the skin, muscles, and other soft tissues of the neck. [NIH]
**Neck Muscles:** The neck muscles consist of the platysma, splenius cervicis, sternocleidomastoid(eus), longus colli, the anterior, medius, and posterior scalenes, digastric(us), stylohyoid(eus), mylohyoid(eus), geniohyoid(eus), sternohyoid(eus), omohyoid(eus), sternothyroid(eus), and thyrohyoid(eus). [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]

**Need:** A state of tension or dissatisfaction felt by an individual that impels him to action toward a goal he believes will satisfy the impulse. [NIH]

**Neoplasms:** New abnormal growth of tissue. Malignant neoplasms show a greater degree of anaplasia and have the properties of invasion and metastasis, compared to benign neoplasms. [NIH]

**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 Endings:** Specialized terminations of peripheral neurons. Nerve endings include neuroeffector junction(s) by which neurons activate target organs and sensory receptors which transduce information from the various sensory modalities and send it centrally in the nervous system. Presynaptic nerve endings are presynaptic terminals. [NIH]

**Nerve Fibers:** Slender processes of neurons, especially the prolonged axons that conduct nerve impulses. [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]

**Neuralgia:** Intense or aching pain that occurs along the course or distribution of a peripheral or cranial nerve. [NIH]

**Neurites:** In tissue culture, hairlike projections of neurons stimulated by growth factors and other molecules. These projections may go on to form a branched tree of dendrites or a single axon or they may be reabsorbed at a later stage of development. "Neurite" may refer to any filamentous or pointed outgrowth of an embryonal or tissue-culture neural cell. [NIH]

**Neuroanatomy:** Study of the anatomy of the nervous system as a specialty or discipline. [NIH]

**Neuroeffector Junction:** The synapse between a neuron (presynaptic) and an effector cell other than another neuron (postsynaptic). Neuroeffector junctions include synapses onto muscles and onto secretory cells. [NIH]

**Neurogenic:** Loss of bladder control caused by damage to the nerves controlling the bladder. [NIH]

**Neurogenic Inflammation:** Inflammation caused by an injurious stimulus of peripheral neurons and resulting in release of neuropeptides which affect vascular permeability and help initiate proinflammatory and immune reactions at the site of injury. [NIH]

**Neuroleptic:** A term coined to refer to the effects on cognition and behaviour of antipsychotic drugs, which produce a state of apathy, lack of initiative, and limited range of emotion and in psychotic patients cause a reduction in confusion and agitation and normalization of psychomotor activity. [EU]
Neurologic: Having to do with nerves or the nervous system. [NIH]

Neurologist: A doctor who specializes in the diagnosis and treatment of disorders of the nervous system. [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]

Neuropeptide: A member of a class of protein-like molecules made in the brain. Neuropeptides consist of short chains of amino acids, with some functioning as neurotransmitters and some functioning as hormones. [NIH]

Neuropharmacology: The branch of pharmacology dealing especially with the action of drugs upon various parts of the nervous system. [NIH]

Neurophysiology: The scientific discipline concerned with the physiology of the nervous system. [NIH]

Neurosyphilis: A late form of syphilis that affects the brain and may lead to dementia and death. [NIH]

Neurotoxicity: The tendency of some treatments to cause damage to the nervous system. [NIH]

Neurotoxin: A substance that is poisonous to nerve tissue. [NIH]

Neurotransmitters: Endogenous signaling molecules that alter the behavior of neurons or effector cells. Neurotransmitter is used here in its most general sense, including not only messengers that act directly to regulate ion channels, but also those that act through second messenger systems, and those that act at a distance from their site of release. Included are neuromodulators, neuroregulators, neuromediators, and neurohumors, whether or not acting at synapses. [NIH]

Neutrons: Electrically neutral elementary particles found in all atomic nuclei except light hydrogen; the mass is equal to that of the proton and electron combined and they are unstable when isolated from the nucleus, undergoing beta decay. Slow, thermal, epithermal, and fast neutrons refer to the energy levels with which the neutrons are ejected from heavier nuclei during their decay. [NIH]

Niacin: Water-soluble vitamin of the B complex occurring in various animal and plant tissues. Required by the body for the formation of coenzymes NAD and NADP. Has pellagra-curative, vasodilating, and antilipemic properties. [NIH]

Nicardipine: 1,4-Dihydro-2,6-dimethyl-4-(3-nitrophenyl) methyl 2-(methyl(phenylmethyl)amino)-3,5-pyridinecarboxylic acid ethyl ester. A potent calcium channel blocker with marked vasodilator action. It has antihypertensive properties and is effective in the treatment of angina and coronary spasms without showing cardiodepressant effects. It has also been used in the treatment of asthma and enhances the action of specific antineoplastic agents. [NIH]

Niche: The ultimate unit of the habitat, i.e. the specific spot occupied by an individual organism; by extension, the more or less specialized relationships existing between an
organism, individual or synusia(e), and its environment. [NIH]

Nicotine: Nicotine is highly toxic alkaloid. It is the prototypical agonist at nicotinic cholinergic receptors where it dramatically stimulates neurons and ultimately blocks synaptic transmission. Nicotine is also important medically because of its presence in tobacco smoke. [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]

Norepinephrine: Precursor of epinephrine that is secreted by the adrenal medulla and is a widespread central and autonomic neurotransmitter. Norepinephrine is the principal transmitter of most postganglionic sympathetic fibers and of the diffuse projection system in the brain arising from the locus ceruleus. It is also found in plants and is used pharmacologically as a sympathomimetic. [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]

Nucleic Acid Hybridization: The process whereby two single-stranded polynucleotides form a double-stranded molecule, with hydrogen bonding between the complementary bases in the two strains. [NIH]

Nucleus: A body of specialized protoplasm found in nearly all cells and containing the chromosomes. [NIH]

Nystagmus: An involuntary, rapid, rhythmic movement of the eyeball, which may be horizontal, vertical, rotatory, or mixed, i.e., of two varieties. [EU]

Oligonucleotide Probes: Synthetic or natural oligonucleotides used in hybridization studies in order to identify and study specific nucleic acid fragments, e.g., DNA segments near or within a specific gene locus or gene. The probe hybridizes with a specific mRNA, if present. Conventional techniques used for testing for the hybridization product include dot blot assays, Southern blot assays, and DNA:RNA hybrid-specific antibody tests. Conventional labels for the probe include the radioisotope labels 32P and 125I and the chemical label biotin. [NIH]

Opacity: Degree of density (area most dense taken for reading). [NIH]

Ophthalmic: Pertaining to the eye. [EU]

Opioid Peptides: The endogenous peptides with opiate-like activity. The three major classes currently recognized are the enkephalins, the dynorphins, and the endorphins. Each of these families derives from different precursors, proenkephalin, prodynorphin, and proopiomelanocortin, respectively. There are also at least three classes of opioid receptors, but the peptide families do not map to the receptors in a simple way. [NIH]

Opium: The air-dried exudate from the unripe seed capsule of the opium poppy, Papaver somniferum, or its variant, P. album. It contains a number of alkaloids, but only a few -
morphine, codeine, and papaverine - have clinical significance. Opium has been used as an analgesic, antitussive, anti-diarrheal, and antispasmodic. [NIH]

**Optic Nerve:** The 2nd cranial nerve. The optic nerve conveys visual information from the retina to the brain. The nerve carries the axons of the retinal ganglion cells which sort at the optic chiasm and continue via the optic tracts to the brain. The largest projection is to the lateral geniculate nuclei; other important targets include the superior colliculi and the suprachiasmatic nuclei. Though known as the second cranial nerve, it is considered part of the central nervous system. [NIH]

