HEIFER DEVELOPMENT
Lesson 5
OSU Extension Beef Team
http://beef.osu.edu

BREEDING PHASE

Breed heifers to calve 20 to 30 days ahead of the cow herd. This program allows the heifers more time to rebreed after calving. Normally a young, light bull should be used to breed heifers. This reduces the risk of injury to the heifer at breeding as the heifer must support less weight than if she were bred by a mature bull. About 60 days after removing the bull, palpate and cull open heifers. Heifers that calve later will likely calve late the rest of their lives or miss at least one pregnancy. Another advantage of breeding heifers before the cow herd is that the producer can spend more time checking and assisting heifers with calving difficulty.

Bull Selection: The traditional "heifer" bull was a yearling that did not cause physical injury to the heifers during the mount of natural service. However we must also be concerned with the impact of the bull on calf birth weights. Ideally, we are looking for bulls that sire easy delivery calves that grow rapidly. Unfortunately, the negative correlation of these traits make the combination hard to find. Even when yearling bulls with low birth weight EPDs and high growth EPDs are located, they should be tested for a year due to low accuracies of the EPDs before they are used on large numbers of heifers. There are probably several high growth, easy calving bulls with high accuracy EPDs available in most all breeds. Using these mature bulls on yearling heifers through artificial insemination provide on of the most logical applications for AI.

Health Management: About 1 month before breeding heifer need to be vaccinate heigfers against Vibrio, Lepto, and respiratory disease complex (IBR, BVD, etc.). If using a killed vaccine, heifers need to be boosted 2-3 weeks after initial vaccination. Heifer may need to be dewormed.

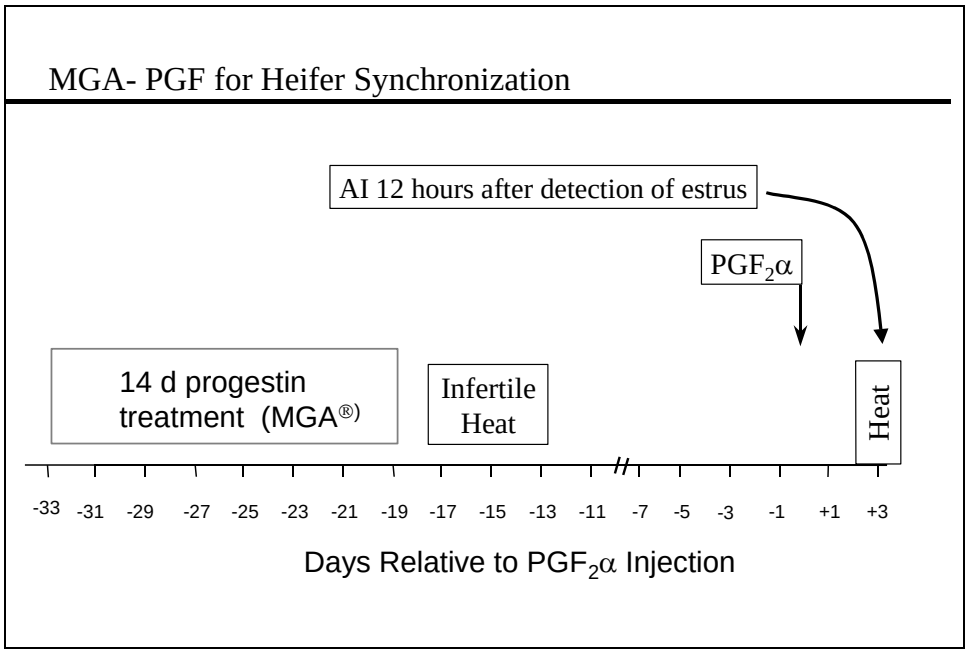
Puberty and Estrus Synchronization : One of the fastest methods that we have available to us to alter our genetics is through the use of AI. In conjunction with AI is the development of new estrus synchronization protocols. There are two advantages of synchronization systems that need to be considered when developing replacement heifers. Firstly, heifers can be synchronized to conceive earlier in the breeding season, resulting in a shorter calving season. The end result is that more calves are born in a shorter period of time and the calf crop is more uniform at market time. Secondly, synchronization programs have been developed that will initiate puberty in heifers that are not cycling by the initiation of the breeding season. This is critical to producers who aim at a short breeding season and, ultimately, a shorter calving season. Consequently these females produce their first calf early in the calving season and tend to continue to calve earlier throughout their productive life.

