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OTHER PROGRAM AFFILIATIONS

Metabolic Disease and Obesity

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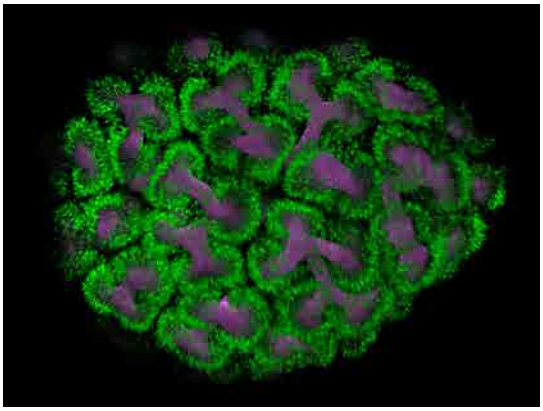
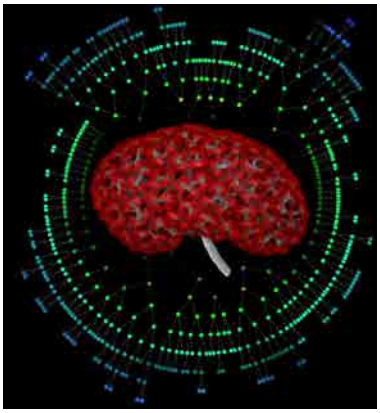
Our group studies how the embryo develops with a view to understanding the developmental basis for congenital diseases and those caused by a compromised fetal environment. In particular we are interested in understanding the developmental mechanism known as “branching morphogenesis”, which is employed by a large number of organs to establish the tissue architecture required to facilitate exchange of nutrients, gases or waste in the adult organ. The branched airways of the lung and the urine collecting system of the kidney are examples of the end products of this remarkable process. By accurately quantifying how this happens in model organisms we aim to determine, in an appropriately rigorous manner, how genetic changes and environmental factors can shape organ structure. This is important for understanding the developmental origins of congenital diseases and in assessing whether and how the “normal” variations observed in the structure of organs between different individuals are influenced by their experiences and exposures as an embryo.

Research Projects

1. **Understanding normal and abnormal kidney development**
2. **Dissecting the molecular basis of congenital kidney diseases**



Cells on the surface of the developing kidney



The complex branched epithelium in the fetal kidney

Selected significant publications:

1. Combes AN*, Short KM*, Lefevre J*, Hamilton NA, Little MH^, **Smyth IM**^. 2014. An integrated pipeline for the multidimensional analysis of branching morphogenesis. *Nature Protocols* 9(12):2859-79.
2. Short KM*, Combes AN*, Lefevre J, Ju AL, Georgas KM, Lamberton T, Cairncross O, Rumballe BA, McMahon AP, Hamilton NA, **Smyth IM**^, Little MH^. 2014. Global quantification of tissue dynamics in the developing mouse kidney. *Developmental Cell*, 29(2):188-202.
3. DiTommaso T, Jones LK, Cottle DL, The WTSI Mouse Genetics Program, Gerdin AK, Vancollie VE, Watt FM, Ramirez-Solis R, Bradley A, Steel KP, Sundberg JP, White JK, **Smyth IM**. 2014. Identification of Genes Important for Cutaneous Function Revealed by a Large Scale Reverse Genetic Screen in the Mouse. *PLoS Genetics* 10(10): e1004705.
4. DiTommaso T, Cottle DL, Pearson HB, Schlüter H, Kaur P, Humbert PO, **Smyth IM**. 2014. Keratin 76 Is Required for Tight Junction Function and Maintenance of the Skin Barrier. *PLoS Genetics* 10(10):e1004706.
5. Short KM, Hodson M, **Smyth I**. 2013. Spatial mapping and quantitation of developmental branching morphogenesis. *Development* 140(2):471-8.

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