

Basilar membrane mechanics at the base of the chinchilla cochlea. I.

Input-output functions, tuning curves, and response phases)

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Basilar membrane (BM) velocity was measured at a site 3.5 mm from the basal end of the chinchilla cochlea using the Mossbauer technique. The threshold of the compound action potential recorded at the round window in response to tone bursts was used as an indicator of the physiological state of the cochlea. The BM input-output functions display a compressive nonlinearity for frequencies around the characteristic frequency (CF, 8 to 8.75 kHz), but are linear for frequencies below 7 and above 10.5 kHz. In preparations with little surgical damage, isovelocity tuning curves at 0.1 mm/s are sharply tuned, have Q10 9s of about 6, minima as low as 13 dB SPL, tip-to-tail ratios (at 1 kHz) of 56 to 76 dB, and high-frequency slopes of about 300 dB/oct. These mechanical responses are as sharply tuned as frequency-threshold curves of chinchilla auditory nerve fibers with corresponding CF. There is a progressive loss of sensitivity of the mechanical response with time for the frequencies around CF,