Current Concepts in Transition Cow Feeding and the NASEM Requirements

James K. Drackley, Ph.D., Professor of Animal Sciences

University of Illinois Urbana-Champaign

drackley@illinois.edu

The transition period surrounding calving remains a critical time for welfare of cows and dairy farm profitability. Many farms still struggle with a high incidence of metabolic and infectious disorders, and suboptimal milk production and fertility as a result of improper transition programs. Publication of the 8th revised edition of *Nutrient Requirements of Dairy Cattle* by the National Academies of Sciences, Engineering, and Medicine (NASEM, 2021) provides updated guidelines for nutritional management of cows during the dry period and transition period. New equations for predicting dry matter intake (DMI) were developed, which predict that cows fed lower NDF diets will have higher DMI. Conversely, high NDF diets can be used to control total DMI and limit energy intake to near requirements, which is particularly important during the far-off dry period. The equations predict that DMI starts to decrease about 2.5 wk before calving, and reach a nadir before calving at about 1.65% of DMI. Requirements for pregnancy now begin in early pregnancy and are less in the far-off period but greater in the transition cow than predicted by the last edition of NRC (2001).

Increasing prefresh energy (more starch, less NDF) increases prepartum DMI but has little impact on postpartum DMI. Most studies show no effect on milk yield. Single group dry period management can work as demonstrated by our recent research. Milk fat concentrations are lower with a single diet approach, which we have shown is related to increased *trans*-10 fatty acid intermediates. Therefore, a close-up group may have advantages in that regard. Diets should be low enough in energy density during the far-off period and make uniform steps up in energy density to the high lactation group. The requirements for energy have been revised, with the maintenance requirement being increased for all classes of cattle except newborn calves. Consequently, total requirements for net energy for lactation (NEL) are about 17-18 Mcal/kg DM for dry cows and 19-20 Mcal/kg DM for close-up cows. However, the equations that predict dietary energy supply also result in greater NEL density of diets; as a result, the balance of supply and requirement for NEL is slightly lower for the new system and more in line with

observations in the field. Dry cows can easily consume more energy than they require. There is little evidence to suggest that high DMI per se prevents transition problems; rather, we should strive to meet the cows' requirements for energy and nutrients while avoiding excesses. Thus the problem is more often limiting energy supply rather than struggling to meet it.

Requirements for metabolizable protein (MP) are not changed much from the previous edition and are about 1000 g/d for typical Holstein cows. This does not include possible uses for the immune system or mammary development, and may not be optimal for first-calving heifers. The NASEM model provides estimates of amino acid supply. Typical diets based on corn silage and wheat straw likely will benefit from supplementation of rumen-protected methionine. Our research has demonstrated increases in postpartum DMI and milk yield with supplemental methionine, as well as favorable metabolic responses during the transition period.

Requirements for minerals and vitamins also have been adjusted as newer evidence has become available. A fully acidified, negative DCAD ration results in greater milk production than a partial DCAD approach. Requirements for potassium and sodium have been increased. For the trace minerals, cobalt, copper, iodine, manganese and zinc have been increased. While the NASEM committee recognized the responses to chromium and choline supplementation, no requirement or adequate intake was established. The requirement for vitamin E has been increased to about 2000 IU per day.

Publication of the new NASEM volume on nutrient requirements provides a tremendous resource for practicing nutritionists to fine-tune their approach to dairy cattle nutrition.