Dairy Barn to Lab Bench:
Imaging Ovaries to Analyzing Cell Function

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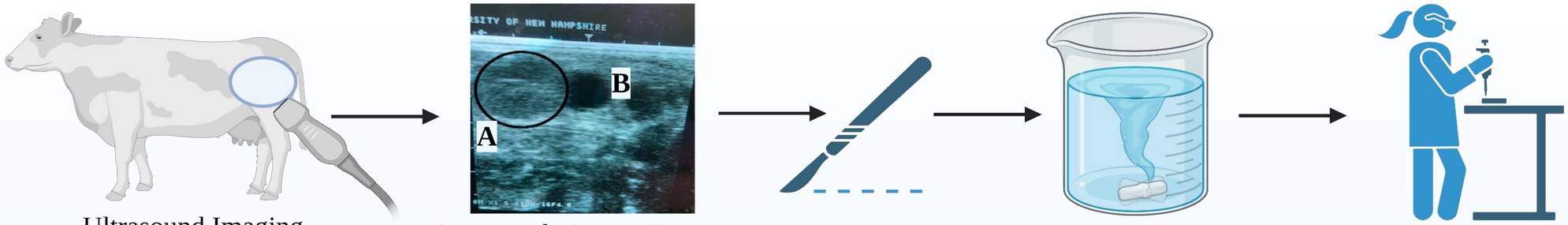
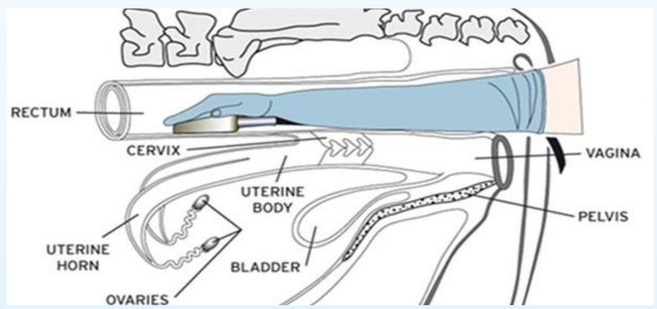


Ultrasound Imaging → Ovary with Corpus Luteum (A) and Follicle (B) → Surgery → Tissue Breakdown → Experiments

Background & Methods

https://blog-international.imv-imaging.com/use-of-ultrasound-scanning-technique-bovine

Figure 1. Portable Ultrasound



https://blog-international.imv-imaging.com/use-of-ultrasound-scanning-technique-bovine

Figure 2. Ultrasound Imaging Technique

Objective: Use ultrasound imaging to identify and localize the corpus luteum to facilitate surgical removal for cell culture experiments

Ultrasound Imaging (Figs 1-4)

- Transducer emits sound waves from crystals and produces black-grey-white images based on density.
- Solid structures (bones) are white while fluid is black.

What is the Corpus Luteum?

- Corpus luteum produces progesterone and regulates fertility in animals.

Surgical Removal of the Corpus Luteum and Isolation of Cells in the Lab

- Enzymes were used to break down tissue and isolate cells from the corpus luteum.

Same-day Incubation of Isolated Luteal Cells

- Cells were incubated for 2 hours and treated with or without fetal bovine serum (FBS).
- Total RNA was extracted from cells and prepared for polymerase chain reaction (PCR).

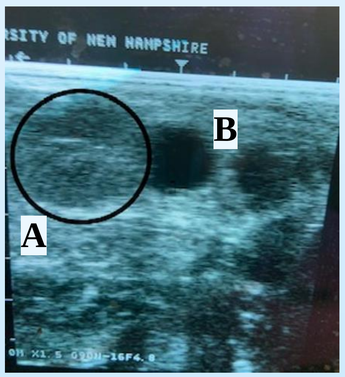
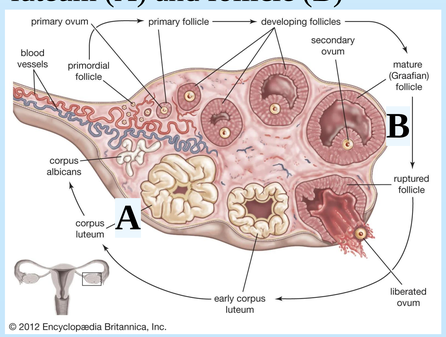


Figure 3. Ultrasound image of ovary, showing corpus luteum (A) and follicle (B)



https://www.britannica.com/science/corpus-luteum

Figure 4. The Ovary

Results

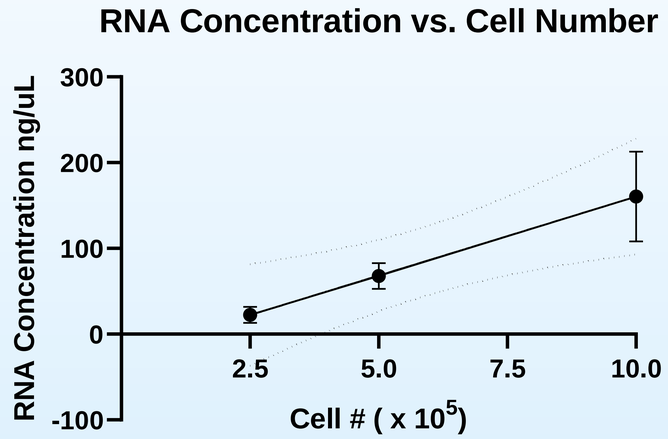


Figure 5. Relationship between cell number and RNA concentration. Isolated luteal cells (2.5 to 10.0 x 10^5) were aliquoted into test tubes and incubated for 2 hours at 37°C (n=3). RNA was then extracted using RNeasy Plus kits (Qiagen).

Pilot Experiment

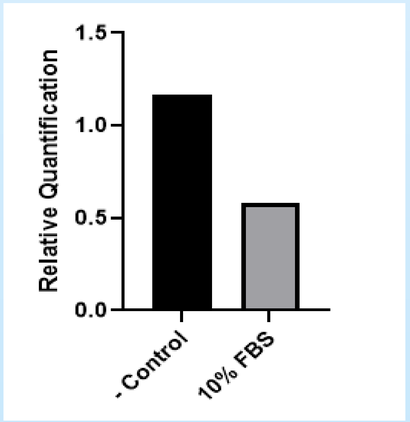


Figure 6. Regulation of cellular communication network factor 1 (CCN1), a builder of blood vessels, by FBS. Luteal cells (5.0 x 10^5) were treated with 10% FBS for 2 hours. Then, RNA was extracted before performing quantitative PCR for CCN1 expression. Analysis was done using QuantStudio Cloud Connect Utility (ThermoFisher).

Summary & Future Work

Summary:

- Validated the relationship between RNA concentration and cell number (R^2 = 0.99) in short term incubations of luteal cells isolated immediately after surgery.
- The pilot experiment suggested that FBS inhibited CCN1, which was the opposite of what we expected This requires confirmation through more replicate experiments.

Future Work:

- Future analysis of progesterone concentrations in the medium will provide additional information about luteal cell function in short term incubations.

Acknowledgements

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