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Planar cell polarity protein Celsr2 maintains structural and functional integrity of adult cortical synapses

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Abstract
A few developmental genes remain persistently expressed in the adult stage, whilst their potential functions in the mature brain remain underappreciated. Here, we report the unexpected importance of Celsr2, a core Planar cell polarity (PCP) component, in maintaining the structural and functional integrity of adult neocortex. Celsr2 is highly expressed during development and remains expressed in adult neocortex. In vivo synaptic imaging in Celsr2 deficient mice revealed alterations in spinogenesis and reduced neuronal calcium activities, which are associated with impaired motor learning. These phenotypes were accompanied with anomalies of both postsynaptic organization and presynaptic vesicles. Knockout of Celsr2 in adult mice recapitulated those features, further supporting the role of Celsr2 in maintaining the integrity of mature cortex. In sum, our data identify previously unrecognized roles of Celsr2 in the maintenance of synaptic function and motor learning in adulthood. © 2022

Author Keywords
Corticostriatal circuit; de novo spinogenesis; Motor learning; Pla2g4e; Synaptic plasticity

Index Keywords
biological marker, cadherin egf lag seven pass g type receptor 2, cadherin related protein, calcium, cell protein, clozapine n oxide, doxycycline, n methyl dextro aspartic acid receptor 2A, protein c fos, short hairpin RNA, structural protein, synaptosome associated protein 25, unclassified drug, cadherin, Celsr2 protein, mouse; adult, animal cell, animal experiment, Article, controlled study, de novo spinogenesis, down regulation, excitatory postsynaptic potential, gene knockdown, gene ontology, knockout mouse, latency to fall, male, motor learning, mouse, neocortex, nerve cell plasticity, nonhuman, phenotype, planar cell polarity signaling, postsynaptic density, RNA sequencing, rotarod test, synapse, transmission electron microscopy, Western blotting, whole cell patch clamp, animal, brain, cell polarity, nerve cell, nerve cell plasticity, physiology; Animals, Brain, Cadherins, Cell Polarity, Mice, Mice, Knockout, Neuronal Plasticity, Neurons, Synapses

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