



Cooperative Extension Service
College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Livestock Management
April 2007
LM-14

Three Simplified Estrus Synchronization Programs for Hawai'i's Beef Breeding Season

Michael W. DuPont and Kara K. Lee

Department of Human Nutrition, Food and Animal Sciences

The use of prostaglandins (specifically, prostaglandin F-2 alpha or PGF_{2α}) in animal reproduction programs has been approved for beef cattle since 1979. Since then, the use of PGF_{2α} for estrus synchronization has greatly improved the feasibility of artificial insemination (AI) programs within the beef industry. Today, most beef producers inseminating cattle prefer a shorter period AI program (1–14 days) in conjunction with clean-up bulls for repeat services, rather than breeding artificially for their 45-day breeding schedule. For the last decade, the UH-CTAHR Mealani Research Station in Kamuela, Hawai'i, has been experimenting with three different PGF_{2α} synchronization programs for artificial insemination of the beef herd. This publication summarizes a brief contrast of three proven simplified PGF_{2α} protocols.

What is prostaglandin and PGF_{2α}?

Prostaglandins are a group of naturally occurring compounds that regulate various functions in the body. PGF_{2α} specifically regulates part of the reproductive or estrous cycle. When injected into cycling female beef cattle and heifers, PGF_{2α} causes the corpus luteum on the ovary to prematurely regress. The cow or heifer will then come into heat and ovulate 2–5 days later. Hence, all injected animals will be on synchronized estrous cycles.

Administering prostaglandins

Pregnant women and people with respiratory problems need to be *extremely careful* when handling prostaglandin products. Read and follow all label instructions and precautions.

To ensure carcass quality, adhere to Beef Quality Assurance injection site procedures. PGF_{2α} needs to be administered deep in the neck muscle for it to be effective and longer needles (18 gauge, 1½ inch) should be used.

One-shot PGF_{2α} method

During days 1 to 5 of this breeding scheme, monitor all female animals and breed any that come into estrus during standing heat.

By day 6, the AI technician should have bred a minimum of 25 percent of the herd; if so, proceed with a PGF_{2α} injection on the cows that have *NOT* been bred during days 1 to 5.

If an animal is in heat on day 6, breed her but do not administer PGF_{2α}. Monitor the rest of the herd for the next five days and breed all animals in standing heat. If your herd is cycling and healthy, a high percentage (90–95%) of the animals should come into heat by day 11.

NOTE: If less than 25 percent of the herd is bred by day 6, *do not proceed* with the PGF_{2α} injections. This indicates that your animals are not cycling, and you should check herd nutrition and reproductive status with your local veterinarian, extension agent, or herd consultant.

Modified two-shot PGF_{2α} method

Inject all animals with PGF_{2α} on day 1 and release the animals into good pastures.

On day 13, inject animals with second injection of PGF_{2α}. This method is termed “modified” because traditionally the second injection of PGF_{2α} was administered on day 11, but recent research has concluded that by delaying the second shot to day 13, a higher percentage of females were able to be bred during standing heat due to the regression of a more mature corpus luteum.

Monitor and breed any animals during standing heat for the next four days. It is not uncommon to have 70–75 percent of females in heat within 48–72 hours after the second treatment with PGF_{2α}.

NOTE: A timed insemination program with this method is *NOT* recommended. A non-cycling herd attributed to nutritional or reproduction problems increases the cost of artificial insemination.

CIDR and PGF_{2α}

This method consists of inserting a progestin implant (CIDR) with a plastic applicator into the vagina of the animal on day 1.

On day 6, inject all animals with PGF_{2α}.

Remove all vaginal implants on day 7. Monitor for heat and bred standing heat for the next four days. Most females will exhibit estrus within 24–72 hours after the PGF_{2α} injection.

NOTE: The progestin implant induces cycling in anestrus females and advances puberty in heifers, so you can expect a 10 percent increase of cattle coming into heat.

Discussion

PGF_{2α} synchronization can be a valuable tool in beef AI programs. A comparison of the three PGF_{2α} synchronization methods described above is shown in Figure 1.

The one-shot method has the lowest drug expense, but it has the highest requirement for skilled labor, nearly three times that of the other methods. This method has the advantage of opting out of administering PGF_{2α} for those herds found to be non-cycling (less than 25 percent coming into heat after the first 6 days of heat detection).

The modified two-shot method takes the longest time to complete (17 days) due to the week of down-time (days 2–12) between PGF_{2α} injections. Although two PGF_{2α} injections were administered, the skilled labor requirement (for four days) was greatly reduced compared to the one-shot method. Perceived shortcomings prevail when this protocol is applied to a timed insemination program. Non-cycling cattle thus increase the costs of synchronization in a modified two-shot program.

The method using both a vaginal implant and a PGF_{2α} injection is the most expensive to administer but requires

a shorter time to complete and the minimum amount of skilled labor. A distinct advantage to this method is its ability to increase the number of cycling females and, subsequently, potential successful inseminations.

For all three methods, the estimated peak breeding day is given. It is recommended that more trained AI technicians be available around that time.

Summary

All three protocols described show merit as valuable tools in synchronizing cycling beef cattle to be exposed to AI. Selecting which estrus synchronization program is right for a herd depends on the labor, facilities, and goals set by the individual operation. Economic projections need to take into account the cost of a synchronization program, as well as herd conception rates, semen price, and labor cost to determine the overall investment per live calf produced. Estrus synchronization, however, will not solve problems related to poor management, such as improper nutrition, substandard herd health practices, poorly kept records, low-quality semen, lack of proper facilities, or personnel inexperienced or untrained in heat detection and AI. A successful AI program using synchronization can assist beef herds to reap a benefit from genetic improvement that is second to none on the road to profitability.

References

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Thanks for review go to Andrew Kawabata and Glenn Sako.

Table 1. A comparison of protocol length, animal handling, and expenses for three PGF_{2α} synchronization methods.

Protocol method	Program duration (days)	Skilled labor ¹ (days)	Drug administering (days)	Peak day for breeding	Drug cost (\$)
One-shot	11	11	1	8	5 ^a
Modified two-shot	17	4	2	16	10 ^b
CIDR with PGF _{2α}	11	4	3	9	15 ^c

¹ labor for heat detection and insemination. ^a estimated cost of PGF_{2α}. ^b estimated cost of PGF_{2α} x 2. ^c estimated cost of implant + PGF_{2α}.