

Dairy Herd Synchronization Programs



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Research has shown that pregnant cows survive 420 days longer than herdmates that were open. A cow must be pregnant by 85 days postpartum in order to achieve optimum milk production and calve every 12½ months. Ninety percent of the cows in a well-managed herd should show heat by 50 days. Data from Dairy Records Management Systems (DRMS) show that while higher producing herds have lower conception rates, they also have fewer days open and higher heat detection rates.

Primary causes of long calving intervals are poor heat detection, waiting too long after calving to begin breeding, and low conception rates. Identifying open animals in your insemination management program can help. Several alternatives with different costs and benefits are now available to producers. These include both estrus and ovulation synchronization programs using a variety of hormone injections and varying periods of time.

Prostaglandin Injection Programs

Prostaglandins can help bring groups of animals into heat. Animals must be cycling and heat detection must be efficient for prostaglandin programs to be successful. These programs can be used on cows and heifers, unlike the ovulation synchronization programs (that will be discussed later), which work best on cows.

If you are working with heifers, they should be at least 60 percent of mature weight when bred at 15 months of age. This will allow them to calve when they are 2 years old. Jersey heifers should weigh more than 500 pounds at breeding, Ayrshire and Guernsey heifers more than 650 pounds, and Swiss and Holstein heifers more than 750 pounds. Producers need to use a weight tape and monitor heifer growth regularly.

Heifers are the most fertile animals in your herd and should be bred artificially to genetically superior bulls. Select those bulls known to produce the fewest difficult births. Remember that low Estimated Relative Conception Rate (ERCR) bulls already in your semen inventory may work better on higher fertility animals, like heifers.

Of course, prostaglandin procedures do require detecting heat. This is the first step to getting an animal bred. Cows only stand a total of 3 to 5 minutes at a time during their heat period. Heat detection must be done routinely and accurately. In most herds, missed heats are much more of a problem than low conception. Watch for heat three times a day for 15 to 20 minutes each. Heat periods only last 8 to 15 hours and can begin any time throughout the day or night. Animals on concrete are not as active as those on dirt or pasture, and activity is lower while milking or feeding.

As the number of cows in heat increases, the number of mounts per heat period also increases. Having groups of animals in heat increases activity as is shown in the table below. Prostaglandins can be used to bring groups of animals into heat.

Cows in Heat	Mounts/Heat Period
1	12
2	36
3	53

Source: Hurnik, J.F., G.J. King, and H.A. Robertson. 1975. *Appl. Anim. Ethol.* 2, 55-68.

Weekly or bi-weekly controlled prostaglandin (PGF) breeding programs are a useful and economical way to use heat synchronization procedures with current dairy reproductive management systems. Prostaglandins

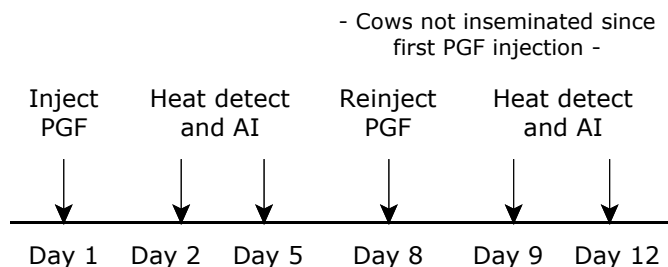
require a functional corpus luteum (CL) on the ovary for the animal to respond. If the animal is between days 6 and 16 of her cycle, she will generally come into heat 36 to 72 hours after injection of the drug.

The most popular program is the Monday Morning Program (Pharmacia Animal Health), which recommends you begin with a 30-day postpartum examination as part of a monthly herd health program. All healthy cycling cows 50 days postpartum are candidates. The producer selects a day of the week, usually Monday.

On Monday morning, the dairy producer gives any cows that are 50 days or greater postpartum an injection of prostaglandin and checks for heat the remainder of the week. The 50 day postpartum open cow list can be easily generated by computer with the PCDart program. A cow observed in heat during the week is inseminated 8-12 hours later. Most cows will come into heat by Friday. A cow not seen in heat is re-injected the following Monday morning and the same procedure is followed. A cow not observed in heat and inseminated after three weeks of injections is recommended for a reproductive examination.

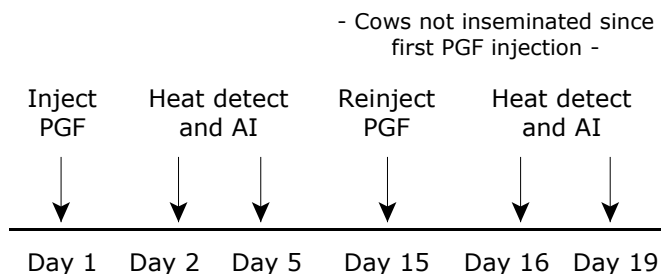
The benefits of this program are that cows come into heat at a predetermined time, thus aiding in heat detection efficiency. Cows also come in heat in groups, increasing estrus activity and, hopefully, heat detection efficiency. In all these programs, check heat daily, not just at a designated period.

