Evidence that oviduct-sperm-immune cells interaction ensures Th2 environment in bovine oviduct immunity for protecting sperm survival

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Sperm are allogenic in the female reproductive tract; however, sperm are protected, and stored in the oviduct until fertilization. Recently, we showed that polymorphonuclear neutrophils (PMN) exist in the bovine oviduct fluid under physiological conditions, and that oviduct-derived prostaglandin E2 (PGE2) is actively involved in the suppression of sperm phagocytosis by PMN. We hypothesized that the binding of sperm to bovine oviduct epithelial cells (BOEC) induces anti-inflammatory (Th2) environment. Investigations were extended to confirm the impact of sperm-BOEC binding on PMN gene expressions and sperm phagocytosis.

**Exp. 1:** Co-culture of sperm with BOEC: After 6, 12 or 24 h, Th2 cytokines (IL-10 & TGFB) expression and PGE2 secretion were stimulated. **Exp. 2:** Immunohistochemistry: Epithelial cells strongly express IL-10 & TGFβ proteins in the oviduct. **Exp. 3:** PGE2 at physiological level suppressed major Th1 cytokines (TNFα & IL-1β). **Exp. 4:** A 4 h pre-exposure of PMN with BOEC supernatant (with & without sperm co-culture) suppressed PMN to express TNFα, but the BOEC media co-cultured with sperm stimulated PMN to express IL-10 & TGFB with PGE2 secretion. **Exp. 5:** BOEC media and Th2 cytokines suppressed PMN phagocytosis of sperm. The results provide new evidence that 1) BOEC supply Th2 environment under physiological condition, 2) the binding of sperm to BOEC further strengthens the Th2 balance in the oviduct, and 3) this local immunity leads PMN to act anti-inflammatory. PGE2 with IL-10 & TGFβ is likely to drive the strong Th2 balance in the oviduct. Thus, sperm create their favorable immunity in the oviduct and PMN may contribute to supply such a strong Th2 balance prior to fertilization.