Function of vesicular glutamate transporters during ontogenesis of synaptic connections in the auditory brain stem

(PhD-project, Prof. Eckhard Friauf)

The superior olivary complex (SOC) is a prominent part of the mammalian auditory brain stem. It is the first station where the input in both ears converges. SOC neurons build the neural offsetting basis of physical parameters (differences in run-time and intensity) which are essential for the localization of an acoustic source. Inputs in the SOC neurons are profoundly disposed and specialized for exquisite timing accuracy. A fundamental aim of our research is to analyze the development of the microcircuits during ontogenesis and to clarify the molecular mechanisms responsible for their particular attributes.

Within the scope of this project, the role of vesicular glutamate transporters (VGLUT) in the fast glutamateric transmission and in the activity dependent maturation of the glutamateric inputs into the SOC shall be investigated. VGLUTs provide exocytosis with the excitatory transmitter glutamate by sluicing it via secondary active transport into synaptic vesicles. Three isoforms of VGLUT (VGLUT1-VGLUT3) are known (Herzog et al., 2004). All of them are already expressed neonatal in the SOC of rats and show a differential pattern, interestingly (Blaesse et al., 2005).

Special questions are: 1) What role do VGLUTs play in the regulation of synaptic transmission at the “Held'sche Calyx”? 2) To what extend is the precision in time of transmission and the short-time plasticity through VGLUT1 or VGLUT2 arranged? 3) Which effects occur in VGLUT-deficient mice with respect to the maturation of the synaptic structures in the SOC?
