LBP transcription factors: their role in stem cells, pregnancy and healthy babies.

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LBP transcription factors are a novel family of proteins with diverse functions, although many of their roles are yet to be discovered. We are interested in the role this family of proteins plays in embryonic stem (ES) cells and in the placenta.

LBPs and embryonic stem cells:
A network of transcription factors is required to maintain ES cells as pluripotent cells, that is, cells that can be differentiated to all the cell types in the body. LBP-9 has been identified as part of this network, but its role in the network has not been examined. We would like to investigate its function in the network and determine if other family members are also involved.

LBPs and pregnancy outcomes:
LBP transcription factors appear to play several roles in the placenta that could impact profoundly on the health of a pregnancy: they control the production of progesterone during pregnancy and also placental blood vessel development. We propose that mutations or polymorphisms in these factors may affect these processes resulting in miscarriage or reduced/impaired fetal growth. Understanding the molecular basis of these processes and determining if mutations/polymorphisms in these genes are risk factors for pregnancy complications could lead to screening tests and the development of interventions to improve pregnancy outcomes.

Miscarriage, and recurrent miscarriage (which is three or more consecutive losses), is devastating and is made worse when no explanation can be offered. If these genes are implicated in miscarriage, progesterone supplementation may be effective in preventing loss in some cases. Similarly, poor placental development can lead to serious pregnancy complications, which include intrauterine growth restriction (when a fetus is smaller than it should be). This is seen when the LBP1a gene is knocked out in mice, suggesting that this gene may have a similar role in human pregnancy. We aim to understand the molecular basis for this effect and identify the pathways involved in placental development. Fetal growth restriction can have serious consequences for babies, both for their health at birth, their development through childhood and their risk of developing chronic disease, such as diabetes and heart disease, in adulthood.

If you are interested in finding out more, I am very happy to talk about the research in my lab and discuss potential Honours projects at any time. Honours projects are designed with several priorities in mind: data generation, a good grounding in molecular techniques and publication potential.

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