Dementia – An Auditory Outlook

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Abstract (300-word limit)

According to the 2020 Lancet commission on dementia, hearing loss is the top modifiable risk factor against dementia, and risk of dementia worsens with every 10 dB of hearing loss. The commission also found an increased dementia risk for those not using hearing aids and, it recommends hearing aids to reduce the risk of cognitive decline and dementia [1]. So, hearing loss treatment/management could be a way of significantly lowering the risk of dementia among our aged population. Hearing loss is an invisible disability and is among the top three medical chronic conditions among our aged population. Apart from contributing to cognitive decline, hearing loss leads to social isolation, dependence on others and anxiety [2, 3]. Current treatments like hearing aids and cochlear implants often help improve the daily life of people with hearing loss. There is still no drug available to prevent/treat it. Recently, we have established that aldosterone – a natural occurring mineralocorticoid hormone has potential to treat certain aspects of age-related hearing loss in aging mice. Animals were treated with subcutaneous time-release pellets for four months. A therapeutic effect was mediated via induced protein enhancement of Na-K-Cl and Na-K-ATPase – two key ion transporters that decline in the aging inner ear [4-10]. Our clinical study revealed that higher serum aldosterone levels are associated with better hearing in elderly [11]. Though not FDA-approved yet, it is likely that aldosterone will play a significant role in drug development for hearing loss. In sum, efforts to address the concerns of hearing loss – both in terms of drug development and alternative technologies for cochlear implants (i.e., new stimulation techniques), could significantly help to prevent dementia and other age-linked cognitive deficits.

Image

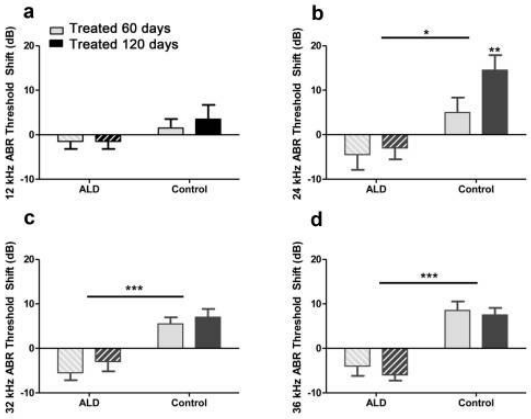


Figure 1: Comparison of hearing threshold shifts between aldosterone treated and non-treated groups of CBA/CaJ Mice [9]

References:

1. Livingston, G., et al., *Dementia prevention, intervention, and care: 2020 report of the Lancet Commission*. The Lancet, 2020. **396**(10248): p. 413-446.
2. Parham, K., et al., *Challenges and Opportunities in Presbycusis*. Otolaryngology - Head and Neck Surgery, 2011. **144**(4): p. 491-495.
3. Shukla, A., et al., *Hearing Loss, Loneliness, and Social Isolation: A Systematic Review*. Otolaryngology – Head and Neck Surgery, 2020. **162**(5): p. 622-633.
4. Bazard, P., et al., *Aldosterone up-regulates voltage-gated potassium currents and NKCC1 protein membrane fractions*. Scientific Reports, 2020. **10**(1): p. 15604.
5. Bazard, P., et al., *Roles of Key Ion Channels and Transport Proteins in Age-related Hearing Loss*. International Journal of Molecular Sciences, 2021. **22**(11): p. 6158.
6. Ding, B., et al., *Direct control of Na+-K+-2Cl−-cotransport protein (NKCC1) expression with aldosterone*. 2014. **306**(1): p. C66-C75.
7. Ding, B., et al., *Age-related changes in Na, K-ATPase expression, subunit isoform selection and assembly in the stria vascularis lateral wall of mouse cochlea*. Hearing Research, 2018. **367**: p. 59-73.
8. Frisina, R.D., et al., *Translational implications of the interactions between hormones and age-related hearing loss*. Hearing Research, 2021. **402**: p. 108093.
9. Frisina, R.D., et al., *Age-related hearing loss: prevention of threshold declines, cell loss and apoptosis in spiral ganglion neurons*. Aging, 2016. **8**(9): p. 2081-2099.
10. Halonen, J., et al., *Long-term treatment with aldosterone slows the progression of age-related hearing loss*. Hearing Research, 2016. **336**: p. 63-71.
11. Tadros, S.F., et al., *Higher serum aldosterone correlates with lower hearing thresholds: A possible protective hormone against presbycusis*. Hearing Research, 2005. **209**(1): p. 10-18.

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Biography (150-word limit)

Parveen Bazard is a Research Scientist at the Global Center for Hearing and Speech Research, Medical Engineering Dept., University of South Florida, Tampa, FL, USA. He works in the field of otolaryngology and audiology research with special focuses on drug discovery for hearing loss and alternative optical based cochlear implants. He did his Masters at the Indian Institute of Science, Bangalore, India; and doctoral and postdoctoral studies at the University of South Florida, Tampa, FL, USA. During his PhD studies, he developed next generation neural stimulation methods – nanoparticles enabled optical neural stimulation for auditory and sensory prosthetic devices. After his PhD, he is carrying out research on drug development, pre-clinical projects for prevention and treatment of hearing loss. He publishes regularly in various peer-reviewed journals that include *ACS Nano (Impact Factor – 15)*; and has awarded 3 patents (1 pending approval) so far.

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