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PhD project: Post-embryonic development and anatomy of the zebrafish inner ear

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School of Biosciences, Bateson Centre for Disease Mechanisms, and Neuroscience Institute, University of Sheffield

The zebrafish is a superb model system for study of the inner ear. Many key developmental events that form the vestibular apparatus—including epithelial folding, fusion and perforation to establish the semicircular canal ducts—are complete by 5 days post fertilisation. However, several important steps take place during the post-embryonic period, including continued development of the semicircular canals and otoliths. These later developmental events remain largely undescribed. Moreover, inner ear defects in homozygous viable lines at post-embryonic stages remain uncharacterised.

The aim of this project is to use a variety of imaging and computational image analysis techniques to generate a 3D morphometric atlas of post-embryonic stages of otic development, using the zebrafish as a model system. There will be a focus on development of the semicircular canal system. An atlas of wild-type semicircular canal development will form an important reference point to generate in-depth morphometric and behavioural phenotypic profiles of selected viable mutant lines at post-embryonic stages.

Two genes of interest are *adgrg6* (*gpr126*) and *bmper*, both of which form models for human disease. Knowledge of the genetic pathway disrupted will allow the student to test hypotheses concerning gene function. The student will receive training in state-of-the-art imaging using equipment housed in the Light Microscopy Facility (https://www.sheffield.ac.uk/lmf). Wild-type and mutant lines will be crossed to transgenic lines of interest for live fluorescence imaging. The student will receive training in both open-source and available commercial packages for image analysis.

The project will incorporate a clinical placement, hosted by Meena Balasubramanian, a clinical geneticist specialising in relevant human disorders. This will provide important context and relevance for the project, together with experience of the clinical sector.

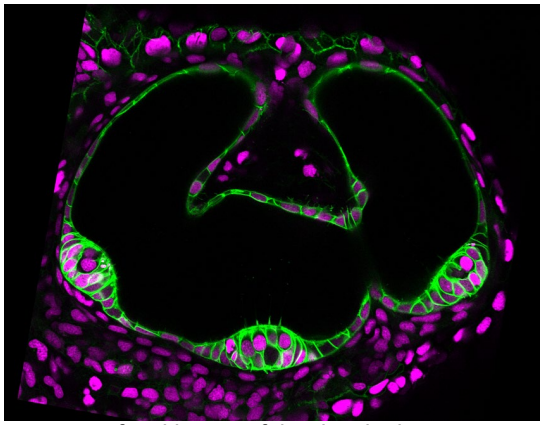

Image: Airyscan confocal image of the developing sensory epithelia and semicircular canal ducts in a 3-day old zebrafish ear.
Cell membranes are labelled in green; cell nuclei are labelled in magenta.

For more information, please visit the Whitfield lab website and blog:
https://sheffield.ac.uk/biosciences/people/academic-staff/tanya-whitfield
https://whitfield-lab-news.blogspot.com/