Like an earplug in a pill; Drugs may one day prevent noise damage from concerts, construction and combat.

Ted Ax knows he should wear earplugs when he leans into the noisy engine compartment of an MG sports car. He's been working among clanging metal and whirring power tools in garages for the last 15 years and has already developed tinnitus, a ringing in the ears that is one of the most common symptoms of hearing loss caused by excessive noise.

But between the need to pinpoint troubled engine sounds and listen out for the phone -- and with his fingers forever covered in grease -- the Denver man's earplugs go unused.

"I have yet to come up with a real-world scenario where I can have hearing protection and do my job," says the 42-year-old foreign- car mechanic.

Ax might soon have a more amenable option -- a pill he could take before work that would help protect his ears from noise.

Ax is one of an estimated 30 million Americans who are exposed to hazardous levels of noise daily at work or at leisure, be it from the buzz of leaf-blowers and landscape equipment, the jangling of construction tools, the cacophony of a concert or the roar of a motorcycle engine. Until now, hearing protection for such people has consisted of using barrier devices such as earplugs or earmuffs and limiting the time a worker spends exposed to loud noises.

Recently, however, several groups have started testing various chemicals for their safety and effectiveness at preventing noise- induced hearing loss in people. If the tests go well and the drugs are approved by the Food and Drug Administration, they would be the first of their kind.

Noise damages hearing by stressing out the inner-ear cells that convert sound waves into electrical signals that travel to the brain. These hair cells vibrate in response to sound and can be both physically and chemically destroyed by noise.

Most commonly, noise causes levels of toxic chemicals called free radicals inside the hair cell to rise beyond manageable levels, and the cell dies. Once a hair cell dies, the body cannot replace it.

Damage can occur from repeated exposure to noise at or above 85 decibels -- the loudness of a busy city street or a vacuum cleaner - - or from a short burst of a very intense noise such as gunfire.

If too many hair cells die, the inner ear can no longer detect sounds from certain frequencies -- particularly, high-pitched sounds. Eventually, that hearing loss obscures conversation, dropping out sounds such as "ess" and "ch."

"I compare it sometimes to playing Wheel of Fortune, when the vowels are up and you have to guess the word without the consonant sounds," says Kathleen Campbell, director of audiology research at Southern Illinois University in Springfield.

So too can come an aggravating tinnitus, in which a person experiences a ringing, hissing or roaring in the ears, even when no external sound is present.

About 10 million Americans suffer from noise-induced hearing loss, according to the National Institute for Occupational Safety and Health. The problem is particularly rampant in the military: In 2006, the Veterans Administration paid $1 billion in compensation to veterans for service-related hearing disabilities, the vast majority of which are noise-related.

"The military is really loud, for long periods of time," says Cmdr. Ben Balough, chairman of otolaryngology at the Navy Medical Center in San Diego. If you are on a submarine, an aircraft carrier or in Iraq, you cannot escape the noise, Balough adds. Explosions and jet engine noise are so jarring that even wearing hearing protection is not always enough.

So it's not surprising that three of the potentially protective chemicals -- D-methionine, ebselen and N-acetylcysteine (NAC) -- will be tested on military personnel first. All three give a boost to a natural antioxidant, glutathione, that's found in hair cells and battles chemical stress. All three can be taken orally as pills or dissolved in water. And each has been shown to be relatively safe in preliminary human studies.

Balough and his colleagues tested NAC on 566 Marine Corps recruits during boot camp weapons training in San Diego in 2004, during which they were exposed to about 300 rounds of M-16 rifle fire. Half of the recruits drank NAC three times a day for the 15 days of training, while the other half received a placebo tablet. (All recruits wore foam insert earplugs during training, as is standard.) Researchers measured the recruits' hearing before and after the noise exposure.

The results, reported April at a San Diego otolaryngology meeting, revealed that about one-third of recruits in the placebo group showed some hearing loss and that the NAC treatment reduced the number of people injured by the noise by about 25%. These results are not bad, but not spectacular, Balough says. More work is needed to determine if the drug really gives a protective benefit.

D-methionine, a naturally occurring chemical that can be found in cheese and yogurt, is also being tested. Campbell estimates that a person would have to eat 5 pounds of cheese to get the correct dose for hearing protection. She has formulated D-methionine into an orange-flavored syrup that can be diluted in a glass of water.

