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Degree Objective: Ph.D. Endocrinology and Reproductive Physiology

Background: BS Animal Sciences Brigham Young University – Idaho, Rexburg, ID MS Endocrinology & Reproductive Physiology Univ Wisconsin-Madison, Madison, WI

Current Research Project:

My research is focused on the study of the effect of insulin resistance on ovarian function and how this relates to Polycystic Ovarian Syndrome. Previous experiments, in which Dexamethasone was utilized to induce insulin resistance, resulted in an anovulatory phenotype that was overcome by exogenous GnRH, but not E2. However, Dexamethasone has several limitations. This glucocorticoid can induce negative health consequences if used long-term, thus precluding the use of this agent for extensive periods of time. Additionally, data suggests that it may cross-react with the progesterone receptor, which would produce the results that were observed in our trials. Thus, my current research is instead based on the use of growth hormone (GH) to induce insulin resistance.

A five-month study was completed in which three separate treatment groups were utilized: animals that received saline twice weekly (Control, n=3), animals that received 500 mg of growth hormone once weekly and saline once weekly (1X, n=3), and animals that received 500 mg of growth hormone twice weekly (2X, n=3). The experimental design consisted of three 'rest periods', followed by three 'intensive periods'. During the rest periods, which lasted for four weeks, animals were administered their respective treatments, and blood samples were collected twice weekly to determine insulin and glucose concentrations. Additionally, several presynchronization treatments were administered during this time to ensure that animals were at the correct stage of the cycle at the initiation of the intensive periods and that all corpora lutea had been regressed. However, minimal ovarian monitoring was performed during these time periods. Each rest period was followed by an intensive period. Intensive periods, each lasting for two weeks, were initiated by the ablation of all follicles greater than or equal to 5mm from the ovaries. This induces the emergence of a new follicular wave at a set time that can be monitored via transrectal ultrasound. During the intensive periods, animals continued to receive their respective treatments; additionally, animals were blood sampled daily to determine insulin and glucose, as well as several reproductive hormones, including progesterone, estradiol, FSH, and AMH. During this time period, animals also underwent daily ovarian evaluation to determine number, size and growth of follicles, and if ovulation occurred. Furthermore, at the conclusion of each intensive period, a glucose tolerance test was performed to evaluate insulin sensitivity of the animals. Preliminary hormone analysis indicates that treated animals have numerically higher serum insulin concentrations than control animals; however, these results have not been analyzed statistically, and so it is unknown if this increase is significant. Preliminary glucose results are also numerically higher in treated animals, but the increase is much less dramatic than insulin. Again, it has not yet been



determined if this increase is statistically significant. Ultrasound data showed that all animals were capable of ovulating or lutenizing a follicle at all time points tested. If animals prove to be insulin resistant, this finding indicates that either insulin resistance alone is not enough to induce anovulation or insulin resistance must be present for longer than was induced in our study. If, however, animals prove to not be insulin resistant, such an outcome would not be unexpected and would indicate instead that the results obtained are not indicative of what may be occurring in true insulin resistance.

Honors:

NIH T32 Trainee; NIH Ruth L. Kirschstein National Research Service Award NIH T32-HD041921.

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Publications:

Hackbart KS, Ferreira RM, Dietsche AA, Socha MT, Shaver RD, Wiltbank MC, Fricke PM. Effect of dietary organic zinc, manganese, copper, and cobalt supplementation on milk production, follicular growth, embryo quality, and tissue mineral concentrations in dairy cows. *J Anim Sci.* 2010 Dec;88(12):3856-70.

National Presentations:

Poster Presentation: Katherine S. Hackbart, Rudelle K. Meyer, Pauline M. Cunha, Robb W. Bender, Hemanta K. Shrestha, Patrick G. Kusilek, and Milo C. Wiltbank. Effect of glucocorticoid treatment to induce insulin resistance on follicle development and ovulation. SSR Annual Meeting. July 30-Aug 3, 2010. Milwaukee, Wisconsin.

Other Presentations:

K. S. Hackbart, R. M. Ferreira, A. A. Dietsche, M. T. Socha, R. D. Shaver, M. C. Wiltbank, and P. M. Fricke. Effect of Organic Zinc, Manganese, Copper, and Cobalt On Follicular Growth, Embryo Quality, and Tissue Mineral Concentrations In Lactating Dairy Cows. ERP Annual Symposium. 2009.

Oral Presentation: Katherine S. Hackbart, Rudelle K. Meyer, Pauline M. Cunha, Robb W. Bender, Hemanta K. Shrestha, Patrick Kusilek, and Milo C. Wiltbank. Effect of Insulin Resistance on Follicle Development and Ovulation. ERP Annual Symposium. 2010.

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