

# Effects of Excess Salt Intake on Endolymphatic Hydrops Formation and Aldosterone Regulation in a Meniere's Disease Animal Model

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## Summary

Meniere's disease (MD) is a neuro-otological disorder marked by recurrent vertigo and hearing loss. Pathologically, endolymphatic hydrops (EHs) is consistently observed. Endolymph is produced in cochlea and vestibular organs and absorbed in the endolymphatic sac (ES). In many MD patients, the ES exhibits hypoplasia or fibrosis, suggesting that impaired absorption is a key mechanism behind EHs.

Salt restriction is commonly used in MD management, but evidence for its impact on inner ear fluid balance and hormonal regulation is limited. The ES expresses sodium transporters and hormone receptors similar to those in the kidney. Among them, the renin–angiotensin–aldosterone system (RAAS) regulates sodium reabsorption. Salt restriction activates RAAS, raising aldosterone (Aldo) levels. While this may help in a healthy ear, it can be harmful when ES function is impaired. In such cases, Aldo may increase endolymph secretion in the cochlea and vestibule, worsening EHs. Thus, the effect of salt intake on RAAS and inner ear function likely depends on ES integrity.

To examine this, we used a guinea pig model of ES dysfunction via ES ablation (ES group), with a sham-operated group as control. Each was further divided into two dietary groups: normal-salt (0.41% NaCl) and high-salt (2.0% NaCl) for two weeks, resulting in four groups: Sham-Normal, Sham-HighNa, ES-Normal, and ES-HighNa.

Optical coherence tomography showed EHs in the ES groups, most severe in ES-HighNa. Vestibular evoked potential thresholds were significantly higher in ES-HighNa, indicating vestibular dysfunction. Plasma Aldo levels peaked in the ES-Normal group, suggesting that ES dysfunction activates RAAS. High-salt intake suppressed Aldo, as expected.

These findings underscore the key roles of the ES and RAAS in inner ear fluid homeostasis. When ES function is impaired, high salt intake may disrupt hormonal balance, exacerbating EHs. Elevated Aldo in this context may worsen, rather than improve, the condition –challenging the rationale for salt restriction in MD.