FATS AND PROTEINS RESEARCH FOUNDATION, INC.

Director's Digest

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Nutrition, Temperature and Piglet Survival

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Piglet survival is of utmost importance in swine production. Twenty-five percent of all pigs born die before weaning. The majority of these losses occur during the first few days after birth. The first twelve hours of life are most critical. It is quite apparent that pre-weaning mortality is a major cause of loss to the swine industry. Efficiency of production would be greatly enhanced if this mortality were reduced.

Several factors can be listed as causes of piglet mortality. The major reported causes are overlay by the sow and congenital weakness. These major causes, as they are considered, may be brought about by chilling, starvation and dehydration. The newborn piglet is vulnerable to cold stress because of his sparse hair coat, thin hide and small amount of body fat. The newborn pig is not able to control body temperature efficiency. This is a handicap to survival when exposed to a stressful environment or limited milk supply. The reactions of the piglet to changes in the environment are a signal to the herdsmen that he is either comfortable or uncomfortable. In cold conditions, the pig crouches lying on his knees, shivering violently, sometimes with the forelimbs thrust between the hindlimbs and with its sparse coat of hair erected. When pigs are chilled, they huddle close to the sow and thus the opportunity for crushing increases. In warm conditions the limbs are extended and the pig lies relaxed on its side, signaling that he is comfortable.

The critical temperature of the newborn pig is approximately 86° F. (26.7° C.) and gradually declines as the pig grows. The newborn pig is attracted to artificial heat sources such as heat lamps, catalytic heaters, heat in the floor, etc., and

warm. Research from Illinois reported that non-suckled pigs in a warm comfortable environment lived 56 hours longer than non-suckled pigs in a cold environment. Thus pigs born into a cold environment and not allowed to nurse immediately are doomed and will probably die within a few hours after birth.

Frequent nursing has a sparing effect on the piglet's energy stores and helps him to maintain his blood sugar level. Adequate energy nutrition is difficult to guarantee for every piglet. The size of the litter and the body weight of the piglet will determine how much milk he receives. Larger, more vigorous piglets usually receive larger shares.

The newborn piglet is very dependent not only upon stored energy, but also upon energy acquired by suckling. To improve his ability to survive it would appear beneficial to increase his energy stores. In an experiment conducted in Nebraska, tallow added to the sow's diet at the rate of 20% and fed from day 100 of pregnancy to parturition, produced a slight increase in piglet liver glycogen at birth, and this difference was maintained through 12 hours after birth (table 2). Cornstarch fed at the same energy intake as tallow maintained a high glycogen level at 6 hours but not at 12 hours. This extra energy after birth should be beneficial to sustain the piglet until he has nursed.

The next consideration would be to improve the piglet's energy acquired by suckling. For many years herdsmen have equalized litter size by fostering pigs from one sow to another in order to reduce competition in large litters and equalized milk intake. Another way would be to assure adequate energy intake for each piglet. In an attempt to improve the energy content of sow's milk and subsequent survival rate of piglets, an experiment was designed to study the effects of tallow and choline additions to the diets of sows. Treatments were initiated on day 109 of gestation and continued through two weeks of lactation (table 3). Tallow added (15%) to the diet of the sow increased the fat content of the milk (6.8% vs 9.2%) when compared to the control diet which contained no added tallow. Choline, (a B-vitamin) is involved in the transport of lipids in the blood. Therefore, choline chloride (990 gm/ton) was added to the high energy diet in an attempt to increase lipid transport and thereby increase even further the fat content of the milk. The addition of fat plus choline resulted in the highest milk fat levels at farrowing and at one week, which is the most critical period for the piglet. The increase, observed in the colostrum, indicates how rapidly dietary fat is transported to the milk, since the treatment diets were fed for only four days before farrowing.

Table 1-Rate of Liver Glycogen Disappearance in Piglets from Birth Through 24 hours of Age (Nebraska Experiment 75416)[a]

Hour of Sacrifice	No. of Piglets	Glycogen Concentration, mg/g	% of 0 Hour
0 (birth)	12	177.87	---
6	12	87.25	49.1
12	12	73.04	41.1
24	12	25.39	14.3

[a]Boyd, M.S. Thesis 1977 University of Nebraska.

Table 2-Effect of Dam's Dietary Treatment Prior to Parturition on the Rate of Liver Glycogen Disappearance in the Piglet from Birth Through 24 Hours (Nebraska Experiment 75412)[a,b]

Hour of Sacrifice	No. Pigs Per Treatment	Control[c]	Control +Tallow[d]	Control + Cornstarch[e]	SE
		(mg glycogen/g wet liver tissue)			
0 (birth)	4	174.9	188.7	170.0	9.55
6	4	77.8	93.9	90.0	24.64
12	4	62.7	95.6	60.8	14.13
24	4	20.2	22.6	33.4	7.02

[a]Boyd, M.S. Thesis 1977 University of Nebraska.

[b]Diets fed from day 100 pregnancy to parturition.

[c]Corn-SBM 14% protein, feeding rate 4 lb/hd/day (1.82 kg).

[d]Tallow added at 20% of the diets.

[e]Fed to the same energy intake as the tallow diet.

Table 5-Effect of Tallow and Choline Fed During Late Gestation (day 109) and Lactation on Piglet Survival (%) at Two Weeks of Age (Nebraska Experiments 75412, 13, 16)

	Control[a]	Tallow 15 or 20%	15% Tallow + 990 gm/ ton Choline Chloride
Trial[b,c]		% Survival (no. of litters)	
1	69.2 (20)	73.2 (19)	---
2	85.9 (18)	87.7 (17)	---
3	87.5 (5)	79.6 (5)	87.5 (11)
4	84.4 (12)	85.4 (10)	88.7 (20)
5	79.8 (9)	87.3 (8)	93.7 (19)
6	92.9 (6)	96.4 (5)	76.8 (6)
7	55.6 (4)	86.9 (4)	77.7 (3)
8	85.8 (3)	78.0 (4)	85.8 (3)
9	94.3 (5)	90.9 (3)	88.7 (4)
Weighted Average (Trials 1-9)	80.6 (82)	83.3 (75)	
Weighted Average (Trials 3-9)	83.6 (44)	86.3 (39)	88.2 (66)

[a]Corn-SBM, 16% protein, 0% added tallow, 200 gm/ton (220 mg/kg) choline chloride.

[b]Trials 1 and 2, 20% added tallow, treatments started at farrowing.

[c]Trials 3-9, 15% added tallow, treatments started day 109 of gestation.

Our contributor to this month's issue of the Director's Digest is Bobby D. Moser, Associate Professor of animal science at the University of Nebraska-Lincoln. A native of Cyril, Oklahoma, he earned his B.S. and M.S. degrees in animal science from Oklahoma State University and then went on to the University of Nebraska-Lincoln where he obtained his Ph.D. in 1972. He has been active as an investigator in swine production and in the development of innovative methods of teaching swine production to students.

Prof. Moser and his wife, Patsy, are the parents of two sons. The family enjoys hunting and fishing on their many camping expeditions and is active in church work and 4-H leadership.

Last year Prof. Moser was awarded the University of Nebraska Distinguished Teaching Award in Science and Technology which was accompanied by a medallion and a $1,000 stipend. This year he was named recipient of the Younger Animal Scientist Teaching Award by the Midwestern Section of the American Society of Animal Science. We are indeed fortunate to collaborate with this outstanding young researcher whose investigations on the use of tallow in swine feeds promise to have a very significant impact on swine production.