

Understanding Tinnitus

This handout is designed to help you learn more about the relationship between tinnitus and the auditory system. It is my goal that this packet provides useful information on the likely cause, origin, and possible treatment options available for patients with tinnitus. If you have any questions or concerns regarding hearing or tinnitus, please do not hesitate to contact The Comprehensive Hearing Center of Texas at **512-478-2273**.

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FAQs about Tinnitus

What is tinnitus?

Simply stated, it is the perception of sound when no external stimulation is present.

Is tinnitus normal?

There is a distinction between “normal” and “pathological” tinnitus. Most auditory systems produce tinnitus from time to time. It appears unexpectedly and lasts less than five minutes, and typically is not bothersome. In “pathological” tinnitus, the sound is more persistent and constant. It does not predictably go away; therefore it can be much more disturbing. (Dauman & Tyler, 1992)

How common is “pathological” tinnitus?

Approximately 12-15 million Americans are bothered enough by it that they seek medical help. (Fagelson, 2009)

What can cause tinnitus?

It is important to think of tinnitus as a symptom, not a disease. Tinnitus is commonly a symptom of hearing damage. The extent of damage to the hearing organ can vary, but typically it is caused by noise exposure. Other factors have been attributed to tinnitus such as medication, surgery, illness, and more. (Hazell, 1995)

If tinnitus is most commonly caused by hearing damage, what is the relationship between the brain and tinnitus?

There are several neurophysiological theories regarding the origin of tinnitus. A well-accepted model is that of spontaneous activity. This theory states that damage to hair cells in the inner ear can cause an increased amount of neuronal activity (specifically, excitation and inhibition). The auditory system picks up on this spontaneous activity of the inner ear hair cells, and the auditory system tries to make sense of the sound- thus perceiving tinnitus. (Jastreboff, 1990; Kaltenbach, 2011)

Basically, this theory states that the brain perceives extra sound caused by damaged inner hair cells.

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Neurophysiological/Behavioral Approach to Tinnitus Treatment

Ok, so the brain perceives an extra sound. Why is it annoying?

Following the neurophysiological theory, as people experience tinnitus they may or may not pay it attention. In the case where it is ignored, it “blends” into the background and very little attention is paid to it. In the case where it is assigned a high priority, tinnitus can increasingly become a focal point.

Constant tinnitus can cause anxiety and stress in many people. Once a negative connection is established, a vicious cycle can begin.

Basically, this cycle involves perceiving tinnitus, negative feelings, and physical reactions. The physical reactions (stress, etc.) can therefore, cause a greater perception of tinnitus. Thus the cycle continues. (Jastreboff & Hazell, 1993; Fagelson, 2009)

What treatments are available?

One treatment option is *sound therapy*. The goal with *sound therapy* is to introduce a different sound to the auditory system in hopes that the patient habituates to their tinnitus over time. This helps reduce the perceived strength of the tinnitus through habituation.

In recent studies, improvement has been seen by delivering sound that concentrates in the frequency range of the hearing loss. (Kaltenbach, 2011)

Another option is *Tinnitus Retraining Therapy (TRT)*. In *TRT*, emphasis is placed on educating patients to better understand their tinnitus and how their negative thoughts and reactions can actually cause the tinnitus to be more severe. The goal of *TRT* is to give patients more control over their tinnitus and how they react to it. For example, the steps would grossly follow:

1. Recognize what the sound is and know what causes it.
2. Recognize that you have ignored other sounds in the past.
3. Think of tinnitus as a neutral sound that you can process (and eventually ignore) *without emotion*.

Sound therapy and *TRT* can be used together to help patients ignore their tinnitus.

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Medical/Chemical Approach to Tinnitus Treatment

How is this different from the behavioral approach?

Typically, both theories accept that the underlying cause of tinnitus is due to a damaged inner ear causing excitation and inhibition of the auditory system. The medicinal approach looks at treating the symptoms through drugs.

How do drugs and chemicals affect the auditory system?

There has been increasing interest in chemical pathways that underlie abnormal patterns of activity leading to tinnitus. Recent studies are showing that auditory neurons can be affected by glycine, glutamate, and acetylcholine. Other studies are looking at NMDA receptors- the idea is that blocking these receptors can help eliminate tinnitus. (Kaltenbach, 2011)

What about vitamins and herbal supplements?

Vitamins and herbal supplements that are successful typically target cerebral and CNS blood flow.

Vitamin B Complex has been researched significantly and the benefit for patients seems to be related to the stabilizing effect the vitamin has on the CNS.

Lipoflavonoids have been shown to help improve blood flow.

In general, supplements have variability in their success rate due to low regulation of substance and the placebo effect.

Caffeine and sodium are thought to negatively affect tinnitus by changing fluid levels and/or by causing excitation of the inner ear.

(Fagelson, 2009)

What else is out there.. and what is the future of treatment?

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At this time, and to this author's knowledge, a few other treatment options are being used and studied.

Researchers are exploring the benefits of vagus nerve stimulation to restore neural activity. The study was conducted on rats with noise damaged ears and it showed that vagus nerve stimulation eliminated physiological and behavioral symptoms of tinnitus. Researchers plan to start clinical trials with humans very soon. (Neurology Today, 2011)

New studies are suggesting that jaw clenching or resisting pressure applied to the side of the head can alter tinnitus. Up to 80% of tinnitus patients can change the loudness or pitch of their tinnitus in this way. More research is currently needed to determine the true therapeutic benefit. (Kaltenbach, 2011)

Acupuncture has been shown to help alleviate tinnitus symptoms. (Gu and Acelsson, 1996)

Biofeedback, hypnosis, and relaxation therapy all have shown inconsistent benefit. (Fagelson, 2009)

Surgery is an option with mixed results (some studies show that 40% of patients still have tinnitus after their auditory nerve is cut) and should only be considered after an exhaustive investigation into other treatment options. Typically, surgery is only performed on tinnitus patients when tinnitus is a secondary symptom to a specific disease (Meniere's, tumor on the auditory nerve, etc.).

In Summary

To date, the most effective compounds and agents are:

- Improve cortical and CNS blood flow
- Foster relaxation
- Reduce the effects of stress
- Reduce psychological distress
- Generally improve diet

(Fagelson, 2009)

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