**Orderly:** A male hospital attendant. [NIH]

**Orthostatic:** Pertaining to or caused by standing erect. [EU]

**Ossicle:** A small bone. [EU]

**Osteoarthritis:** A progressive, degenerative joint disease, the most common form of arthritis, especially in older persons. The disease is thought to result not from the aging process but from biochemical changes and biomechanical stresses affecting articular cartilage. In the foreign literature it is often called osteoarthrosis deformans. [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]

**Otolaryngologist:** A doctor who specializes in treating diseases of the ear, nose, and throat. Also called an ENT doctor. [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]

**Otorrhea:** A discharge from the ear, especially a purulent one. [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]

**Otoxic:** 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]

**Oval Window:** Fenestra of the vestibule; an oval opening in the medial wall of the middle ear leading into the vestibule. Normally it is covered by the base of the stapes. [NIH]

**Overweight:** An excess of body weight but not necessarily body fat; a body mass index of 25 to 29.9 kg/m². [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]

**Oxygenation:** The process of supplying, treating, or mixing with oxygen. No:1245 -
oxygenation the process of supplying, treating, or mixing with oxygen. [EU]

**Pacemaker:** An object or substance that influences the rate at which a certain phenomenon occurs; often used alone to indicate the natural cardiac pacemaker or an artificial cardiac pacemaker. In biochemistry, a substance whose rate of reaction sets the pace for a series of interrelated reactions. [EU]

**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]

**Palsy:** Disease of the peripheral nervous system occurring usually after many years of increased lead absorption. [NIH]

**Pancreas:** A mixed exocrine and endocrine gland situated transversely across the posterior abdominal wall in the epigastric and hypochondriac regions. The endocrine portion is comprised of the Islets of Langerhans, while the exocrine portion is a compound acinar gland that secretes digestive enzymes. [NIH]

**Paralysis:** Loss of ability to move all or part of the body. [NIH]

**Paresis:** A general term referring to a mild to moderate degree of muscular weakness, occasionally used as a synonym for paralysis (severe or complete loss of motor function). In the older literature, paresis often referred specifically to paretic neurosyphilis. "General paresis" and "general paralysis" may still carry that connotation. Bilateral lower extremity paresis is referred to as paraparesis. [NIH]

**Parietal:** 1. Of or pertaining to the walls of a cavity. 2. Pertaining to or located near the parietal bone, as the parietal lobe. [EU]

**Parietal Lobe:** Upper central part of the cerebral hemisphere. [NIH]

**Parkinsonism:** A group of neurological disorders characterized by hypokinesia, tremor, and muscular rigidity. [EU]

**Paroxysmal:** Recurring in paroxysms (= spasms or seizures). [EU]

**Partial remission:** The shrinking, but not complete disappearance, of a tumor in response to therapy. Also called partial response. [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]

**Pathologies:** The study of abnormality, especially the study of diseases. [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]

**Peptic:** Pertaining to pepsin or to digestion; related to the action of gastric juices. [EU]

**Peptic Ulcer:** Ulcer that occurs in those portions of the alimentary tract which come into contact with gastric juice containing pepsin and acid. It occurs when the amount of acid and pepsin is sufficient to overcome the gastric mucosal barrier. [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]

**Percutaneous:** Performed through the skin, as injection of radiopaque material in radiological examination, or the removal of tissue for biopsy accomplished by a needle. [EU]

**Perforation:** 1. The act of boring or piercing through a part. 2. A hole made through a part or substance. [EU]

**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]

**Peripheral Nerves:** The nerves outside of the brain and spinal cord, including the autonomic, cranial, and spinal nerves. Peripheral nerves contain non-neuronal cells and connective tissue as well as axons. The connective tissue layers include, from the outside to the inside, the epineurium, the perineurium, and the endoneurium. [NIH]

**Peripheral Nervous System:** The nervous system outside of the brain and spinal cord. The peripheral nervous system has autonomic and somatic divisions. The autonomic nervous system includes the enteric, parasympathetic, and sympathetic subdivisions. The somatic nervous system includes the cranial and spinal nerves and their ganglia and the peripheral sensory receptors. [NIH]

**Peripheral Vascular Disease:** Disease in the large blood vessels of the arms, legs, and feet. People who have had diabetes for a long time may get this because major blood vessels in their arms, legs, and feet are blocked and these limbs do not receive enough blood. The signs of PVD are aching pains in the arms, legs, and feet (especially when walking) and foot sores that heal slowly. Although people with diabetes cannot always avoid PVD, doctors say they have a better chance of avoiding it if they take good care of their feet, do not smoke, and keep both their blood pressure and diabetes under good control. [NIH]

**Peroneal Nerve:** The lateral of the two terminal branches of the sciatic nerve. The peroneal (or fibular) nerve provides motor and sensory innervation to parts of the leg and foot. [NIH]

**Peroral:** Performed through or administered through the mouth. [EU]

**Peroxidase:** A hemeprotein from leukocytes. Deficiency of this enzyme leads to a hereditary disorder coupled with disseminated moniliasis. It catalyzes the conversion of a donor and peroxide to an oxidized donor and water. EC 1.11.1.7. [NIH]

**Peroxide:** Chemical compound which contains an atom group with two oxygen atoms tied to each other. [NIH]

**Pertussis:** An acute, highly contagious infection of the respiratory tract, most frequently affecting young children, usually caused by Bordetella pertussis; a similar illness has been associated with infection by B. parapertussis and B. bronchiseptica. It is characterized by a catarrhal stage, beginning after an incubation period of about two weeks, with slight fever, sneezing, running at the nose, and a dry cough. In a week or two the paroxysmal stage begins, with the characteristic paroxysmal cough, consisting of a deep inspiration, followed by a series of quick, short coughs, continuing until the air is expelled from the lungs; the close of the paroxysm is marked by a long-drawn, shrill, whooping inspiration, due to spasmodic closure of the glottis. This stage lasts three to four weeks, after which the convalescent stage begins, in which paroxysms grow less frequent and less violent, and
finally cease. Called also whooping cough. [EU]

**Pharmacologic**: Pertaining to pharmacology or to the properties and reactions of drugs. [EU]

**Pharmacotherapy**: A regimen of using appetite suppressant medications to manage obesity by decreasing appetite or increasing the feeling of satiety. These medications decrease appetite by increasing serotonin or catecholamine—two brain chemicals that affect mood and appetite. [NIH]

**Pharynx**: The hollow tube about 5 inches long that starts behind the nose and ends at the top of the trachea (windpipe) and esophagus (the tube that goes to the stomach). [NIH]

**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]

**Phospholipases**: A class of enzymes that catalyze the hydrolysis of phosphoglycerides or glycerophosphatidates. EC 3.1.-. [NIH]

**Phosphorus**: A non-metallic element that is found in the blood, muscles, nerves, bones, and teeth, and is a component of adenosine triphosphate (ATP; the primary energy source for the body's cells.) [NIH]

**Phosphorylated**: Attached to a phosphate group. [NIH]

**Phosphorylation**: The introduction of a phosphoryl group into a compound through the formation of an ester bond between the compound and a phosphorus moiety. [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]

**Placenta**: A highly vascular fetal organ through which the fetus absorbs oxygen and other nutrients and excretes carbon dioxide and other wastes. It begins to form about the eighth day of gestation when the blastocyst adheres to the decidua. [NIH]

**Placental Insufficiency**: Failure of the placenta to deliver an adequate supply of nutrients and oxygen to the fetus. [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; absence 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]