Weekly Prostaglandin Program



The diagram above can be done on 10-day intervals to improve results and reduce heat detection time. However, weekly intervals fit scheduling better. Animals can also be monitored for heat activity six days prior to the first injection and bred on standing heat. This may be extremely useful to determine if a group of heifers is cycling. Animals must be cycling for prostaglandins to work. Several other modifications of this program follow:

Double Injection Prostaglandin Program



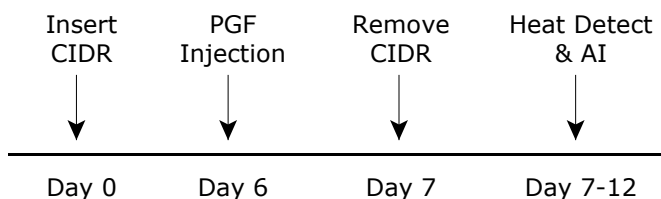
Heifers can also be brought into heat with melangestrol acetate (MGA). MGA is an economical synthetic progesterone that can be fed in grain for 14 days. MGA has received clearance from FDA for use in dairy heifers and beef animals. After withdrawal from the ration, animals come into heat. However, this heat is subfertile and animals should not be bred. PGF (Prostaglandin) can then be used to breed heifers as shown below. A variation of MGA Synch is to inject GnRH (Gonadotropin Releasing Hormone) on day 26 of the protocol. A clean up insemination can be used for those not in heat by 72-80 hours. Note that MGA is difficult to mix at such low concentrations. A premix containing MGA is preferred. The MGA Synch is shown at the top of page 3.

A modified protocol for beef heifers has been reported that decreases the number of days animals are on MGA from two weeks to one. This 7-11 Synch protocol is shown at the top of page 3.

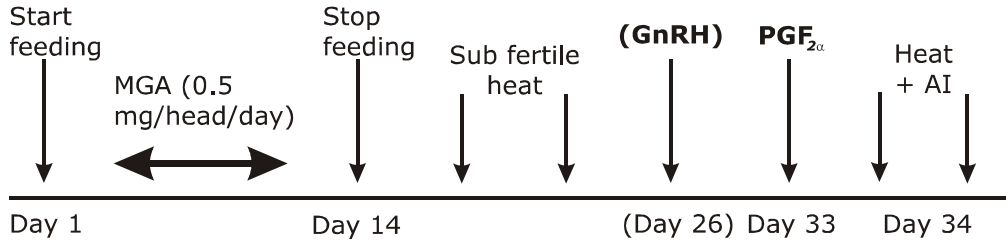
A new product called CIDR™ from Pharmacia Animal Health is now available as an intravaginal progesterone releasing device. CIDR stands for *controlled internal drug release*. CIDRs have a nylon case with a silicone rubber cover and are designed to deliver natural progesterone slowly over a seven day period to prevent heat expression. CIDRs are only approved for dairy heifers, not lactating cows.

These are T-shaped inserts and are placed into the vagina with an applicator that collapses the wings for insertion. An injection of prostaglandin can then be used to bring animals into heat before removing the inserts, as shown below. CIDRs are easy to apply and remove and have excellent retention rates. The following program is recommended:

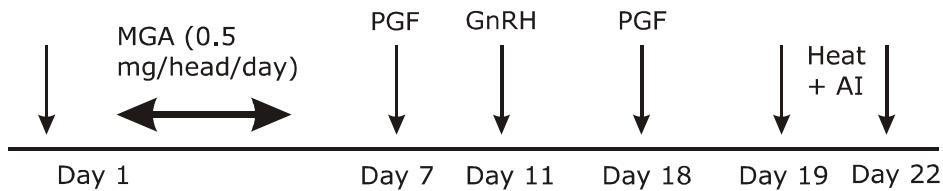
CIDR Synch



MGA Synch



7-11 Synch



Timed A.I. programs using CIDRs are currently being investigated.

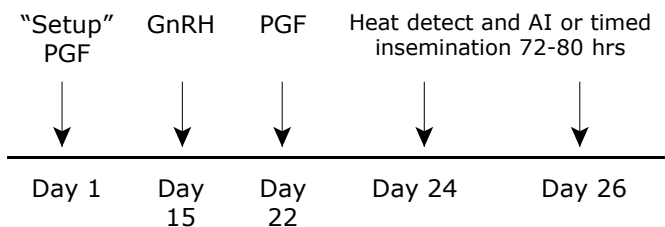
Targeted Breeding

One of the most cost effective breeding programs available is Targeted Breeding (Pharmacia Animal Health). This program requires heat detection. Overall drug costs are higher than the prostaglandin programs but lower than ovulation synchronization programs. Targeted breeding begins by administering a set-up shot of prostaglandin 30 to 40 days after freshening. Administer the second shot of prostaglandin 14 days later. Animals should be watched closely for standing heat and bred after the second shot.

