1986

G86-821 Weaned Pig Management and Nutrition (Revised August 1992)

Duane Reese
University of Nebraska - Lincoln, dreese1@unl.edu

Mike Brumm
University of Nebraska-Lincoln, mbrumm@hickorytech.net

G86-821-A
(Revised August 1992)

NebGuide

Published by Cooperative Extension, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln

Weaned Pig Management and Nutrition

Temperature, space, health considerations, dietary nutrient allowances, feeding management and more are covered here.

Michael C. Brumm, Extension Swine Specialist
Duane E. Reese, Extension Swine Specialist

The weaning age of pigs farrowed in Nebraska is variable. While the average age at weaning is about four weeks, the range is from two to eight weeks. However, industry surveys indicate that more than 50 percent of the pigs in the United States are weaned at 28 days of age or earlier, with the majority weaned between three and four weeks of age. This trend towards earlier weaning is expected to continue with advances in management, housing, health and nutrition. Earlier weaning (under 28 days) also is likely to increase as producers try to maximize the number of pigs weaned per sow per year.

For most Nebraska producers with adequate nursery facilities, weaning at 21 to 28 days of age appears to provide the best compromise between weaned pig performance and potential pigs per sow per year. Weaning at ages consistently younger than 21 days has not proven to increase pigs per sow per year in most herds and the problems in handling the weaned pig have proven taxing to even the most dedicated manager.

For many swine enterprises, weaned pig management is the weak link in the production chain. Similar to other phases of production, a set of goals and accurate production records improves a producer's chances of minimizing this weak link. *Table I* lists several suggested goals for weaned pigs. These goals represent reasonable expectations of pig performance with moderate to good facilities and health control. Also listed are current levels of weaned pig performance typical of Nebraska and midwest farms.

Table I. Weaned pig performance.

Item	Industry Standards[a]	Goal
Death loss, %	2.5-3	<2
Rate of gain, wean to 40 lb, lb/d	.70	>.75
Feed/Gain	2.0	1.75

Feed cost/lb gain[b]¢	21-23	?

[a]University of Nebraska Swine Enterprise Records and Swine Graphics Inc., Webster City, IA.
[b]Corn $2.50/Bu; 44 SBM = $250/Ton.

Temperature

At birth, the pig's body contains approximately 1 percent fat. At 21 to 28 days of age, a healthy pig suckling a sow with reasonable milk production has between 12 and 18 percent fat. While body fat serves many diverse functions in a young pig, two of the most important at weaning are energy reserves and body insulation.

During the first few days after weaning, pigs commonly experience a "negative" energy balance (more energy is used to support life than is consumed in feed). The pig uses up limited energy reserves or fat.

In doing so, the pig depletes a limited store of energy, decreases its insulation and decreases its ability to adjust to changing ambient temperatures. Consequently, the temperature in the pigs' desired sleeping area should be 10 to 1°F higher than it was in the creep area of the farrowing crate. Gradually reduce the temperature as pig feed intake increases.

Temperature fluctuations of more than 5°F per hour (such as might occur with faulty or poorly located thermostats) can lead to scours and poor performance. It should be noted that the temperature at eye level may be 10 to 12°F higher than the temperature in the pig zone, which is the area of importance.

The question of comfort for the pigs involves more than temperature, however. The degree of comfort in response to a given air temperature is affected by air movement (drafts), dampness, feed intake, type of floor, number of pigs in the social group, and amount of insulation in the floor, walls and ceiling. The term effective environmental temperature includes consideration of these variables and their impact on the pigs' perception of temperature. *Table II* lists recommended effective air temperatures to be maintained in the pigs' desired sleeping area. These temperatures are appropriate for a group of pigs housed without exposure to drafts and without access to bedding.

Table II. Recommended effective air temperature for weaned pigs.

Age (wt)	Effective Temperature (°F)
3 wks (10-15 lbs)[a]	85-90
8 wks (35-40 lbs)	70-75

[a]Lower temperature 3-4°F/wk once weaned pigs are eating aggressively.

