

Contribution of glial cells during action selection in *Drosophila* larvae

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Glial cells are required for proper neuronal signalling and homeostasis. In the CNS of *Drosophila* astrocyte-like glia (AG) and cortex glia (CG) modulate neuronal activity (Littleton, Freeman) whereas in the PNs wrapping glia (WG) control neuronal signalling precision (Kottmeier). WG encapsulate either single or bundles of axons along the whole nerve and isolate them from neighbouring axons. Electric field effects around axons, resulting from action potentials, might activate apposed axons, a phenomenon known as ephaptic coupling. This electric cross-talk is prevented by the insulation provided by WG cells which thereby ensure signalling precision. WG specific ablation experiments revealed a decreased neuronal transduction speed and abnormal larval locomotor behaviour. Moreover, uncoordinated muscle contractions were triggered after optogenetic activation of sensory neurons much faster than in wild type, suggesting that ephaptic coupling resulted in unintentional activation of motor axons.

Here, I will present live-imaging approaches to address the question if and where in the PNS ephaptic coupling triggers action potentials in neighbouring axons. For this flies were generated that allow wrapping glia ablation whilst concomitantly activating selected sensory neurons optogenetically and monitoring motor neuron activity via GCaMP8s/ f expression and using mCherry as baseline control (vGlut-GCaMP8s/f, vGlut-mCherry). First results will be discussed.

To address ephaptic coupling in the CNS, I established an assay using optogenetics to activate the Wave or Goro circuit, governing backward crawling or rolling respectively, and taking the behavioural output as read-out. First results show that AG ablation is lethal and that blocking of exo-/ endocytosis in AG in the Wave circuit leads to a decrease in backward waves. In contrast, WG ablation does not affect the Wave circuit whilst it has a strong impact on the Goro circuit.

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