**Plasticity**: In an individual or a population, the capacity for adaptation: a) through gene changes (genetic plasticity) or b) through internal physiological modifications in response to
changes of environment (physiological plasticity). [NIH]

**Platelet Activation:** A series of progressive, overlapping events triggered by exposure of the platelets to subendothelial tissue. These events include shape change, adhesiveness, aggregation, and release reactions. When carried through to completion, these events lead to the formation of a stable hemostatic plug. [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]

**Plexus:** A network or tangle; a general term for a network of lymphatic vessels, nerves, or veins. [EU]

**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]

**Polymorphism:** The occurrence together of two or more distinct forms in the same population. [NIH]

**Polyneuropathies:** Diseases of multiple peripheral nerves. The various forms are categorized by the type of nerve affected (e.g., sensory, motor, or autonomic), by the distribution of nerve injury (e.g., distal vs. proximal), by nerve component primarily affected (e.g., demyelinating vs. axonal), by etiology, or by pattern of inheritance. [NIH]

**Polypeptide:** A peptide which on hydrolysis yields more than two amino acids; called tripeptides, tetrapeptides, etc. according to the number of amino acids contained. [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]

**Population Characteristics:** Qualities and characterization of various types of populations within a social or geographic group, with emphasis on demography, health status, and socioeconomic factors. [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]

**Postherpetic Neuralgia:** Variety of neuralgia associated with migraine in which pain is felt in or behind the eye. [NIH]

**Postoperative:** After surgery. [NIH]

**Postsynaptic:** Nerve potential generated by an inhibitory hyperpolarizing stimulation. [NIH]
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]

Potassium Channels: Cell membrane glycoproteins selective for potassium ions. [NIH]

Potentiating: A degree of synergism which causes the exposure of the organism to a harmful substance to worsen a disease already contracted. [NIH]

Potentiation: An overall effect of two drugs taken together which is greater than the sum of the effects of each drug taken alone. [NIH]

Practicability: A non-standard characteristic of an analytical procedure. It is dependent on the scope of the method and is determined by requirements such as sample throughout and costs. [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]

Practice Management: Business management of medical and dental practices that may include capital financing, utilization management, and arrangement of capitation agreements with other parties. [NIH]

Precursor: Something that precedes. In biological processes, a substance from which another, usually more active or mature substance is formed. In clinical medicine, a sign or symptom that heralds another. [EU]

Prednisolone: A glucocorticoid with the general properties of the corticosteroids. It is the drug of choice for all conditions in which routine systemic corticosteroid therapy is indicated, except adrenal deficiency states. [NIH]

Prednisone: A synthetic anti-inflammatory glucocorticoid derived from cortisone. It is biologically inert and converted to prednisolone in the liver. [NIH]

Pre-Eclampsia: Development of hypertension with proteinuria, edema, or both, due to pregnancy or the influence of a recent pregnancy. It occurs after the 20th week of gestation, but it may develop before this time in the presence of trophoblastic disease. [NIH]

Premedication: Preliminary administration of a drug preceding a diagnostic, therapeutic, or surgical procedure. The commonest types of premedication are antibiotics (antibiotic prophylaxis) and anti-anxiety agents. It does not include preanesthetic medication. [NIH]

Presumptive: A treatment based on an assumed diagnosis, prior to receiving confirmatory laboratory test results. [NIH]

Presynaptic: Situated proximal to a synapse, or occurring before the synapse is crossed. [EU]

Presynaptic Terminals: The distal terminations of axons which are specialized for the release of neurotransmitters. Also included are varicosities along the course of axons which have similar specializations and also release transmitters. Presynaptic terminals in both the central and peripheral nervous systems are included. [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]

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]

Procaïne: A local anesthetic of the ester type that has a slow onset and a short duration of action. It is mainly used for infiltration anesthesia, peripheral nerve block, and spinal block. (From Martinale, The Extra Pharmacopoeia, 30th ed, p1016). [NIH]

Progesterone: Preg-4-ene-3,20-dione. The principal progestational hormone of the body, secreted by the corpus luteum, adrenal cortex, and placenta. Its chief function is to prepare the uterus for the reception and development of the fertilized ovum. It acts as an antiovulatory agent when administered on days 5-25 of the menstrual cycle. [NIH]

Prognostic factor: A situation or condition, or a characteristic of a patient, that can be used to estimate the chance of recovery from a disease, or the chance of the disease recurring (coming back). [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]

Projection: A defense mechanism, operating unconsciously, whereby that which is emotionally unacceptable in the self is rejected and attributed (projected) to others. [NIH]

Prolapse: The protrusion of an organ or part of an organ into a natural or artificial orifice. [NIH]

Promoter: A chemical substance that increases the activity of a carcinogenic process. [NIH]

Pro-Opiomelanocortin: A precursor protein, MW 30,000, synthesized mainly in the anterior pituitary gland but also found in the hypothalamus, brain, and several peripheral tissues. It incorporates the amino acid sequences of ACTH and beta-lipotropin. These two hormones, in turn, contain the biologically active peptides MSH, corticotropin-like intermediate lobe peptide, alpha-lipotropin, endorphins, and methionine enkephalin. [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]

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]

Prostaglandin: Any of a group of components derived from unsaturated 20-carbon fatty acids, primarily arachidonic acid, via the cyclooxygenase pathway that are extremely potent mediators of a diverse group of physiologic processes. The abbreviation for prostaglandin is PG; specific compounds are designated by adding one of the letters A through I to indicate the type of substituents found on the hydrocarbon skeleton and a subscript (1, 2 or 3) to indicate the number of double bonds in the hydrocarbon skeleton e.g., PGE2. The predominant naturally occurring prostaglandins all have two double bonds and are synthesized from arachidonic acid (5,8,11,14-eicosatetraenoic acid) by the pathway shown in the illustration. The 1 series and 3 series are produced by the same pathway with fatty acids having one fewer double bond (8,11,14-eicosatrienoic acid or one more double bond (5,8,11,14,17-eicosapentaenoic acid) than arachidonic acid. The subscript a or ß indicates the configuration at C-9 (a denotes a substituent below the plane of the ring, ß, above the plane). The naturally occurring PGF’s have the a configuration, e.g., PGF2a. All of the prostaglandins act by binding to specific cell-surface receptors causing an increase in the level of the intracellular second messenger cyclic AMP (and in some cases cyclic GMP also). The effect produced by the cyclic AMP increase depends on the specific cell type. In some
cases there is also a positive feedback effect. Increased cyclic AMP increases prostaglandin synthesis leading to further increases in cyclic AMP. [EU]

**Prostaglandins A:** (13E,15S)-15-Hydroxy-9-oxoprostanoic acid (PGA(1)); (5Z,13E,15S)-15-hydroxy-9-oxoprostanoic acid (PGA(2)); (5Z,13E,15S,17Z)-15-hydroxy-9-oxoprostanoic acid (PGA(3)). A group of naturally occurring secondary prostaglandins derived from PGE. PGA(1) and PGA(2) as well as their 19-hydroxy derivatives are found in many organs and tissues. [NIH]

**Prostate:** A gland in males that surrounds the neck of the bladder and the urethra. It secretes a substance that liquifies coagulated semen. It is situated in the pelvic cavity behind the lower part of the pubic symphysis, above the deep layer of the triangular ligament, and rests upon the rectum. [NIH]