It is important to restrict air movement at the level of the newly weaned pig as much as possible. A scarcely noticeable air speed of 30 feet per minute chills a pig as much as a 7°F drop in air temperature. A draft of 90 feet per minute (2 mph and common in many housing situations) is equivalent to an 18°F drop in temperature. Solid pen partitions in the desired sleeping area are recommended if draft control is a problem.

Wet floors also can increase chilling and can equal a 10 to 15°F drop in temperature as the pig uses body heat to dry itself. One inch of straw bedding on solid floors is comparable to increasing the temperature as much as 7°F.

A problem common to many Nebraska nurseries is temperatures above the pigs' upper critical temperature. In their desire to accommodate the weaned pig, many producers often unknowingly create a heat stress situation. This is especially true in those nurseries where all-in all-out (AIAO) management cannot be practiced.

In these nurseries, the air temperature often is raised to meet the need of the smallest pig, resulting in a heat stress for the larger pigs in the facility. This heat stress causes a reduction in feed intake and gain. Successful managers heat the air space of a facility to meet the needs of the largest animals in the facility, then use hovers or supplemental heat to provide for the needs of smaller pigs. This not only improves pig performance, it also saves on expensive fuel (generally propane).

Space

Recommended space allowances for various weights of weaned pigs in differing facilities are given in *Table III*. Use the final weight of pigs in determining floor space requirements. Lack of adequate space (crowding) often results in reduced feed intake and rates of gain. There may or may not be a decrease in feed conversion efficiency with crowding. The addition of antimicrobials to the diet will not overcome the depression in performance due to crowding.

Size pens to hold a maximum of 15 to 20 pigs. This will reduce fighting and other dominance activities that limit performance in larger group sizes. With larger groups, growth rate tends to decline and variation in performance within the pen tends to increase.

Table III. Minimum recommended space allowances for weaned pigs.

Pig Weight (lbs)	Slotted Floors	Solid Floors
	----------ft²/pig----------	
0-25	1.7-2.0	3
25-40	2.0-2.5	4
40-60	3.0-4.0	5

Drinker Space

Provide at least one drinking space for every 10 pigs in a pen. University of Nebraska results suggest an increased variation in pig weight within a pen if only one nipple is provided for 16 pigs versus one nipple for eight pigs.

Nipple drinkers are recommended because of cost and the assurance that each pig drinks from a clean supply. Provide a minimum of two nipples per pen to ensure that one nipple is always functioning. Locate nipples at least 12 to 14 inches apart, or some pigs will dominate both drinkers.

Clean cup drinkers daily and check drinkers for ease of use and water flow rate. Water pressure in excess of 30 to 40 psi may make paddles and nipples difficult for weaned pigs to operate. Slow flow rates (thought to be under 1.5 cups per minute) may result in insufficient water intake. Let nipple drinkers trickle slowly for the first day after weaning, especially if pigs have had no prior experience with nipple drinkers in farrowing facilities.

Feeder Space

Provide one 5" to 6" feeder space for every two to three pigs in a pen. University of Nebraska research indicates that if there is not enough trough space, variation in growth rate within a pen will increase. Excess trough space is expensive and often results in pigs eating from only a few holes, with stale feed and/or feces and urine in the unused holes.

Because young pigs are accustomed to eating together as a social group prior to weaning, producers may want to consider hand feeding small amounts of feed on a piece of plywood or other solid area so all pigs have ready access to feed during the first few days post-weaning. Size feeders and automatic feeding systems so frequent additions of fresh feed are necessary.

In pens with totally slotted floors, a small (2' x width of feeder) rubber mat or piece of plywood placed on the pen floor in front of the feeder for the first several days may be used. This not only provides a solid surface for the pig to lie on, but also ensures that spilled feed is more readily detected once pigs start eating feed.

