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COCHLEAR FUNCTION AND HEARING LOSS: A REVIEW

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There is a great deal of current interest in the physiological mechanisms responsible for the ear's frequency selectivity. Because experiments show the tuning of cochlear nerve responses to be much sharper than those of the basilar membrane, it has been proposed that a 'second' filter is involved. What mechanisms are involved in this frequency sharpening process remain obscure.

However, the mechanisms responsible for the normal sharp tuning of the cochlear fibre responses are physiologically vulnerable: under conditions of experimental cochlear pathology the tuning deteriorates.

We have proposed that the normal sharp tuning of cochlear fibres can more than account for our normal auditory frequency selectivity. On this hypothesis, therefore, we would expect a deterioration in frequency selectivity to accompany the deterioration in neural tuning in hearing impairment due to cochlear pathology. This prediction has now been demonstrated in patients in various ways. The deterioration in cochlear frequency selectivity can account simply for many of the features of cochlear hearing loss. It may also be an important factor underlying deterioration in the intelligibility of speech found in these conditions, and has led to attempts to compensate for it in new, speculative, designs for hearing aids.

This review is expanded in the following references:

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3. E.F. EVANS 1975 Audiol. 14, 419-442. The sharpening of cochlear frequency selectivity in the normal and abnormal cochlea.
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5. E.F. EVANS 1975 In: Sound Reception in Mammals: Symp. Zool. Soc. Lond. 197, No.37, R.J. Bench, A. Pye and J.D. Pye (eds), Academic Press, London, 133-165. Normal and abnormal functioning of the cochlear nerve.
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7. E.F. EVANS 1978 Audiol. 17, 369-420. Place and time coding of frequency in the peripheral auditory system: some physiological pros and cons.