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Those painful ear rings

Signs that the brain plays a key role in ringing of the ears resonate with research looking for causes and treatments

Wednesday, March 12, 2008

JOE ROJAS-BURKE
The Oregonian Staff

When it's quiet, Elliott Berger's ears sense a cacophony: ringing, hissing and a rough, cricketlike blaring.

The virtual noises began plaguing the 55-year-old hearing-protection researcher after an accidental exposure to a loud blast from a starter pistol heard through a malfunctioning electronic device.

"It was debilitating," Berger said. "I had trouble working, concentrating, thinking -- it was incredibly difficult to sleep, to work, to relax, to enjoy life."

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Jim Bunn of Amity, a former legislator and congressman, filed Tuesday as a Republican candidate for the Oregon House.
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An estimated 40 million Americans suffer from chronic ringing in the ears, or tinnitus. Despite decades of research and hundreds of clinical trials of potential treatments, researchers still haven't found an effective way to stop the noise.

But recent discoveries challenge long-standing assumptions about what causes tinnitus. The new findings suggest that for many sufferers, the problem resides more in the brain than in the ears. That insight has sparked promising treatment ideas being tested in clinical trials. Among them:

Using drugs to target brain neurotransmitters, which might restore a balance of signaling in hyperactive brain areas linked to tinnitus.

Applying powerful electromagnets to the scalp to suppress those same overactive brain areas.

Implanting devices, for the most severe cases, that directly stimulate the brain to stop tinnitus.

"In the past, we've always approached it as an ear issue," says Billy Martin, a professor at Oregon Health & Science University and director of the medical school's tinnitus clinic. "Now a lot of the research is starting to look at what's going on in the brain. There's lots of new tracks being pursued."

OHSU researchers recently launched a clinical trial testing a drug called acamprosate, marketed since 2004 as treatment for alcoholism. Brazilian researchers, the first to study the drug for tinnitus, reported in 2005 that it improved symptoms in a majority of patients with few side effects. But the preliminary study included only 50 patients and tracked symptoms for only three months.

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Martin says the drug might work by restoring a balance of brain neurotransmitters.

"There is evidence from basic science research that tinnitus is probably related to an increase in abnormal spontaneous activity in the brain," he says. One brain-signaling molecule that puts the brakes on brain activity is depleted in people and animals that have this increase in spontaneous activity, Martin says.

Beyond the ears

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Richard Salvi, a tinnitus researcher at the State University of New York at Buffalo, long doubted that the cause could reside entirely in the ears. The biggest clue: Tinnitus persists in patients who've had tumors removed from the inner ear, even though the surgery cuts the nerves between the ear and brain.

"You lose all your hearing, but you still have tinnitus," Salvi says.

To understand what was going on, Salvi and fellow researchers recruited patients who could readily provoke more intense ear-ringing symptoms by clenching their jaws or shifting their gaze.

"We could have the same brain, with tinnitus active or inactive, and show the changing pattern of brain expression," he says. "Patients loved it." They had a picture to show others and validate their symptoms.

In silence, but while experiencing sounds of tinnitus, the brain scans lit up with activity in the brain's hearing center -- but only on one side of the brain. That was significant, Salvi says, because real sounds propagating from the ear activate both sides of the brain.

"Since tinnitus only activated one side, it couldn't have come from the inner ear," he says.

When the researchers played sounds during brain scanning, they found that the hearing centers in the brains of people with tinnitus overreacted compared to the brains of people without tinnitus.

Phantom pain

The emerging picture suggests that tinnitus might be akin to phantom-limb syndrome, in which amputees experience itching or pain from a limb that no longer exists.

Damage from too much loud noise -- rock concerts, gunfire, machinery -- is the most common cause of tinnitus. Sensitive hearing tests show that most people with tinnitus also have some degree of hearing loss.

Salvi and fellow researchers speculate that in some people, the brain goes overboard trying to compensate for the lost hearing, like a driver turning up the volume on the car radio as the signal from the hometown radio station fades.

"The ear is no longer sending information to the brain," Salvi says. "The lack of information causes the brain to turn up its volume control. When the brain turns up its volume control, noise or static increases as well."

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