

CHESTER COUNTY OTOLARYNGOLOGY AND ALLERGY ASSOCIATES

A DIVISION OF PINNACLE EAR, NOSE AND THROAT ASSOCIATES

Adult and Pediatric Ear, Nose and Throat and Allergy Evaluation and Treatment

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Sinus Surgery
Allergy Evaluation and Treatment
Audiology and Hearing Aids

Hearing Loss and Hearing Protection

What humans perceive as “sound” is a result of molecules vibrating forming waves which travel through any medium: solid, liquid or air. The denser the medium, the more efficiently and the farther the vibrations travel. This is why when you put your ear on a train track, you can hear the train coming from miles away or why whales can hear each other in the oceans despite being many miles apart. There are no molecules to vibrate in a vacuum which is why sound does not travel in space. These vibrations travel through the air, enter the ear canal and then hit the ear drum (Tympanic Membrane). Sound is then transmitted and passed along three tiny bones (the ossicles) to an inner membrane which then vibrates creating a wave in the fluid in the inner ear (the Cochlea). The wave then travels around the Cochlea, which is a 2.5 turn spiral, and depending on the frequency of the sound, stimulates a set of nerve endings corresponding to that frequency. They in turn send a signal along the Cochlear Nerve (hearing nerve), making 4-5 connections along the way to the Auditory Cortex of the brain where we “hear” the sound. Other parts of the brain are also involved in the analysis of sound which is why hearing is such a complex and important sense. The nerve endings which pick up high-pitched (high frequency) tones are located at the start of the spiral and the farther you go along the spiral, the lower the frequency.

Conductive Hearing Loss is when the sound vibrations do not conduct all the way in from the outside to the nerve endings in the Cochlea. Some causes of conductive hearing loss include:

- An obstruction in the ear canal like wax or a foreign body, which blocks the sound from getting to the drum.
- A hole in the ear drum, which results in less surface area of the drum to vibrate.
- Fluid or a tumor in the middle ear, which affects how the ossicles in the middle ear vibrate.
- Conditions that result in scarring of the ear drum or bones in the middle ear such as previous infections, trauma or bone deposits.

Sensorineural Hearing Loss describes hearing problems caused by damage to the inner ear, Cochlear nerve, the various connections of nerves transmitting nerve impulses to the brain or the brain itself. The nerve endings in the cochlea, called “hair cells”, start to die off with age or noise damage and no longer send acoustical impulses to the brain. This type of loss is also caused by degeneration of the cochlear nerve or there is a “central” or brain deterioration causing loss of hearing or understanding of what we hear. The wave of fluid causes wear and tear on the nerve endings. As the wave of fluid travels along the spiral, it becomes weaker which is why as we all age, we start to lose high frequency sound earlier than low frequency. Consonant sounds (K, T, S...) are high frequency sounds which is why people who don’t hear well complaint that “everyone is mumbling”. They hear the low frequency sounds, vowels like A, E O, U, better. In addition, recent research is revealing how damage to the nerve connections, even from as little noise exposure as a few loud concerts or firecrackers when we were kids, is enough to cause damage which will manifest much later in life. In fact, many animal models show that there can be as much as 80% loss of the nerve connections transmitting sound impulses to the brain before we can measure hearing loss using traditional hearing tests.

The loudness of a sound corresponds to the amplitude of the wave. The louder the sound, the larger the amplitude (bigger wave) and the more damage it causes. Noise damage is CUMULATIVE. Even short bursts of loud sound will contribute to noise damage over the course of a lifetime. So, it is imperative that you always try to protect your ears from loud noises, even in childhood. **If it is loud enough for you to have to talk over the noise, it is probably loud enough to cause hearing damage.** This includes things like vacuum cleaners, blow dryers, kitchen appliances like blenders and certainly power tools, lawn and yard machinery, guns, motor cycles and loud music.

It is important to protect your hearing as noise damage will worsen hearing and ringing. Ear muffs and ear plugs provide about the same amount of hearing protection so it is a matter of comfort. Remember that noise damage is cumulative (like sun exposure and skin cancer) so noises you expose yourself to now may not present clinically until years down the line.

Regular exams and hearing tests are important to monitor hearing loss.

HEARING LOSS and DEMENTIA

We have known for many years that older people with hearing loss who should wear hearing aids but don't, have much more cognitive decline, memory loss and are at much greater risk for dementia. Both the incidence and rate of progression of these problems is increased when you don't hear well. Recent studies have revealed that even in 50-year olds with mild hearing loss, if they do nothing about their hearing, the risks of developing dementia when they are older doubles.

