research snapshot
summarize mobilize

Is Progesterone Responsible for Follicular Development in Ewes?

What is this research about?

Some processes within the reproduction organs of sheep are not completely understood. For example, within sheep and other mammals, the exact mechanism controlling the peaks of Follicle Stimulating Hormone (FSH) is not known. Typically, the growth of ovarian antral follicles in sheep, a precursor of ovulation, happens in an orderly fashion. There are usually three to four follicular waves within a sheep's 17 day oestrus cycle. A precursor for any follicular wave is marked by a rise in FSH. Generally, the time between the first two FSH peaks and follicular wave is generally shorter than the second two. The longer time period between the last two FSH peaks and follicular waves happens when lower levels of progesterone are present. This occurs during the end of the oestrous cycle or beginning of the luteal cycle when the corpus luteum is not yet fully functional.

Previous studies have lead to theories that suggest oestradiol (An estrogen hormone responsible for many female reproductive functions) is responsible for the regulation of FSH and follicular waves. A follicular wave is defined as a group of follicles that emerge to become 2-3mm in diameter. The researchers of this study theorize that FSH peaks must reach a threshold before a follicular wave can occur. Furthermore they suggest that FSH peaks operate independently of follicular wave influences. They refer-

What you need to know:

Further investigation is needed to understand the relationship between luteal function and FSH bioavailability. This study could serve as the basis of future studies that aim to fully understand the mechanisms controlling FSH peaks.

enced a previous study that used exogenous FSH (an administered dose) between two endogenous FSH peaks (naturally occurring). The exogenous FSH resulted in a follicular wave. This wave did not affect the next endogenous FSH peak and follicular wave. The induced peak and wave did not delay or affect the next naturally occurring wave. Further studies have suggested that progesterone (P4) could be the mechanism controlling FSH Peaks as opposed to oestradiol. The researchers observed that P4 levels were lower between the 3rd and 4th FSH peaks which could indicate its influence.

The goal of this study was to further assess the interrelation between P4 and FSH. They did this by manipulating of P4 levels in female sheep (ewes).

How can you use this research?

Researchers and breeders could use this knowledge to improve the timing and dosage of progestins (P4) and FSH treatments that are used in artificial reproduction technologies.

UNIVERSITY of GUELPH

CHANGING LIVES IMPROVING LIFE

What did the researchers do?

The study was performed during the months October and November (breeding season) on 12 clinically healthy ewes. There were 6 ewes randomly selected for treatment and 6 selected for control. The treatment group received 15mg of P4 twice a day. Blood samples were also taken twice daily.

During the first 10 days of the experiment, ultrasonography examinations (ultrasonography examinations use images of internal structures) were completed every day at 3pm. The dimensions and relative positions of antral follicles and luteal structures were recorded.

Throughout the study period the concentrations of FSH, P4 & E2 (Oestradiol/estradiol) were all analyzed using radioimmunoassay procedures, which is a technique used to measure concentrations of hormones.

The number of follicular waves was also recorded during the 10 day period. The follicles that emerged within a 24hr period were included in a wave. The day of wave emergence and the number of follicles in each wave were recorded. Finally the largest antral follicle of each wave was analysed.

What did the researchers find?

The administration of P4 in the treated ewes generated 4 times the concentration of P4 relative to the non-treated ewes. Furthermore, the average concentration of FSH was higher in the treated ewes on the 3rd day, but on the 6th day, the average FSH concentration was higher in the control ewes. There were slightly more FSH peaks in the treated ewes than with the control ewes. All of the treated ewes experienced an FSH peak on days 1-2.3, while the control ewes' first FSH peak was detected on day 3.3-5. Overall the first two peaks in the treated ewes were detected 2.5 days earlier.

As expected the exogenous P4 administration produced a significant increase in P4 concentrations within treated ewes. However, the elevated concentration did not linger beyond 4 days. Oestradiol levels were lower in treated ewes. There was no difference in the size or number of antral follicles between the control ewes and treated ewes. The P4 did shorten the interval between FSH peaks and subsequent follicular waves. This supports the hypotheses that P4 organises the pattern of FSH Peaks. This study indicates P4 as a key regulator in this process.

About the Researchers:

Pawel M. Bartlewski is an Associate Professor with the Department of Biomedical Sciences at University of Guelph and The Ontario Veterinary College. It is published in Journal of Reproduction, Fertility and Development. Baby, T., Bartlewski, P. (2011). Progesterone as the driving regulatory force behind serum FSH concentrations and antral follicular development in cycling ewes. *Reproduction, Fertility and Development, 23,* 303-310. pmbart@uoguelph.ca

Keywords:

Endocrine signal, follicular waves, FSH peaks, ovarian function

Cite this work:

Clear Language Research Summaries are a project of the Institute for Community Engaged Scholarship (ICES) at the University of Guelph. Project partners include the Business Development Office (BDO), SPARK Program at the University of Guelph, and Knowledge Mobilization Unit at York University. This project is part of the Pan-Canadian Research Impact Network. **On the Web: www.csahs.uoguelph.ca/pps/clear_research**