

Can We Get More

Researcher studies mechanics to improve reproduction efficiency in beef cattle.

by *Kindra Gordon*, field editor

Cattlemen understand that getting more cows bred means the opportunity to produce more calves, which in turn equates to more beef to sell. While increasing the economic return to the rancher, it also plays an important role in increasing domestic and global beef supplies.

Looking into the future, producing more beef is especially important with the projection for the global population to add 2 billion more people to the planet during the next 35 years. As a result, the world is racing to address the grand challenge of the 21st century: “How do we feed more people?”

George Perry, South Dakota State University (SDSU) professor of animal science and beef extension reproduction specialist, is conducting research that may contribute to the solution. Perry’s research during the past decade has focused on reproduction efficiency in beef cattle. It goes back to that basic premise of more cows bred means the opportunity for more calves and more beef to be produced.

“All ag sectors are looking at production efficiency as we address the grand challenge

of the future,” Perry says. “Dairy is looking at producing more milk. Poultry is looking at more eggs. Swine is aiming to add more piglets in a litter. We in the beef industry are taking the approach that asks, ‘How can we get more cows bred early?’”

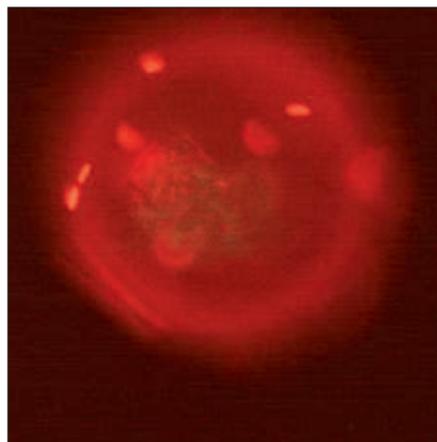
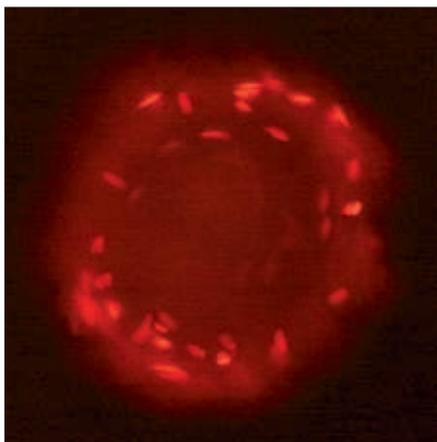
Perry reports that research has shown that beef cows bred earliest in a breeding season are more productive (i.e., have more calves) during their entire life cycle.

“If we can get more cows bred early, we can produce more beef,” he observes.

Beef producers do face challenges with pregnancy rates in their herds, Perry

says. He explains that when a cow shows estrus and ovulates and semen is present from artificial insemination (AI) or natural service, fertilization occurs 90% of the time, but conception rates usually average only 50%-60%.

“This equates to a 30% to 40% embryonic loss. If we can get more of these embryos to survive — even if conception rates were 75% — that many more cows bred and producing that much more beef over their lifetime would benefit the world’s food supply,” Perry says.



► Cows that have elevated concentrations of estradiol prior to fixed-time AI have more than twice as many sperm reach the site of fertilization as cows that have low concentrations of estradiol prior to fixed-time AI. Left: An oocyte (egg) from a cow with elevated concentrations of estradiol prior to fixed-time AI that has numerous accessory sperm attached to it. Right: An oocyte (egg) from a cow with low concentrations of estradiol prior to fixed-time AI that has only a few accessory sperm attached to it.



Cows Bred?



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Focus on estradiol

Perry’s reproductive work with heifers and cows is focusing on the hormone estradiol.

“Estradiol is the signal to the brain for onset of estrus,” Perry explains. Different levels of estradiol appear to result in differences in estrus expression.

From data collected on 10,000 cows synchronized with recommended fixed-time artificial insemination (FTAI) protocols, Perry and his team of researchers identified a 27% improvement in animal conception rates among those cows and heifers with high levels of estradiol. Those results mean estradiol prompted the opportunity for an extra 27 calves out of 100 cows.

Currently, estradiol cannot legally be administered to cattle. Thus, Perry says, “We need to figure out how to get the body to produce estradiol.”

His current research is focused on studying what regulates production of estradiol by the follicle and evaluating what might prompt increased production of the hormone in some animals and not others.

An additional study is evaluating what estradiol does in the uterus to aid beef cow conception rates and embryo survival.

“At Day 6 (after fertilization) we are seeing improved embryo quality when there are high concentrations of estradiol, and by Day 16 estradiol also appears to prompt beneficial changes in the uterine environment,” Perry reports.

Studying bulls, too

From this research, a third area to evaluate was identified — sperm transport.

“We are looking at what factors may influence better sperm survival and fertilization,” Perry explains. He points out that sperm in the epididymis can live for a few weeks, but in lab cultures only for a few days and in the reproductive tract for a few hours. Additionally, the cryo-packaging process for semen to be used for AI can negatively impact sperm survivability.

“We need to learn more about the proteins that surround sperm and the environments we ask sperm to live in,” Perry says. For instance, he points to the fact that among poultry, hens can store sperm and fertilize an egg each day for a week. He believes it may be related to the protein that surrounds the sperm.

Perry believes with more information, the

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beef industry can eventually better identify which sperm will do better at fertilization. He notes that currently a breeding soundness exam (sometimes referred to as a BSE) looks at motility and morphology of a bull's sperm. However, a bull may have good sperm motility and morphology but still have poor conception rates. The research Perry's conducting aims to learn more about the fluid that the semen is in.

"Some sperm may have higher

survivability based on the protein that surrounds it," he says.

As new information is gleaned from this research, Perry says better technologies to store semen and increase conception rates through AI may be developed.

For beef producers, especially those in developing countries, this could be a game changer. "One bull requires a lot of resources," Perry explains. "If producers can replace that bull with a female and use AI instead to

improve conception rates, we can increase beef production. The world would have more beef."



Editor's Note: Funding support for Perry's research has been provided from the National Science Foundation, USDA-Hatch funds, SARE, and industry organizations including AI and animal health companies. Perry acknowledges that many producers have provided access to their cows and, he says, "The fun part of this has been having producers involved." Kindra Gordon is a freelancer and cattlemaster from Whitewood, S.D.