The chemical is currently being tested for its ability to protect cancer patients from hearing loss caused by certain chemotherapy drugs, such as cisplatin (results are still pending). And Campbell is seeking funding to test the compound in military trials for noise- induced hearing loss. In studies using the chinchilla -- a desert rodent that has a hearing frequency range similar to humans -- D-methionine protected against noise-induced hearing loss almost completely, with animals losing less than 10% of their hair cells compared with the 40% lost by animals that went unprotected.

Seattle-based drug company Sound Pharmaceuticals is developing the third compound, ebselen, a man-made compound. The drug mimics the action of an enzyme in the body that naturally recharges glutathione. Ebselen has been shown to protect against noise- induced hearing loss in rats and guinea pigs and at very low oral doses -- something that is critical for developing a daily treatment, says Jonathan Kil, the company's chief executive.

The company will test ebselen in two weapons-training trials this summer: at Camp Pendleton in Oceanside and Ft. Lewis in Tacoma, Wash. Soldiers will take an oral dose of ebselen twice daily for two weeks. Their hearing will be tested six hours after noise exposure to see if ebselen can protect against the temporary hearing loss experienced after loud noises. It will be tested again two and four weeks after the weapons training to see if ebselen protects against permanent hearing loss.

The developers of these drugs say a drug for noise-induced hearing loss will likely be approved in the next five to 10 years.

The possibility that sailors or soldiers could take a pill that would protect their ears appeals to Lt. Cmdr. Joel Bealer, head of occupational audiology at the Naval Medical Center Portsmouth in Virginia. He oversees the hearing health of roughly 60,000 patients, many of whom work in the most deafening of noise environments, on aircraft carriers. To be practical, drugs will have to be "easily deliverable, palatable and have no side effects," he says.

Bealer does see one potential downside to such pills -- that soldiers might forgo wearing their earplugs. Drugs, he says, must be added to current protection practices, not replace them.

Whether these drugs will be picked up by other occupations or for recreational noise exposures such as hunting and concerts remains up in the air.

"Clearly there's a tremendous need in the military, but I really doubt people are going to be swigging this stuff before going to a nightclub," says William Martin, a hearing scientist at Oregon Health & Science University in Portland. Drugs, he says, usually come with expensive price tags and possible side effects.

But Kil of Sound Pharmaceuticals predicts that people would take a pill before mowing the lawn or heading out for a night on the town if it were available as a safe and effective way to save their hearing.

Ax, the Colorado mechanic, says he would have taken a drug if it could have safely prevented his hearing loss and the ringing sensation he now lives with daily.

"That," he says, "would have been a no-brainer."

Turn down the volume

Protective drugs may be coming soon, but they'll never be substitutes for good hearing health.

And it's never been more important. Ten million Americans currently suffer from noise-induced hearing loss today. Today's earbuds for cellphones and iPods put hearing at greater risk.

The Centers for Disease Control and Prevention estimate that more than 12% of children ages 6 to 19 already show symptoms of noise damage.

Fortunately, noise-induced hearing loss is preventable (go to www.dangerousdecibels.org, www.cdc.gov/niosh/topics/noise and www.hearingconservation.org.) Here are some general tips.

A rule of thumb: If someone has to raise his or her voice to be heard by you, the noise level is probably above the 85-decibel danger line.

The National Institute for Occupational Safety and Health has set 85 decibels as the level of noise to which a worker can be safely exposed for up to eight hours. For every three decibels added above that, the safe exposure time is cut in half.

Leaf-blowers, snowmobiles, motorbikes, kitchen blenders and sporting events are all louder than 85 decibels. You can buy a noise meter that will tell you when you've reached the danger zone for any activity.

When you encounter dangerous noise levels, take steps to protect your hearing:

* Turn down the volume. Most MP3 players can be safely listened to at 70% of the maximum volume for several hours. But more than 90 minutes at 80% volume is damaging.

* Put distance between yourself and the noise. Sound pressure is cut in half when you double the distance from the source.

* Plug your ears. Wearing earplugs, earmuffs or even sticking your fingers in your ears can save your hearing from noisy assaults.

-- Kendall Powell

Credit: Special to The Times