

## **Abstract EFAS/DGA 2007**

### **Tinnitus in aging population**

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Hearing loss is a very frequent health problem of the aging population. Difficulties in hearing can be amplified by an inability to filter a background noise, trouble with spatial hearing and by tinnitus, ultimately decreasing a quality of life. To design a cure, one has to understand the mechanism. Discussed here will be main pathological ways leading to age-related hearing loss (AHL) and tinnitus in context of aging biology. Some of the important causes of AHL are partial or total destruction of hair cells and neurotransmitter signaling. Tinnitus can affect auditory peripheral (outer and inner hair cells) or/and central system (cochlear nucleus, superior olivary complex, inferior colliculus, medial geniculate nucleus and the primary and secondary auditory cortex). One of the accepted definitions presents tinnitus as a lack of equilibrium between auditory peripheral and central checkpoints induced by either damage to hair cells or by changes in neurotransmitter release or alteration in their post-synaptic effects. These pathological changes usually intensify with age. Of special importance are changes in glutamate, dopamine, GABA, acetylcholine and serotonin networks. For example, dopamine receptors are downregulated during aging, which could possibly lead to tinnitus. Progressive changes in synthesis, exocytosis and signaling of dopamine were observed in experimental old animals. Similar changes were documented for GABA, whereas GABA-receptors were overexpressed with age, suggestive of compensatory mechanisms. The diminished synthesis and release of GABA could lead to an increased action of glutamate, most likely resulting in tinnitus. In patients suffering from Alzheimer disease (often associated with a hearing loss), a significant reduction of acetylcholine receptors accompanied by serotonin gene polymorphism was documented. Lastly, malfunction in the serotonin network leading to loss of auditory filter function could either generate or habituate already existing tinnitus.

