

SYNCHRONIZATION OF DAIRY HEIFERS WITH PROSTAGLANDIN F_{2α}:
CURRENT UPDATE

by

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As reported in previous production conferences, detection of estrus and proper timing of insemination are major reproduction problems facing dairymen. Utilization of systems to synchronize estrus and control the time of insemination will benefit markedly the dairy producer of Florida. Large herds, seasonal periods of infertility associated with heat stress, and large use of artificial insemination place a major emphasis on reproductive management. We reported previously on our research findings, done within Florida, that prostaglandin F_{2α} is a drug which will provide dairymen with a practical method to control time of ovulation, and that insemination at this synchronized ovulation yields a normal level of fertility.

Due to a major research effort by the Upjohn Co. in cooperation with research establishments throughout the United States and internationally, a PGF_{2α} product is now available commercially to dairy producers. This product may be used to control the time heifers are inseminated.

Marketed under the name of Lutalyse this drug contains prostaglandin F_{2α}, which when injected into normal cycling dairy animals, results in a predictable onset of heat and allows for controlled or timed breeding. As such Lutalyse can be thought of as a new breeding management tool for dairymen. However, it is not a substitute for good management. Successful use of Lutalyse requires even greater attention to management practices.

Lutalyse combined with good total management has many benefits: reduces or eliminates heat detection, utilizes AI more conveniently, times entry of animals in the milking herd, produces (via the use of AI) a genetically superior calf, and certainly increases productivity potential.

Lutalyse is currently available to the dairy producer as a prescription drug to be purchased from a veterinarian. At the present time it is approved by the Food and Drug Administration (FDA) to be used in non-lactating animals or dairy heifers. It is not at this time approved for use in lactating cows. However, approval of its use for lactating animals probably will be obtained in the near future.

How the drug is best utilized to control heat is a decision that is made between you and your veterinarian. The Upjohn Co. has proposed a management scheme for the drug's use that we will now review. There are

several factors required for an effective "Management Program". Animals must be cycling normally since the drug is only effective in cycling animals. It will not work in prepubertal heifers, and it will cause abortion if administered accidentally to a pregnant animal. Animals need to be under a proper plane of nutrition, adequate handling facilities must be available, and a good overall herd health program is essential. A two injection program is recommended by Upjohn. Simply stated, one Lutalyse injection is given followed by a second injection 11 days later, and then animals are inseminated. Producers can either observe for heat and follow normal breeding procedure, or do a timed AI at 80 hours after the second injection.

Study after study, including those in our own herd, indicate that you can expect conception rates characteristic of your herd. If your particular herd has a conception rate of 70% normally, then 70% will be expected following Lutalyse treatment. Likewise, if normal conception rate for your herd was only 40%, than you can expect 40% after treatment. Lutalyse is not a fertility drug, and it will not increase or decrease conception rates.

It is important to understand how Lutalyse works because this is the key to your management program and decisions will be based around it. On day zero of the biological clock, heifers shows heat for 8 to 18 hours at which time she will stand for other animals. On day one she ovulates releasing an egg from the ovarian follicle into the oviduct. In the next 5 days following ovulation, the empty follicle undergoes a change and develops into the corpus luteum (CL or yellow body) which produces progesterone. Progesterone is responsible for maintaining pregnancy should fertilization occur. About 16 days after ovulation, if fertilization does not occur, the CL begins to disappear or regress and progesterone secretion decreases markedly. As regression occurs, another follicle begins to develop and heat occurs again on approximately day 21 when the cycle is repeated. If fertilization occurs there is no regression of the CL and progesterone concentration is maintained throughout pregnancy.

If Lutalyse is injected during the first 5 days after ovulation, before the corpus luteum is functional, the cycle length is not altered. The developing CL is not affected by the drug. Consequently, injection at this time results in no alteration of cycle length. From about days 6 to 16 a functional CL exists. Injection of Lutalyse at this time will cause the CL to regress and the heifer to return to heat in 2 to 5 days. After day 16 the CL starts to regress naturally. If Lutalyse is injected at this time there is no effect and the animal returns to estrus naturally in 2 to 5 days.