**Protein Binding:** The process in which substances, either endogenous or exogenous, bind to proteins, peptides, enzymes, protein precursors, or allied compounds. Specific protein-binding measures are often used as assays in diagnostic assessments. [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 Conformation:** The characteristic 3-dimensional shape of a protein, including the secondary, supersecondary (motifs), tertiary (domains) and quaternary structure of the peptide chain. Quaternary protein structure describes the conformation assumed by multimeric proteins (aggregates of more than one polypeptide chain). [NIH]

**Protein Kinases:** A family of enzymes that catalyze the conversion of ATP and a protein to ADP and a phosphoprotein. EC 2.7.1.37. [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]

**Proteinuria:** The presence of protein in the urine, indicating that the kidneys are not working properly. [NIH]

**Proteolytic:** 1. Pertaining to, characterized by, or promoting proteolysis. 2. An enzyme that promotes proteolysis (= the splitting of proteins by hydrolysis of the peptide bonds with formation of smaller polypeptides). [EU]

**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. [EU]

**Protons:** Stable elementary particles having the smallest known positive charge, found in the nuclei of all elements. The proton mass is less than that of a neutron. A proton is the nucleus of the light hydrogen atom, i.e., the hydrogen ion. [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]

**Proximal:** Nearest; closer to any point of reference; opposed to distal. [EU]

**Pseudotumor Cerebri:** A condition marked by raised intracranial pressure and characterized clinically by headaches; nausea; papilledema, peripheral constriction of the visual fields, transient visual obscurations, and pulsatile tinnitus. Obesity is frequently
associated with this condition, which primarily affects women between 20 and 44 years of age. Chronic papilledema may lead to optic nerve injury (optic nerve diseases) and visual loss (blindness). [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]

Psychological Techniques: Methods used in the diagnosis and treatment of behavioral, personality, and mental disorders. [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]

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]

Psychosis: A mental disorder characterized by gross impairment in reality testing as evidenced by delusions, hallucinations, markedly incoherent speech, or disorganized and agitated behaviour without apparent awareness on the part of the patient of the incomprehensibility of his behaviour; the term is also used in a more general sense to refer to mental disorders in which mental functioning is sufficiently impaired as to interfere grossly with the patient's capacity to meet the ordinary demands of life. Historically, the term has been applied to many conditions, e.g. manic-depressive psychosis, that were first described in psychotic patients, although many patients with the disorder are not judged psychotic. [EU]

Psychosomatic: Pertaining to the mind-body relationship; having bodily symptoms of psychic, emotional, or mental origin; called also psychophysiologic. [EU]

Psychotherapy: A generic term for the treatment of mental illness or emotional disturbances primarily by verbal or nonverbal communication. [NIH]

Psyllium: Dried, ripe seeds of Plantago psyllium, P. indica, and P. ovata (Plantaginaceae). Plantain seeds swell in water and are used as demulcents and bulk laxatives. [NIH]

Pterygoid: A canal in the sphenoid bone for the vidian nerve. [NIH]

Public Assistance: Financial assistance to impoverished persons for the essentials of living through federal, state or local government programs. [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]

Pulmonary: Relating to the lungs. [NIH]

Pulmonary Artery: The short wide vessel arising from the conus arteriosus of the right ventricle and conveying unaerated blood to the lungs. [NIH]
**Pulsatile Flow:** Rhythmic, intermittent propagation of a fluid through a vessel or piping system, in contrast to constant, smooth propagation, which produces laminar flow. The quality of blood flow, whether smooth (laminar) or pulsatile, is important to the integrity of the tissues being artificially perfused by various heart assist devices or in regional perfusion. [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]

**Purulent:** Consisting of or containing pus; associated with the formation of or caused by pus. [EU]

**Quackery:** The fraudulent misrepresentation of the diagnosis and treatment of disease. [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]

**Quaternary:** 1. Fourth in order. 2. Containing four elements or groups. [EU]

**Quinidine:** An optical isomer of quinine, extracted from the bark of the Cinchona tree and similar plant species. This alkaloid dampens the excitability of cardiac and skeletal muscles by blocking sodium and potassium currents across cellular membranes. It prolongs cellular action potential, and decreases automaticity. Quinidine also blocks muscarinic and alpha-adrenergic neurotransmission. [NIH]

**Quinine:** An alkaloid derived from the bark of the cinchona tree. It is used as an antimalarial drug, and is the active ingredient in extracts of the cinchona that have been used for that purpose since before 1633. Quinine is also a mild antipyretic and analgesic and has been used in common cold preparations for that purpose. It was used commonly and as a bitter and flavoring agent, and is still useful for the treatment of babesiosis. Quinine is also useful in some muscular disorders, especially nocturnal leg cramps and myotonia congenita, because of its direct effects on muscle membrane and sodium channels. The mechanisms of its antimalarial effects are not well understood. [NIH]

**Radial Artery:** The direct continuation of the brachial trunk, originating at the bifurcation of the brachial artery opposite the neck of the radius. Its branches may be divided into three groups corresponding to the three regions in which the vessel is situated, the forearm, wrist, and hand. [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]

**Radiation therapy:** The use of high-energy radiation from x-rays, gamma rays, neutrons, and other sources to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy), or it may come from radioactive material placed in the body in the area near cancer cells (internal radiation therapy, implant radiation, or brachytherapy). Systemic radiation therapy uses a radioactive substance, such as a radiolabeled monoclonal antibody, that circulates throughout the body. Also called radiotherapy. [NIH]

**Radioactive:** Giving off radiation. [NIH]

**Radioactivity:** The quality of emitting or the emission of corpuscular or electromagnetic radiations consequent to nuclear disintegration, a natural property of all chemical elements of atomic number above 83, and possible of induction in all other known elements. [EU]

**Radioimmunoassay:** Classic quantitative assay for detection of antigen-antibody reactions using a radioactively labeled substance (radioligand) either directly or indirectly to measure the binding of the unlabeled substance to a specific antibody or other receptor system. Non-
immunogenic substances (e.g., haptens) can be measured if coupled to larger carrier proteins (e.g., bovine gamma-globulin or human serum albumin) capable of inducing antibody formation. [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]

**Radiolabeled:** Any compound that has been joined with a radioactive substance. [NIH]

**Radiological:** Pertaining to radiodiagnostic and radiotherapeutic procedures, and interventional radiology or other planning and guiding medical radiology. [NIH]

**Radiology:** A specialty concerned with the use of x-ray and other forms of radiant energy in the diagnosis and treatment of disease. [NIH]

**Radiopharmaceutical:** Any medicinal product which, when ready for use, contains one or more radionuclides (radioactive isotopes) included for a medicinal purpose. [NIH]

**Radiotherapy:** The use of ionizing radiation to treat malignant neoplasms and other benign conditions. The most common forms of ionizing radiation used as therapy are x-rays, gamma rays, and electrons. A special form of radiotherapy, targeted radiotherapy, links a cytotoxic radionuclide to a molecule that targets the tumor. When this molecule is an antibody or other immunologic molecule, the technique is called radioimmunotherapy. [NIH]

**Radius:** The lateral bone of the forearm. [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]

**Reassurance:** A procedure in psychotherapy that seeks to give the client confidence in a favorable outcome. It makes use of suggestion, of the prestige of the therapist. [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]

**Receptors, Opioid:** Cell membrane proteins that bind opioids and trigger intracellular changes which influence the behavior of cells. The endogenous ligands for opioid receptors in mammals include three families of peptides, the enkephalins, endorphins, and dynorphins. The receptor classes include mu, delta, and kappa receptors. Sigma receptors bind several psychoactive substances, including certain opioids, but their endogenous ligands are not known. [NIH]

