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BEYOND the NRC REQUIREMENTS: Maximizing Swine Fertility with a Nutritional Approach

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Advances in swine productivity through genetic selection, management, health and nutritional strategies have resulted in reproductive performance once unimaginable.

Feed efficiencies during the growing and finishing phase of production have improved in the range of 25 percent over the past 15 years. Sow reproductive efficiency has shown equal improvement and the biological potential of today's hyperprolific modern genotypes is truly staggering. However, currently defined nutrient requirements are largely outdated as they are based on research conducted decades ago.

Indeed the question has been raised, "If a technology exists to improve reproductive performance, while maintaining or lowering cost of production and at the same time reducing the impact on the environment, are nutritionists not obligated to consider it?" This is a very timely question and one that should be seriously considered during diet formulations.

Traditionally, dietary formulation has relied on the research-based requirements set forth by scientific collaborations such as the NRC (1998) and ARC

(1981). Also, detailed models have been developed to accurately estimate the amino acid and energy requirements of sows (Nobles et al., 1990; Pettigrew et al., 1992a,b; and NRC, 1998).

While these applications are accurate for the energy and amino acid component of sow nutrient requirements, very little research has focused on the trace mineral requirements of hyperprolific sows. The trace mineral recommendations can also vary considerably between industry and reference recommendations and many of these recommendations are based on research that is decades old.

For example, in 2005 Mateos et.al. looked at the recommended trace mineral levels for lactating sows and found a large difference between levels of zinc for NRC requirements - 50 mg/kg of complete feed - to studies completed by the University of Nebraska and South Dakota State University with levels of zinc at 80 to 150 mg/kg of complete feed.

So the question could be asked, "Has trace mineral nutrition kept up with genetic progress, and if not, what are the consequences?"

The role of trace minerals in sow and boar production is extremely important. In 1995, Mahan and Newton clearly demonstrated that the draining effects of enhanced reproduction result in the depletion of sow body mineral reserves after three parities. In working boars, although the impact of trace mineral supplementation and research is very limited, current research findings are proving to be interesting and indicate that enhanced supplementation to working boars with proteinated trace minerals improves semen concentration and increases the number of doses of extended semen per ejaculate.

Unfortunately, dealing with today's breeding stock of higher genetic potential does not simply allow nutritionists to continually supplement diets with higher levels of minerals due to the known interactions between the elements. In addition, environmental pressures exist to reduce heavy metals in effluent, yet higher recommended levels may contribute unnecessarily to pollution. Therefore, a more detailed approach to diet formulations must be undertaken to ensure the nutritional needs of the modern sow and boar are met allowing them to express their genetic potential while improving longevity and lifelong performance.

The ultimate goal of nutritionists and producers alike is to maximize the number of healthy, top quality piglets from the sow that can then be reared to maximize meat production per sow per year at minimal cost. For this goal, the following objectives should be front and center:

1. To maintain or improve reproductive performance
2. To maintain cost or reduce the cost of production

3. To reduce nutrient emissions in effluent to protect the environment

Keeping these objectives in mind, the swine industry needs to look at the current recommendations for minerals and the source of the minerals. Studies by Fehse and Close (2000) were among the first to show the impact of proteinated trace mineral supplementation on reproductive performance. This data, coupled with the report by Mahan and Newton, indicated a depletion of trace elements as sows age. Supplementation with proteinated trace minerals appeared to offer a solution due to their higher retention.

The first diets to contain proteinated trace minerals in the form of Bioplex® and Sel-Plex® were lactation rations. Large nutrient drains occur during the late gestation and lactation periods of the reproductive cycle. Before the increased feed intake seen during lactation, the final two weeks of gestation may potentially pose the largest drain on the sow, with over 50 percent of the mineral content of the fetal tissue being deposited during this time. Therefore, supplementing the lactation ration with proteinated trace minerals and feeding these diets pre-farrowing may be an excellent management technique to ensure maximum mineralization of the fetus while minimizing the drain on the sow.

Recent research findings (Peters, 2006) demonstrated that the level and source of trace mineral supplementation affect sow reproductive performance. Over a six parity period, utilizing 375 litters, Peters found that increasing the dietary trace mineral level improved performance when proteinated trace mineral forms (Bioplex and Sel-Plex) were fed, whereas increasing the levels using sulphate minerals reduced performance.

between the treatments, with the exception of selenium, the mineral drain on the sows was greater as indicated by the larger litter size and higher sow productivity.

The author concluded that feeding non-proteinated trace minerals in excess of NRC recommendations may be detrimental to sow reproductive performance, however when these same levels of trace minerals are fed in the proteinated form, sow reproductive performance is not adversely affected.

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We have noticed that not everyone has taken advantage of the Circovirus Vaccine Funding Program. Rules have changed, so you may qualify. Contact your veterinarian for more details.

HOG UPDATE is published in the interest of helping hog producers become more profitable. We welcome your comments.

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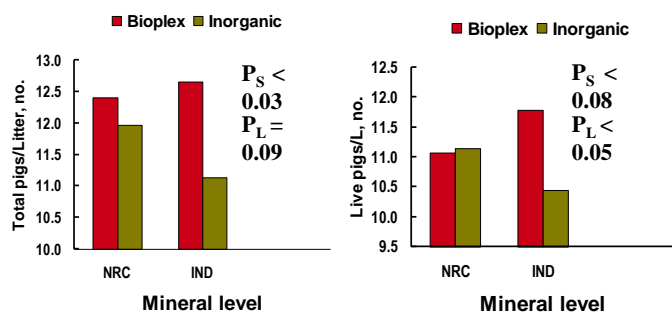
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Sow Reproductive Performance

n = 375 litters



Mahan and Peters, 2006

The supplementation of proteinated trace minerals in this trial resulted in one extra pig per litter when trace minerals were fed at typical industry levels compared with the NRC recommended levels. Likewise, sow and piglet body mineral data were evaluated and it was found that while there were effectively no differences