Health Considerations

A baby pig's immune system is not fully developed to handle enteric disease challenges until 5 to 6 weeks of age.

Prior to weaning, maternal immunoglobulin (IgA) in the milk gives the baby pig protection from enteric disease. The level of immunoglobulins in the milk begins to decline two weeks after farrowing at which time the piglet begins to develop some ability to respond to infection by producing its own antibodies. Because this defense mechanism is poorly developed at the time most pigs are weaned (3 to 4 weeks of age), outbreaks of diarrhea frequently result. Therefore, weaned pigs that are moved to clean, dry and draft-free pens face less disease risk.

The adoption of all-in all-out management can have a major impact on pig performance and health following weaning. While all farms will not experience the extremes in performance noted in the results of *Table IV*, AIAO must be considered as producers design and remodel nursery facilities.

Table IV. Effect of continuously used or all-in all-out facility management on nursery pig growth performance[a].

Criteria[b]	Management System	
	Continuous	All-in All-out
0-14 days		
Average daily gain, lb	.25	.35
Average daily feed, lb	.53	.65
Feed/gain	2.13	1.89
0-35 days		
Average daily gain, lb	.71	.82
Average daily feed, lb	1.39	1.50
Feed/gain	1.96	1.85

[a]Michigan State University.
[b]Pigs were weaned at 28 + 2 days of age. Experiments were conducted for 35 days.

To be effective, pigs should be put into the nursery room or building within a two to three day time span, with pig age differences between oldest and youngest pigs limited to 7 to 10 days. The nursery then is completely emptied of all pigs and cleaned and disinfected before the addition of the next group of pigs.

The heating, ventilation and manure systems of each room/building must be separate for AIAO to return the biggest performance response. If individual rooms are used in a multi-room nursery, doors must be kept closed at all times between rooms or the open door(s) serves as a ventilation and disease corridor between adjacent rooms.

In addition to the obvious disease control advantages for AIAO management, pig ages and weights are more similar within the entire animal space, and it is easier to provide for the specific temperature and nutritional needs of the pigs.

Dietary Nutrient Allowances

Dietary nutrient allowances for weaning pigs are listed in *Swine Diet Suggestions* (EC92-210-A). The crude protein content of starter diets is a particularly important consideration because a supplemental protein provides amino acids essential for growth. Starter diets containing 18 to 22 percent crude protein using primarily corn and soybean meal and dried milk products will supply the necessary quantities of amino acids.

Many commercial starter diets contain lower levels of crude protein than recommended for optimum performance. For example, a diet for a 15 lb pig may contain 18 percent crude protein while a level of 20 percent is considered optimum. However, optimum amino acid levels can be restored in the low protein diet by the use of crystalline amino acids, especially lysine. This is done in an effort to reduce the cost of the diet and, perhaps, postweaning scours.

Ingredient Selection

When choosing ingredients for starter diets, it is important to recognize that young pigs are accustomed to highly palatable and digestible sow's milk. Soybean meal protein causes weanling pigs to experience an allergic reaction characterized by damage to the small intestine. Therefore, starter diets should contain ingredients that encourage feed consumption, reduce immunological stresses and complement the relatively immature digestive system of the weanling pig.

The weanling pig is limited in its ability to digest complex starches and protein found in grain and soybean meal. This is because of the low levels of amylase and proteases that digest starch and protein in the digestive tract *(Figure 1)*.

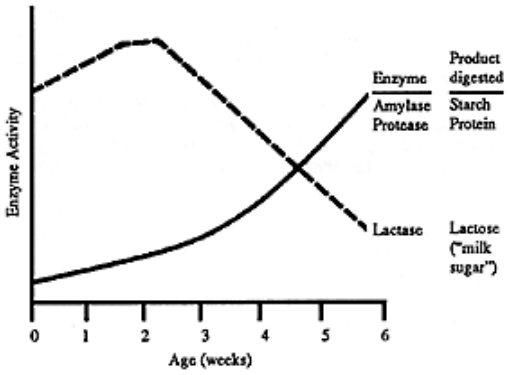

Figure 1. Digestive enzyme activity in young pigs.

