



The Current Status of Applied Reproductive Technologies for Beef Cattle

Dr. Cliff Lamb, University of Minnesota Beef Team

Cattle producers may be aware of numerous methods to utilize reproductive management to enhance the productivity of their operations. Quite simply, the use of a bull to breed cows to obtain pregnancies tends to remain the most widely exploited form of reproductive management used. However, to become more efficient producers manipulate the breeding season by inserting and removing bulls at predetermined times to ensure that calves are born at the ideal time for each producer. The breeding and calving seasons are dictated by each producer to ensure that cows calve to optimize production efficiency in each operation. Many producers are now familiar with more advanced methods to enhance reproductive efficiency which may further add potential economic efficiency to cattle operations. Artificial insemination, estrous synchronization, embryo transfer, in vitro fertilization, sexed-semen, and cloning are all procedures that have already influenced the beef industry or will influence the industry in the near future.

Artificial insemination (AI) has been a tool that has impacted the beef industry for more than 30 years and numerous purebred and commercial producers have used AI to influence the rate of genetic improvement in their operations, yet AI continues to only be used in about 10% of beef cattle operations in the United States. Clearly, the primary reason often stated by producers for there reason for not adopting this simple technology is the lack of time and labor. The extensive nature of our cattle production systems makes the use of AI a more challenging option

than AI use in the dairy industry, an intensively managed industry. However, since the early 1970's estrous synchronization systems have been developed to assist producers to incorporate AI into their operations by reducing time and labor associated with estrus detection. But not until recently have researchers developed economical, efficient, reliable systems that allow producers to AI their cattle at a predetermined fixed-time, eliminate estrus detection, and only require that cattle be handled three times. These fixed-time AI systems work well in mixed populations of cycling and noncycling cows with fertility that would be equal to a bull. With the advent of the fixed-time AI systems producers do not need to know how to AI their cattle because technicians can be scheduled months in advance to inseminate cattle on the first day of the breeding season. Producers interested in incorporating AI into their operations now have systems that will effectively enhance fertility that require limited time and labor resources. The major AI companies also are trained and have the technicians able to provide these services.

As with AI, the development of reliable and effective estrous synchronization systems also are influencing the embryo transfer industry. Although embryo transfer has tended to be a genetic improvement technology for seedstock producers, fixed-time embryo transfer and the development of direct transfer embryos will filter into the commercial sector of the beef industry. This will allow commercial producers the possibility of incorporating an embryo transfer program into their operations to produce seedstock calves from commercial

cows, valued at a premium over their commercial counterparts. Nonetheless, the cost of embryo transfer remains high and tends to be a technology that will predominantly be used by elite cattle producers.

For over a decade questions have frequently been asked about the future of sexed-semen. Gradually the technology has finally reached the market and has been primarily marketed in the dairy industry to produce female offspring. Currently, only two companies (Select Sires, Inc. and ABS Global) market sexed semen sorted by the flow cytometry sorting process, but only ABS Global currently has semen available from a limited number of beef bulls. During the sorting process fewer live sperm become available to be packaged and fertility is slightly compromised. Therefore, producers contemplating the use of sexed product should be aware that the product will be more expensive than conventional semen and fertility may be compromised. Therefore, recommendations for use of sexed product are to utilize virgin heifers that are detected in estrus twelve hours prior to AI. Producers can expect pregnancy rates of 75 to 90% of what conventional semen would yield.

In vitro fertilization is a procedure that requires fertilization of an unfertilized egg (oocyte) in an incubator and then transferred into a recipient cow when the fertilized embryo is seven days old. The advantage of this system is that oocytes of genetically superior animals can be harvested, matured, fertilized, and transferred into recipients and generate numerous calves. Nonetheless, the cost of a live calf often is a deterrent and the “big calf syndrome” has been a cause of concern during the development of this

technology. However, companies offering in vitro fertilization now indicate that calves are born with birth weights that are within normal ranges. Problem breeding genetically superior cows appear to be where this procedure may have its greatest value.

Recently the Food and Drug Administration (FDA) indicated that meat and milk from cloned animals would be safe for human consumption. Therefore, it appears that cloning of farm animals (including cattle) will become an approved applied reproductive technology in the US. Essentially, cloned animals are scientifically developed identical twins using a skin cell or fibroblast from an animal that is transferred into an oocyte that has had all of its genetic material removed. After exposure to electrical shock the egg begins to divide, thus producing a clone. Cloning is currently an expensive procedure that has little application to commercial beef operations in its current form. However, producing clones of cows or bulls of superior genetics in cases when the animal loses its ability to reproduce or eliminate the spread of disease especially in semen or embryo export cases. Perhaps an ideal opportunity for cloning will occur to generate a clone bull from a high performing steer. Regardless of the future of cloned animals in production agriculture producers should be aware that many breed associations may not be willing to register cloned cattle. Therefore, producers should enquire with each association prior to investing the capital to produce cloned cattle. Feel free to contact the University of Minnesota Beef Team for further questions.