

High frequency sound treatment of tinnitus

“High-frequency stimulation in tinnitus treatment”

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Prevalence of Tinnitus:

It has been estimated that over 36 million people in the United States have tinnitus, a sense of internal auditory ringing in the absence of external sound. About 10 million have severe tinnitus that is often very difficult to treat. The most common clinical non-drug approach is to mask the tinnitus with an external sound, but masking is effective in a little more than half the cases. The suppression of tinnitus after the masking is removed is termed residual inhibition. Long-term residual inhibition is a goal of all masking. Another approach is to recondition or habituate to the tinnitus, a process that can take a year or more and even then may not be successful.

Present Study:

In the present study we evaluated a novel approach to tinnitus. Imaging studies strongly suggest a brain site of tinnitus not just the ear, although many individuals have some degree of high frequency hearing loss. Possibly related to the hearing loss is that most tinnitus sufferers experience high pitched (<6 kHz) tinnitus. Recently evidence has been mounting that the brain reprograms its nerve cells based on sensory loss or learning. If the brain was changing its response as a result of some hearing loss, then this could be the tinnitus trigger. We considered the possibility that the reprogramming could be reversed with high frequency stimulation. To test this, nine subjects with severely tinnitus was evaluated with a novel method of bone conduction delivery to stimulate residual high frequency receptors in the inner ear. High frequency bone conduction transducers were fabricated to deliver frequencies from 6 to 40 kHz. The aluminum ceramic transducers were placed on the skin behind the ear. Patterned high frequency stimulation (>10,000 Hz), derived from music, was recorded on a compact disc and played back through a custom amplifier at only 6 dB above threshold. Two half hour sessions for four weeks were provided at the Martha Entenmann Tinnitus Research Center in Brooklyn N.Y.

Findings of the present study:

Exit questionnaires revealed satisfaction with tinnitus relief from high frequency stimulation in all subject completing the study (8 of 9) with residual inhibition lasting on the order of weeks (mean = 1.5 weeks). Using follow up questionnaires 2-4 months after completing the trial, 6 of 8 subjects rated their tinnitus as improved. No one indicated a worsening of tinnitus.

Encouraged by the limited but convincing findings that high frequency induced residual inhibition that lasted substantially longer than that from conventional masking, more extensive trials are underway to explore the efficacy of high frequency bone conduction treatment in central tinnitus. If verified in a larger sample, the rapid reduction in tinnitus with this technique would offer a dramatic improvement over conventional masking and long-term habituation approaches.