Editorial: Mechanisms Safeguarding the Trophoblast Multipotent State

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Approximately one-third of the human pregnancies have placenta-related defects including recurrent miscarriage, preeclampsia, fetal growth restriction, and uterine inflammation (Young, Levine et al. 2010, Giakoumopoulos and Golos 2013, James, Srinivasan et al. 2014). Hence it is very important to understand the pathophysiology of placental development. Pregnancy is a unique situation in which the mother and the hemi allogeneic fetus cordially coexist. Several fetal, maternal and placental mechanisms function in concert to protect the fetus from immunological recognition and rejection (PrabhuDas, Bonney et al. 2015). The placenta provides the interface for gas and nutrient exchange between the mother and the fetus and hence proper placental function is critical for healthy pregnancy. However, despite its role in sustaining pregnancy, the trophoblast stem and progenitor cells hierarchy and the underlying molecular mechanisms responsible for the development of the placenta are not well described. Recent advancement in the embryonic stem cells (ESCs)/trophoblast stem cells (TSCs) research led to better understanding of their regulation in terms of transcription networks, cell signaling pathways and epigenetic modifiers (Natale, Schweitzer et al. 2017, Yang, Liu et al. 2017, Nandi, Lim et al. 2018, Okae, Toh et al. 2018). In this issue of the Postdoc Journal, Chrysanthou and colleague described the critical role and mechanisms safeguarding the trophoblast multipotent state. Authors highlighted genes and signaling pathways with significant relevance in the maintenance of the trophoblast multipotent state and differentiation; namely Tead4.

Cdx2, Hippo, Yap1, Eomes, Esrrb, Elf5, Ap-2γ (Tcfap2c), Sox2, Fgf signaling, and Tgf-β. And the importance of these genes has been broadly described in this issue. Epigenetic regulation of the trophoblast lineage-specific transcription factors controls various differentiation-related and physiological processes in trophoblast via imprinting-dependent and -independent mechanisms (Branco, King et al. 2016). Chrysanthou and colleague have elegantly described the intriguing aspect of TSC lineage restriction, maintenance of the trophoblast stem cell state, subtype specialization and differentiation.

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