The reason for this link is complicated however it fundamentally has to do with lack of stimulation of both the nerves which transmit the electrical impulses to the brain and the multiple, complex parts of the brain involved in hearing and analyzing sound. The basic problem with hearing damage and loss is that you can go many years and even decades of slow decline before you realize how bad your hearing is. Most people we see should probably have been assessed years if not decades earlier. Although the brain is not a muscle, there is definitely a "use it or lose it" phenomenon which occurs. The same does not occur with vision because you can only squint so much before you get glasses. With hearing loss, you can go a long time before thinking you need hearing assistance. In addition, not hearing well is very isolating both socially and from a sensory perspective. We know that people who are socially isolated are at much greater risk of developing dementia and hearing loss contributes to that.

TINNITUS MANAGEMENT and TREATMENT

Tinnitus is the name we give to perceived sounds in the ear or the head. Everyone's inner ears (even people with normal hearing) produce sound continuously which gets transmitted to the brain but most people are able to filter it out as background and are not aware of the sounds. This process occurs at multiple levels and we are constantly learning more and more about this often-frustrating symptom. Some causes for tinnitus include: hearing loss and hearing damage (the vast majority of cases), medications (like blood pressure medication, antidepressants and even some supplements), uncontrolled blood pressure, excessive stress, poor sleep and very rarely tumors in the brain and other neurologic conditions like multiple sclerosis.

In most cases, patients simply need hearing aids. When you hear better, you are not aware of the tinnitus. Most people who experience tinnitus are eventually able to filter the sound out and are no longer aware of it, kind of like someone moving into a house next to a train track who no longer is aware of the train sounds as they pass because they are used to it. This is a form of biofeedback. There is therapy for tinnitus called Tinnitus Re-Training Therapy which essentially teaches you to ignore the sound but this is rarely necessary. For most people, they get used to those sounds and it does not

bother them. Other techniques to help drown out the sound include: running a fan or humidifier, playing a sound generator or putting your bedside clock radio on faint static in between stations. If you have hearing loss and tinnitus, the simple truth is that you need to wear a hearing aid. This will improve your hearing and basically drowns out the tinnitus. By hearing better, it also trains your brain to ignore the tinnitus. There are some non-prescription medications which can help. A few include:

- **GINKGO BILOBA** **Dosage:** 40 mg., 3 times per day with food, for approximately 12 weeks. Standardized extract containing 25% of active Ginkgo biloba should be used. It should be free of salt, sugar, yeast, wheat, corn, coloring and preservatives. Ginkgo can cause increased bleeding and blood pressure elevation so please tell all physicians and surgeons that you are on this supplement.
- **MELATONIN** **Dosage:** 3 mg., taken at bedtime as needed. It can be habit forming so use in only limited amounts.

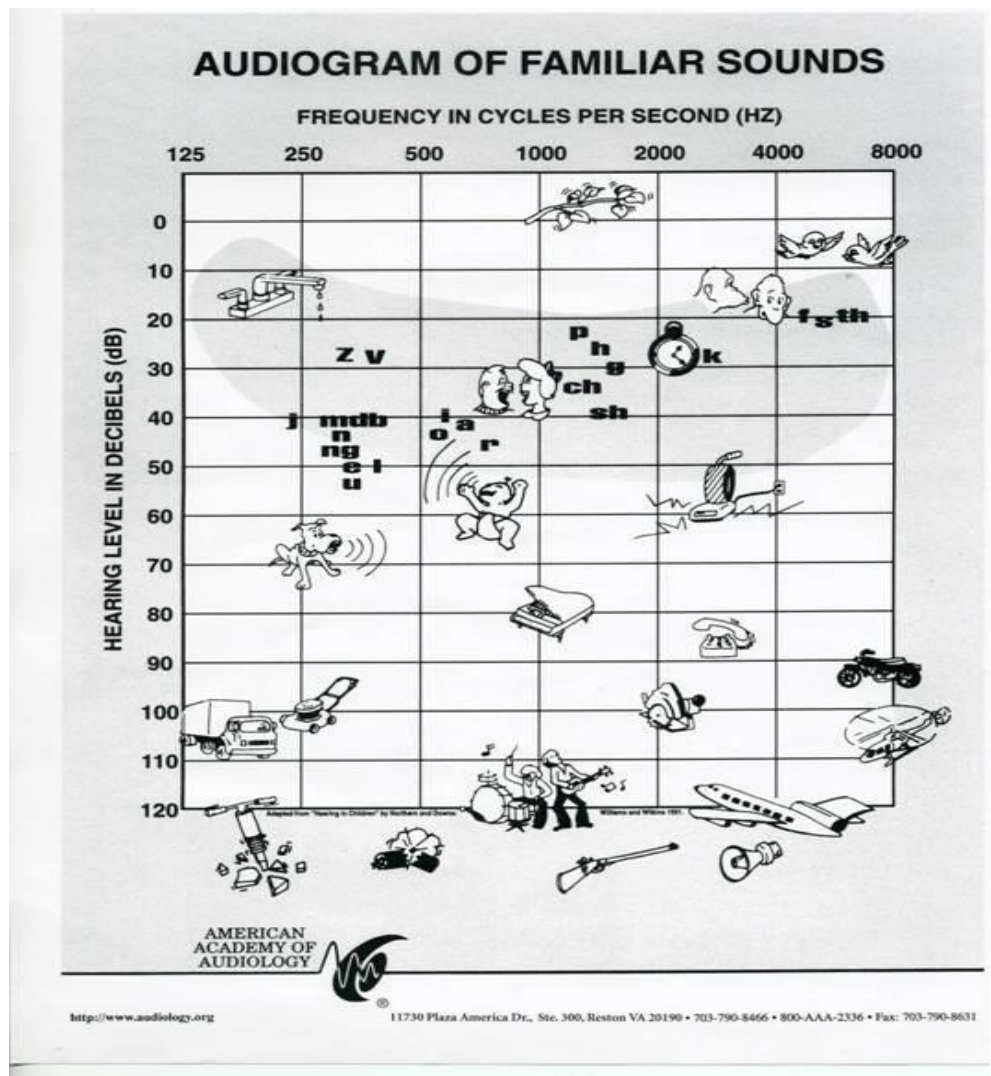
There are some herbal supplements that may help. One in particular advertised in some ENT literature is found at the website www.tinnitusformula.com. We don't have any personal experience with this product but some patients have reported improvements in their tinnitus.

