

Neuroscience Colloquium Winter Semester 2010/2011

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Molecular Mechanisms of Synapse Formation and Synaptic Specificity

The assembly of functional neuronal circuits during development relies on an intricate interplay of cellular interactions, molecular recognition signals, and neuronal activity-dependent processes. The goal of our work is to understand the molecular mechanisms underlying the differentiation of synaptic junctions and the signaling systems that restrict synapse formation and/or stability to the appropriate target cells in vivo. We screened for cell adhesion and signaling molecules that can either stabilize or destabilize synaptic junctions. In this effort, we identified Bone Morphogenic Proteins as novel inhibitory regulators of synapse formation in the mouse cerebellum. A second focus of our studies has been on the neuroligin-neurexin protein complex, a heterophilic adhesion system at central synapses with “synaptogenic” activities. Neuroligins and neurexins are encoded by multiple genes and substantial molecular diversity is generated at the level of alternative splicing. We have characterized isoform-specific functions of individual neuroligin and neurexin isoforms. Moreover, we have uncovered a signal transduction pathway which dynamically regulates alternative splicing of the neurexin mRNAs in response to neuronal activity. Copy number variations and mutations in the human neuroligin and neurexin genes have been identified in patients with autism-spectrum disorders. Therefore, our insights into the basic molecular mechanisms of neuroligin and neurexin functional regulation may be helpful with respect to understanding the neuronal abnormalities underlying these disorders.

Location: BCCN lecture theater,
Bernstein Center for Computational Neuroscience
Humboldt-Universität zu Berlin
Philipplstr. 13, Haus 6

Date: Friday, November 19th, 4:00 p.m.

Host: Christina Zube

Supported by:

SFB 665 “Developmental Disturbances in the Nervous System”

GRK 1123 “Cellular Mechanisms of Learning and Memory Consolidation in the Hippocampal Formation”

SFB-TRR 43 “The brain as a target of inflammatory processes”

NeuroCure