On the other hand, weaning pigs can use lactose (milk sugar) effectively because of the high activity of the enzyme lactase. The pig's ability to use complex starches and proteins improves with age.

Dried whey and, to a lesser extent, dried skim milk are the most common milk products used in starter diets. Dried whey is high in lactose, has excellent quality protein, and is usually cheaper on a per unit of protein basis than dried skim milk. The level of protein in whey is lower than dried skim milk (12 vs 33 percent), so whey is not a direct substitute for dried skim milk.

Levels of 20-25 percent edible grade dried whey maximize performance of starter pigs, but as little as 10 percent is beneficial. Levels higher than 10 percent tend to cause bridging in feeders when the diet is in meal form.

When quality is an important consideration for weanling pigs. Human edible whey, rather than feed grade, is recommended for use in starter diets. The main quality factors to look for when buying whey are:

1. Lactose content --greater than 72 percent;
2. Protein content --greater than 12 percent;
3. Ash content --not greater than 9 percent;
4. Color --generally the lighter the better;
5. Salt --less than 3 percent;
6. Lysine --greater than 9 percent.

There is a general trend for milk products, especially dried skim milk, to become less available and more expensive. Recent research has demonstrated that specially processed soybean protein (soy protein concentrate) appears to be a viable alternative to the use of milk products.

Fat is commonly added to starter diets for at least three reasons: 1) to control dust; 2) to help pellet or crumblize diets containing high levels of milk products; 3) to improve growth rate and feed use of pigs. For each one percent addition of fat to a complete feed (20 lb/ton), aerial dust levels will decrease by about 10 percent. Adding 5 percent fat to the diet decreases aerial dust levels by about 50 percent. Levels of added fat beyond 5 percent do not proportionally decrease aerial dust levels. Adding between 1 and 3 percent fat to weanling pig diets is most practical for optimum dust control.

Because most fats are poorly utilized by weanling pigs, particularly during the first two weeks post-weaning, growth rate of weaning pigs fed fat supplemented diets is no better on the average than that of pigs fed diets with no supplemental fat. The feed:gain ratio decreases by .1 on the average when fat is added to diets (from 1.6 to 1.5, for example). A high level of fat (greater than 3 to 4 percent added or 60 to 80 lb/ton) is inappropriate for enhanced growth response.

Fat should be viewed as an alternative source of energy replacing some of that supplied by grain. Fat contains about 2.25 times more energy as the same quantity of grain. When comparing grain and fat on an energy basis only, it may be difficult to justify paying more than 2.25 times more for a pound of fat than one pound of grain (if grain costs 5¢/lb, fat would be worth about 11¢/lb in weanling pig diets).

Fat sources commonly available for inclusion in weanling pig diets include those derived from plants (soybean, corn and coconut oil) and animals (tallow and choice white grease). Tallow appears to be least effective at improving performance of weanling pigs. Some evidence suggests that a 50:50 mixture of coconut and soybean oil maximizes weanling pig performance.

Some studies show beneficial results from additions of fish meal to starter diets, while others show no advantage. The reason for these inconsistencies in response may be due to the variation in quality of different fish meals. Attempts have been made recently to produce a high quality fish meal for starter diets. One newly developed type is a select menhaden fish meal. Research shows significant improvements in growth rate when additions (4 percent of the diet) of a select menhaden fish meal are made to starter diets.

Antimicrobials are extremely beneficial for starter pigs, and their use is recommended. Generally, growth rate is improved by 10 to 20 percent and feed efficiency by 5 to 10 percent. The response to antimicrobials differs from farm to farm; it is not possible to generalize which specific antimicrobial to use. Copper sulfate (1 to 2 lb per ton of complete feed providing 125 to 250 ppm supplemental copper) stimulates performance of starter pigs, especially in combination with another antimicrobial. Producers are encouraged to check with their feed suppliers before adding additional copper to starter diets as toxicity problems may develop if the total level of supplemental copper approaches 500 ppm.