For those animals not found in heat after the second shot, administer a third breeding shot 14 days following the second shot. Breed animals preferably on standing heat (or they can be bred 80 hours after injection).

This program can be modified for better results by giving a setup shot of prostaglandin, followed by a shot of GnRH 14 days later and a second prostaglandin shot 7 days later. Detect heat and breed 2 to 4 days later as shown below.

Modified Targeted Breeding

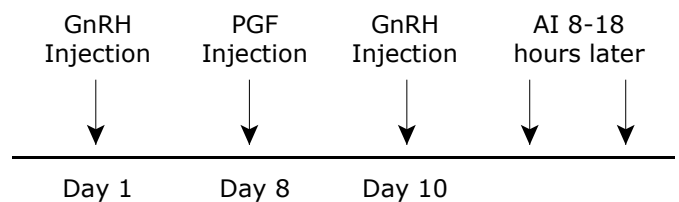


Ovulation Synchronization

Through the use of ultrasonography, studies of follicular development have resulted in a new method for the synchronization of ovulation (Ovsynch). Many Georgia producers refer to this procedure as "C-L-C." This is based on the trade names of the hormones used (Cystorelin-Lutalyse-Cystorelin). Two injections of GnRH, 7 days before and 2 days after prostaglandin (PGF_{2α}), will effectively synchronize ovulation in more than 90 percent of lactating cows treated. Time of ovulation occurs 24 to 32 hours after the second injection of GnRH.

Using this technique provides us the opportunity to breed all animals treated at a designated time. Animals should be bred 8 to 18 hours after the second GnRH injection. Note that animals between day 5 to 12 of their cycle respond best to Ovsynch. Heifers do not respond as well to this treatment because of possible differences in follicular waves.

Ovsynch Program



The PC Dart program can help keep track of timed AI programs with Timed AI Report Number 124. This report has been recently modified to accommodate more alternatives used by producers.

It is important to note that administering two injections of PGF 14 days apart and 12 days prior to initiating the Ovsynch protocol has been shown to improve pregnancy rates in studies at Florida and Kansas. This program is referred to as the Presynch program.

It is also important to note that, although it is not necessary to see animals in standing heat for them to be inseminated with this protocol, heat detection is useful to find animals that do not conceive; and some animals will display heat after the first two injections. Breeding these animals prior to the last GnRH injection will lower costs.

Also, there are limited data indicating that 50 µg of GnRH may be as effective as 100 µg. This will lower costs. It is important when trying the lower dosage to use a 20 gauge 1½ inch needle with the GnRH and get the entire dose in the animal. Total cost of hormones in this study was decreased from \$47.88 to \$27.61 per pregnancy. The results from the study by Fricke and coworkers using 50 µg GnRH are shown below:

Ovsynch synchronization and conception rates with 100 µg or 50 mg GnRH Injections

Item	GnRH full dose (100 µg)	GnRH half dose (50 µg)
Synchronization rate (synchronized/total)	84.9% (101/119)	83.1% (98/118)
Conception rate 28 days post A.I. (pregnant/total)	41.0% (48/117)	41.1% (46/112)
Conception rate 56 days post A.I. (pregnant/total)	33.6% (38/113)	35.1% (39/111)

Source: *Theriogenology* (1998) 50. 1275-1284.

There is also evidence that estradiol cypionate (ECP) can be substituted for the second GnRH injected. This will lower overall costs. ECP is given 24 hours after the PGF injection, and animals are bred 48 hours after ECP. Heifers should receive a .5 mg dose of ECP and cows should receive a 1 mg dose.

The table at the top of the next column shows the increased number of pregnancies and net return with Ovsynch compared to a traditional heat-detection program.

