

Growth Hormone and Insulin-Like Growth Factor-1 Axis in the Bovine Oviduct: Up Regulation during the Periovulatory Period

Suranga P. Kodituwakku¹, Barana C. Jayawardane¹, K.B.M. Nishany¹, Akio Miyamoto² and Missaka P.B. Wijayagunawardane^{1*}

¹Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka

²Graduate School of Animal and Food Hygiene, Obihiro University of Agriculture and Veterinary Medicine, Obihiro, Japan

**missakaw@pdn.ac.lk*

Growth hormone (GH) and insulin-like growth factor-I (IGF-I) are known to be crucial for female reproductive functions. Thus, the objectives of the present study were to determine cyclic regulation of local oviductal GH/IGF-1 and its involvement with oviductal prostaglandin E2 (PGE2), prostaglandin PGF2 α (PGF2 α), endothelin-1 (ET-1) and Angiotensin II (Ang II) secretion. The mRNA expression for GH Receptors (GH-R), IGF, and IGF receptor-1 (IGF-R1) during the normal estrous cycle, as well as the effect of luteinizing hormone (LH), estradiol-17 (E2), and/or progesterone (P4), and GH/IGF-1 axis on the expression of those substances were evaluated. The study was further extended to evaluate the effect of GH/IGF axis on the secretion of PGs, ET-1 and Ang II during the normal estrous cycle. The mRNA expressions for GH-R, IGF-1, and IGF-R1 in the oviducts collected during the different phases of the estrous cycle as well as in cultured bovine oviductal epithelial cells (BOEC) with treatments of GH (ng/ml), IGF-1 (100 pg/ml), LH (1 g/ml), E2 (100 ng/ml), and/or P4 (100 ng/ml) were investigated using quantitative RT-PCR. In vitro microdialysis was used to study the effect of GH/IGF axis on the secretions of PG, ET-1 and Ang II during the normal estrous cycle. The oviductal segments were infused for 4-8 h with GH (1 g/ml) and IGF (10 ng/ml) during a 16-h incubation period. The levels of PG, ET-1 and Ang II in the fractions were measured using enzyme immunoassay. An elevated expression of GH-R mRNA was observed during the periovulatory period and, mRNA expression for IGF-1 was increased only during the postovulatory phase. The mRNA levels for both IGF-R1 were higher during post ovulatory and luteal phases. BOEC treated with LH, E2 and LH+E2 shown significant increased in mRNA levels for GH-R and IGF-1, and only LH shown a significant elevation of IGF-1R. Moreover, a significant increase in mRNA for IGF-1 was resulted with GH, GH+LH and GH+LH+E2, but no effect on IGF-R1. On the other hand, GH, GH+LH and GH+LH+E2 significantly increased COX-2 mRNA expression. Treatments with GH, GH+LH and GH+LH+E2 increased the COX-2 mRNA expression, and IGF+LH and IGF+LH+E2 increased the mRNA expression for PGES and PGFS in BOEC. The results of the present study indicate that, the oviductal GH/IGF1 axis is stimulated during the periovulatory period that may contribute to provide the best oviductal environment for gamete transport, fertilization, embryo transport, development and metabolism, thus improving the fertility and embryo survival.

Keywords: Bovine oviduct, *in vitro* microdialysis, GH/IGF Axis, gene expression, prostaglandins

Acknowledgements: This project was supported by a National Research Council Grant (No. 11-198)