U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES · National Institutes of Health

NIH National Institute on Deafness and Other Communication Disorders

NIDCD Fact Sheet | **Hearing and Balance**

# Age-Related Hearing Loss

## What is age-related hearing loss?

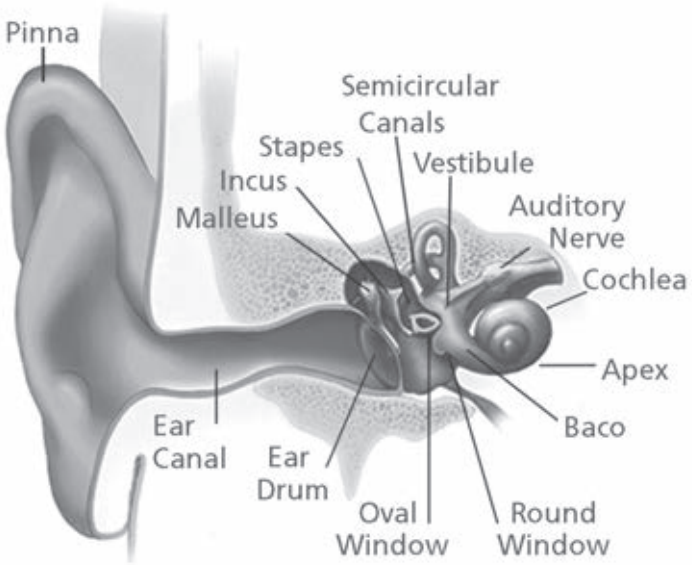
Age-related hearing loss (presbycusis) is the loss of hearing that gradually occurs in most of us as we grow older. It is one of the most common conditions affecting older and elderly adults.

Approximately one in three people in the United States between the ages of 65 and 74 has hearing loss, and nearly half of those older than 75 have difficulty hearing. Having trouble hearing can make it hard to understand and follow a doctor's advice, respond to warnings, and hear phones, doorbells, and smoke alarms. Hearing loss can also make it hard to enjoy talking with family and friends, leading to feelings of isolation.

Age-related hearing loss most often occurs in both ears, affecting them equally. Because the loss is gradual, if you have age-related hearing loss you may not realize that you've lost some of your ability to hear.

There are many causes of age-related hearing loss. Most commonly, it arises from changes in the inner ear as we age, but it can also result from changes in the middle ear, or from complex changes along the nerve pathways from the ear to the brain. Certain medical conditions and medications may also play a role.

**The auditory system**

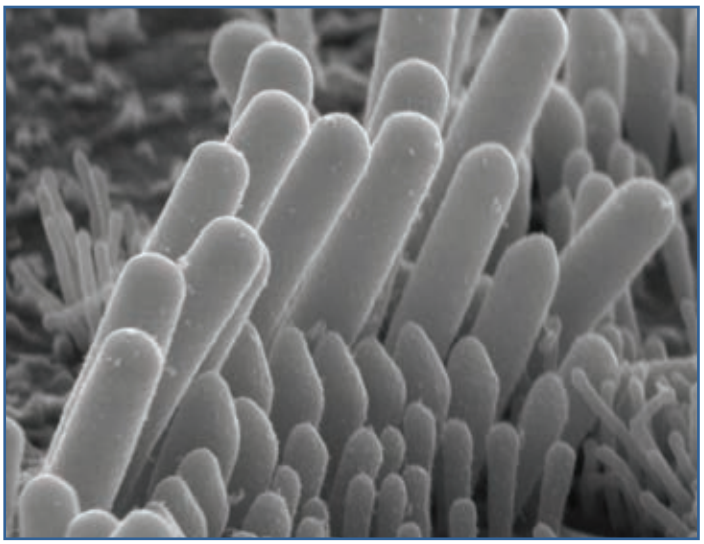



*Credit: NIH Medical Arts*

## How do we hear?

Hearing depends on a series of events that change sound waves in the air into electrical signals. Your auditory nerve then carries these signals to your brain through a complex series of steps.

1. Sound waves enter the outer ear and travel through a narrow passageway called the ear canal, which leads to the eardrum.



