The average number of pigs weaned per litter across all swine farms in the United States continues to improve. Many producers today routinely achieve 9-10 pigs weaned and 22-24 pigs/sow/year. This production level has been achieved by changes in many important factors — genetics, management, health, record-keeping, and nutritional advances.

Genetics plays a key role in balancing increased lifetime sow productivity with offspring growth and carcass traits. Along with genetics, herd health, environment, facilities, nutrition, and husbandry are critical to improve productivity. Optimizing reproductive performance is a life cycle opportunity. Knowledge of gilt selection and development, breeding programs, gestation, farrowing/lactation, and rebreeding are all important. Detailed records of each of these aspects are important for achieving and maintaining a high level of productivity. Obviously, the information gleaned from an appraisal of herd records can be used to make many educated decisions. One significant aspect of productivity is sow nutrition.

**Sow Nutrition**

Many breeding herd nutrition philosophies were founded on research involving low sow productivity standards. Most of the older research was conducted over a single reproductive cycle (breeding to weaning), pigs weaned at four or five weeks of age, litter sizes of 7.5 to 8.5 pigs, and litter weaned weights of 100-120 lb (four weeks) or 125-150 lb (five weeks). The old research has little application for producers pushing the upper limits of sow productivity. The concept of lifetime productivity (60-70 pigs weaned/sow over 6-7 parities) has combined with 14-18 day weaning of at least 9 pigs/litter at a litter weaning weight of at least 110 lb.

To achieve optimum performance, nutrition and management must be evaluated at each stage of the reproductive cycle. Figure 1 schematically outlines a phased sow feeding program. Proper diet formulation and feeding management for each phase is necessary to optimize productivity and maximize profit. The schematic changes when feeding developing replacement gilts.

ADM Alliance Nutrition’s sow feeding program is based on the latest research. The nutrient requirements of highly productive sows and gilts are met with ADM Alliance Nutrition’s products and programs. The use of ADM Alliance Nutrition’s Alliance® Animal Health add-packs enables customization to meet individual herd needs. Nutrients that may be of particular importance to the breeding herd includes:

- Folic acid
- Vitamin E — Natural source
- Pyridoxine (vitamin B6)
- Carnitine
- Chromium
- Selenium yeast
- Manganese
- Lysine and energy (Refer to the Swine Technical Edge article titled “Lactation: Feed Management and Nutrient Requirements”)

**Folic Acid**

Folic acid is important for reproductive performance and is found in ovarian and uterine tissue. The benefit of elevated levels was thought to increase conception rates and litter sizes. Supplemental folic acid at 0.454 mg/lb has been shown to increase litter size by 0.93 pigs born alive (Virginia Polytechnic Institute and State University). It is suggested the increased litter size is due to increased embryonic survival rather than increased ovulation rate.
Vitamin E

Inadequate vitamin E concentrations in the diet have been shown to result in increased incidence of the mastitis-metritis-agalactia (MMA) complex in sows. Vitamin E has long been known to reduce the incidence of MMA, but recent research suggests current NRC and University recommendations may still be too low. Research from The Ohio State University suggested the vitamin E requirement to maximize litter size at weaning and piglet immunocompetency is 20 to 27 mg/lb. These research studies were conducted using the most commonly used source of vitamin E in swine feeds — synthetic vitamin E. A natural source of vitamin E derived from vegetable oils is now available. Natural source vitamin E has been shown to be at least 1.36 times more bioavailable than synthetic vitamin E. In a recent study at The Ohio State University, sows were fed different sources of vitamin E (synthetic versus natural) for five parities. The alpha-tocopherol (a form of vitamin E) concentration in serum, colostrum, and milk was higher in sows fed natural source of vitamin E than in sows fed synthetic source of vitamin E. Serum and liver alpha-tocopherol content was higher in weaned pigs when natural source of vitamin E was fed to sows. These findings suggest more vitamin E is transferred to dam’s milk and ultimately absorbed and retained by nursing pigs when natural source vitamin E is fed to sows.

Pyridoxine

Pyridoxine (vitamin B6) is highly involved in the metabolism of protein and energy. It has also been shown to be an integral component in several biochemical reactions required to optimize reproductive performance. A University of Illinois study showed feeding diets containing added pyridoxine from breeding through gestation increased the number of live pigs born and pigs weaned per litter. Two experiments at the University of Manitoba also showed pyridoxine supplementation increased the number of pigs born per litter. In addition to improving litter size, the addition of pyridoxine to sow diets resulted in a one-day reduction in days to estrus postweaning.

Carnitine

Carnitine is a water-soluble, vitamin-like compound, which is utilized by the body to transport fatty acids into mitochondria (cell’s engine). Thus, carnitine plays an important role in energy metabolism. Out of eight sow trials conducted by Kansas State University and Oklahoma State University and a commercial sow operation, six trials have shown addition of 50 ppm of L-carnitine improved born alive from 0.6 to 1.8 pigs/litter, and two trials demonstrated offspring from sows fed L-carnitine during gestation had higher carcass lean percentage units of 0.6 and 1.8, respectively.

Chromium

Chromium is a trace mineral that has several physiological roles in the body including involvement in enzyme activity and stability of nucleic acids and protein. The primary role of chromium as a nutrient, however, is its involvement in carbohydrate metabolism, serving as a component of a compound that potentiates the action of the hormone insulin. A series of sow research trials, utilizing over 52,000 sows and four genotypes, were conducted at different universities and commercial operations. Data from these trials has shown addition of complexed chromium results in an improvement of litter size of 0.8 to 1.5 pigs/sow/year. The improved sow productivity will likely be derived from a combination of enhanced rebreeding efficiency, increased litter size, and reduced sow mortality.

Conclusion

The science of feeding sows has become more precise. Formulation of farm specific diets for the breeding herd requires knowledge of genetic potential, body condition scoring, nutrient needs, and feed intake. Although more sophisticated dietary nutrient adjustment may initially appear complex or confusing, sow productivity advantages dramatically offset the small extra time required to implement these feeding techniques.

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