Pain and immunity

Supervision by: Peter Hoitinga

Contact: p.k.hoitinga@rug.nl, room 5172.0666; language: English or Dutch

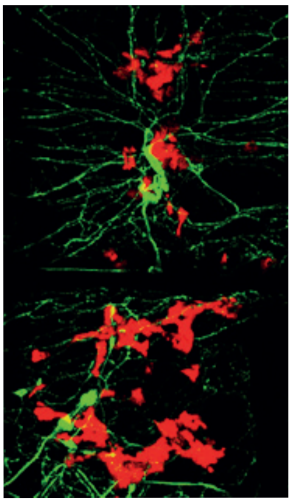

Figure: A close up of a sessile haemocyte cluster with sensory neurons in green, and haemocytes in red. From Makhijani et al. 2017

The immune system is a fast evolving trait, due to the enormous evolutionary pressure that immune challenges, such as wounding, pathogens and parasites, inflict. The immune response involves the action of multiple different organs, tissues and circulating blood cells. In my research, I aim to study the mechanisms and the evolution of the immune response against parasitoid wasps in *D. melanogaster*. Parasitoids lay their eggs in the larvae of *Drosophila*; this induces the proliferation and differentiation of different types of blood cells (called haemocytes in insects) that surround the parasitoid egg, encapsulate and kill it. At present, much is still unknown on precisely how parasitoid attack triggers the production of haemocytes.

When the skin of a fruit fly larva is punctured with a needle (or the ovipositor of a parasitoid wasp) there is a very rapid increase in the number of blood cells (haemocytes) that circulate in its haemolymph. I suspect that sensory neurons may play an important role in this process. Fruit fly larvae have a special type of tissue called sessile haemocyte clusters, where blood cells are found in close association with sensory neurons (see figure 1). I suspect that puncturing the skin leads to the activation of nociceptors that send a signal to these sessile haemocyte clusters, after which the haemocytes are released into the haemolymph. To better understand this response we will assess what happens when we genetically or experimentally knock-out the pain perception of fruit fly larvae, and assess how this changes the hemocytic response to puncturing the skin.

References: Makhijani, K. et al. (2017) Regulation of *Drosophila* hematopoietic sites by Activin-β from active sensory neurons. Nature Communications 8, Article number: 15990

Methods: Fly genetics & phenotypic assays (crossings, parasitization assays, cell counting); molecular methods (RNA extractions, qPCR)

Starting date: open