Spray-dried plasma protein (SDPP) is becoming increasingly common in feeds for pigs weighing less than 20 lb. Research indicates that SDPP, a by-product of blood obtained from pork slaughter plants, can replace dried skim milk and dried whey in starter diets containing added lactose. Research at the University of Nebraska indicates weaning pigs prefer diets containing SDPP and respond by increasing feed intake.

Feeding Management

As mentioned earlier, the ability of young pigs to use starches and proteins from corn and soybean meal increases with age. Because the cost of starter diets is directly related to the amount of special ingredients, such as milk products, in the diet, switching pigs to a simple diet containing little or no special ingredients at the opportune time is important in minimizing costs.

The decision to switch from a complex diet containing milk products, fat, etc., to a simple corn-soybean meal diet is best based on pig weight. Feed pigs weighing less than about 15 lb at weaning a complex diet for at least three weeks following weaning to optimize performance. Pigs weighing more than 15 lb at weaning usually do not benefit from complex starter diets if fed longer than 10 to 15 days after weaning. Use the lightest pigs in a group as the primary guide in determining when to switch to a simple diet.

Feeding a complex rather than a simple diet during early stages of the postweaning period usually results in heavier pigs at the end of the nursery period. In general, the weight advantage obtained by feeding complex diets is maintained to market weight.

Research often shows that increased weight gain brought about by feeding complex rather than simple diets during the nursery phase does not affect performance of pigs during the growing-finishing period. Thus, any weight advantage observed at the end of the nursery period is maintained (not lost) to market weight, indicating compensatory gain does not occur. In addition, there is no conclusive evidence in the published literature to indicate that differences in the body weight of 40 to 50 lb pigs caused by providing different diets during the nursery phase becomes larger as the pigs approach market weight. A group of pigs that is three pounds heavier following the nursery phase will be about three pounds heavier at a constant age later.

The amount of money a producer can afford to invest in nursery diets depends on whether the producer sells feeder pigs or slaughter hogs. Feeder pig producers will receive more money than farrow-to-finish producers for any extra

poundage of pork produced in the nursery (for example, $1/lb for a feeder pig and 50¢/lb for slaughter hogs). Feeder pig producers usually can invest more money in feed to obtain that extra gain.

In addition, farrow-to-finish producers should not be compelled to invest significant dollars in nursery feed, because performance during the growing-finishing period usually is not altered by what is fed in the nursery. Nevertheless, if market hogs are sold according to the need for space, the few extra pounds of weight produced in the nursery may produce a marketing advantage. If market hogs are sold according to weight, some nonfeed costs may be reduced because the hogs are marketed a few days earlier.

The selection of a specific nutritional regimen for weaned pigs should include not only diet cost per pound of gain but also other variable and fixed costs. Maximum pig performance may not result in maximum profit. See *Table I* for current industry standards for pig performance and feed cost per pound of gain.

Source of Starter Diets

Producers can buy ingredients and manufacture their own starter diets. Sample starter diets are given in *Swine Diet Suggestions* (EC92-210-A). However, because of the problems with inventorying several ingredients and the difficulty in securing and maintaining quality, fresh ingredients, two other options should be considered. These are: 1) buying complete starter diets; 2) buying a base mix that contains several special ingredients the producer then can combine with grain and soybean meal on the farm to make the complete starter diet.

Producers who prepare feed without scales using vertical screw mixers with capacities of one ton or greater should purchase complete feeds for pigs weighing less than 25 lb, rather than making the feeds on the farm. Small mixing errors in these diets can have a dramatic impact on performance.

File G821 under: SWINE
C-8, Swine Management
Revised September 1992; 7,500, printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.