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Estrous Synchronization of Cattle

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Two primary methods of estrous synchronization are available for beef producers that breed artificially: 1) prostaglandin injections and 2) "progesterone-like" ear implants combined with estradiol/progesterone injections.

A third method is being researched and at this printing has not yet received label clearance by the Food and Drug Administration. This third method is combination of an orally active progesterone (MGA) and a prostaglandin.

Prostaglandins

Developments in the study of cattle physiology have revealed a series of hormone-like substances called prostaglandins that are highly effective in synchronizing estrus (or heats) under certain conditions. They act by causing the corpus luteum (a tissue found on the ovary in mid-cycle or during pregnancy) to regress, thereby allowing the cow to return to heat. For this to be accomplished the following conditions must be met: 1) the cows must be cycling and 2) the cows must have functional corpus lutea (between days 5 and 18 of the cycle). Prostaglandins do not cause non-cycling cows to come into heat. Their only effect is to cause regression of a functional corpus luteum (CL).

When management has been good, prostaglandins have greatly reduced the labor and expense of A.I. The period of time, during which cows must be observed for heat, is greatly reduced or eliminated entirely depending on the management system adapted. The prostaglandin or prostaglandin analog products available at this printing include "Lutalyse" (UpJohn), "Bovilene" (Syntex), and "Estrumate" (Haver).

Three basic schemes have been used:

1. Cattle are detected for heat for at least 4 days and correspondingly inseminated. On the morning of the 5th day all cattle not previously detected in heat are injected with prostaglandin. Breeding continues according to heat detection for another 5 or 6 days. This method utilizes less expense in drug (prostaglandin) costs but requires more days of heat detection and artificial insemination. This approach

allows the producer an opportunity to breed all cycling females in an 10 to 12 day period.

2. Two injections of prostaglandin are given 11 days apart. The first injection interrupts the cycles of those cows with mature (more than 5 days old) CL's. Any normally cycling cows not having a CL at the time the first injection was given should have one at the time of the second injection, 11 days later. Plus those cows that responded to the first injection now have 7 to 10 day-old CL's also. Therefore all cycling cows will be synchronized by the second injection. Cows are either bred upon detection of heat or at 75 to 80 hours after the 2nd injection regardless of heat. Most technicians agree that improved conception rates result when the synchronized females are bred on detected heat rather than by appointment. Some experienced inseminators breed potential problem cows twice -- once at 72 hours after prostaglandin and again at 96 hours after the injection. Problem cows are often defined as those that are returning to estrus for the third time and have not been successfully bred on previous attempts. This will increase labor and semen costs but has been shown to be effective with some problem breeders.

3. Prostaglandin is injected and cows are inseminated at detected heat for about 6 days. Cows in the first 5 days of their cycle at the time of injection would not be synchronized. Therefore 25 percent to 35 percent of cycling cows would not be eligible to respond to prostaglandin treatment and would not be detected in the synchronized estrus. Heat detection would have to continue for three more weeks if those cows are given an opportunity to be bred artificially. Otherwise they are usually bred by cleanup bulls if the producer wishes to discontinue the heat detection efforts.

The choice of systems depends on costs, labor, facilities and the amount of time the cattleman wants to devote to breeding. Success requires a cow herd with a close calving interval, good nutrition, good facilities, high quality semen, an experienced inseminator, and accurate heat detection, if heat detection is used. Prostaglandin products are sold through licensed veterinarians. The labels should be read and followed closely. These products can cause abortions in cattle and miscarriages in humans. They also must be

handled with extreme caution by anyone that suffers from asthma.

Progesterone and Estradiol (Syncro-Mate-B System)

A second synchronization program is available for beef and dairy heifers and beef cows (not approved for lactating dairy cows). This system does not use a prostaglandin but utilizes a combination of Norgestomet, a potent synthetic progesterone, and Estradiol Valerate, an estrogen compound. Twelve days prior to insemination, an implant containing Norgestomet is inserted in the ear and a 2 ml intramuscular injection containing Norgestomet and Estradiol Valerate is administered. Nine days later the implant is removed and all cycling females are expected to be in estrus within the next 3 days. Breeding artificially after good heat detection should result in the highest conception rate. Some producers, however choose to breed by appointment. In these cases, they will inseminate all the treated females between 48-54 hours after implant removal. The company that sells this product, called "Syncro-Mate-B" (CEVA Laboratories) recommends that nursing cows be separated from their calves for 48 hours starting at the time of implant removal. This has resulted in a greater percentage of cows exhibiting heat in a tightly synchronized pattern. Because this method causes cattle to come into heat more uniformly than the prostaglandin programs, it has become the method of choice by some A.I. technicians that wish to breed by appointment.

The same precautions about good nutrition, semen quality, facilities, herd health and insemination skill that were given for the prostaglandin system also apply to the implant program. Both systems work well under good management.

Orally Active Progesterone (MGA) and Prostaglandins

The newest estrous synchronization technique is the combined use of MGA and prostaglandin. Melengestrol acetate (MGA; UpJohn) is a feed additive commonly used in feedlot heifer rations to block cycling activity of the heifers. When fed for a short period of time, and then removed from the diet, MGA tends to cause a large percentage of the cattle to exhibit estrus together. Research, however has shown that the first heat after MGA removal has been

somewhat sub-fertile, but subsequent heats have been normal. This program calls for feeding 0.5 milligram of MGA per head per day for 14 days. At this point MGA is removed from the feed. Most of the females will then exhibit heat. Seventeen days after the MGA feeding has stopped, each female is injected with prostaglandin to interrupt the next cycle. Two to five days later, females are bred following detected standing heat. Research at Oklahoma State University has indicated that this method has induced some non-cycling replacement heifers to begin cycling therefore increasing the percentage that were bred early in the insemination season. Normal conception rates were achieved when the cattle were inseminated on the second heat after MGA removal. An important consideration is that the breeding schedule must be planned at least 35 days prior to the start of the breeding season. **At this printing, MGA has not yet been approved for use with animals intended for breeding purposes.**

Terminology Used:

Corpus Luteum (CL)—structure on the ovary that produces progesterone; will continue producing progesterone if pregnancy occurs; if no pregnancy then CL will be regressed (by prostaglandin produced by the cow) and cease to produce progesterone.

Estrus (Estrous)—the time of receptivity of the male by the female; occurs at approximately 21 day (may vary from 18 to 24 days) intervals in cattle; behavior of female is dominated by estrogens in blood.

Hormone—chemical messenger that is produced in one location in the body, travels via the blood stream to another or target tissue and causes changes in the target tissue.

Estrogen—hormone released by the follicles of the ovary; causes behavioral signs of estrus; prepares the reproductive tract for insemination; causes contractions of the uterus

Progesterone—hormone released by the corpus lutea (CL), causes the tract to cease contractions; promotes and maintains pregnancy; blocks release of new hormones from the brain, decline in progesterone becomes a signal to start new cycle.

Prostaglandin—hormone released by the uterine lining, causes death or regression of corpus luteum on the ovary; is a signal that the cow is not pregnant, used commercially as a synchronizing drug or for aborting feedlot heifers.

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