Shaping membranes – roles in cellular organization and function

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Brain functions rely on induction, maturation and plastic modulation of neuronal networks and synaptic contacts. BAR domain superfamily proteins, such as the neuronal F-BAR domain protein syndapin I, have emerged as important components in membrane shaping. BAR domain proteins have the power to imprint their crescent shape onto membranes. Loss-of-function studies provide *in vivo* evidence for a physiological importance of syndapin I in proper neuronal network and synaptic function. Syndapin I knockout mice suffer from seizures. Syndapin I knockout results in defects in synaptic vesicle size control, accumulation of endocytic intermediates, impaired activity-dependent synaptic vesicle retrieval and defective synaptic activity. Further analyses show that syndapin I deficiency also leads to defects in shaping the dendritic compartment during developmental processes. Hereby, syndapin I interactions with components promoting actin filament formation are of crucial importance. Locally restricted actin filament formation is a key requirement for shaping cells by cytoskeletal forces. High-resolution imaging and functional analyses thereby reveal that membrane-associated syndapin I provides cortical anchor points and molecular organizing platforms in shaping distinct neuronal membrane areas.