CRITICAL BANDWIDTH IN THE CAT FOLLOWING THE SELECTIVE DESTRUCTION OF COCHLEAR INNER AND OUTER HAIR CELLS

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It is of interest to determine the significance of the inner and outer hair cells of the cochlea in critical bandwidth measurements, as there is evidence for a difference in their roles in frequency selectivity (Dallos *et al.*, 1977) and in frequency discrimination (Nienhuys and Clark, 1978). The present study has been undertaken on four monauralized cats which were trained to respond by a conditioned suppression technique. Behavioural auditory thresholds were measured by plotting suppression ratios for frequencies of 1kHz, 4kHz, 8kHz, 10kHz, 12kHz and 16kHz. Critical bands were measured at the same frequencies by recording the pure tone thresholds in the presence of a masking noise with six different bandwidths, a constant total power, and geometrically centred on the test tone (Greenwood, 1961). The cats were then given a series of intramuscular injections of kanamycin (200mg $kg^{-1}d^{-1}$) for 10 days to selectively destroy the outer hair cells, and behavioural thresholds determined shortly afterwards. Critical bands were again measured at all the previous frequencies except 16kHz, where the auditory behavioural threshold was too high. At the completion of the experiments behavioural thresholds were re-determined, the animals were anaesthetized with pentobarbital sodium (40mg/kg, i.p.) and auditory nerve action potentials recorded. The animals were perfused, the cochleas prepared for surface preparation histology, and the inner and outer hair cells counted along the length of the cochleas so that cochleograms could be constructed on the basis of studies correlating the site of lesions with functional deficit. The results showed no difference in the critical band measurements between the pre- and post- drug conditions for frequencies of 8kHz and 10kHz, where there was complete loss of outer hair cells but less than 50% loss of inner hair cells. The only difference occurred at 12kHz where the post- drug critical band was too broad to be determined, and this was associated with complete loss of outer hair cells and a greater than 50% loss of inner hair cells. Consequently, this study shows that inner hair cells are important for narrow critical band measurements.

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