**Receptors, Opioid, kappa:** A class of opioid receptors recognized by its pharmacological profile. Kappa opioid receptors bind dynorphins with a higher affinity than endorphins which are themselves preferred to enkephalins. [NIH]

**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]

**Recovery of Function:** A partial or complete return to the normal or proper physiologic activity of an organ or part following disease or trauma. [NIH]

**Rectal:** By or having to do with the rectum. The rectum is the last 8 to 10 inches of the large
intestine and ends at the anus. [NIH]

**Rectum:** The last 8 to 10 inches of the large intestine. [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, decision. [NIH]

**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]

**Reliability:** Used technically, in a statistical sense, of consistency of a test with itself, i.e. the extent to which we can assume that it will yield the same result if repeated a second time. [NIH]

**Remission:** A decrease in or disappearance of signs and symptoms of cancer. In partial remission, some, but not all, signs and symptoms of cancer have disappeared. In complete remission, all signs and symptoms of cancer have disappeared, although there still may be cancer in the body. [NIH]

**Reperfusion:** Restoration of blood supply to tissue which is ischemic due to decrease in normal blood supply. The decrease may result from any source including atherosclerotic obstruction, narrowing of the artery, or surgical clamping. It is primarily a procedure for treating infarction or other ischemia, by enabling viable ischemic tissue to recover, thus limiting further necrosis. However, it is thought that reperfusion can itself further damage the ischemic tissue, causing reperfusion injury. [NIH]

**Reperfusion Injury:** Functional, metabolic, or structural changes, including necrosis, in ischemic tissues thought to result from reperfusion to ischemic areas of the tissue. The most common instance is myocardial reperfusion injury. [NIH]

**Research Support:** Financial support of research activities. [NIH]

**Resection:** Removal of tissue or part or all of an organ by surgery. [NIH]

**Resorption:** The loss of substance through physiologic or pathologic means, such as loss of dentin and cementum of a tooth, or of the alveolar process of the mandible or maxilla. [EU]

**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]

**Respiratory Physiology:** Functions and activities of the respiratory tract as a whole or of any of its parts. [NIH]

**Response rate:** The percentage of patients whose cancer shrinks or disappears after treatment. [NIH]

**Restoration:** Broad term applied to any inlay, crown, bridge or complete denture which restores or replaces loss of teeth or oral tissues. [NIH]

**Retina:** The ten-layered nervous tissue membrane of the eye. It is continuous with the optic
nerve and receives images of external objects and transmits visual impulses to the brain. Its outer surface is in contact with the choroid and the inner surface with the vitreous body. The outer-most layer is pigmented, whereas the inner nine layers are transparent. [NIH]

Retinae: A congenital notch or cleft of the retina, usually located inferiorly. [NIH]

Retrogression: A reversion to some earlier stage of succession consequent on the introduction of an adverse factor, commonly soil degradation. [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]

Rheumatoid: Resembling rheumatism. [EU]

Rheumatoid arthritis: A form of arthritis, the cause of which is unknown, although infection, hypersensitivity, hormone imbalance and psychologic stress have been suggested as possible causes. [NIH]

Ribose: A pentose active in biological systems usually in its D-form. [NIH]

Rigidity: Stiffness or inflexibility, chiefly that which is abnormal or morbid; rigor. [EU]

Riluzole: A glutamate antagonist that has reported anticonvulsant activity. It has been shown to prolong the survival of patients with amyotrophic lateral sclerosis and has been approved in the United States to treat patients with ALS. [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]

Round Window: Fenestra of the cochlea; an opening in the medial wall of the middle ear leading into the cochlea. [NIH]

Rubber: A high-molecular-weight polymeric elastomer derived from the milk juice (latex) of Hevea brasiliensis and other trees. It is a substance that can be stretched at room temperature to at least twice its original length and after releasing the stress, retracts rapidly, and recover its original dimensions fully. Synthetic rubber is made from many different chemicals, including styrene, acrylonitrile, ethylene, propylene, and isoprene. [NIH]

Salicylate: Non-steroidal anti-inflammatory drugs. [NIH]

Salivary: The duct that convey saliva to the mouth. [NIH]

Salivary glands: Glands in the mouth that produce saliva. [NIH]

Saponins: Sapogenin glycosides. A type of glycoside widely distributed in plants. Each consists of a sapogenin as the aglycon moiety, and a sugar. The sapogenin may be a steroid or a triterpene and the sugar may be glucose, galactose, a pentose, or a methylpentose. Sapogenins are poisonous towards the lower forms of life and are powerful hemolytics when injected into the bloodstream able to dissolve red blood cells at even extreme dilutions. [NIH]

Scans: Pictures of structures inside the body. Scans often used in diagnosing, staging, and monitoring disease include liver scans, bone scans, and computed tomography (CT) or computerized axial tomography (CAT) scans and magnetic resonance imaging (MRI) scans. In liver scanning and bone scanning, radioactive substances that are injected into the bloodstream collect in these organs. A scanner that detects the radiation is used to create pictures. In CT scanning, an x-ray machine linked to a computer is used to produce detailed pictures of organs inside the body. MRI scans use a large magnet connected to a computer to create pictures of areas inside the body. [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]

**Schwannoma:** A tumor of the peripheral nervous system that begins in the nerve sheath (protective covering). It is almost always benign, but rare malignant schwannomas have been reported. [NIH]

**Sciatic Nerve:** A nerve which originates in the lumbar and sacral spinal cord (L4 to S3) and supplies motor and sensory innervation to the lower extremity. The sciatic nerve, which is the main continuation of the sacral plexus, is the largest nerve in the body. It has two major branches, the tibial nerve and the peroneal nerve. [NIH]

**Sclerosis:** A pathological process consisting of hardening or fibrosis of an anatomical structure, often a vessel or a nerve. [NIH]

**Scopolamine:** An alkaloid from Solanaceae, especially Datura metel L. and Scopolia carniolica. Scopolamine and its quaternary derivatives act as antimuscarinics like atropine, but may have more central nervous system effects. Among the many uses are as an anesthetic premedication, in urinary incontinence, in motion sickness, as an antispasmodic, and as a mydriatic and cycloplegic. [NIH]

**Screening:** Checking for disease when there are no symptoms. [NIH]

**Second Messenger Systems:** Systems in which an intracellular signal is generated in response to an intercellular primary messenger such as a hormone or neurotransmitter. They are intermediate signals in cellular processes such as metabolism, secretion, contraction, phototransduction, and cell growth. Examples of second messenger systems are the adenyl cyclase-cyclic AMP system, the phosphatidylinositol diphosphate-inositol triphosphate system, and the cyclic GMP system. [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]

**Secretory:** Secreting; relating to or influencing secretion or the secretions. [NIH]

**Sedative:** 1. Allaying activity and excitement. 2. An agent that allays excitement. [EU]

**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-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]
**Sensibility:** The ability to receive, feel and appreciate sensations and impressions; the quality of being sensitive; the extend to which a method gives results that are free from false negatives. [NIH]

**Sensor:** A device designed to respond to physical stimuli such as temperature, light, magnetism or movement and transmit resulting impulses for interpretation, recording, movement, or operating control. [NIH]

**Septal:** An abscess occurring at the root of the tooth on the proximal surface. [NIH]

**Septal Nuclei:** Neural nuclei situated in the septal region. They have afferent and cholinergic efferent connections with a variety of forebrain and brainstem areas including the hippocampus, the lateral hypothalamus, the tegmentum, and the amygdala. Included are the dorsal, lateral, medial, and triangular septal nuclei, septofimbrial nucleus, nucleus of diagonal band, nucleus of anterior commissure, and the nucleus of stria terminalis. [NIH]

