



A program of the National Institutes of Health

Hair Cell Activity



Every day, we experience sound in our environment, such as the sounds from television and radio, household appliances, and traffic. Normally, these sounds are at safe levels that do not damage our hearing. However, sounds can be harmful when they are too loud, even for a brief time, or when they are both loud and long lasting. These sounds can damage sensitive structures in the inner ear and cause noise-induced hearing loss (NIHL). Approximately 26 million adults in the United States—and millions of teens—have hearing loss likely caused by noise.

The good news is that NIHL is preventable. Developing healthy hearing habits while young is a key step to preventing hearing loss. To increase awareness among parents and youth about NIHL and how to prevent it, the National Institute on Deafness and Other Communication Disorders (NIDCD), part of the National Institutes of Health, developed the health education campaign *It's a Noisy Planet. Protect Their Hearing.*[®]

The Noisy Planet campaign offers a wide range of print and online materials to help spread the word and educate youth and adults about the importance of hearing preservation.

One component of the campaign is an interactive 45-minute classroom presentation. There are several activities that presenters can choose to reinforce the educational messages. One activity to reinforce the “hair cell damage” message is the pipe cleaner activity. This activity uses pipe cleaners as a science model to represent hair cells, or stereocilia, to demonstrate to participants how loud sounds over time can damage their sensory hair cells. This activity shows how NIHL occurs and why it is so important to protect our hearing.

Steps:

1. Show the audience the picture of healthy and unhealthy hair cells. Explain that people often call the image of the healthy hair cell the “flaming pickle.” There are about 18,000 hair cells inside your ear, and they are so small that all of them can fit on the head of a pin. Explain that each hair cell is topped with a hair cell bundle made of precisely arranged structures called stereocilia (pronounced STARE-ee-oh-SILL-ee-ah). Explain that the pipe cleaners represent stereocilia, and their hand is the body of a single hair cell.



Materials:

- Five pipe cleaners per participant

- 
2. Hold the pipe cleaners in your fist and ask the audience to do the same. These pipe cleaners will act as stereocilia do in the cochlea—they bend when they are exposed to sound. Tell a narrative of typical sounds people hear. At the same time, you, as well as the audience, run your hand over the pipe cleaners to bend them.
 - a. Adjust the intensity of the contact with the pipe cleaners with the loudness of the sound being described. Gently bend the pipe cleaners for softer sounds, and apply more pressure and intensity to the pipe cleaners when describing louder noises.
 - b. Have the audience hold the pipe cleaners in their left fist while you tell the story of a typical 4th of July day. You get up, and you make a bowl of cereal, which is now snapping, crackling, and popping (audience run their hands over pipe cleaners a little). Then your dad comes downstairs and asks you to mow the lawn. You go out (without hearing protection) and start the mower, which is really loud (run your hand over pipe cleaners more intensely). Then you go to a picnic, and you're having a great time, when at 10 p.m., it's time for the fireworks. You go down to the front row, and all of a sudden, you hear BOOM BANG BOOM! (Students are running their hands over their pipe cleaners like crazy.) Now let's look at our stereocilia. (Most are going to look very misshapen and bent.) Can you fix it? No, you can't seem to fix it, can you? You may want to think about what you say depending on the age of the audience. For example, if your audience is younger kids, you wouldn't mention high school football games and concerts. However, if your audience is older, you might mention these things and the noise of pep rallies, school shows, and things like that.
 - c. By the end of the demonstration, the pipe cleaners should be pretty bent and look "broken."
 3. Ask the audience to "fix" (straighten) their pipe cleaners. Can they make them as straight as they were originally? The answer is no. Just like the damaged pipe cleaners, stereocilia can be damaged after too much noise. And just as you can't make the pipe cleaners go back to normal, you can't fix stereocilia.
 4. Furthermore, when stereocilia are damaged, the hair cells will die. Only fish, frogs, and birds can regrow new hair cells after they have been damaged. NIDCD scientists are trying to figure out how to get hair cells to regrow in people, but that hasn't happened yet.

The National Institute on Deafness and Other Communication Disorders (NIDCD), part of the National Institutes of Health (NIH), conducts and supports research in the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language.

For more information about hearing and hearing loss, contact:

NIDCD Information Clearinghouse
1 Communication Avenue, Bethesda, MD 20892-3456
Voice: (800) 241-1044
TTY: (800) 241-1055
Email: NPInfo@nidcd.nih.gov



NIH...Turning Discovery Into Health®