Embryonic Survival in Cows and Sheep

This project developed and enhanced preventive and therapeutic approaches that address fertility problems and embryonic loss in cattle and sheep, thus supporting better animal care and sustaining efficient, profitable, and competitive agricultural production.

Who cares and why?

Impaired reproductive performance is an increasing problem and a major cause of reduced profitability for dairy and meat producers. Farmers dealing with low fertility or infertility are faced with reduced milk production, fewer calves for raising or selling, as well as expensive fertility enhancement strategies. Various genetic, physical, nutritional, and environmental factors impact ovarian function, fertilization success, and embryo survival; however, further research is needed to understand the underlying mechanisms that affect fertility in cattle and sheep. With enhanced knowledge of the biology of ovarian function, animal producers, veterinarians, nutritionists, and scientists can work together to develop and implement new preventive and therapeutic reproductive management strategies, especially ones that are not drug-based. These kinds of innovative strategies are critically needed so that farmers can efficiently and safely produce high-quality meat and dairy products that meet rising consumer demands. Improved animal reproductive performance is a key part of sustaining an agricultural production system that is highly competitive in the global economy.

Minutes after giving birth, a two-year-old beef cow attends to her newborn calf. Calves are an important source of income for cattle farmers, and farmers and scientists are working together to ensure that reproduction is successful. Photo courtesy of USDA-ARS.

What has the project done so far?

NE-1027 has brought together molecular biologists, physiologists, geneticists, and other animal scientists from multiple states. These scientists have studied the characteristics and processes necessary for an egg to complete maturation, undergo successful fertilization, and survive as an embryo during early pregnancy. By collaborating, these scientists have been able to standardize protocols and exchange samples, and thereby quickly produce reliable findings. NE-1027 studies have identified markers of low fertility in females and in bulls. In addition, scientists have identified the molecules that trigger the development of an egg into an embryo and have determined cell signaling and hormone regulation patterns during early pregnancy. Participating scientists have also started defining genes that are important for establishing a high-quality egg and genes that can be targeted in order to reverse the effects of abnormal ovarian function. Furthermore, researchers have examined how high feed intake and high metabolism during peak lactation are related to conception rates. Using these findings, NE-1027 members have improved fertility tests, treatments, and management strategies. Findings and recommendations have been shared in over 100 published articles.

Impact Statements

Improved the reproductive performance of cattle and sheep and the efficiency of meat and dairy production systems in ways that protect animal health as well as profits for farmers.

Identified novel strategies to control and possibly enhance ovarian function in dairy and beef cattle. For example, researchers are exploring ways to enhance female reproductive longevity based on new knowledge about ovarian follicles.

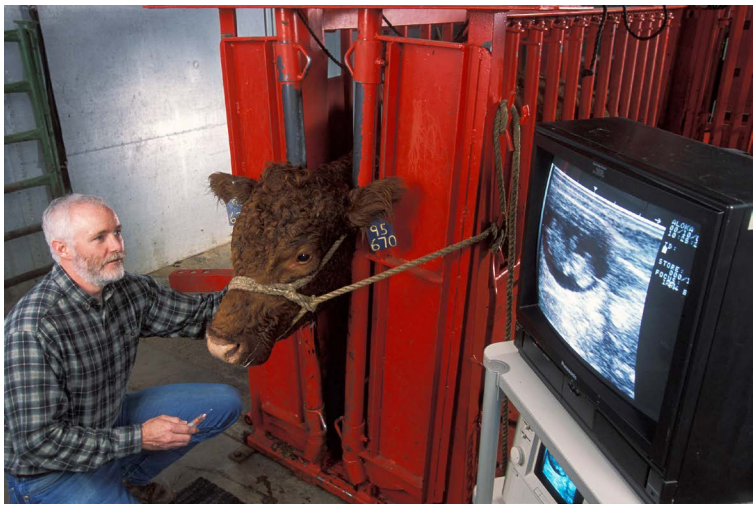
Made discoveries about gene expression and regulation of egg and embryo development in dairy and beef cows that could provide insights for human fertility.

Made molecular discoveries that advanced Assisted Reproductive Technologies (e.g., cloning and sperm injections) and improved conception rates among artificially inseminated animals.

Discovered ways to detect infertility/subfertility in sires, helping farmers make more productive breeding choices.

Helped develop methods for increasing the success of out-of-season breeding in sheep. These methods are being increasingly used by producers and are resulting in greater income.

Advanced and standardized research methods, so that culture samples are more reliable and comparable and a wider variety of tests can be performed.



Reproductive physiologist Tom Geary prepares to take a blood sample from a cow to measure her hormones. An ultrasound monitor on the right indicates this cow is 45 days pregnant. New testing technology has helped scientists and farmers better understand fertility problems and come up with strategies to improve reproductive performance. Photo courtesy of USDA-ARS.

What research is needed?

The team will continue to conduct studies to identify novel genes that predict egg quality. Specifically, researchers will focus on how these genes regulate gene expression in the embryo and during luteal development and function. Additional studies will focus on environmental and metabolic stress that negatively impacts embryo and fetus survival in cattle and sheep. Project scientists will continue to distribute findings to producers to assist them with management strategies and decisions that minimize the detrimental effects of genetic, nutritional, and environmental stress on herd fertility.

Want to know more?

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