Localization of beta1-adrenergic receptors in the cochlea and the vestibular labyrinth.

Abstract:
Sympathetic activation in a "fight or flight reaction" may put the sensory systems for hearing and balance into a state of heightened alert via beta1-adrenergic receptors (beta1-AR). The aim of the present study was to localize beta1-AR in the gerbil inner ear by confocal immunocytochemistry, to characterize beta1-AR by Western immunoblots, and to identify beta1-AR pharmacologically by measurements of cAMP production. Staining for beta1-AR was found in strial marginal cells, inner and outer hair cells, outer sulcus, and spiral ganglia cells of the cochlea, as well as in dark, transitional and supporting cells of the vestibular labyrinth. Receptors were characterized in microdissected inner ear tissue fractions as 55 kDa non-glycosylated species and as 160 kDa high-mannose-glycosylated complexes. Pharmacological studies using isoproterenol, ICI-118551 and CGP-20712A demonstrated beta1-AR as the predominant adrenergic receptor in stria vascularis and organ of Corti. In conclusion, beta1-AR are present and functional in inner ear epithelial cells that are involved in K+ cycling and auditory transduction, as well as in neuronal cells that are involved in auditory transmission.