With Ovsynch, the heat-detection rate (HDR) is 100 percent, since 100 percent of the cows are inseminated. The result would be 40 pregnancies or a 40 percent pregnancy rate (PR) per 100 cows when the conception

Costs of Ovsynch compared with traditional heat detection (per 100 cows; 40% conception rate)

	Heat detection rate (HDR)	
	50%	70%
Increased no. of pregnancies with Ovsynch	+20	+12
Total cost of additional pregnancies	\$2,800	\$2,400
Per-cow cost of additional pregnancies	\$140	\$200
Value of additional pregnancy (semen, labor, extra days open and replacement costs)	\$274	\$253
Net return per additional pregnancy	+\$134	+\$53

Source: Jeff Stevenson, Kansas State University in *Dairy Today*, April, 2000. p. 10.

rate is 40 percent. Under a traditional program, a 50 percent HDR yields a 20 percent PR; a 70 percent HDR yields a 28 percent PR. More cows are pregnant under the latter traditional scenario (28 vs 20) but still, not as many with Ovsynch (40). Hence, Ovsynch results in a lower net return per pregnancy when it's compared with the traditional 70 percent HDR. Costs of Ovsynch programs are generally higher than the PGF programs. However, if you look at total pregnant animals with fewer days after calving to first service, Ovsynch is the most efficient program and works well to lower the daily demands of heat detection and inseminating animals. The benefit of the program is that 100 percent are inseminated at a set time after calving.

The costs of different breeding programs were reported by Stevenson and Smith (1996) and are shown in the table on page 5.

A study conducted at the University of Florida used a computer model based on actual data to compare estimated net revenues for different A.I. breeding scenarios. The results are shown in the table on page 6. Ovsynch has the greatest impact on net revenue during the hot season. Note that not inseminating cows during the hot season is a bad idea because net revenue per cow drops by almost \$30. Also, regardless of season, Ovsynch was always more profitable than no system or only detecting heats. Control animals were bred without a system and detecting heats. (See "Comparison of net revenues for various A.I. Breeding scenarios" on page 6.)

**Estimated average per cow cost for a first-service using
nine programmed breeding systems**

Program (A)	Drug cost ^b (B) \$	Palpation or milk P4 test ^c (C) \$	Injection labor ^d (D) \$	Total cost per cow ^e (E) \$
1	6.00	0	1.00	7.00
2	7.05	0	1.17	8.22
3	4.50	0	0.75	5.25
4	3.00	0	0.50	3.50
5	3.29	10.27	1.70	15.26
6	3.15	13.62	1.13	17.90
7	10.67	0	1.83	12.50
8	9.00	0	1.00	10.00
9	15.00	0	1.50	16.50

^a1 = A.I. breeding at heat only after the second of two PGF_{2a} injections given 14 days apart.

2 = Target breeding program where A.I.-breeding at heat only after the second of two PGF_{2a} injections given 14 days apart, and those cows not observed in estrus after the second PGF_{2a} injection are given a third injection and inseminated at heat or at 80 hours (in absence of detected heat) after the third injection.

3 = A.I.-breeding at heat after the first or second of two PGF_{2a} injections given 14 days apart.

4 = A.I.-breeding at heat during 6 days of heat detection or after one PGF_{2a} injection, given in the absence of detected heat on the sixth heat detection day.

5 = A.I.-breeding at heat occurs after weekly palpation.

6 = A.I.-breeding at heat occurs after weekly milk progesterone test.

7 = A.I.-breeding at heat occurs after weekly Monday injections of PGF_{2a}.

8 = A.I.-breeding at heat that follows PGF_{2a} (preceded one week earlier by GnRH).

9 = Ovsynch A.I.-breeding at 16 hours after GnRH, which was injected 48 hours after PGF_{2a} (preceded one week earlier by GnRH).

^bDoses of PGF_{2a} = \$3.00 and GnRH = \$6.00.

^cPalpation = \$3.00 and milk progesterone (P4) test = \$6.00.

^dCow handling cost = \$0.50.

^eTotal cost per cow (E) = B + C + D.

Source: *Dairylines, The Kansas State Dairy Extension News*, Vol. 2 No. 10 (10/96).

Heat check labor was not included in the above study. Prostaglandin programs tend to be the most economical and Ovsynch tends to be the most expensive, as shown above.

Comparison of net revenues for various A.I. breeding scenarios

Reproductive management system		Difference in net revenue per cow
Cool season	Hot season	\$
Control	Control	.00
Control	No A.I.-breeding	-30.24
Control	Ovsynch	25.36
Ovsynch	Control	15.34
Ovsynch	Ovsynch	16.57
Ovsynch	A.I.-breeding at detected heat	8.12
A.I. breeding at detected heat	Control	0.48
Control + Ovsynch in April	Control	71.35
Control + Ovsynch in April	Ovsynch	63.39
Ovsynch + Ovsynch in April	Control	31.44
Ovsynch + Ovsynch in April	Ovsynch	30.79

Source: Risco, *et.al.*, 1998. *The Compendium* 20: 1284-1290.

One of these programs will help improve your reproductive management efficiency. Try the one that fits your management system the best. Both estrus and ovulation synchronization programs will help get more animals bred more efficiently. Feeding open animals extra days can be costly to producers. Identify open

animals and pick the best breeding alternative for your operation.

Trade or brand names are mentioned only for information. The authors intend no endorsement nor imply discrimination to the exclusion of other products that also may be suitable.



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