



Michigan Society
for Medical Research

BioFocus

A Newsletter Exploring Science & Biomedical Research Issues For School Educators

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Our Mission

The Michigan Society for Medical Research (MISMR) is a nonprofit educational organization that supports biomedical research and testing and the judicious use of animals in research, education and testing in the interests of human and animal welfare. Established in 1981, MISMR is made up of the state's leading research universities, teaching hospitals, pharmaceutical companies, voluntary health organizations and hundreds of scientists, educators and students who understand and support the importance of animal research and testing in advancing health care and treatment.

MISMR Educational Projects & Activities

ANNUAL ESSAY CONTEST

Every year MISMR sponsors an essay contest open to all Michigan high school students. Students from well over 500 schools in the state have annually participated in the contest to address the benefits of biomedical research. Prizes are awarded.

SPEAKERS BUREAU

MISMR volunteers visit K–12 schools and civic community groups through out Michigan each year to educate the public about biomedical research and to dispel commonly held myths.

ANNUAL SYMPOSIUM

MISMR's popular annual meetings have often proved to be "standing room only," typically attracting local and national educators and researchers with interactive training workshops and presentations promoting biomedical research.

WE WANT TO HEAR FROM YOU!

We want to include your stories, comments or questions relating to animals in your classroom in upcoming editions of *BioFocus*. Please email stories to: mismr@umich.edu

BioFocus

BioFocus is published by the Michigan Society for Medical Research. Please send your questions, comments, and suggestions to:

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Do You Hear What I'm Saying?



The answer from young people to this popular rhetorical question may increasingly be "no." A 2008 study by the European Scientific Committee on Emerging and Newly Identified Health Risks shows that 5–10% of listeners to personal music players (iPods, etc.) risk permanent hearing loss if they listen at high volume for at least one hour a week over extended periods of time: throughout high school, for example. Other studies show that 15% of college

graduates have hearing loss equal to or worse than their parents.

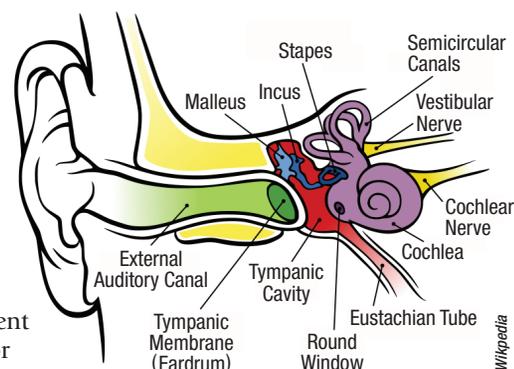
The U.S. National Institute on Deafness and Other Communication Disorders estimates that 26 million American are suffering from noise-induced hearing loss. With at least 173 million people using iPods and MP3 players, over 17 million are at risk of permanent damage to their hearing if they listen to music that is too loud for too long.

How many hours a day do you listen to your iPod or MP3 player, and how often do you "crank up" the volume?

Hearing is produced by a finely tuned set of mechanisms that collect, amplify, and interpret sound waves traveling through the air. Short sound waves are higher in frequency and higher in pitch (they sound higher); longer waves are less frequent and sound lower. The number of sound waves per second is measured in hertz. People can normally hear between 20 and 17,000 hertz. A dog whistle that is too high for people to detect is 20,000 hertz.

The intensity or loudness of sound is measured in decibels. Normal human conversations occur at 60 decibels, whereas whispering is only 20. Traffic noise is 80, and gradual hearing loss begins with long exposure to 90 decibels (the sound of a lawnmower or motorcycle). A mere minute-long exposure to a chainsaw's 110 decibels can cause permanent hearing loss. At the high end, the sounds of firecrackers and rock concerts — at 140 decibels — hearing is seriously at risk. Many rock stars are living examples of loudness-induced hearing loss.

The ear is divided into 3 obvious regions, containing increasingly delicate mechanisms the deeper one goes. The outer ear collects sound waves from the air, which passes through the ear canal. The middle ear is more complex. Inside it the eardrum, a thin membrane that vibrates as sound waves hit it, sets into motion a series of three tiny bones that fine-tune and amplify the sound. The first is the malleus (or hammer), which hits the second bone, the incus (or anvil). The movement of the anvil drives the third bone, the stapes (or piston) so that it pushes back and forth against a tiny membrane in the cochlea, a snail-shaped, fluid-filled vessel in the inner ear. As the fluid moves it sets in motion tiny hair cells inside the cochlea. (Imagine the wires of a piano.) The hair cells are organized in three rows, and the inner row sends auditory information to the auditory nerve and on to the brain. Hearing is lost in direct proportion to how many hair cells die.