*Stereocilia perch atop sensory hair cells in the cochlea of the inner ear.*
*Credit: Yoshiyuki Kawashima*

2. The eardrum vibrates from the incoming sound waves and sends these vibrations to three tiny bones in the middle ear. These bones are called the malleus, incus, and stapes.
3. The bones in the middle ear couple the sound vibrations from the air to fluid vibrations in the cochlea of the inner ear, which is shaped like a snail and filled with fluid. An elastic partition runs from the beginning to the end of the cochlea, splitting it into an upper and lower part. This partition is called the basilar membrane because it serves as the base, or ground floor, on which key hearing structures sit.
4. Once the vibrations cause the fluid inside the cochlea to ripple, a traveling wave forms along the basilar membrane. Hair cells—sensory cells sitting on top of the basilar membrane—ride the wave.
5. As the hair cells move up and down, microscopic hair-like projections (known as stereocilia) that perch on top of the hair cells bump against an overlying structure and bend. Bending causes pore-like channels, which are at the tips of the stereocilia, to open up. When that happens, chemicals rush into the cells, creating an electrical signal.
6. The auditory nerve carries this electrical signal to the brain, which turns it into a sound that we recognize and understand.

## Why do we lose our hearing as we get older?

Many factors can contribute to hearing loss as you get older. It can be difficult to distinguish age-related hearing loss from hearing loss that can occur for other reasons, such as long-term exposure to noise.

Noise-induced hearing loss is caused by long-term exposure to sounds that are either too loud or last too long. This kind of noise exposure can damage the sensory hair cells in your ear that allow you to hear. Once these hair cells are damaged, they do not grow back and your ability to hear is diminished.

Conditions that are more common in older people, such as high blood pressure or diabetes, can contribute to hearing loss. Medications that are toxic to the sensory cells in your ears (for example, some chemotherapy drugs) can also cause hearing loss.

Rarely, age-related hearing loss can be caused by abnormalities of the outer ear or middle ear. Such abnormalities may include reduced function of the tympanic membrane (the eardrum) or reduced function of the three tiny bones in the middle ear that carry sound waves from the tympanic membrane to the inner ear.

Most older people have a combination of both age-related hearing loss and noise-induced hearing loss.

## Can I prevent age-related hearing loss?

At this time, scientists don't know how to prevent age-related hearing loss. However, you can protect yourself from noise-induced hearing loss by protecting your ears from sounds that are too loud and last too long. It's important to be aware of potential sources of damaging noises, such as loud music, firearms, snowmobiles, lawn mowers, and leaf blowers. Avoiding loud noises, reducing the amount of time you're exposed to loud noise, and protecting your ears with ear plugs or ear muffs are easy things you can do to protect your hearing and limit the amount of hearing you might lose as you get older.

## What should I do if I have trouble hearing?

Hearing problems can be serious. The most important thing you can do if you think you have a hearing problem is to seek advice from a health care provider. There are several types of professionals who can help you. You might want to start with your primary care physician, an otolaryngologist, an audiologist, or a hearing aid specialist. Each has a different type of training and expertise. Each can be an important part of your hearing health care.

- An otolaryngologist (oh-toe-lair-in-GAH-luh-jist) is a doctor who specializes in diagnosing and treating diseases of the ear, nose, throat, and neck. An otolaryngologist, sometimes called an ENT, will try to find out why you're having trouble hearing and offer treatment options. He or she may also refer you to another hearing professional, an audiologist.
- An audiologist (aw-dee-AH-luh-jist) has specialized training in identifying and measuring the type and degree of hearing loss. Some audiologists may be licensed to fit hearing aids.

## How can I tell if I have a hearing problem?

Ask yourself the following questions. If you answer "yes" to three or more of these questions, you could have a hearing problem and may need to have your hearing checked.

| YES | NO | |
|---|---|---|
| ☐ | ☐ | Do you sometimes feel embarrassed when you meet new people because you struggle to hear? |
| ☐ | ☐ | Do you feel frustrated when talking to members of your family because you have difficulty hearing them? |
| ☐ | ☐ | Do you have difficulty hearing or understanding co-workers, clients or customers? |
| ☐ | ☐ | Do you feel restricted or limited by a hearing problem? |
| ☐ | ☐ | Do you have difficulty hearing when visiting friends, relatives, or neighbors? |
| ☐ | ☐ | Do you have trouble hearing in the movies or in the theater? |
| ☐ | ☐ | Does a hearing problem cause you to argue with family members? |
| ☐ | ☐ | Do you have trouble hearing the TV or radio at levels that are loud enough for others? |
| ☐ | ☐ | Do you feel that any difficulty with your hearing limits your personal or social life? |
| ☐ | ☐ | Do you have trouble hearing family or friends when you are together in a restaurant? |

