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Analysis of Sound Stimulus Dependence in K^+ Transport System in the Stria Vascularis of the Cochlear Lateral Wall

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Summary

The cochlear lateral wall controls the electrochemical environment in the endolymph by its K^+ transport and generation of the endocochlear potential (EP) of +80 mV. Although it has been known that its function is indispensable for audition, whether it depends on sound stimuli or not remains uncertain. We previously found that the potential and $[K^+]$ in the intrastrial space mainly contributes to the EP under no sound stimulation. In this study, we examined the potential and $[K^+]$ change in both of the intrastrial space and endolymph in the living guinea pigs with electrodes sensitive to potential and K^+. Under sound stimulation, potential decreased, whereas $[K^+]$ increased in the intrastrial space. In the endolymph, on the other hand, potential decreased, whereas $[K^+]$ unchanged. Theoretical analysis of the potential and $[K^+]$ change revealed that the potential change was formed by K^+ diffusion potential change through K^+ channels in the stria vascualaris. These results indicate that the function of the lateral wall depends on the sound stimulation. We also found that the cochlear summating potential of electrocochleogram reflects these potential and $[K^+]$ changes in the stria vascularis by genetical approach. Functional dependence of the lateral wall on sound stimulation suggests that not only hair cell and auditory neuron but also the lateral wall relates to the phathophysiology in frequency dependent hearing loss.