Most programs for estrus synchronization use progestins (MGA), prostaglandins (PGF2a),

and gonadotropin-releasing hormone (GnRH), or a combination of these three products. Most of these systems rely on the accurate detection of estrus for acceptable results, whereas some systems use a single fixed-time insemination but results have been variable. There are obvious advantages and disadvantages to any system. Therefore, a producer who is interested in establishing a breeding program utilizing synchronization needs to consult with a reproductive specialist to establish an ideal system to suit their needs.

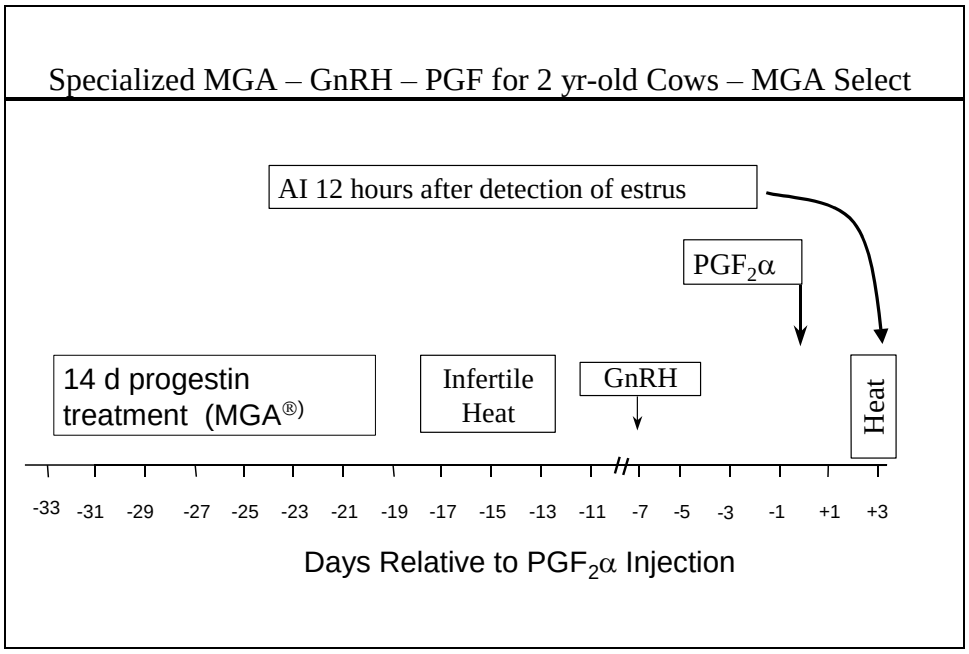
Melengestrol Acetate (MGA) and PGF: Perhaps the best system in heifers is synchronization using MGA and PGF. In this system, MGA is fed at .5 mg/head/day for 14 days. Feeding MGA for 14 days prevents cyclic cows from showing heat even if their CL regresses, until the MGA is removed from their feed. Essentially all cyclic females, and some anestrous females will exhibit estrus within a week after withdrawal of the MGA. This is a **subfertile** heat, with many females ovulating a persistent follicle. They should not be inseminated at this estrus. A single injection of PGF, administered 17 - 19 days after the MGA has been withdrawn will regress the CL that developed following the infertile heat. Most females will show estrus 48 to 72 hours after PGF and can be inseminated 12 hours after detection of estrus. The most common approach is to check heat for 5-7 days and inseminate upon detection. Alternatively, timed AI of all females, or just those that have not yet displayed heat by 72 hours after PGF can often result in acceptable pregnancy rates.

There are two major reasons that this is a highly effective system; particularly with heifers. First, the 14 - day feeding period of MGA will group the cyclic females, and induce onset of cycles in some prepubertal heifers. Variable proportions of the anestrous females will be induced to ovulate; probably dependent upon their distribution between peri – estrous and anestrous status. The 17-19 day waiting period was carefully chosen, in order to ensure that most females would be in the latter stages of the estrous cycle (after day 12) when PGF was given. The effectiveness of PGF to cause regression of the CL is highest at this time. It is not uncommon for estrus response rates to exceed 80%, and conception rates to be 70% or greater when using this system on heifers. The 19 - day interval between the last day of feeding MGA and PGF yield a more precise estrous response.

