Role of the Presynaptic Active Zone during Synaptic Plasticity and Pathophysiology

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The basic structure of information transfer in the nervous system is the synapse, where information is transmitted by one neuron to another via chemical neurotransmitters. At the presynapse neurotransmitter-filled synaptic vesicles only dock and fuse at a specialized area of the plasma membrane, called the active zone. The number, size and distribution of active zones have direct implications on information processing and on adaptive processes in neuronal circuits. The protein network at the active zone is involved in regulating the fusion of synaptic vesicles and in mediating use-dependent changes in release during short-term and long-term forms of synaptic plasticity. However, the molecular mechanisms that control active zone assembly and function during synapse maturation and during changes related to synaptic plasticity and pathophysiology are still largely unknown. Using a combination of molecular, biochemical, and imaging approaches as well as experimental animal models we are examining how key components of the active zone are involved in mediating active zone function.

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