John Aplin: Report on travel to the IFPA meeting in Buenos Aires, September 10-13 2019

The SRF kindly granted me a travel award to support attendance at this really excellent meeting, the first IFPA to be held in South America. It was a pleasure to be able to support the local organisers as a member of the Scientific Committee and also a member of the judging panel for Early Career Researcher talks. It was attended by over 400 delegates, about half from South American countries, and the scientific quality was high. The conference venue at the Catholic University of BA was of an excellent standard and location and the social events were well run and attended.

My invited platform presentation was as follows:
EARLY STEPS IN TROPHOBLAST DIFFERENTIATION Aplin, John; Bennie, S.; Brison, D. R.; et al. Conference: Meeting of the International-Federation-of-Placenta-Associations (IFPA) Location: Buenos Aires; Date: SEP 10-13, 2019
PLACENTA Volume: 83 Page: E8 Meeting Abstract: S5 Published: AUG 2019

Intercellular contact between the trophectoderm (TE) of the hatched blastocyst and the uterine luminal epithelium initiates implantation, but much remains to be learned about the early trophoblast lineages that initiate the cascade of events that leads to placental development. We set out to observe the pioneering trophoblast at human embryo implantation in vitro, and examine the possibility that intrinsic cellular heterogeneity present in TE before interaction with uterine cells may anticipate characteristics of differentiated trophoblast that arise post-attachment. Computational methods were used to integrate single-cell transcriptomic datasets generated from human blastocyst trophectoderm and human trophoblast stem (TS) cells undergoing differentiation. High-resolution fluorescence microscopy was used to examine 46 human blastocysts interacting with human epithelial Ishikawa cells from day 6 to day 8 of development. Clustering revealed at least 3 minority subsets of TE segregating progressively from the main population from day 5 to day 7 of development, two of which showed a strong resemblance to primary syncytium derived from TS cells. Overall, the TE transcriptome is biased towards genes that have appeared relatively recently in evolution, and this is even more evident in cells showing a more differentiated mRNA profile. Embryos had attached to the epithelial monolayer within 6 hours, and by 48 hours, foci of primary syncytium (STR; cells lacking intercellular borders marked by E-cadherin) had appeared that breached the epithelium. Heterogeneity was also apparent in the mononuclear trophoblast population, with sub-populations of CDX2+ and GATA3+ cells respectively distal from, and more proximal to, the epiblast. The results suggest that the TE contains cells that are transcriptomically primed to form invasive syncytium. Direct cell contact-induced differentiation of TE can occur rapidly and non-uniformly to produce invasive primary STR, while TS cells are hypothesised to reside amongst the mononuclear population.

The presentation generated a good discussion and many questions outside the conference hall. It interfaced well with other presentations from groups moving into the rapidly moving field of human trophoblast stem cells. The abstract was published as above.

In addition I was a coauthor/cosupervisor on a poster presentation by Dr Lewis Renshall, an MRC-supported postdoc in our centre:
TARGETED LIPOSOMAL DELIVERY OF EPIDERMAL GROWTH FACTOR INCREASES SYSTEM A AMINO ACID TRANSPORTER ACTIVITY IN HUMAN PLACENTAL EXPLANTS
Lewis J Renshall, Frances Beards, Susan L Greenwood, Paul Brownbill, Edward Johnstone, Colin P Sibley, John D Aplin, Lynda K Harris