Profitable Dairy Systems

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Checklist for Nutritional Aspects for Improving Reproductive Efficiency

Last Updated: May 31, 2013

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Introduction

Almost all dairy farmers would like to improve the reproductive efficiency of their dairy herd, but they must manage many aspects to achieve this goal, including the nutritional program. The feeding program during the dry period, for the fresh cows, and throughout the breeding period is very important for optimizing reproductive efficiency in a herd. Although the voluntary waiting period (VWP) for first insemination following calving is typically 60 days, feeding the herd must be on target before and during this time period.

Please check this link first if you are interested in organic or specialty dairy production.

Energy Balance: Greatest Nutritional Impact on Reproduction

Energy balance has the greatest effect on reproduction. Intake of cows can begin to drop within one week before calving, and feeding practices today focus on trying to minimize the drop in dry matter (DM) intake before calving to minimize the extent and magnitude of a negative energy balance. Negative energy balance after calving caused by low DM intake and increasing milk yield can be affected by the transition diets fed. Stable DM intake before and high DM intake after calving usually minimize metabolic problems after calving, which in turn minimize the impact on energy balance. The goal is for cows to have a body condition score (BCS) of no greater than 3.5 during the dry period and to lose less than 1 BCS during early lactation. Earlier Cornell University data revealed that the first ovulation after calving typically occurs about 10 to 14 days after energy balance is at its most negative point. However, the occurrence of this first ovulation sets in place the timing of the subsequent ovulations, where the third ovulation will likely occur near the VWP.

In addition, it is important to keep in mind that the follicle that will ovulate near the VWP began development about 14 days before calving (the follicle takes about 10 weeks to develop). Thus, the follicles ovulating near the time of breeding were developing during the time of negative energy balance before

calving and shortly after calving. The extent and magnitude of the negative energy balance may affect the fertility of the ovum released. So the two keys to achieving good reproductive efficiency are 1) managing the feeding program of transition cows to maintain DM intake before calving and obtain high DM intake after calving and 2) minimizing metabolic problems. To learn more about how pre-calving feeding and management programs impact herd health and future milk production, click **here**.

Fat Supplements

Recent focus has been on feeding specific fat supplements during the transition period for improving reproductive efficiency. Although fat is a very dense source of energy, the focus has been on specific fatty acids and their effects on the function of the reproductive organs, not feeding the fat as an energy source. The focus has been on feeding sources of linoleic acid (C18:2) to close-up and fresh cows with the idea that the linoleic acid is important for prostaglandin synthesis that will aid in uterine involution. Several commercial sources of fat are available that are high in linoleic acid, but typical feed sources such as soybeans and cottonseed also can be good sources. During the breeding period, the focus is on providing adequate eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA), which are thought to help maintain a viable corpus luteum to aid in maintaining a pregnancy. Again, a few commercial sources are available, and fish meal and other marine feed sources contain appreciable concentrations of these fatty acids.

Protein Nutrition

The focus on protein relative to reproduction has been on not feeding it in excess, especially not feeding excessive amounts of rumen degradable protein (RDP). Milk and blood urea nitrogen (MUN and BUN, respectively) are monitored in reference to this aspect. Caution should be exercised if MUN for the herd or high cow group exceeds 18 mg/dL and/or BUN exceeds 20 mg/dL. The actual targets for MUN are 10 to 14 mg/dL with the aim at reducing feed costs and nitrogen excretion by animals. To reduce nitrogen excretion, some scientists are even lowering the recommended MUN concentration to 8 mg/dL with strategic formulation of diets for amino acids. The high circulating concentrations of ammonia and urea may be toxic to sperm, ova, or embryos or may reduce the binding of luteinizing hormone to ovarian receptors, which leads to a decrease in serum progesterone. In general, the focus has been the potential for embryo mortality with high BUN, which is reflected in higher MUN. Although this is a potential effect to keep in mind, other influences (e.g., heat stress, disease, etc.) may more likely be causing the embryo mortality. This association of protein on reproduction has been speculated by some to occur because the highly RDP sources fed to dairy cattle are often legumes (e.g., soybean meal), and these legumes are sources of estrogen that could be affecting the reproductive cycles. However, this relationship has not been substantiated by research.

Mineral and Vitamins

An adequate supply of many minerals and vitamins is needed before calving and throughout the breeding period for good reproduction efficiency. Blood calcium is not only important for milk synthesis but also for function of smooth muscle. Thus, hypocalcemia can increase the risk for metritis and displaced abomasum. Adequate (but not excessive) dietary concentrations of calcium, phosphorus, potassium, magnesium, and even sodium, chloride, and sulfur as they relate to dietary cation-anion difference (DCAD) are important for minimizing the risk for hypocalcemia and hypomagnesia.

In addition to its relationship with calcium, phosphorus has been a focus for many years relative to reproduction. A severe deficiency of phosphorus (usually reduced milk yields will occur before any negative effects on reproduction are observed with low phosphorus diets; that is, less than 0.25% of diet) will reduce reproductive efficiency; however, overfeeding phosphorus does not boost reproductive performance. As an industry, we went through several years of overfeeding phosphorus (e.g., 0.5 to 0.6% of diet); however, with the increased excretion of P and the associated risks to the environment and increased ration costs,

phosphorus concentrations in diets were reduced. Dietary concentrations of 0.38 to 0.42% are adequate for cows in the breeding herd.

Adequate dietary concentrations of selenium, copper, and zinc are important for reproduction, especially in reducing the incidence of retained placenta and metritis. Dietary concentrations should be 0.3 ppm of supplemental selenium, 20 ppm of copper, and 70 ppm of zinc. Adequate concentrations of vitamins A, D, and E can be important for optimal reproductive efficiency. Adequate concentrations of vitamins E and selenium are important to immune function. The generally recommended dietary concentrations for close-up dry cows is 60,000, 15,000, and 1000 IU/day and for breeding cows 100,000, 25,000, and 500 IU/day for vitamins A, D, and E, respectively. Supplemental B-carotene, independent of its role as a vitamin A precursor, has improved fertility in some studies, but it is expensive.

Summary

In evaluating the potential that the feeding problem may be affecting the pregnancy rate in a dairy herd, the first and primary focus should be on energy status of the cows pre- and post-calving. The next step is to assess the calcium status; dietary concentrations of selenium, copper, and zinc; and dietary concentrations of vitamins A, D, and E. Although likely adequate, review the dietary phosphorus concentration. If embryo mortality is an issue in the herd and the herd has high MUN, the amount of RDP likely needs to be reduced. After reviewing the dietary components, discuss with your nutritionist the possibility of fine-tuning the feeding program for optimizing reproductive performance and for adding certain fat sources to provide specific fatty acids during the pre-breeding or post-breeding periods.

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