

FEEDING REPLACEMENT HEIFERS

Lesson 3

Influence of Nutrition

Nutrition is the management tool that can have the greatest impact on the age at which heifers reach puberty. Heifers of a similar breed composition can reach puberty several months apart when fed different diets. In addition, feed cost accounts for 60 to 70% of the costs of raising replacement heifers. Therefore, the financial impact of puberty onset is dictated by age at puberty, and feed costs associated with achieving a younger age at puberty. In other words, cost of feeding heifers to reach puberty early should be weighed against the income gained by increased conception rates and heavier weaning weights.

Energy is the primary limiting factor in most replacement heifer diets. In an experiment reported by Montana researchers (Table 1), heifers were fed for low (.5 lb/day), medium (1.0 lb/day) or high (1.5 lb/day) gain from weaning until breeding. The high-gain heifers reached puberty earlier than those in the other two groups. In addition, 60% of the heifers in the medium and high gain groups conceived in the first 20 days of the breeding season, and overall conception rates were greater for the medium- and high-gain heifers compared to those for the low-gain heifers.

Results of this study and others have lead to the recommendation that heifers should gain between 1.25 and 1.75 pounds per day between weaning and breeding. Depending on the size of the heifer, the desired rate of gain, and feed intake, diets will need to contain between 62 and 70% TDN.

Table 1. Effect of feed level on reproductive performance in beef heifers

	Feed Level		
	Low	Medium	High
Gain, lb/day	0.5	1.0	1.5
Age at first estrus, days	434	412	388
Weight at first estrus, lb	523	545	563
Conception rate first 20 days of breeding season, %	30	62	60
Overall conception rate, %	50	86	87

Adapted from Short and Bellows, 1971

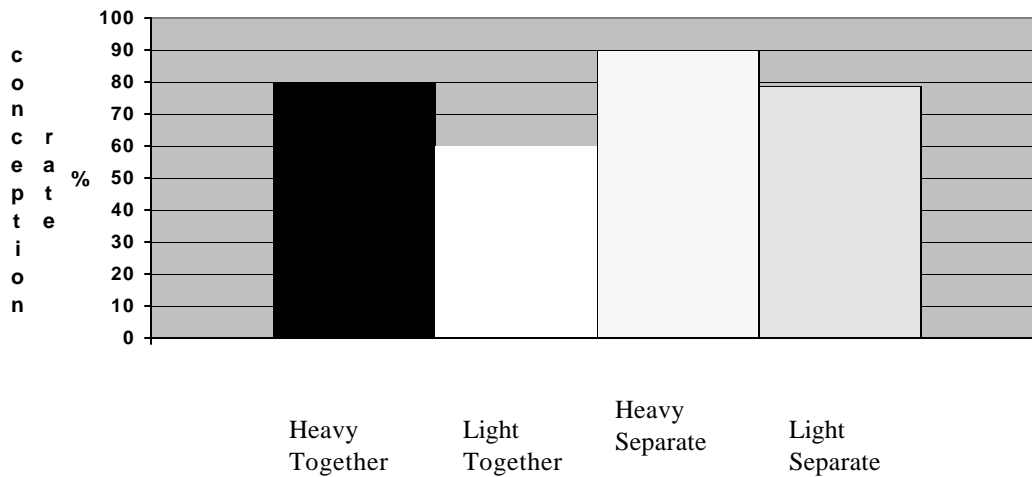
Protein availability can also influence age at puberty onset. By the start of the breeding season, only 40% of the heifers fed a low protein (9% crude protein, CP) diet had reached puberty compared to 90% of heifers fed adequately. Extra energy (i.e., corn) could not overcome the protein deficiency. Similarly, additional protein could not overcome a lack of available energy. Protein requirements for developing heifers are between 11 and 12% CP.

Minerals and vitamins are also essential for proper reproductive health. Symptoms of deficiencies in Vitamin A, copper, zinc and phosphorous often appear as decreased conception rates or increases in age at puberty. Iron, which is found in high levels in soils, is antagonistic to copper uptake. It may be wise to test forages for high iron levels if copper deficiencies or reproductive problems are noted.

In general, forages and other feed ingredients should be tested before formulating a mineral mix. A basic mineral mix for heifers is 50% dicalcium phosphate, 50% trace mineralized salt. The trace mineralized salt should be high in copper and selenium. Vitamin A, D and E should be added to the mineral mix or given as a depot injection once every 2 to 3 months. Vitamins and minerals are discussed in more detail in Lesson 1.

Feeding management can also affect both age at puberty and feed costs. Splitting replacement heifers into heavy and light weaning weight groups for feeding can result in a 20 to 30% increase in cycling and conception rates in lightweight heifers (Figure 1).

Figure 1. The effect of feeding management on conception rate in heifers



Timing of supplementation of grazing cattle will influence feed costs. Cattle supplemented in morning or late afternoon will stop grazing to eat supplement, while cattle that are supplemented during their normal rest period (around noon) require less supplement for similar gains or performance.

Growth Promotants - Ionophores and Implants

Because age at puberty can be reduced by increased growth rates as a result of improved nutrition, producers are often interested in the effects of growth promoting implants and feed additives. Although results may be similar (increased growth rate), ionophores (Rumensin, Bovatec) and growth implants work differently. Therefore, their effects on reproduction can be different.

