FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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THE ROLE OF FAT IN SOW DIETS

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Lipids (fats) have a unique and beneficial role in modern swine diets. The role is to improve the diet when traditional corn-soy-type diets cannot serve for optimal production and health of the animals in certain facilities and management techniques. Specifically the stress periods are in baby pig survival, lactation energy and thermal stress to cause decreased feed intake. The weaknesses cause unnecessary baby pig losses and early culling of sows. An understanding of caloric sources and how these different sources can best be utilized in ration formulation is important for feed nutritionists and livestock producers. Lipid calories can be more valuable than carbohydrate calories in some diets and feeding situations.

Baby Pig Survival

Piglets are weak at birth or shortly thereafter compared with animals of other species. Body fat is low (2%) and only 5 to 10 grams of fat are utilized during a starvation situation with an estimated caloric utilization of 166 kcal/day. Glycogen concentration in liver and muscle decreases to low levels by 24 to 48 hours of age, whether pigs are fed or fasted.

Normal pigs have little remaining energy reserve at 48 hours of

age, then they are dependent on external support for survival. Stressed pigs are more inclined to die after 48 hours of life. Some of the stresses include lower body energy reserves at birth, low birth weight, low milk energy, insufficient milk intake, littermate competition, cold environmental temperature and disease. Any single stress or combination decreases survival percentages.

Significant improvement of survival rate of smaller pigs by feeding sows fats versus more carbohydrates has been reported. Feeding sows more energy from fat in late pregnancy increased the survival rate of smaller pigs. Survival rate of all pigs is most improved when survival rate is low (80%). Modern production should achieve above 90% pig survival.

Fat in late gestation and lactation diets has a unique role to increase fat metabolism, conserve body energy reserves and increase sow milk productivity. The percentage of fat in the sow's colostrum and milk is consistently increased by the feeding of high dietary fat during gestation. Milk from the initiation of farrowing to about 5 to 7 days normally increases in fat content. Sows metabolize fat from body cells for the milk. Consequently they become thinner and lose weight. The feeding of fat prior to farrowing assists her metabolic process as the fat is available in her blood for synthesis of milk fat.

Published information indicates that milk yield is increased 8 to 30% by feeding fat. Percentages of fatty acids are altered by the source of lipids and the ratio of fatty acids reflect the ratio in the fat source. When the pigs have low carbohydrate and essentially no energy reserves, the higher energy of colostrum and of early milk at days 2 and 3 appears to be the most beneficial component of fat feeding for baby pig survival.

Longer term (35 days) feeding of fat at a level of 5% added to the diet has some advantages versus shorter term (5 days) feeding at 10% of the diet. In 5 day feeding of fat to sows, pig blood glucose in the fat group was not higher at birth, but higher than control pigs after a 48-hr fast. Beta hydroxybutyrate was not different. In 35 day feeding, pig blood glucose was high in the fat group at birth and after the 48-hr fast. Beta hydroxybutyrate was higher in fat-group

pigs after the fast, which is an indication that pigs from sows fed fat for a longer time are more capable of utilizing and metabolizing lipids as an energy source.

Fat feeding should be initiated 2 to 3 weeks before farrowing in order to feed at least 3.0 pounds of fat prior to farrowing. A diet with 5% added fat would provide adequate fat intake. The start of feeding fat after farrowing is too late to improve baby pig survival. The objective is to achieve increased blood glucose and liver and muscle glycogen in pigs, and increase the fat content of colostrum. The value of the glycogen is short term, but the higher quality colostrum and milk have a longer term effect to provide energy.

Sow Conditioning and Estrus

Under farm conditions with sows having delayed estrus after weaning, the feeding of fat to sows decreases the days after weaning for sows to return to estrus. Subsequently proper sow conditioning has been established as important in sow reproduction. Generally, sows were maintained too thin during that earlier period of time. It was reported by researchers in England that sows decreased in body fat and eventually stopped reproducing. Unfortunately, the sows having large litters, milking well and weaning the best litters were the first to fail to reproduce and would be culled from the herd. The problem was that good sows were not given enough energy during gestation or lactation. Other researchers showed that gilts with larger litters lost more body fat and farrowed fewer pigs the second parity than gilts with smaller litters. The current problem is low energy intake during lactation. The problem can occur due to thin sows, "picky-eating" sows, good milking sows and large litters. If sows are thin at weaning and they fail to exhibit estrus within 10 days or reproduction is a problem, feeding a lactation diet with 5% added fat should be beneficial.

Heat Stress

Relative to many other animals, swine have an inferior cooling system. Since they do not sweat, they must depend on respiration and removing heat from the surface of the body. But, these systems are

limited by hot air and dry conditions with limited air movement. Thus sows can suffer in warm, dry farrowing houses and these conditions can exist all year in more tropical climates. The result is lower feed intake and subsequently the reproductive problems already discussed.

The diet used can have some effect on heat stress. A simplistic explanation for a complex metabolic process is that during heat stress, sows can eat less of a high energy diet containing fat and still consume equally as many or more calories and metabolize it with less heat production. In contrast, a low energy diet containing fiber requires a greater feed intake and produces more metabolic heat in the process of digestion. Obviously, high fat diets are more valuable in hot than cold weather conditions.

Source and Quality of Fat

Unfortunately, research comparing sources of fat in sow diets is very limited. Some nutritionists prefer tallow to oils, yet animal fat (including poultry fat) and plant oils are used with good results. Fats should be stabilized with an antioxidant and used preferably within a few weeks to avoid rancidity. High quality, cost effective, fat is desirable. Quality affects palatability and performance; therefore, high quality, cost effective fat is desirable.

REFERENCES

Boyd, R. D. 1979. Glucose homeostasis and fatty acid utilization in the neonatal pig. Ph.D. Dissertation. Univ. of Nebraska, Lincoln.

Coffey, M. T., R. W. Seerley, D. W. Funderburke, and H. C. McCampbell. 1982. Effect of heat increment and level of dietary energy and environmental temperature on the performance of growing-finishing swine. J. Anim. Sci. 54:95.

Coffey, M. T., R. W. Seerley, R. J. Martin and J. W. Mabry. 1982. Effect of level, source and duration of feeding supplemental energy in sow diets on metabolic and hormonal traits related to energy utilization in the baby pig. J. Anim. Sci. 55:329.

Coffey, M. T., R. W. Seerley and J. W. Mabry. 1982. The effect of source of supplemental dietary energy on sow milk yield, milk composition and litter performance. J. Anim. Sci. 55:1388.

Kruse, P. E., V. Danielson and K. Christensen. 1977. The influence of different dietary levels of linoleic acid on reproductive performance and fatty acid composition of milk fat and plasma lipids in pigs. Acta. Agr. Scand. 27:289.

Moser, B. D. and A. J. Lewis. 1980. Adding fat to sow diets. Feedstuffs 52:36.

Pettigrew, J. E. 1981. Supplemental dietary fat for peripartal sows: A review. J. Anim. Sci. 53:107.

Seerley, R. W. and R. C. Ewan. 1983. An overview of energy utilization in swine nutrition. J. Anim. Sci. 57:300.

Seerley, R. W., T. A. Pace and D. R. Poole. 1973. The effect of energy on the survival of neonatal piglets. Proc. Georgia Nutr. Conf. p 52.

Seerley, R. W., R. A. Snyder and H. C. McCampbell. 1981. The influence of sow dietary lipids and choline on piglet survival, milk and carcass composition. J. Anim. Sci. 52:42.

Whittemore, C. T., M. F. Franklin and B. S. Pearce. 1980. Fat changes in breeding sows. Anim. Prod. 31:183.