NANYANG TECHNOLOGICAL UNIVERSITY
SINGAPORE

School of Biological Sciences
College of Science

Seminar Announcement

Spatio-molecular mapping of the epithelial cell polarity network

Date: 28 February 2020
Time: 4 p.m.
Venue: Classroom 1, SBS

Speaker:
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Polarity is a fundamental property of most cell types and is critical during development and for many cell and tissue functions. The overarching goal of my lab is to understand the molecular and cellular mechanisms that establish and maintain polarity in epithelial cells. Central to epithelial apico-basal polarity are the polarity proteins Par, Crumbs, and Scribble. These proteins assemble into membrane-associated scaffolds and thereby organise an asymmetric protein network that sets up cell polarity in a precise spatio-temporal manner. Apical (Par and Crumbs) and basolateral (Scribble) polarity modules overlap at the apical-lateral border, which, in mammals, is defined by the apical junctional complex (AJC). The AJC is composed of tight junctions (TJ) and adherens junctions (AJ) and plays important roles in epithelial polarity, tissue morphogenesis and plasticity. However, the molecular composition and precise sub-junctional organization of the AJC and its associated polarity regulators are still not well defined.

To address this question we have mapped the cortical distribution and molecular environment of the Par and Crumbs modules by electron microscopy imaging and quantitative proximity proteomics using the peroxidase APEX2. This permitted us to localise cell polarity and junctional proteins with high spatial precision and to produce a spatially resolved proteome of the apical-lateral border. Intriguingly, and contrary to previous models, we find that the Crumbs polarity module defines a hitherto unidentified polarity domain apical of tight junctions. This newly discovered “vertebrate marginal zone” (VMZ) is composed of the Crumbs complex, HOMER scaffolding proteins, regulators of the actin cytoskeleton, and novel HIPPO pathway proteins. Taken together our work defines the spatio-molecular organisation of the apical-lateral border in fully polarised epithelial cells, reveals an unprecedented degree of molecular and spatial conservation of invertebrate and vertebrate polarity domains, and provides a comprehensive resource for potentially novel regulators of cell polarity and cell-cell junction assembly. The possible implications of our findings as well as future research directions will be discussed.