

Detection of amplitude modulation in hydrodynamic cochlea model

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Hearing loss may improve the detection of amplitude modulation. It was suggested and showed by theoretical studies that this improvement may result from the loss of fast-acting amplitude compression in the cochlea. Another possible cause of the phenomenon may be the enhanced neural phase locking observed in auditory nerves of hearing-impaired mammals. This study uses a 2D nonlinear hydrodynamic cochlea model simulating the response of the basilar membrane to predict detection of amplitude modulation. The model allows for simulation of hearing loss by adjusting the active feedback force accounting for the function of the outer hair cells. The predicted results were, in agreement with results of listening tests reproduced from literature, better (improved detection) for the model with simulated hearing loss. The simulations showed that not only the loss of cochlear compression but also the spread of excitation along the basilar membrane, which is caused by wider cochlear filters in the model simulating hearing loss, contributes to better detection.