

Imaging zebrafish neutrophils and macrophages during inflammation

Background

The complex partnership between neutrophils and macrophages during inflammation is central to host defense. The zebrafish is a powerful model for the intravital imaging of inflammation; however there is currently no zebrafish model which is capable of distinguishing macrophages from neutrophils. In this study, researchers have engineered and characterized a novel transgenic zebrafish which allows clear distinction between macrophages and neutrophils. This was used to perform simultaneous intravital imaging to investigate the individual contributions of these important substrates during inflammation.

How did the UltraVIEW VoX and Volocity help them to achieve their research goals?

Confocal microscopy was performed on anaesthetized zebrafish embryos using the UltraVIEW[®] VoX 3D live cell imaging system. To observe the recruitment of both neutrophils and macrophages to a site of inflammation, an inflammatory response was induced by tail transection. The figure shows a representative confocal timelapse series, acquired up to 14h after injury. Volocity[®] 3D imaging software was used to quantify cell number at the site of injury. Neutrophils were rapidly recruited and their number peaked ~6h post-injury, before resolving. The number of macrophages increased until at least 48h.

Researchers also used Volocity to track neutrophil and macrophage movement to the site of injury in order to measure their migration speed. Macrophages were shown to move significantly more slowly towards an inflammatory stimulus, compared with neutrophils.

How will this study contribute to scientific knowledge?

Researchers have revealed distinct differences in the migration speed and kinetics of recruitment of neutrophils and macrophages to sites of tissue injury. The novel transgenic zebrafish used here will provide a powerful tool for future intravital imaging studies.

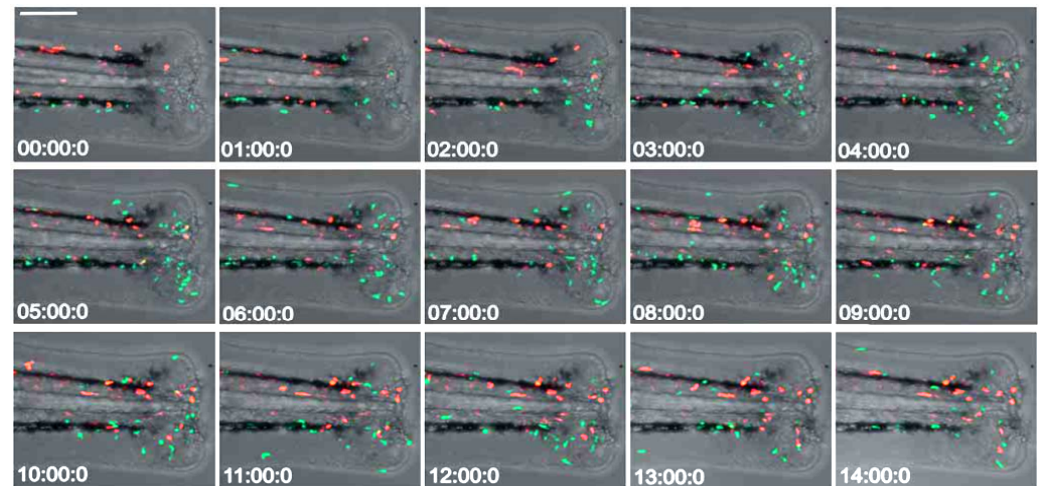


Figure: UltraVIEW VoX timelapse series of a novel transgenic zebrafish embryo, showing the migration of GFP-expressing neutrophils (green) and mCherry-expressing macrophages (red) to a site of tailfin injury from 0-14h after injury. An initial neutrophilic response can be seen before resolving while macrophage recruitment increases more slowly over time. Scale bar = 140 μ m. A movie is also available at <http://www.schattauer.de/index.php?id=2397> which shows frames acquired every 60s over the first 12h.