REPRO TRACKS

by Cliff Lamb, Texas A&M University

Developing Replacement Heifers

Tools to manage reproduction.

With the theme of "Icons of Innovation," I thought it would be appropriate to share some significant advances that have been made in recent years that have provided tools to producers to manage reproduction within their herds.

An increase in demand for beef is expected over the next few decades. Reproductive performance of beef cattle will not only determine the overall efficiency of cow-calf operations, but will significantly affect the world's food supply.

Beef cattle production has become a more efficient process during the past few decades, which is largely due to the development and adoption of new technologies, as well as an overall improvement in herd genetics. However, additional advancements in both management and technologies are going to be required to reach a level of animal production that we do not currently meet.

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Cow-calf operations rely on their females to produce a healthy calf once per year to generate revenue and remain profitable. Females that do not produce a calf annually are utilizing resources that could be used to support more productive cattle. Therefore, reproductive management strategies aimed at improving the overall prolificacy and quality of calves play a large role in increasing overall output and profitability of a beef enterprise.

Tools for reproduction

There are technologies available to cattle producers that can be utilized to introduce superior genetics into their herds, reduce the transfer of diseases, improve both male and female fertility, and ultimately increase the value of their calves. These technologies include, but are not limited to, the use of a defined breeding season, diagnosis of pregnancy, estrous synchronization, fixed-time artificial insemination (FTAI), breeding soundness evaluations of bulls, multiple ovulation embryo transfer (MOET), *in vitro* fertilization and the use of sex-sorted semen.

However, many beef producers fail to incorporate these practices into their production system and opt for more traditional approaches. Further improvements to fertility, ease of application and reductions in overall cost will persuade more cattle producers to adopt these reproductive management strategies in the future.

One example of how advanced technology has had an effect is

Continued on page 56

 continued from page 54

demonstrated by the significant improvements made on our understanding of the physiology controlling the bovine estrous cycle. These advances laid the foundation for the development of estrous synchronization protocols that utilize exogenous hormones to synchronize estrous expression and ovulation in cattle.

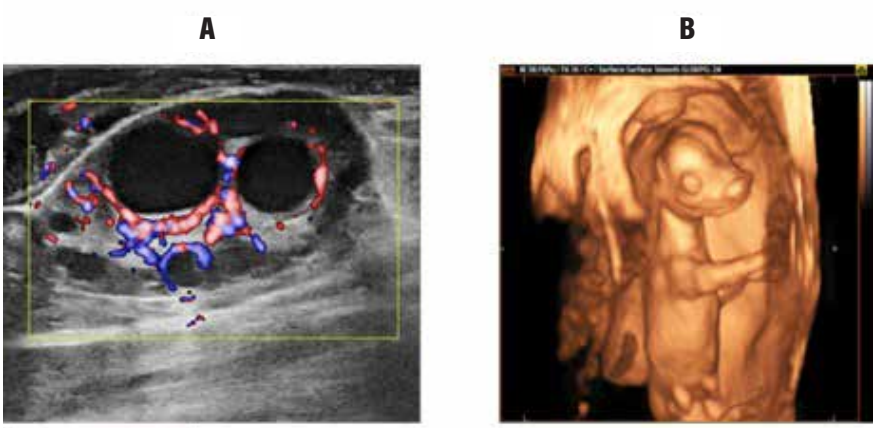
The primary objective of these hormonal treatments is to manipulate the estrous cycle in order to facilitate the adoption of biotechnologies such as artificial insemination (AI) and embryo transfer (ET) by cattle producers. Prior to the establishment of effective synchronization protocols, the labor associated with visual detection of estrus was a major factor limiting the adoption of these biotechnologies.

The understanding of the wave-like pattern of follicular growth increased with the opportunity to utilize ultrasonography (Figure 1A), has led to the development of fixed-time AI protocols that we currently use today.

These recent advances allow us to combine advancements in genetic selection tools with pharmacological hormonal supplementation and adequate nutritional management to effectively overcome puberty and postpartum anestrus to generate highly productive and efficient beef cattle systems.

Consider what may occur with the new technologies, such as 3D ultrasonography (Figure 1B). Researchers at Texas A&M University (TAMU) are now utilizing this technology to better understand embryo survival, especially to focus on enhancing reproductive efficiency.

Figure 1: ***Ultrasound images from the Texas A&M University, Areas of Excellence focused on pregnancy and developmental programming. Panel A represents an image of an ovary demonstrating follicles (black circles) and blood flow (red and blue). Panel B represents a 3D image of a fetus.***



Similarly, the commercialization of sex-sorted semen has drastically increased due to enhanced equipment and improvements in processing procedures. There are a number of benefits associated with the utilization of sex-sorted semen, such as selecting calf gender with greater than 90% accuracy, faster genetic progress and the removal of defective sperm through the sorting process.

In addition, it is easy to incorporate the use of sexed semen into a management system if AI is already being performed, as it will not change the workflow. However, a primary disadvantage that currently hampers the adoption of this technology are poorer and less consistent pregnancy rates through the use of sexed semen when compared to conventional semen.

Nonetheless, new developments in estrous cycle control are now being utilized to provide results that are more acceptable and predictable. In the near future these technologies will be producer-ready. Together with genetic selection, the use of sexed semen will be a good strategy to produce genetically superior animals of the desired sex. As costs decline, and as greater pregnancy rates are achieved, sexed sperm may be increasingly adopted in the beef cattle industry. AJ

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