Investigating the role of *pinchado* in the regulation of oocyte polarity and oogenesis in zebrafish (Danio rerio)

Cell polarisation is a process by which a symmetric cell attains asymmetry by differential distribution of its molecules and components. This asymmetry can be structural and/or functional and is essential for cells to carry out their destined functions. Many cell types such as epithelial cells, immune cells, neurons, and oocytes undergo polarisation to perform their functions. In many organisms, oocytes undergo polarisation upon the formation and appearance of a membrane-less granule called the Balbiani body (Bb). In the vertebrate, zebrafish (*Danio rerio*), oocyte polarity is established early in oogenesis. Oocyte polarity is important for proper development of the animal-vegetal axis of the egg and for specification of the germline. However, the mechanisms are not well understood.

A novel gene, *pinchado (pin)* was identified as a potential germplasm and oocyte component in zebrafish, with maternally expressed transcripts. Previous study from the Sampath lab has shown that maternal pin mutants produce defective eggs with multiple openings for the sperm entry in the chorion. These openings are called micropyles and they serve as the entry point for sperms during fertilisation. Wildtype embryos have a single micropyle, that ensures the entry of a single sperm for fertilisation/prevent polyspermy. In addition, the egg cytoplasm is distributed circumferentially, around the yolk, and many mutant eggs lack a clear animal-vegetal axis. These observations suggest that pin might be involved in the establishment of oocyte polarity. However, how pin regulates oocyte polarity is not understood. The molecular pathways through which pin functions are unknown, and how it interacts with other components essential for establishment of oocyte polarity in zebrafish is also not known.

Hence, my PhD project aims to investigate in depth the role of pin in zebrafish oogenesis and the establishment of oocyte polarity. I intend to use a combination of imaging, cell biological and molecular assays such as single cell transcriptomics, combined with embryological manipulations to answer these questions. Through this study I hope to gain a better understanding of oogenesis and the mechanisms involved in establishment of oocyte polarity in zebrafish. The pathways and mechanisms that I identify through this study can be applied to other fish species and may also provide insights about polarity establishment in a range of cell types.