Other prescription medications such as Valium, Ativan and Xanax can also be helpful but these are also habit forming. Also keep in mind that although they may help put you to sleep, they interfere with the quality of your sleep so in the end, they may cause just as much sleep deprivation. It is important to protect your hearing as noise damage will worsen hearing and ringing.

"Volume Control" by David Owen is a book reviewing all aspects of hearing from the basic pathology to different hearing assistive devices (hearing aids). A must read for anyone with hearing loss.

For the television there are 2 products which are helpful. **TV Ears** are simple wireless headphones and are available from many retailers. There is also a TV soundbar (speaker) called **Z-VOX** which has settings for people with hearing

loss. It can selectively amplify voices and not all the background noise and music. This is also available from retailers like Best Buy or Amazon.



WEB MD Article

Jan. 22, 2013 -- [Hearing loss](#) and mental decline are two common conditions of aging, and now a new study finds that they may be related.

Older people with hearing deficits were more likely than those with normal hearing to develop problems with memory and thinking over the course of the study.

On average, the study participants with hearing issues had significant mental impairments three years earlier than those without them.

UNTREATED HEARING LOSS IS VERY COMMON. About two-thirds of adults over the age of 70 have some degree of hearing loss. And the number of people with [dementia](#) is projected to double over the next two decades as the population ages.

The researchers now hope to study whether hearing aids can slow mental decline in the elderly.

Otologist and epidemiologist Frank R. Lin, MD, PhD, led the study. He says only about 15% of people who need [hearing aids](#) get them. Lin is an assistant professor at the Johns Hopkins University School of Medicine in Baltimore.

“Our findings emphasize just how important it is for physicians to discuss hearing with their patients and to be proactive in addressing any hearing declines over time,” he says.

The investigation included close to 2,000 men and women in their 70s and 80s who took part in an aging and health study that began in the late 1990s. Hearing was tested in year five of the study, and the men and women underwent a series of tests over the next six years to assess declines in memory and thinking.

The men and women with hearing loss showed evidence of these declines 30% to 40% faster than the people with normal hearing. And those people with more hearing loss had steeper declines in mental function.

Social Isolation, Brain Overload May Explain Link.

While it did not address how age-related hearing loss may worsen problems with memory or thinking, Lin says there are several theories. One theory is that the social isolation common among people with untreated hearing loss leads to mental decline. Previous research has identified loneliness as a risk factor for such decline, he says. Another theory is the idea that the working memory is limited with respect to the amount of information it can hold and the operations it can perform.

“The job of the inner ear is to take in sounds and encode them with accurate fidelity before the signal goes to the brain for decoding, but with hearing loss the brain has a very hard time doing that,” Lin says. “If the brain constantly has to expend more resources to decode sound, this may come at a cognitive cost.”

Neurologist and Alzheimer’s researcher Marc L. Gordon, MD, calls the research compelling, but he says more studies are needed to confirm that hearing loss has a direct impact on mental decline and to understand the reasons for the link. He adds that the study emphasizes the importance of addressing not just hearing loss but also vision loss in the elderly.

“This reinforces the notion that evaluating and treating these sensory impairments may be even more important for an aging person’s overall well-being than we have known,” he says.