Secreted Semaphorins from Degenerating Larval ORN Axons Direct Adult Projection Neuron Dendrite Targeting

Summary

During assembly of the Drosophila olfactory circuit, projection neuron (PN) dendrites pre-pattern the developing antennal lobe before the arrival of axons from their presynaptic partners, the adult olfactory receptor neurons (ORNs). We previously found that levels of transmembrane Semaphorin-1a, which acts as a receptor, instruct PN dendrite targeting along the dorsolateral-ventromedial axis. Here we show that two secreted semaphorins, Sema-2a and Sema-2b, provide spatial cues for PN dendrite targeting. Sema-2a and Sema-2b proteins are distributed in gradients opposing the Sema-1a protein gradient, and Sema-1a binds to Sema-2a-expressing cells. In Sema-2a and Sema-2b double mutants, PN dendrites that normally target dorsolaterally in the antennal lobe mistarget ventromedially, phenocopying cell-autonomous Sema-1a removal from these PNs. Cell ablation, cell-specific knockdown, and rescue experiments indicate that secreted semaphorins from degenerating larval ORN axons direct dendrite targeting. Thus, a degenerating brain structure instructs the wiring of a developing circuit through the repulsive action of secreted semaphorins.

Reference: