

Research Theme: Cell and Structural Biology
Research Project Title: Nanometer-scale organisation of the epithelial apical-lateral membrane border
Principal Investigator/Supervisor: A/Prof Alexander Ludwig
Co-supervisor/ Collaborator(s) (if any): NA
Project Description
<p>a) Background:</p> <p>The establishment and maintenance of cell polarity is pivotal for epithelial tissue morphogenesis and function and its loss is associated with a range of human diseases including cancer. My lab is interested in the molecular and spatial organisation of the protein network that controls epithelial apico-basal polarity. We focus our efforts on a particular membrane compartment – the apical junctional complex (AJC), which is located at the boundary between the apical and lateral membrane. The AJC plays an important role in epithelial cell polarity; it connects adjacent cells into a tight monolayer, it controls the passage of molecules across epithelial tissues, and it serves as a diffusion barrier that physically separates apical and baso-lateral membrane components. In addition, the AJC serves as a signaling and trafficking platform to control epithelial cell plasticity. We are interested in the nanometer-scale organisation of the AJC and in identifying and functionally interrogating novel regulators of this membrane domain.</p>
<p>b) Proposed work:</p> <p>The aim of this PhD project is to study the organisation of the epithelial apical-lateral border using multiplex quantitative proximity proteomics (QPP), different imaging approaches, and functional assays. QPP will be performed in genome-engineered epithelial cell lines using quantitative labels (SILAC, NeuCode) for multiplex mass spectrometry. The aim is to produce a spatio-molecular map of the apical-lateral border at nanometer precision, and to identify novel components of this membrane compartment. Direct protein labels for electron microscopy (APEX) and state-of-the art 3D EM imaging (cryo imaging, tomography, FIB-SEM) will be applied to produce insight into the structural organisation of the apical-lateral border. Potentially novel components and regulators identified by QPP will be functionally interrogated using RNAi and CRISPR/Cas9 technology.</p>
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Please apply at the following:
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