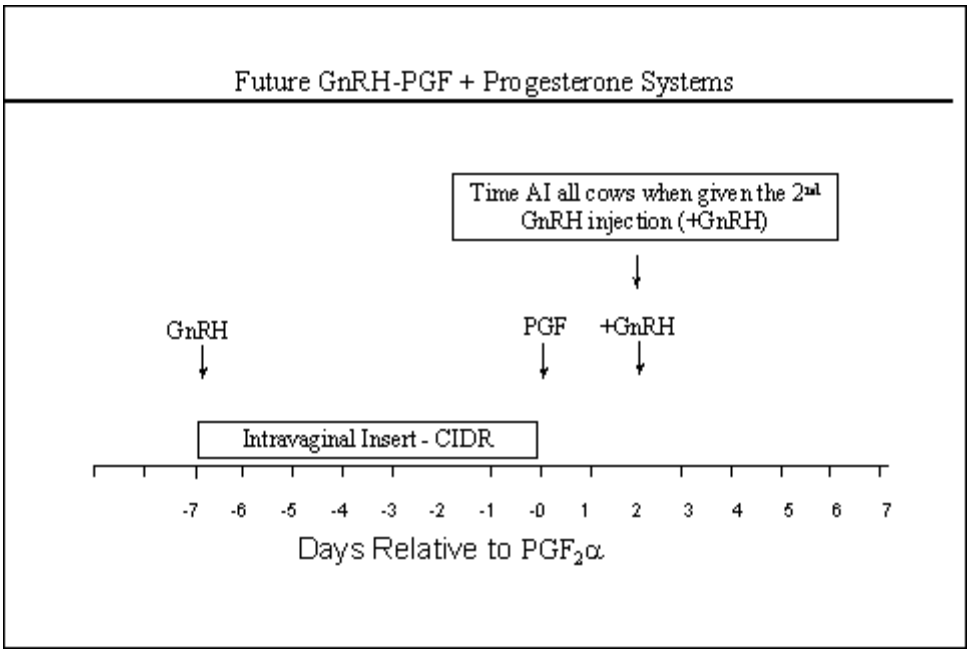


An important consideration of this system is to ensure that all females consume MGA on a daily basis. If consumption is variable, females will show estrus during the MGA feeding period, and the initial synchronizing effect of the MGA will be lost. A disadvantage of this system is the length of time between initiation of feeding of MGA and the breeding season (31 – 33 days). With yearling heifers, this can be accommodated with careful planning. In postpartum cows, with an annual calving interval, there are not typically 31-33 days available between calving, and the start of the next breeding system to implement this system. A second concern is that with postpartum cows, there is some evidence of an increased incidence of twinning with this system.

A specialized adaptation of this system can be used with 2 year-old cows or cows calving approximately 60 days before the start of breeding. Since some producers calve 2 year-olds up to a month before the cows, there are sufficient days between the end of calving and onset of breeding for this 33-day system. This system would be effective in most females that have calved 30 days before the onset of the MGA feeding (63 days before onset of the breeding season).



Intravaginal Progesterone Insert and GnRH – PGF*:* The CIDR is an intravaginal device that releases progesterone into the bloodstream, and substantially increases the ability to synchronize anestrous cows. It is somewhat more expensive than the MGA system and has not been extensively studied in heifers compared to anestrous cows. Currently is not as proven as MGA and results have been more variable.



Ultrasound: Until recently there has not been an accurate method to determine which heifers conceived to AI or to a clean-up bull. Many producers use rectal palpation, subsequent estrus activity or the calving date to differentiate between calves that were sired by AI or the clean-up bull. Although these methods can be useful management tools to assess the results of certain synchronization systems, they very often present inaccurate conception or pregnancy rates. The use of ultrasonography is becoming a common reproductive management tool to aid producers when selecting replacement heifers. Ultrasonography can be used to determine the presence of a viable embryo as early as 28 days after AI or natural mating. In addition, ovarian and uterine scans, and fetal sexing are all becoming useful tools for producers to increase the productivity and efficiency of their female herd. Using this technology we can accurately determine herd conception and pregnancy rates, and evaluate the viability of estrus synchronization and AI protocols.

Economic Impact of AI: The University of Minnesota maintained records and summarized the net profit or loss for heifers sold during a developmental period during a three-year period (Table 17). Heifers culled on the basis of pelvic area, average daily gain, reproductive tract scores, disposition, or structural soundness at the time of the prebreeding exams and finished in a feedlot had a 3-year average net profit of $9, whereas heifers diagnosed as nonpregnant shortly after the breeding season were sold for a net loss of $86. The loss for pregnant heifers that were then diagnosed nonpregnant after wintering on native pasture and sold at a sale barn was $133. These figures indicate the importance of identifying heifers that will not breed during the breeding season and culling those heifers before they become an economic liability. Heifers that were diagnosed pregnant during the breeding season were allocated to three groups: first-service AI, second-service AI, or natural mating. Average profits were $163 for first-service AI heifers, $139 for second-service heifers, and $83 for heifers naturally mated. These figures take into account all synchronization costs. Therefore, the advantage of AI over natural mating is certainly evident from these analyses, but without sound data these results could not have been noticed. In fact, many people would (and still do) shy away from AI because of the initial costs associated with synchronization, management, and an AI technician. Nonetheless, these results would encourage a producer to seriously consider AI, realizing that the profit potential is far greater than just using natural mating.

