Nutrition for the Modern Sow

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The nutrient needs of the modern lactating sow are enormous and are increasing rapidly with increasing production levels. Quantitative requirement estimates of just a decade ago are no longer useful as both litter size and milk production have increased impressively during the past decade, and continue to do so. This situation demands a system for estimating nutrient requirements that can adapt reliably and logically to changing production levels. Providing adequate nutrient levels to lactating sows requires both an appropriate formulation and consumption of a sufficient amount of feed by the sow. This paper addresses both of those components of a nutritional program.

Formulation

The focus here is on amino acids. As a first principle, it is essential to provide an adequate amount of each of the essential amino acids to lactating sows. The amounts of amino acids needed vary among sows and among situations, largely because of variation in the amount of milk produced. The daily lysine requirement can be estimated from either of the following formulas, based on the litter growth rate as an indicator of milk yield:

Total dietary lysine (g) = 26 * daily litter gain (kg) - 6.71 (Pettigrew, 1993)

Apparent digestible lysine (g) = 22 * daily litter gain (kg) - 6.39 (NRC, 1998)

The litter growth rate can be calculated easily from litter weights at weaning and at birth, and the lactation length in days. The method then requires data on the amount of feed consumed by the sows, so the percent lysine can be calculated.

I interpret these equations to indicate that the sow needs 22 g of apparent digestible lysine (or 26 g of total lysine) to produce enough milk to support a kilogram of litter growth. This interpretation assumes that the sow mobilizes enough lysine from body tissues to cover both the intercept (6 to 7 g/day) and the maintenance requirement. It may be wise to ignore the intercept in order to avoid mobilizing body protein.

Please be cautious with use of these equations. They predict the amount of lysine the sow needs in order to achieve the recorded level of litter growth. If the equation indicates the lysine requirement is near the amount now fed, lysine may be limiting in the present diet. In that case, it may be useful to test higher levels.

Sows that produce more milk require more lysine, and also more of the other essential amino acids, than do lower-producing sows. It is now customary to estimate the quantitative requirements of the other amino acids from the requirement for lysine as a specified ratio of each other amino acid to lysine, often called the Ideal Protein system. However, we make it more complicated. Instead of a single set of ratios of the total requirements, we use ratios of the requirement for maintenance, the requirement for milk production, and the contribution from mobilized body protein. The literature contains several datasets that support estimation of these various ratios, but they are not in good agreement. We conducted a series of experiments, including one in collaboration with Dr. Cuarón and his colleagues at INIFAP in Querétero, designed to test these various estimates. We concluded that the ratios provided by NRC (1998) are appropriate except for an overestimate of the valine requirement.

Feed intake

Several lines of evidence converge to support the notion that lactating sows should consume a large amount of feed in order to maximize not only their litter weaning weight but also their subsequent reproductive performance. Some of the evidence relates to fundamental physiology; some comes from production records. The physiological evidence suggests that the metabolic state associated with minimizing weight loss during lactation is more important than the condition of the sow at weaning, emphasizing the need for a high level of feed intake during lactation.

Pig producers often complain that their lactating sows will not eat enough. However, there is now a wealth of practical experience that shows feed intake of these sows can be increased by management. The following material offers suggested management approaches.

Avoid heat stress

The lactating sow is so metabolically active that she generates a great deal of heat that must be transmitted to the environment. That's difficult in hot weather. The lactating sow's ambient environment should be no more than about 21C, so separate microenvironments must be provided for the sow and for the litter. It is often impossible to keep the ambient temperature so low, but it should not be higher than 21C in winter. The following practices help to avoid or minimize heat stress:

- Use drip cooling.
    - Drip cooling is probably the most powerful cooling technology available. It is more effective than misting because it cools the skin rather than only the air. The chief disadvantage is wet floors.
- Maintain adequate ventilation.
- Insulate the roof.
    - If impossible to insulate, wet the roof during mid-day.
- Use evaporative cooling.
- Use circulating fans within the building.
- Choose flooring that conducts heat.
    - Don't choose concrete for sanitary reasons.

Manage the feeding process

- Use feeders designed to allow *ad libitum* consumption, and manage them closely.
    - Wet/dry feeders are especially good, if well-designed.
- Alternatively, feed frequently.
- Provide an adequate supply of water
    - If using nipples, check frequently to ensure adequate flow rate.
- Provide feed wet, with excellent management to ensure sanitation.

Summary of recommendations

- Use the equations presented herein to estimate the daily lysine needs of the lactating sow.
- Use the amino acid ratios proposed by NRC, except for a lower level of valine.
- Manage sows to ensure a high level of feed intake, using the suggestions provided above.