**Septicemia:** Systemic disease associated with the presence and persistence of pathogenic microorganisms or their toxins in the blood. Called also blood poisoning. [EU]

**Septum:** A dividing wall or partition; a general term for such a structure. The term is often used alone to refer to the septal area or to the septum pellucidum. [EU]

**Septum Pellucidum:** A triangular double membrane separating the anterior horns of the lateral ventricles of the brain. It is situated in the median plane and bounded by the corpus callosum and the body and columns of the fornix. [NIH]

**Sequela:** Any lesion or affection following or caused by an attack of disease. [EU]

**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]

**Serotonin:** A biochemical messenger and regulator, synthesized from the essential amino acid L-tryptophan. In humans it is found primarily in the central nervous system, gastrointestinal tract, and blood platelets. Serotonin mediates several important physiological functions including neurotransmission, gastrointestinal motility, hemostasis, and cardiovascular integrity. Multiple receptor families (receptors, serotonin) explain the broad physiological actions and distribution of this biochemical mediator. [NIH]

**Serous:** Having to do with serum, the clear liquid part of blood. [NIH]

**Serum:** The clear liquid part of the blood that remains after blood cells and clotting proteins have been removed. [NIH]

**Serum Albumin:** A major plasma protein that serves in maintaining the plasma colloidal osmotic pressure and transporting large organic anions. [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]

**Sigmoid:** 1. Shaped like the letter S or the letter C. 2. The sigmoid colon. [EU]

**Sigmoid Colon:** The lower part of the colon that empties into the rectum. [NIH]

**Signal Transduction:** The intercellular or intracellular transfer of information (biological activation/inhibition) through a signal pathway. In each signal transduction system,
Tinnitus is a condition characterized by a perception of sound in the ears or head in the absence of an external source. It can arise from various factors, including exposure to loud noises, certain medications, and conditions such as Meniere's disease or age-related hearing loss.

The treatment of tinnitus often involves a combination of strategies, including hearing aids, noise-cancelling devices, and medications. Additionally, lifestyle changes, such as avoiding exposure to loud noises and managing stress, can be beneficial. In some cases, as I mentioned earlier, surgical options may be considered, although these are typically reserved for those with severe or debilitating forms of tinnitus. It's important to consult with a healthcare provider to determine the most appropriate course of action.
**Somatic:** 1. Pertaining to or characteristic of the soma or body. 2. Pertaining to the body wall in contrast to the viscera. [EU]

**Somatosensory Cortex:** Area of the parietal lobe concerned with receiving general sensations. It lies posterior to the central sulcus. [NIH]

**Somnolence:** Sleepiness; also unnatural drowsiness. [EU]

**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]

**Spasm:** An involuntary contraction of a muscle or group of muscles. Spasms may involve skeletal muscle or smooth muscle. [NIH]

**Spasmodic:** Of the nature of a spasm. [EU]

**Spasticity:** A state of hypertonicity, or increase over the normal tone of a muscle, with heightened deep tendon reflexes. [EU]

**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]

**Spectrin:** A high molecular weight (220-250 kDa) water-soluble protein which can be extracted from erythrocyte ghosts in low ionic strength buffers. The protein contains no lipids or carbohydrates, is the predominant species of peripheral erythrocyte membrane proteins, and exists as a fibrous coating on the inner, cytoplasmic surface of the membrane. [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-Language Pathology:** The study of speech or language disorders and their diagnosis and correction. [NIH]

**Sphenoid:** An unpaired cranial bone with a body containing the sphenoid sinus and forming the posterior part of the medial walls of the orbits. [NIH]

**Spike:** The activation of synapses causes changes in the permeability of the dendritic membrane leading to changes in the membrane potential. This difference of the potential travels along the axon of the neuron and is called spike. [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]

**Spinal Nerves:** The 31 paired peripheral nerves formed by the union of the dorsal and ventral spinal roots from each spinal cord segment. The spinal nerve plexuses and the spinal roots are also included. [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]

**Spiral Lamina:** The bony plate which extends outwards from the modiolus. It is part of the structure which divides the cochlea into sections. [NIH]

**Spirochete:** Lyme disease. [NIH]

**Staging:** Performing exams and tests to learn the extent of the cancer within the body, especially whether the disease has spread from the original site to other parts of the body. [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]

**Statistically significant:** Describes a mathematical measure of difference between groups. The difference is said to be statistically significant if it is greater than what might be expected to happen by chance alone. [NIH]

**Steady state:** Dynamic equilibrium. [EU]

**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]

**Steroid:** A group name for lipids that contain a hydrogenated cyclopentanoperhydrophenanthrene ring system. Some of the substances included in this group are progesterone, adrenocortical hormones, the gonadal hormones, cardiac aglycones, bile acids, sterols (such as cholesterol), toad poisons, saponins, and some of the carcinogenic hydrocarbons. [EU]

**Stethoscope:** An instrument used for the detection and study of sounds within the body that conveyed to the ears of the observer through rubber tubing. [NIH]

**Stimulant:** 1. Producing stimulation; especially producing stimulation by causing tension on muscle fibre through the nervous tissue. 2. An agent or remedy that produces stimulation. [EU]

**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]

**Stomach:** An organ of digestion situated in the left upper quadrant of the abdomen between the termination of the esophagus and the beginning of the duodenum. [NIH]

**Stomatognathic System:** The mouth, teeth, jaws, pharynx, and related structures as they relate to mastication, deglutition, and speech. [NIH]

**Stool:** The waste matter discharged in a bowel movement; feces. [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]

**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]

**Stupor**: Partial or nearly complete unconsciousness, manifested by the subject's responding only to vigorous stimulation. Also, in psychiatry, a disorder marked by reduced responsiveness. [EU]

**Subacute**: Somewhat acute; between acute and chronic. [EU]

**Subarachnoid**: Situated or occurring between the arachnoid and the pia mater. [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]

**Subspecies**: A category intermediate in rank between species and variety, based on a smaller number of correlated characters than are used to differentiate species and generally conditioned by geographical and/or ecological occurrence. [NIH]

**Substance P**: An eleven-amino acid neurotransmitter that appears in both the central and peripheral nervous systems. It is involved in transmission of pain, causes rapid contractions of the gastrointestinal smooth muscle, and modulates inflammatory and immune responses. [NIH]

**Substrate**: A substance upon which an enzyme acts. [EU]

**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]

**Supraspinal**: Above the spinal column or any spine. [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]

**Sympathetic Nervous System**: The thoracolumbar division of the autonomic nervous system. Sympathetic preganglionic fibers originate in neurons of the intermediolateral column of the spinal cord and project to the paravertebral and prevertebral ganglia, which in turn project to target organs. The sympathetic nervous system mediates the body's response to stressful situations, i.e., the fight or flight reactions. It often acts reciprocally to the parasympathetic system. [NIH]

**Sympathomimetic**: 1. Mimicking the effects of impulses conveyed by adrenergic postganglionic fibres of the sympathetic nervous system. 2. An agent that produces effects similar to those of impulses conveyed by adrenergic postganglionic fibres of the sympathetic nervous system. Called also adrenergic. [EU]

**Symptomatic**: Having to do with symptoms, which are signs of a condition or disease. [NIH]

**Synapses**: Specialized junctions at which a neuron communicates with a target cell. At classical synapses, a neuron's presynaptic terminal releases a chemical transmitter stored in synaptic vesicles which diffuses across a narrow synaptic cleft and activates receptors on the postsynaptic membrane of the target cell. The target may be a dendrite, cell body, or axon of another neuron, or a specialized region of a muscle or secretory cell. Neurons may also communicate through direct electrical connections which are sometimes called electrical synapses; these are not included here but rather in gap junctions. [NIH]

