

Mossy fiber synapses in the hippocampus have their individual memories

Michael Frotscher
Zentrum für Molekulare Neurobiologie Hamburg (ZMNH)
Universitätsklinikum Hamburg-Eppendorf

The complexity of environmental stimuli is translated into patterns of neuronal signals that change synaptic strength in specific pathways. In this talk, first structural changes at mossy fiber (MF) synapses in response to the induction of chemical long-term potentiation (cLTP) will be reported. However, global induction of LTP at many synapses does not reflect the natural activation of intricate microcircuits involved in the processing of environmental stimuli. It is more likely that nearby synapses are strengthened or weakened depending on the individual input patterns they receive. Therefore, we next analyzed functional differences between individual MF synapses by combining single MF bouton stimulation and recording of Ca^{2+} transients in the postsynaptic spine. We were surprised to find a great heterogeneity in synaptic strength between individual MF synapses. Moreover, induction of plasticity at these synapses depended on the initially encountered synaptic state, suggesting that MF synapses contribute individually to microcircuits in the hippocampus depending on their individual functional history.