Table 17. Net Profit or Loss Associated with the Sale of Heifers at Various Stages of

Stage	Year 1, $/head	Year 2, $/head	Year 3, $/head
Prebreeding culls	8	16	4
Postbreeding culls	-33	-144	-84
Precalving culls	-213	-61	-124
First Service AI	160	164	164
Second Service AI	129	88	184
Naturally Mated	89	72	86

Source: G. C. Lamb. 1999. Purchasing, producing and managing replacements beef heifers to optimize profits. 1999 Beef Cow/Days. Univ. MN.

FERTILITY: Heritability estimates for fertility (pregnancy rate) are relatively low (.00-.10). However reproductive rate is so economically important it cannot be ignored. Culling heifers that fail to conceive within a set breeding season should enhance cow herd fertility.

CALVING EASE: The birth weight of the calf relative to the dam's pelvic area can be a primary determinant of calving difficulty. As a rule of thumb, bulls having birth weight EPDs within the 15th percentile of their breed can usually be considered calving ease sires.

MILKING ABILITY/FLESHING ABILITY: Within a breed, the most effective way to alter milk production is to use milk EPDs for sire selection. For the commercial producer the easiest way to increase milk may be to crossbreed with a sire from a heavy milking breed. Fleshing ability can be related to milking ability. An optimum body condition score would be 5-6 on a 1 to 9 scale.

TEMPERAMENT: The heritability of temperament is .15-.40. Cull heifers having poor dispositions because they create problems in the rest of the herd.

MUSCLE THICKNESS: For most producers, selecting heifers that avoid extremes will be optimum.

STRUCTURAL SOUNDNESS: Overall structural soundness effect longevity. Some areas to evaluate are the feet, legs, eyes, jaw, and mammary system.

Table 18. Suggested guidelines for beef heifer selection

Trait	Moderate frame & milk	Large frame & milk
Minimum weaing wt., lb	425	500
Minimum weaning wt. ratio	90	90
Minimum yearling wt., lb	600	750
Maximum age at puberty, mo	14	14
Minimum pelvic area at breeding, sq. cm.	160	190
Minimum condition score at breeding	5	5
Minimum wt. at breeding (65% mature wt.), lb	700	875
Minimum frame score	4	5
Maximum frame score	6	7
Temperament	Calm	Calm
Average daily 205-day milk production, lb	12	17

Adapted from Harlan Ritchie and David Hawkins, Michigan State University.

Heifers that calve first as 2-year-olds produce more calves during a lifetime than do heifers that calve first at three years of age or older. The decision to breed heifers as yearlings involves careful consideration of both the economics of production and such characteristics as the reproduction status, breed type and genetic make-up of the heifers involved. Differences in the age at which heifers are first exposed for breeding depend on

three factors: management systems, forage quality and availability, and adaptation of respective breed types to specific environmental conditions.

PRIOR TO CALVING: A 2-year-old heifer should weight about 85% of her mature weight at first calving. They have approximately 280 days to gain the weight from breeding to calving. Bred heifers should gain about 0.7-1 lb/day from breeding to calving. Heifers may reach the target weight coming off good pasture in the fall. Heifer need only maintain their weight through the winter. Feed levels have to be increased if they have not reached their target weight by fall. It is important to provide enough feed without getting the heifers too fat at calving time. They should be at condition score 6-7 at calving.

For those heifers weighing in excess of their target weight at 18 months of age, how should they be handled? The grazing season for these heifers could be extended with protein supplementation being provided. Do not stay out on pasture, however, until body condition starts decreasing.

Inadequate nutrition creates more calving difficulty in heifers than excess nutrition. Some feel that the heifer should be limited in feed before calving so the fetus will not become too large, and consequently reduce calving difficulty. In fact, limiting nutrients to the heifer usually only slightly effects calf birth weight. The heifer will sacrifice body condition and arrest growth before diverting many nutrients from the fetus. Her thin condition affects her breed-back performance. In addition, data from Colorado shows that thin heifers have lower levels of colostrum, and consequently their calves are more susceptible to scours. Excessive nutrition often gets the blame for what is really calving problems via improper bull selection. Excessive protein has not consistently increased calving difficulty. Excessive energy can create calving difficulty. Research studies indicate calf birth weight can be increased 8-10 lbs through nutrition without increasing calving difficulty.