*Adapted from: Newman, C.W., Weinstein, B.E., Jacobson, G.P., & Hug, G.A. (1990). The Hearing Handicap Inventory for Adults [HHIA]: Psychometric adequacy and audiometric correlates. Ear Hear, 11, 430-433.*

- A hearing aid specialist is someone who is licensed by your state to conduct and evaluate basic hearing tests, offer counseling, and fit and test hearing aids. You must be examined by a physician before you can be fitted for a hearing aid, although federal law allows you to sign a waiver if you don't wish to be examined before you purchase an aid.

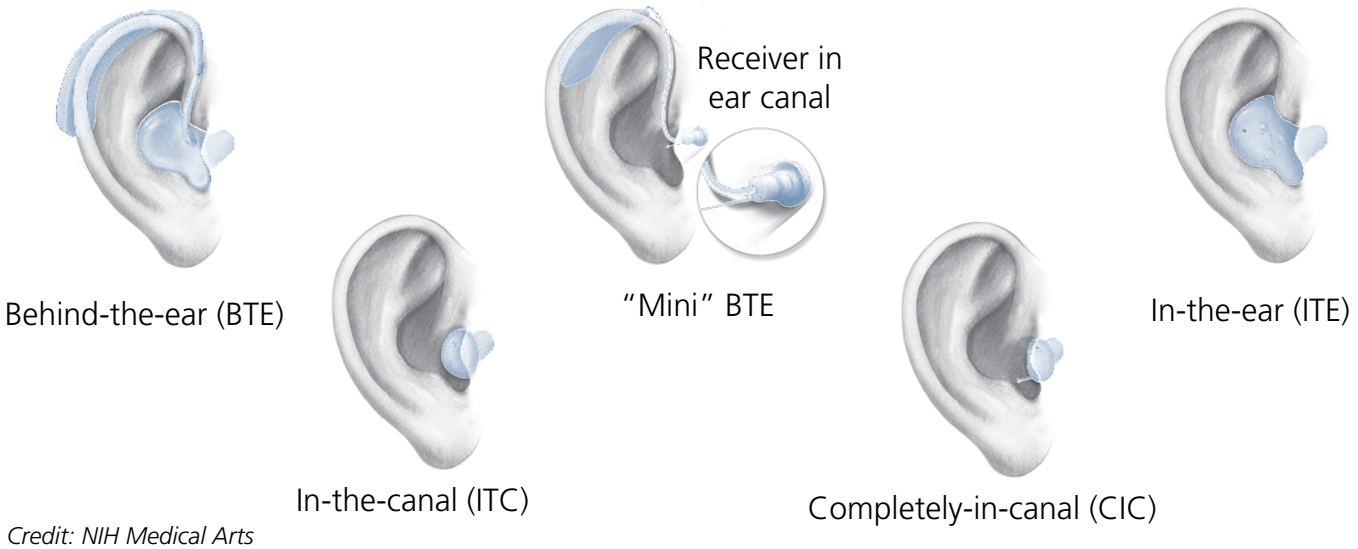
## What treatments and devices can help?

Your treatment will depend on the severity of your hearing loss, so some treatments will work better for you than others. There are a number of devices and aids that help you hear better when you have hearing loss. Here are the most common ones:

- **Hearing aids** are electronic instruments you wear in or behind your ear (see figure). They make sounds louder. To find the hearing aid that works best for you, you may have to try more than one. Be sure to ask for a trial period with your hearing aid and understand the terms and conditions of the trial period. Work with your hearing aid provider until you are comfortable with putting on and removing the hearing aid, adjusting the volume level, and changing the batteries. Hearing aids are generally not covered by health insurance companies, although some do. Medicare does not cover hearing aids for adults; however, diagnostic evaluations are covered if they are ordered by a physician for the purpose of assisting the physician in developing a treatment plan. (Read the NIDCD fact sheet "Hearing Aids" at *https://www.nidcd.nih.gov/health/hearing-aids* for more information.)