Upjohn recommends a two injection sequence for the following reasons. On the day of the first injection, about 75 to 80% of normal cycling heifers will be between day 6 and 21 of the cycle. All these will be in heat within 2 to 5 days following injection. Those between days 6 and 16 of the cycle will respond to the drug and those between days 16 and 21 will return to heat naturally. This heat period 2 to 5 days after the 1st injection becomes another management check point. If the majority (example 75%) of animals are not in heat after the first injection; STOP! Do not give the second injection or inseminate.

In all probability the animals are not cycling normally (too young, pre-puberal, underfed, etc.). With the help of your veterinarian, you should re-evaluate your management program. The remaining 20 to 25% of the animals will be between days zero and 6 of the cycle, without a functional CL, and will not respond to the first injection of the drug.

Assuming that the majority of animals showed heat after the first injection, continue with the plan. That is reinject 11 days after the first injection. At this time all animals will have developed a fully functional and responsive CL which will be regressed by the drug. The second injection thus allows you to breed either by observing for estrus and following normal breeding procedure or by AI 80 hours after the second injection.

It is rather clear at this point that Lutalyse is a management tool which requires the implementation of a total breeding management program. Such a program includes cycling animals, proper nutrition, adequate handling facilities (adequate handling facilities must be available to restrain animals at least three times in 15 days; facilities should include holding pen, crowding alley and breeding chute), good herd health program, and quality semen and insemination technique. A quality inseminator is critical for in large herds fatigue is a major factor in lowering subsequent conception rate. These are all important to implement a controlled breeding program.

Let's review two examples of responses to Lutalyse treatment. In one trial dairy heifers were cycling and successfully synchronized by Lutalyse as evidenced by the fact that 90% of the injected heifers were in heat after the second injection. The control animals were also cycling with about 5% in heat per day. However, final pregnancy rates for the entire study were only 30% for both groups. These low pregnancy rates were attributed to poor semen handling and insemination problems.

In a trial with beef cows, results indicated that the animals did not respond to the first injection with no greater number in heat after the drug than in the control group. Normally you would have expected some 70-75% of animals responding to the Lutalyse treatment. Researchers believed animals were not cycling. The poor response was not a fault of the drug but poor timing relative to beginning the program. Animals must be cycling prior to the beginning of the program for it to be successful.

Let us now consider some specifics relative to implementing the program. If, for example, a September 1 calving date is desired, then breeding must occur about November 22. Working from a 4:00 p.m. breeding time on this date and using a two injection scheme, the second injection must be given 80 hours earlier at 8:00 a.m. on November 19. Consequently, the first injection should be given 11 days earlier to this on November 8.

Extensive field trials on over 25,000 test animals indicated that Lutalyse treated animals had conception rates and calving rates comparable to contemporary controls. No adverse effect on calving rate was found.

One question asked by dairy management is: will all cows calve on the same day? Normal gestation length varies by as much as 10 days; so not all heifers will calve on the same day.

Overall, dairy producers will show benefit from a "Lutalyse Total Reproductive Management Program". The program requires cooperation and coordination, between producers, veterinarians and the AI industry. Upjohn has made a conservative, well planned attempt to introduce the drug onto the market with careful consideration for the producers by supplying supplementary management suggestions, educational programs and by coordinating the sales program with the veterinary profession and the AI industry. Correct usage of the total package will increase productivity potential.

Other management options may also be considered. For example, the producer and veterinarian may want to inseminate all animals over a 5 day period and treat the remaining animals with a single Lutalyse injection on day 6. Those treated animals could then be inseminated at observed estrus following normal breeding procedures. If frequency of observed heat is low during the 5 day initial period, than animals may not be cycling and a decision to treat the remaining animals may be re-evaluated.

At the present time we would recommend that cows be bred at estrus or 80 hours following second injection depending on which comes first. Thus, insemination would not go beyond 80 hours following injection of Lutalyse. This system would probably be efficient following either a single or double injection regime.

In the future, treatment programs will undoubtedly be tailored to specific aims and objectives of the producer. However, at the present time Lutalyse is an effective drug that will complement a good reproductive management program. It certainly works in Florida dairy cows based upon studies completed over the last 6 years at the Dairy Research Unit and other locations within the State. However, it is not a substitute or cure all for poor management.

- References:
- 1) Chenault, J.R. and W.W. Thatcher. 1974. Potential Application of Prostaglandin F₂' In Cattle for Ovulation Control. Proc. Fla. Dairy Prod. Conference (eleventh annual) page 41.
 - 2) Upjohn Company Veterinary Products Information, Kalamazoo, Michigan