This Week in The Journal

Molecular Insight Into Precise Synapse Maintenance

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(see article e1310232023)

Connections or synapses between neurons are essential for proper functioning of the brain. Synapse formation and maintenance are mediated, in part, by cell-recognition molecules called cadherins (Cdhs). It remains unclear how Cdhs regulate connections between neuron subtypes across the brain. In this issue, Matcham et al. explored the specificity of synaptic spine maintenance between retinal ganglion cells (RGCs) and superior collicular (SC) neurons. This is an ideal system for understanding precise yet diverse neuron to neuron connections due to the expanse of knowledge on neuron subtypes in these regions. The authors first found high expression of a type II Cdh called Cdh13 in wide-field neurons in the SC. Genetically deleting Cdh13 from these neurons reduced their dendritic spine quantity, thus diminishing synapses onto these neurons. They also found that Cdh13 is expressed on a subset of RGCs and that RGC Cdh13 deletion similarly reduced wide-field neuron dendritic spines, revealing that there is a Cdh13-mediated mechanism extending between the neurons. Notably, Cdh13 deletion further revealed that this mechanism is necessary past development and into adulthood, driving the maintenance of this precise RGC-SC wide-field neuron connection. This study suggests that specific Cdhs may enable precise synapses to persist through an individual's lifetime, which may inform synaptic research in a variety of contexts.

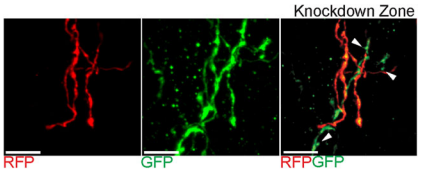

Figure 8B. Representative image of an RGC axon terminal in the SC with Cdh13 genetically knocked down. Red (RFP; left) shows RGC-labeled axons, green (GFP; middle) shows genetic ablation of Cdh13, and the merged overlay (right) enabled detection of RGC neurons with Cdh13 ablation.

Dissociating Claustrum Subregion Roles in Anxiety and Cocaine Reward

Ziheng Zhao, Zhaoyu Liu, Jingjing Wang, Xiang Li, and Yuhong He et al.

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The claustrum is a brain region with a thin structure that makes it difficult to study. The development of precise techniques and genetic mouse models has enabled discoveries about neuron subtypes residing in claustrum, projections from claustrum to other brain regions, and claustrum subregions. Scientists have also begun to reveal the behavioral relevance of claustrum output. Emerging evidence suggests it may play a role in anxiety and drug use. In support of this, researchers in Guan's lab recently found that claustrum may be involved in the anxiety-like behavior that male mice exhibit after exposure to cocaine in adolescence. In this issue, Zhao and colleagues from Guan's lab more directly investigated the role of the claustrum in the heightened anxiety and elevated sensitivity to cocaine reward that adolescent exposure to cocaine induces. Their findings were subregion specific: neurons in the middle portion of the claustrum were involved in anxiety-like behavior, while those in the anterior portion of the claustrum were involved in heightened reward sensitivity following adolescent cocaine exposure. These findings dissociate the roles of claustrum subregions in anxiety- and addiction-like behaviors in mice, which may bring more attention to the discrete roles it plays in behaviors relevant for disease treatment.

This Week in The Journal was written by Paige McKeon

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