Degenerative changes in the efferent innervation of the organ of Corti in a hamster strain with audiogenic seizures

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Hamsters of the GPG/VALL strain (Mesocricetus auratus) suffer from audiogenic seizures which are similar to those described in other inbred strains of rodents. It has been previously shown that the auditory receptor of these animals is macroscopically normal, except for a slight flatness in their lateromedial axis. The organ of Corti and the spiral ganglion show distinct changes in their microscopic structure with a nearly complete loss of outer hair cells (OHC) and a reduced number of spiral ganglion neurons, among others features (Cantos et al. Soc. Neurosci 1996). This study compares the olivocochlear innervation of the organ of Corti in normal and audiogenic animals. Under deep anesthesia, 6 control and 6 epileptic hamsters were fixed transcardially and their cochleas quickly removed and perfused through the oval and round windows. In order to visualize the olivocochlear axons, the organ of Corti was stained in situ for the demonstration of acetylcholinesterase (AChE) (Karnovsky and Roots, 1964), osmicated, dehydrated and embedded in EMbed 812 resin. After polymerization, the organ or Corti and osseous lamina were microdissected into quarter cochlear turns and placed on slides as whole mounts. With this procedure, reconstructions of the organ of Corti can be obtained which display the staining of olivocochlear fibers. On examination, we found a major difference between the control and the epileptic hamsters. The control animals showed dense AChE staining of the inner spiral bundle (ISB), the upper tunnel radial fibers (UTRs), and boutons beneath the OHCs, throughout virtually the entire length of the cochlea. The epileptic animals showed AChE staining in the ISB throughout the length of the cochlea, but staining of UTRs and efferent boutons UTRs was found to be grossly reduced in magnitude, and where present, severely disrupted and abnormal in appearance. Future tracing experiments will be necessary to characterize olivocochlear neurons in this strain, with emphasis on the medial olivocochlear system.

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