

## **Effect of *Escherichia coli* infection of the bovine uterus from the whole animal to cell**

Dr Erin Williams<sup>1</sup>, Dr Shan Herath<sup>1</sup>, Prof Gary England<sup>2</sup>, Prof Hilary Dobson<sup>3</sup>, Dr Clare Bryant<sup>4</sup> and Prof Martin Sheldon<sup>1</sup>.

<sup>1</sup>Royal Veterinary College, London, <sup>2</sup>University of Nottingham, <sup>3</sup>University of Liverpool, <sup>4</sup>University of Cambridge  
Email: Erin.Williams@ucd.ie

Following parturition, contamination of the uterine lumen by bacteria is ubiquitous, and uterine health is impaired in cattle because infection persists in 10 – 15 % of animals as endometritis. Endometritis causes infertility for the duration of infection, however, subfertility persists even after successful resolution of the disease. *Escherichia coli* (*E. coli*) is the pathogenic bacterium most frequently isolated from the bovine postpartum uterus, and its isolation is associated with increased peripheral acute phase protein concentrations and fetid vaginal mucus. The presence of *E. coli* is also associated with a slower growth rate and lower estradiol secretion of the first postpartum dominant follicle. Furthermore, in animals that ovulate the first dominant follicle, the corpus luteum formed is smaller and secretes less progesterone.

Absorption of bacterial components from the uterus can prevent the follicular phase luteinising hormone (LH) surge and ovulation. The endotoxin lipopolysaccharide (LPS), which is released from *E.coli*, can pass from the uterine lumen to the peripheral circulation and concentrations are increased in cows with uterine infection. Infusion of *E. coli* LPS into the uterine lumen suppresses the pre-ovulatory LH surge and stops ovulation in Heifers. *In vitro*, endometrial explants produce prostaglandins in response to LPS. Addition of LPS or *E. coli* to stromal and epithelial cells stimulates the production of PGE and PGF and increases their cyclooxygenase 2 mRNA expression. Furthermore, these cells express mRNA for the molecules required for recognition of LPS, Toll-like receptor-4 and CD14.

In summary, *E. coli* is recognised *in utero* and this results in the modulation of the endocrine function of uterine cells and, in addition to the direct effects on the uterus, the subfertility associated with *E. coli* infection involves perturbation of the hypothalamus, pituitary and ovary.