**Synapsis**: The pairing between homologous chromosomes of maternal and paternal origin
during the prophase of meiosis, leading to the formation of gametes. [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]

**Synaptic Transmission**: The communication from a neuron to a target (neuron, muscle, or secretory cell) across a synapse. In chemical synaptic transmission, the presynaptic neuron releases a neurotransmitter that diffuses across the synaptic cleft and binds to specific synaptic receptors. These activated receptors modulate ion channels and/or second-messenger systems to influence the postsynaptic cell. Electrical transmission is less common in the nervous system, and, as in other tissues, is mediated by gap junctions. [NIH]

**Synaptic Vesicles**: Membrane-bound compartments which contain transmitter molecules. Synaptic vesicles are concentrated at presynaptic terminals. They actively sequester transmitter molecules from the cytoplasm. In at least some synapses, transmitter release occurs by fusion of these vesicles with the presynaptic membrane, followed by exocytosis of their contents. [NIH]

**Synchrony**: The normal physiologic sequencing of atrial and ventricular activation and contraction. [NIH]

**Synergistic**: Acting together; enhancing the effect of another force or agent. [EU]

**Syphilis**: A contagious venereal disease caused by the spirochete Treponema pallidum. [NIH]

**Systemic**: Affecting the entire body. [NIH]

**Systemic therapy**: Treatment that uses substances that travel through the bloodstream, reaching and affecting cells all over the body. [NIH]

**Systolic**: Indicating the maximum arterial pressure during contraction of the left ventricle of the heart. [EU]

**Tardive**: Marked by lateness, late; said of a disease in which the characteristic lesion is late in appearing. [EU]

**Telangiectasia**: The permanent enlargement of blood vessels, causing redness in the skin or mucous membranes. [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]

**Temporomandibular Joint Dysfunction Syndrome**: A symptom complex consisting of pain, muscle tenderness, clicking in the joint, and limitation or alteration of mandibular movement. The symptoms are subjective and manifested primarily in the masticatory muscles rather than the temporomandibular joint itself. Etiologic factors are uncertain but include occlusal dysharmony and psychophysio logic factors. [NIH]

**Tensor Tympani**: Two muscles which operate on the hammer and stirrup. They contract in response to loud sounds. Their action reduces the amplitude of movement of the ossicles, thus limiting the sound intensity delivered to the inner ear. [NIH]

**Tetanic**: Having the characteristics of, or relating to tetanus. [NIH]

**Tetanus**: A disease caused by tetanospasmin, a powerful protein toxin produced by Clostridium tetani. Tetanus usually occurs after an acute injury, such as a puncture wound or laceration. Generalized tetanus, the most common form, is characterized by tetanic
muscular contractions and hyperreflexia. Localized tetanus presents itself as a mild condition with manifestations restricted to muscles near the wound. It may progress to the generalized form. [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; cranioencephal trauma; brain neoplasms; brain hypoxia; intracranial hemorrhages; and infectious processes. [NIH]

**Thalamus:** Paired bodies containing mostly gray substance and forming part of the lateral wall of the third ventricle of the brain. The thalamus represents the major portion of the diencephalon and is commonly divided into cellular aggregates known as nuclear groups. [NIH]

**Theophylline:** Alkaloid obtained from Thea sinensis (tea) and others. It stimulates the heart and central nervous system, dilates bronchi and blood vessels, and causes diuresis. The drug is used mainly in bronchial asthma and for myocardial stimulation. Among its more prominent cellular effects are inhibition of cyclic nucleotide phosphodiesterases and antagonism of adenosine receptors. [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]

**Third Ventricle:** A narrow cleft inferior to the corpus callosum, within the diencephalon, between the paired thalami. Its floor is formed by the hypothalamus, its anterior wall by the lamina terminalis, and its roof by ependyma. It communicates with the fourth ventricle by the cerebral aqueduct, and with the lateral ventricles by the interventricular foramina. [NIH]

**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]

**Thrombin:** An enzyme formed from prothrombin that converts fibrinogen to fibrin. (Dorland, 27th ed) EC 3.4.21.5. [NIH]

**Thrombomodulin:** A cell surface glycoprotein of endothelial cells that binds thrombin and serves as a cofactor in the activation of protein C and its regulation of blood coagulation. [NIH]

**Thrombosis:** The formation or presence of a blood clot inside a blood vessel. [NIH]

**Thyroid:** A gland located near the windpipe (trachea) that produces thyroid hormone, which helps regulate growth and metabolism. [NIH]

**Thyroid Gland:** A highly vascular endocrine gland consisting of two lobes, one on either side of the trachea, joined by a narrow isthmus; it produces the thyroid hormones which are concerned in regulating the metabolic rate of the body. [NIH]

**Thyroid Hormones:** Hormones secreted by the thyroid gland. [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]

**Tibial Nerve:** The medial terminal branch of the sciatic nerve. The tibial nerve fibers originate in lumbar and sacral spinal segments (L4 to S2). They supply motor and sensory
innervation to parts of the calf and foot. [NIH]

**Tic:** An involuntary compulsive, repetitive, stereotyped movement, resembling a purposeful movement because it is coordinated and involves muscles in their normal synergistic relationships; tics usually involve the face and shoulders. [EU]

**Time Management:** Planning and control of time to improve efficiency and effectiveness. [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 Culture:** Maintaining or growing of tissue, organ primordia, or the whole or part of an organ in vitro so as to preserve its architecture and/or function (Dorland, 28th ed). Tissue culture includes both organ culture and cell culture. [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]

**Tolerance:** 1. The ability to endure unusually large doses of a drug or toxin. 2. Acquired drug tolerance; a decreasing response to repeated constant doses of a drug or the need for increasing doses to maintain a constant response. [EU]

**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 auditory cortex). [NIH]

**Tonic:** 1. Producing and restoring the normal tone. 2. Characterized by continuous tension. 3. A term formerly used for a class of medicinal preparations believed to have the power of restoring normal tone to tissue. [EU]

**Tonicity:** The normal state of muscular tension. [NIH]

**Tooth Preparation:** Procedures carried out with regard to the teeth or tooth structures preparatory to specified dental therapeutic and surgical measures. [NIH]

**Topical:** On the surface of the body. [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]

**Transcutaneous:** Transdermal. [EU]

**Transdermal:** Entering through the dermis, or skin, as in administration of a drug applied to the skin in ointment or patch form. [EU]

**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]

**Translational:** The cleavage of signal sequence that directs the passage of the protein through a cell or organelle membrane. [NIH]

**Transmitter:** A chemical substance which effects the passage of nerve impulses from one cell to the other at the synapse. [NIH]

**Trauma:** Any injury, wound, or shock, must frequently physical or structural shock, producing a disturbance. [NIH]

**Treatment Outcome:** Evaluation undertaken to assess the results or consequences of management and procedures used in combating disease in order to determine the efficacy, effectiveness, safety, practicability, etc., of these interventions in individual cases or series. [NIH]

**Triad:** Trivalent. [NIH]

**Tricyclic:** Containing three fused rings or closed chains in the molecular structure. [EU]

**Trigeminal:** Cranial nerve V. It is sensory for the eyeball, the conjunctiva, the eyebrow, the skin of face and scalp, the teeth, the mucous membranes in the mouth and nose, and is motor to the muscles of mastication. [NIH]

