

34 Disorders of Hearing

Anil K. Lalwani

Hearing loss can present at any age and is one of the most common sensory disorders in humans. Nearly 10% of the adult population has some hearing loss, and one-third of individuals age >65 years have a hearing loss of sufficient magnitude to require a hearing aid.

PHYSIOLOGY OF HEARING

The function of the external and middle ear is to amplify sound to facilitate conversion of the mechanical energy of the sound wave into an electrical signal by the inner-ear hair cells, a process called mechanotransduction (**Fig. 34-1**). Sound waves enter the external auditory canal and set the tympanic membrane (eardrum) in motion, which in turn moves the malleus, incus, and stapes of the middle ear. Movement of the footplate of the stapes causes pressure changes in the fluid-filled inner ear, eliciting a traveling wave in the basilar membrane of the cochlea. The tympanic membrane and the ossicular chain in the middle ear serve as an impedance-matching mechanism, improving the efficiency of energy transfer from air to the fluid-filled inner ear. In its absence, nearly 99.9% of the acoustical energy would be reflected and thus not heard. Instead, the eardrum and the ossicles boost the sound energy nearly 200-fold by the time it reaches the inner ear.