

Dietary Crude Protein and Reproductive Efficiency of High Producing Dairy Cows

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The goal of the feeding program for high producing dairy cows is to provide sufficient dietary constituents for reproduction and to maximize milk production. During the first two to three months of lactation, high producing dairy cows cannot consume enough feed to meet the demands of lactation. A negative nutritional balance is induced by the rapid increase in milk production which peaks four to six weeks postpartum and the slow increase in energy intake that maximizes a few weeks later. Consequently, lactating dairy cows normally lose weight during the first several weeks of lactation as they mobilize adipose tissue and body protein in an attempt to meet the metabolic demands of lactation. Dairy cows may utilize as much as 25-27 percent of their total protein to support lactation. Mobilized protein is thought to provide constituents for both milk protein and lactose synthesis. In an effort to compensate for these nutritional deficits, the percent of crude protein in the diet of dairy cows is often increased. Increased feed consumption and digestibility seem to be some of the mechanisms by which higher levels of crude protein facilitate increased milk production. Current NRC crude protein recommendations for high producing dairy cows (66 to 110 lb milk/day) range from 14 to 22 percent of the diet on a dry matter basis.

Recently, there has been some limited evidence that feeding 16 percent or greater crude protein may impair the rebreeding of dairy cows. Greater amounts of crude protein appeared to increase services per conception and days open. Thus, high crude protein may interfere with fertilization and/or cause early embryonic mortality. It is important to definitely establish whether a high level of dietary protein affects reproductive performance. If reproductive efficiency is reduced, then future research will be devoted to resolve such an important conflict between the nutritional and reproductive management programs of dairy cows.

The objectives of this research are to evaluate the effect of dietary crude protein concentration on: 1) fertility and the onset and length of the estrous cycle, 2) plasma urea and β -hydroxybutyrate concentrations, 3) body condition and body weight changes and 4) milk production of dairy cows during the first 145 days of lactation.

The experiment is being conducted over three years at the OSU Dairy Cattle Center. Ayrshire and Holstein cows producing at least 45 lb milk/day by the start of the second week of lactation, are being used in the experiment. Cows are alternately assigned within breed to receive either 15 or 20 percent crude protein diets. Major dietary components include alfalfa hay, ground corn and soybean meal. The diets are fed three times daily on an individual cow basis. Feed intake is recorded daily. Cows are fed these diets until 145 days postpartum.

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The following characteristics are being measured from the time cows go on the experimental diets until 145 days postpartum to evaluate the effects of diet on overall performance. Weight change is determined at regular weekly intervals. Body condition scores, another indicator of nutritional status, are obtained at weekly intervals. A scale of 1 to 9 has been established with 1 being a very emaciated cow and 9 being a cow with excessive fat cover. Blood plasma levels of urea and β -hydroxybutyrate are indicators of protein level in the diet and nutritional stress, respectively. These blood constituents are measured every other week. Milk production is recorded twice daily. The percent milk fat is determined weekly.

Crude protein effects on reproductive performance is being evaluated with the following criteria. Collectively, rectal palpation of ovarian activity, weekly changes in plasma progesterone and daily observation of estrus activity are providing information on the postpartum estrous cycle onset and length of estrous cycles. Semen from a single collection of one bull per breed is being used for artificial insemination at the first three estrus periods greater than 55 days postpartum. The effects of these diets on days from parturition to conception, total percent of cows pregnant after three breedings and the percent that become pregnant from the first, second and third services will be determined.