Noise-induced hearing loss — like a number of modern maladies — is completely preventable, but the symptoms, which increase gradually, may not be recognized at an early stage. Symptoms may include vague feelings of pressure in the ears, distorted sounds, and ringing in the ears. (The sensation of ringing in the ears, called tinnitus, is actually produced by the brain "filling in the void" in response to understimulation by sound waves.) Lowering the volume on sound devices and using background-noise excluding headphones as opposed to earbuds reduce ear damage. Wearing earplugs or earmuffs to reduce decibels to safe levels in the workplace are other simple and obvious preventive measures. Industry restrictions on the maximum loudness of personal music players — currently in place in Europe — are another solution.

Do you ever have ringing in your ears?

There are many other causes of hearing loss and deafness. Premature birth or prenatal rubella can cause hearing loss in a child, as can repeated ear infections (or otitis media). Autoimmune diseases like rheumatoid arthritis can damage hearing, and there are indications that diabetes contributes to hearing loss. Genetic mutations also play a role in auditory function.

The most common treatment for hearing loss is a hearing aid, a device worn inside the outer ear that, in its simplest form, amplifies sound. Digital technology has improved hearing aids, permitting adjustments so that speech can be clearly heard in environments with varying amounts of background noise. Patients who acquire hearing aids show as much

Continued on back...

Fast Facts...

Hearing Aids

Hearing aids can't help everyone with hearing loss, but they can improve hearing for many people. The components of a hearing aid include:

- A microphone to gather in the sounds around you
- An amplifier
- An earpiece to transmit sounds to your ear
- A battery

Hearing aids come in a variety of sizes, shapes and styles. Some rest behind your ear with a small tube delivering the amplified sound to the ear canal (*see photo to the right*). Other styles fit in your outer ear or within your ear canal.

The sound you hear with a hearing aid is different because it's amplified. Getting used to one takes time so most states have laws requiring a trial period before you buy one. This makes it easier for you to decide if the aid helps.

Cochlear Implants

For more severe hearing loss, often due to damage to your inner ear, a cochlear implant may be an option. Unlike a hearing aid that amplifies sound and directs it into your ear canal, a cochlear implant is an electronic device that compensates for damaged or nonworking parts of your inner ear. When considering a cochlear implant, your audiologist, along with a medical doctor who specializes in disorders of the ears, nose and throat (ENT), would discuss the risks and benefits with you.

SOURCE:
<http://www.mayoclinic.com/health/hearing-loss>

www.mismr.org

Do You Hear... Continued from front



Hearing aids amplify sound.

as a 36% reduction in feelings of anger, frustration and depression that had accompanied their hearing loss.

Digital hearing aids may cost from \$1300 to \$3000 per ear, and are not covered by insurance. Analog hearing aids run a bit lower.

While hearing aids amplify sound, cochlear implants are devices that completely bypass the outer and middle regions of the ear, providing information directly to the auditory (or eighth) nerve. Priced at between \$40,000 and \$60,000, implants are for those with severe hearing loss, but intact auditory nerves. Cochlear implant users are still functionally deaf, but can achieve some understanding of speech, depending on when the original hearing loss occurred.

Despite all of the discouraging news, universities in Michigan are making some exciting discoveries. A recent animal study at The University of Michigan suggests that some nutrients may prevent noise-induced hearing loss that

may occur in combat zones, the workplace, and even at rock concerts. When high doses of vitamins A, C, and E combined with magnesium were given to guinea pigs an hour before, and after, daily exposure to sounds as loud as a jet engine, permanent hearing loss was prevented. It's hoped that this research will result in a pill or snack bar that will protect against noise-induced hearing loss.

Taking another tack, Michigan State University has discovered specific genetic mutations that contribute to hearing loss that comes with age. This opens the door to the possible prevention or cure of hearing loss with gene therapy. Some other animals are able to regenerate the hair cells of the inner ear.

Biomedical research with birds has revealed that even if they are repeatedly deafened, they recover their full hearing within a couple of weeks. Eventually, people may be able to restore their own hearing by regrowing damaged parts of the inner ear.

Teens may be unaware of how damaging hearing loss can be to their quality of life, but as we age it becomes increasingly apparent. Hearing loss begins with higher frequency sounds, as those hair cells that detect them are the first to be damaged. Higher frequency sounds include human conversation and particularly the sounds of consonants.

That loss limits the ability to hear speech against background noise, as in a city or at a social event. (In face-to-face conversation, consonants are easily lip-read even by the untrained. This can compensate for hearing loss, so that it goes unnoticed.)

Loss of hearing can have profound social implications. People who are "hard of hearing" are sometimes mistakenly perceived as inattentive, dull, or among the elderly, even senile. The image of grandparents nodding unknowingly to questions they couldn't hear, or repeatedly asking, "What did you say?" is a common one in our culture. Further biomedical research and prevention efforts will relegate that image to the past.

Is there a history in your family that might suggest you have a genetic predisposition to hearing loss?

Should manufacturers of personal music players be required to limit maximum volume to safe levels?

*** November 28th has been designated the National Day of Listening. ***

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