

Is the oviduct an oxygen sensitive organ?

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The Thompson Laboratory has had a long term interest in the role that oxygen concentration, and in particular, hypoxia (low oxygen), has on the reproductive tract and gametes and embryos. We have identified that the oxygen sensitive transcription factors, Hypoxia inducible factors (HIFs) are expressed by a wide variety of cell types involved in reproduction. Furthermore, we have shown that activation of HIFs result in the regulation of many oxygen-sensitive genes in both cells of the follicle and in embryos. This has consequences for the ability for eggs and embryos to adapt to their environment and may also involve signalling of key events such as ovulation.

One organ yet to be examined in detail is the oviduct. Critical events, such as fertilization and early development of embryos occur within the oviduct. The oviductal lumen is thought to be reasonably well oxygenated in comparison to the uterus, which would agree with the dependency by early embryos on oxidative phosphorylation for the production of energy (ATP). In this project we will look at the expression and protein levels of the HIF proteins and determine if typical HIF responses occur by changing oxygen concentration. We will evaluate the impact of low oxygen concentrations on the secretory activity of the oviduct to assess the hypothesis that this is altered under hypoxic conditions. Finally, embryo development may be assessed using in vivo or in vitro models.

Students will learn about the regulation of genes by oxygen-sensitive transcription factors (which is a relatively new and exciting area of environmentally regulated physiology) and the importance of the oviduct to early developmental events. Techniques to be developed are cell, tissue and embryo culture, messenger RNA quantification and protein quantification (Western blotting).

Key words – oocytes (eggs), embryos, metabolic responses