Summary

In the present work we studied the presence and distribution of several voltage gated K^+-channels in two sections of the initial part of the auditory pathway: the cochlear nucleus and the spiral ganglion. We investigated the expression pattern of seven voltage gated K^+-subunits in the cochlear nucleus and its major projection neurones. Our results may help to predict the membrane properties of the individual types of cells. Besides investigating the channel subunit pattern we demonstrated that some Kv subunits are preferentially expressed by the various types of CN neurones, some of which could be even used as markers assisting cell identification in future studies.

Our results showed that two major cell types of the cochlear nucleus, the pyramidal and giant neurones do not form homogenous cell populations concerning their Kv expression patterns, thus it cannot be ruled out that functional/morphological subgroups may exist within these cell classes.

We also demonstrated the Kv4.2 and Kv3.4 positivity of the glomerular synapses of the CN. Since glomerular synapses were found to be Kv4.2 positive in the cerebellum as well, these findings further support the view about the common origin and close morphological similarity between the CN and the cerebellum.

The other section of the auditory pathway investigated in the present study was the spiral ganglion. We developed a new preparation for the investigation of the SGCs, that better preserved the morphology of the neurones and allowed the three dimensional analysis of the cells.

In our experiments we investigated the presence and distribution of nine Kv- and all four known HCN-subunits on guinea pig SGCs. We demonstrated, that spiral ganglion cells expressed LVA DTX-sensitive, delayed rectifier and A-type current producing voltage gated K^+-channel subunits. We also demonstrated, that all four known HCN-subunits were present on the SGCs and that the expression levels of these proteins showed significant cell to cell variability. Moreover we demonstrated that the HCN1 and HCN3 subunits were differentially expressed along the axis of the cochlea: their levels of expression were higher in the apical areas of the modiolus than in the basal areas.