- **Cochlear implants.** Cochlear (COKE-lee-ur) implants are small electronic devices surgically implanted in the inner ear that help provide a sense of sound to people who are profoundly deaf or hard-of-hearing. If your hearing loss is severe, your doctor may recommend a cochlear implant in one or both ears. (Read the NIDCD fact sheet "Cochlear Implants" at *https://www.nidcd.nih.gov/health/cochlear-implants* for more information.)

**Styles of hearing aids**




*Credit: NIH Medical Arts*

- **Bone anchored hearing systems** bypass the ear canal and middle ear, and are designed to use your body's natural ability to transfer sound through bone conduction. The sound processor picks up sound, converts it into vibrations, and then relays the vibrations through your skull bone to your inner ear.
- **Assistive listening devices** include telephone and cell phone amplifying devices, smart phone or tablet "apps," and closed-circuit systems (hearing loop systems) in places of worship, theaters, and auditoriums. (Read the NIDCD fact sheet "Assistive Devices for People with Hearing, Voice, Speech, or Language Disorders" at *https://www.nidcd.nih.gov/health/assistive-devices-people-hearing-voice-speech-or-language-disorders* for more information.)
- **Lip reading** or **speech reading** is another option that helps people with hearing problems follow conversational speech. People who use this method pay close attention to others when they talk by watching the speaker's mouth and body movements. Special trainers can help you learn how to lip read or speech read.

## Can my friends and family help me?

You and your family can work together to make living with hearing loss easier. Here are some things you can do:

- Tell your friends and family about your hearing loss. The more friends and family you tell, the more people there will be to help you cope with your hearing loss.
- Ask your friends and family to face you when they talk so that you can see their faces. If you watch their faces move and see their expressions, it may help you to understand them better.
- Ask people to speak louder, but not shout. Tell them they do not have to talk slowly, just more clearly.
- Turn off the TV or the radio when you aren't actively listening to it.
- Be aware of noise around you that can make hearing more difficult. When you go to a restaurant, for example, don't sit near the kitchen or near a band playing music. Background noise makes it hard to hear people talk.

Working together to hear better may be tough on everyone for a while. It will take time for you to get used to watching people as they talk and for people to get used to speaking louder and more clearly. Be patient and continue to work together. Hearing better is worth the effort.

## What research is being done?

The NIDCD is supporting research on the causes of age-related hearing loss, including genetic factors. Some NIDCD-supported scientists are exploring the potential to regrow new hair cells in the inner ear using drug or gene therapies. Other NIDCD-supported work is exploring medications that may reduce or prevent noise-induced and age-related hearing loss. Scientists supported by the NIDCD are also developing and refining devices that can be used to help people with age-related hearing loss.

National Institute on Deafness and Other Communication Disorders

## Where can I find additional information about age-related hearing loss?

The NIDCD maintains a directory of organizations that provide information on the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language. Visit the NIDCD website at *http://www.nidcd.nih.gov* to see the directory.

Use the following keywords to search for organizations that can answer questions and provide information on age-related hearing loss:

- Late-deafened adults
- Hearing aids
- Presbycusis
- Hard-of-hearing
- Tinnitus

### Additional NIDCD fact sheets on hearing:

- Cochlear Implants
- Hearing Aids
- Hearing Loss and Older Adults
- Noise-Induced Hearing Loss
- Tinnitus

Visit the NIDCD website at *http://www.nidcd.nih.gov* to read, print, or download publications.

For more information, additional addresses and phone numbers, or a printed list of organizations, contact us at:

**NIDCD Information Clearinghouse**
1 Communication Avenue
Bethesda, MD 20892-3456
Toll-free Voice: (800) 241-1044
Toll-free TTY: (800) 241-1055
Fax: (301) 770-8977
Email: nidcdinfo@nidcd.nih.gov

http://www.nidcd.nih.gov

Follow the NIDCD on Twitter at @NIDCD

**The NIDCD supports and conducts research and research training on the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language and provides health information, based upon scientific discovery, to the public.**

**Age-Related Hearing Loss (formerly Presbycusis)**
NIH Pub. No. 97-4235
March 2016