Ionophores act by altering microbes in the rumen, thereby enhancing digestion and growth rate. Addition of ionophores to replacement heifer diets can reduce age at puberty by 15 to 30 days while increasing growth rate. Although some of the effect may be due to ionophore action in the rumen, recent evidence indicates that there may be systemic actions as well. Response to ionophores appears to be less dramatic in lightweight or poorly fed heifers.

Most growth implants are steroids (estrogens or androgens) or have steroid-like activity. Steroids increase the release of growth hormones to improve muscle and bone growth, but they also affect the reproductive system. Therefore, if given at the wrong time or in improper doses, growth implants can have a detrimental effect on reproduction. Many different studies have investigated implants and reproduction and results are varied. Effects on replacement heifers can be summarized as follows:

1. Implanting **before** two months of age dramatically **decreased fertility** in heifers.
2. One implant during the heifer's lifetime appears to improve growth rate without hurting reproduction.
3. One implant **after** weaning appears to be **less risky** than an implant before weaning.

Management of Nutrition

Heifers should be fed in at least two separate weight groups (heavy and light) from weaning until breeding, if possible. Diets should be formulated to contain 11 to 12% CP and sufficient energy to achieve gains of 1.25 to 1.75 pounds per day, depending on weaning weight and expected mature weight of the animal. Diets should also include a balanced mineral supplement that contains trace minerals and an ionophore. Avoid overfeeding protein as it is expensive and some researchers believe high levels of protein in breeding animals have negative effects on conception. Grossly overfeeding energy should be avoided because fat heifers tend to be less fertile and have more calving difficulty.

The goal is to have heifers reach 60 to 65% of their projected mature weight 30 to 45 days before the breeding season. This is known as the **Target Weight** concept. Target weight for exotic heifers is usually 65 to 70% of their projected mature weight. By using a target weight, producers can calculate the rate of gain heifers need to achieve before the breeding season. Diets can then be formulated based on desired gains, and heifers monitored by periodic weighing. An example of the target weight system is shown below.

In this example, we are feeding a group of Angus heifers averaging 500 pounds at weaning in a herd where mature cows average 1,200 pounds at body condition score 5 or 6. The heifers are weaned on November 1 and we want to begin breeding on June 1. We have decided that the target for this herd will be 65% of mature weight by June 1 (approximately 63% if May 1).

Target Weight Calculation Example

$$\text{Target Weight by June 1} = 1200 \text{ lb} \times .65 = \mathbf{780 \text{ lb}}$$

$$\text{Total weight gain needed} = 780 - 500 = \mathbf{280 \text{ lb}} \quad \text{Days to June 1} = \mathbf{211}$$

$$\text{Average daily gain needed to reach Target Weight} = 280 \text{ lb} \div 211 \text{ days} = \mathbf{1.32 \text{ lb/day}}$$

Example Feeding Program

A winter diet is fed from November 1 to April 15 (166 days) that gives a daily gain of 1.25 pounds resulting in heifers weighing 707 pounds on April 15.

The spring diet will be fed from April 16 to June 1 (45 days). The heifers need to gain an additional 73 pounds to reach the target weight for breeding. The spring diet will need to be formulated to give an average daily gain of 1.61 pounds (73 lb ÷ 45 days).

Preferably, heifers should be weighed and diets adjusted at least four times between weaning and breeding.

Ten Tips for Better Replacement Heifers

1. Weigh and condition score heifers at weaning, mid-winter, pre-breeding and breeding.
2. Feed heifers to gain 1.25 to 1.75 pounds per day from weaning until breeding. Don't forget vitamins and minerals.
3. Sort heifers into light and heavy weight groups at weaning.
4. Use the target weight concept - 65 to 70% of mature weight by breeding.
5. Include ionophores in diets, but avoid growth implants.
6. Measure and use pelvic areas and reproductive tract scores to cull heifers prior to breeding.
7. Feed MGA and/or use hormone programs to synchronize estrus in heifers.
8. Breed heifers to bulls with low birthweight EPD.
9. Feed pregnant heifers to calve in body condition score 6.
10. Attend calvings and assist early.

Additional Resources and Reading

- Investing in the Future – Replacement Heifer Management. Elanco Animal Health
- Physiology and Management of the Replacement Heifer (Review). R.A. Bellows and J. B. Hall. Proceedings of the 1996 Canadian Society of Animal Science Annual Meeting.
- Effects of Nutrition and Season on the Onset of Puberty in the Beef Heifer. K. K. Schillo, J.B. Hall and S. M. Hileman. 1992. J. Anim. Sci. 70:3994-4005
- Genetic Effects on Beef Heifer Puberty and Subsequent Reproduction. L. C. Martin, J. S. Brinks, R. M. Bourdon, and L. V. Cundiff. 1992. J. Anim. Sci. 70: 4006-4017.
- Management Considerations in Heifer Development and Puberty. D. J. Patterson, R. C. Perry, G. H. Kiracofe, R.A. Bellows, R. B. Stagmiller, and L. R. Corah. 1992. J. Anim. Sci. 70: 4018-4035.
- Nutrient Requirements of Beef Cattle. 1996. National Research Council.

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