**Trigeminal Ganglion:** The semilunar-shaped ganglion containing the cells of origin of most of the sensory fibers of the trigeminal nerve. It is situated within the dural cleft on the cerebral surface of the petrous portion of the temporal bone and gives off the ophthalmic, maxillary, and part of the mandibular nerves. [NIH]

**Trigeminal Nerve:** The 5th and largest cranial nerve. The trigeminal nerve is a mixed motor and sensory nerve. The larger sensory part forms the ophthalmic, mandibular, and maxillary nerves which carry afferents sensitive to external or internal stimuli from the skin, muscles, and joints of the face and mouth and from the teeth. Most of these fibers originate from cells of the trigeminal ganglion and project to the trigeminal nucleus of the brain stem. The smaller motor part arises from the brain stem trigeminal motor nucleus and innervates the muscles of mastication. [NIH]

**Trigger zone:** Dolorogenic zone (= producing or causing pain). [EU]

**Triglyceride:** A lipid carried through the blood stream to tissues. Most of the body’s fat tissue is in the form of triglycerides, stored for use as energy. Triglycerides are obtained primarily from fat in foods. [NIH]

**Tumor marker:** A substance sometimes found in an increased amount in the blood, other body fluids, or tissues and which may mean that a certain type of cancer is in the body. Examples of tumor markers include CA 125 (ovarian cancer), CA 15-3 (breast cancer), CEA
(ovarian, lung, breast, pancreas, and gastrointestinal tract cancers), and PSA (prostate cancer). Also called biomarker. [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]

**Tunica Intima:** The innermost coat of blood vessels, consisting of a thin lining of endothelial cells longitudinally oriented and continuous with the endothelium of capillaries on the one hand and the endocardium of the heart on the other. [NIH]

**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]

**Tyrosine:** A non-essential amino acid. In animals it is synthesized from phenylalanine. It is also the precursor of epinephrine, thyroid hormones, and melanin. [NIH]

**Unconscious:** Experience which was once conscious, but was subsequently rejected, as the "personal unconscious". [NIH]

**Uncoupling Agents:** Chemical agents that uncouple oxidation from phosphorylation in the metabolic cycle so that ATP synthesis does not occur. Included here are those ionophores that disrupt electron transfer by short-circuiting the proton gradient across mitochondrial membranes. [NIH]

**Urinary:** Having to do with urine or the organs of the body that produce and get rid of urine. [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]

**Vaccine:** A substance or group of substances meant to cause the immune system to respond to a tumor or to microorganisms, such as bacteria or viruses. [NIH]

**Vagina:** The muscular canal extending from the uterus to the exterior of the body. Also called the birth canal. [NIH]

**Vascular:** Pertaining to blood vessels or indicative of a copious blood supply. [EU]

**Vascular Headaches:** A group of disorders characterized by recurrent headaches associated with abnormal dilation and constriction of cerebral blood vessels. Representative disorders from this category include migraine, cluster headache, and paroxysmal hemicrania. [NIH]

**Vasculitis:** Inflammation of a blood vessel. [NIH]

**Vasoactive:** Exerting an effect upon the calibre of blood vessels. [EU]

**Vasodilator:** An agent that widens blood vessels. [NIH]

**Vasomotor:** 1. Affecting the calibre of a vessel, especially of a blood vessel. 2. Any element or agent that effects the calibre of a blood vessel. [EU]

**Vector:** Plasmid or other self-replicating DNA molecule that transfers DNA between cells in nature or in recombinant DNA technology. [NIH]

**Vegetative:** 1. Concerned with growth and with nutrition. 2. Functioning involuntarily or unconsciously, as the vegetative nervous system. 3. Resting; denoting the portion of a cell cycle during which the cell is not involved in replication. 4. Of, pertaining to, or characteristic of plants. [EU]
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]

Ventilation: 1. In respiratory physiology, the process of exchange of air between the lungs and the ambient air. Pulmonary ventilation (usually measured in litres per minute) refers to the total exchange, whereas alveolar ventilation refers to the effective ventilation of the alveoli, in which gas exchange with the blood takes place. 2. In psychiatry, verbalization of one's emotional problems. [EU]

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]

Ventricle: One of the two pumping chambers of the heart. The right ventricle receives oxygen-poor blood from the right atrium and pumps it to the lungs through the pulmonary artery. The left ventricle receives oxygen-rich blood from the left atrium and pumps it to the body through the aorta. [NIH]

Ventricular: Pertaining to a ventricle. [EU]

Venules: The minute vessels that collect blood from the capillaryplexuses and join together to form veins. [NIH]

Vertebrae: A bony unit of the segmented spinal column. [NIH]

Vertebral: Of or pertaining to a vertebra. [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]

Vesicular: 1. Composed of or relating to small, saclike bodies. 2. Pertaining to or made up of vesicles on the skin. [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 Nerve: The vestibular part of the 8th cranial nerve (vestibulocochlear nerve). The vestibular nerve fibers arise from neurons of Scarpas ganglion and project peripherally to vestibular hair cells and centrally to the vestibular nuclei of the brain stem. These fibers mediate the sense of balance and head position. [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 Scarpas 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]

Vibrio: A genus of Vibrionaceae, made up of short, slightly curved, motile, gram-negative
rods. Various species produce cholera and other gastrointestinal disorders as well as abortion in sheep and cattle. [NIH]

**Vibrio cholerae**: The etiologic agent of cholera. [NIH]

**Villi**: The tiny, fingerlike projections on the surface of the small intestine. Villi help absorb nutrients. [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]

**Viscera**: Any of the large interior organs in any one of the three great cavities of the body, especially in the abdomen. [NIH]

**Visceral**: From visci a viscus pertaining to a viscus. [EU]

**Visceral Afferents**: The sensory fibers innervating the viscera. [NIH]

**Viscosity**: A physical property of fluids that determines the internal resistance to shear forces. [EU]

**Vitreous Body**: The transparent, semigelatinous substance that fills the cavity behind the crystalline lens of the eye and in front of the retina. It is contained in a thin hyoid membrane and forms about four fifths of the optic globe. [NIH]

**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]

**Vocal cord**: The vocal folds of the larynx. [NIH]

**Volition**: Voluntary activity without external compulsion. [NIH]

**Voltage-gated**: It is opened by the altered charge distribution across the cell membrane. [NIH]

**Wakefulness**: A state in which there is an enhanced potential for sensitivity and an efficient responsiveness to external stimuli. [NIH]

**Whooping Cough**: A respiratory infection caused by Bordetella pertussis and characterized by paroxysmal coughing ending in a prolonged crowing intake of breath. [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]

**Womb**: A hollow, thick-walled, muscular organ in which the impregnated ovum is developed into a child. [NIH]

**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]

**X-ray therapy**: The use of high-energy radiation from x-rays to kill cancer cells and shrink tumors. Radiation may come from a machine outside the body (external-beam radiation therapy) or from materials called radioisotopes. Radioisotopes produce radiation and can be placed in or near the tumor or in the area near cancer cells. This type of radiation treatment is called internal radiation therapy, implant radiation, interstitial radiation, or brachytherapy. Systemic radiation therapy uses a radioactive substance, such as a radiolabeled monoclonal antibody, that circulates throughout the body. X-ray therapy is also called radiation therapy, radiotherapy, and irradiation. [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]

**Zymogen**: Inactive form of an enzyme which can then be converted to the active form, usually by excision of a polypeptide, e.g. trypsinogen is the zymogen of trypsin. [NIH]
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