Female fertility is an important subject that remains incompletely understood. A central component of fertility is the maturation of eggs within the ovary. Eggs mature in a complex environment surrounded by granulosa cells that nurture and interact with them. A number of specific proteins are required for the proper development of granulosa cells. The levels of these proteins normally change (increase or decrease) during development, controlled by signals from the mother. These signals “switch on” or “switch off” the synthesis or destruction of different RNA “copies” of genes encoded by DNA within the cell. These RNAs instruct the cell to make specific proteins which then carry out the necessary functions. Through understanding these “switches” that control RNA and protein levels, we develop a greater understanding of granulosa cell function and, ultimately, fertility. These two studies examine the control of thrombospondin-1 (TSP-1), a regulatory protein found in granulosa cells. The first examines different switches that control the TSP-1 RNA level, while the second looks at a hormone (IGF-1) that influences how much TSP-1 protein is made from the RNA.

What is this research about?
Female fertility is an important subject that remains incompletely understood. A central component of fertility is the maturation of eggs within the ovary. Eggs mature in a complex environment surrounded by granulosa cells that nurture and interact with them. A number of specific proteins are required for the proper development of granulosa cells. The levels of these proteins normally change (increase or decrease) during development, controlled by signals from the mother. These signals “switch on” or “switch off” the synthesis or destruction of different RNA “copies” of genes encoded by DNA within the cell. These RNAs instruct the cell to make specific proteins which then carry out the necessary functions. Through understanding these “switches” that control RNA and protein levels, we develop a greater understanding of granulosa cell function and, ultimately, fertility. These two studies examine the control of thrombospondin-1 (TSP-1), a regulatory protein found in granulosa cells. The first examines different switches that control the TSP-1 RNA level, while the second looks at a hormone (IGF-1) that influences how much TSP-1 protein is made from the RNA.

What did the researchers do?
In the first paper, the researchers used various techniques to modify the switches on the TSP-1 gene to determine which ones increased or decreased levels of TSP-1 RNA and protein. In the second paper, the researchers grew granulosa cells on small plates and treated the cells with IGF-1 to determine what effect IGF-1 had on the levels of TSP-1 protein and whether it used the switches identified in the first study.

Keywords:
fertility, granulosa cells, TSP-1, IGF-1, genes, proteins, switches

What you need to know:
Eggs mature in a complex environment surrounded by granulosa cells that nurture and interact with the egg. TSP-1 is a protein known to influence granulosa cell development. Specific switches turn the gene for TSP-1 on or off, influencing the amount of protein present in the cell and thus influencing fertility.

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What did the researchers find?
In the first paper, the researchers identified two important switches that control the levels of TSP-1 RNA. In the second, the researchers found that IGF-1 treatment turns off the switch for the TSP-1 gene, and consequently decreases the amount of TSP-1 protein found in the granulosa cells. This was an important finding as the level of TSP-1 in the granulosa cells is closely connected with their survival and, ultimately, fertility.

How can you use this research?
Research scientists studying fertility can use this research to further understand the role of TSP-1 in granulosa cell development and further investigate the “switches” in other important genes.
Animal scientists can use TSP-1 in granulosa cells as a potential marker of fertility in animals.
Clinicians specializing in fertility can use this research to better understand the basis of problems that may be associated with infertility in animals and people.

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About the University of Guelph researchers:
Jonathan LaMarre is a Professor with the Ontario Veterinary College at the University of Guelph. jlamarre@uoguelph.ca
James J. Petrik is a Professor with the Ontario Veterinary College at the University of Guelph. jpetrik@uoguelph.ca
A.J. Robert McGray was a MSc candidate and Timothy Gingerich was a PhD candidate, both at the University of Guelph, during the course of these studies.

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