Chapter 5
Pork Products

Wholesale, Retail and Food Service Cuts

Now that you have raised a show and/or market hog, you will probably find it interesting and perhaps useful to see how this animal contributes to the Consumer Market.

The illustration (Figure 5.1) shows the location and names of the main or "wholesale" cuts of pork that come from a market pig.

Pork chops come from the loin. Bacon comes from the belly. The butt makes a tasty pork roast. The picnic is often called "callie". The callie looks like a small ham.

Remember, you are looking at one side of this pig. There are two of each of these main cuts in a pig. Each of these cuts from an average market pig will weigh as follows: **Ham (leg):** 15–20 pounds; **Loin:** 10–14 pounds; **Belly (side):** 15–20 pounds; **Butt (boston butt/ shoulder butt):** 5–7 pounds; **Picnic (picnic shoulder/ arm shoulder) :** 6–8 pounds.

A 250 pound hog would yield two 15–20 pound hams, 60 to 70 pork chops, 15 to 20 pounds of pork steaks, two 6 to 7 pound roasts, 15 to 20 pounds of bacon, spare ribs, and pork hocks, and 15 to 20 pounds of sausage.

Retail cuts of pork—see Figure 5.2.
Food service cuts of pork—see Figure 5.3.

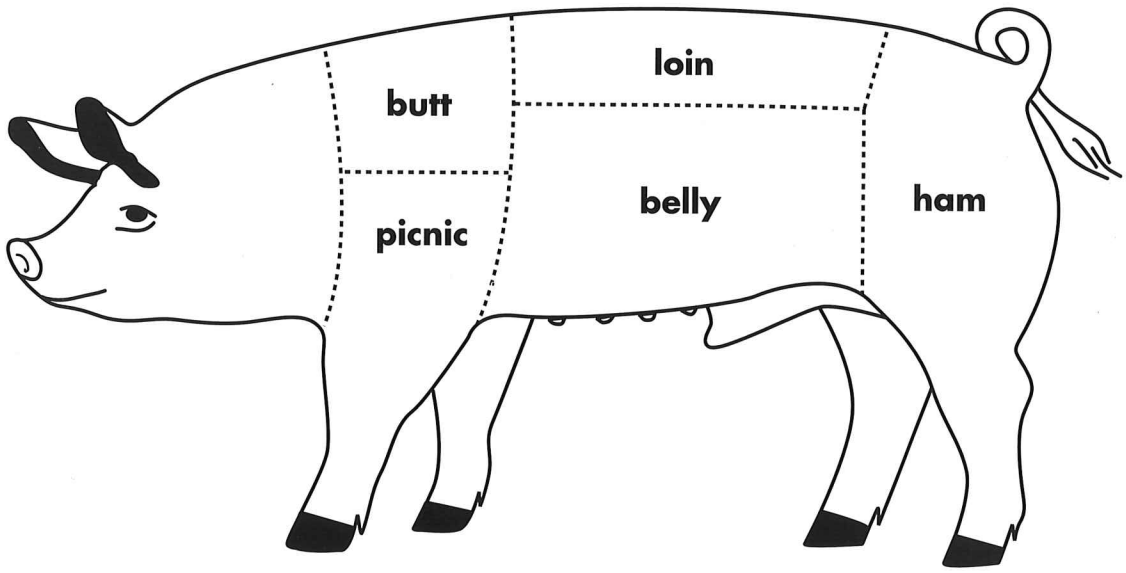


Figure 5.1
Wholesale cuts

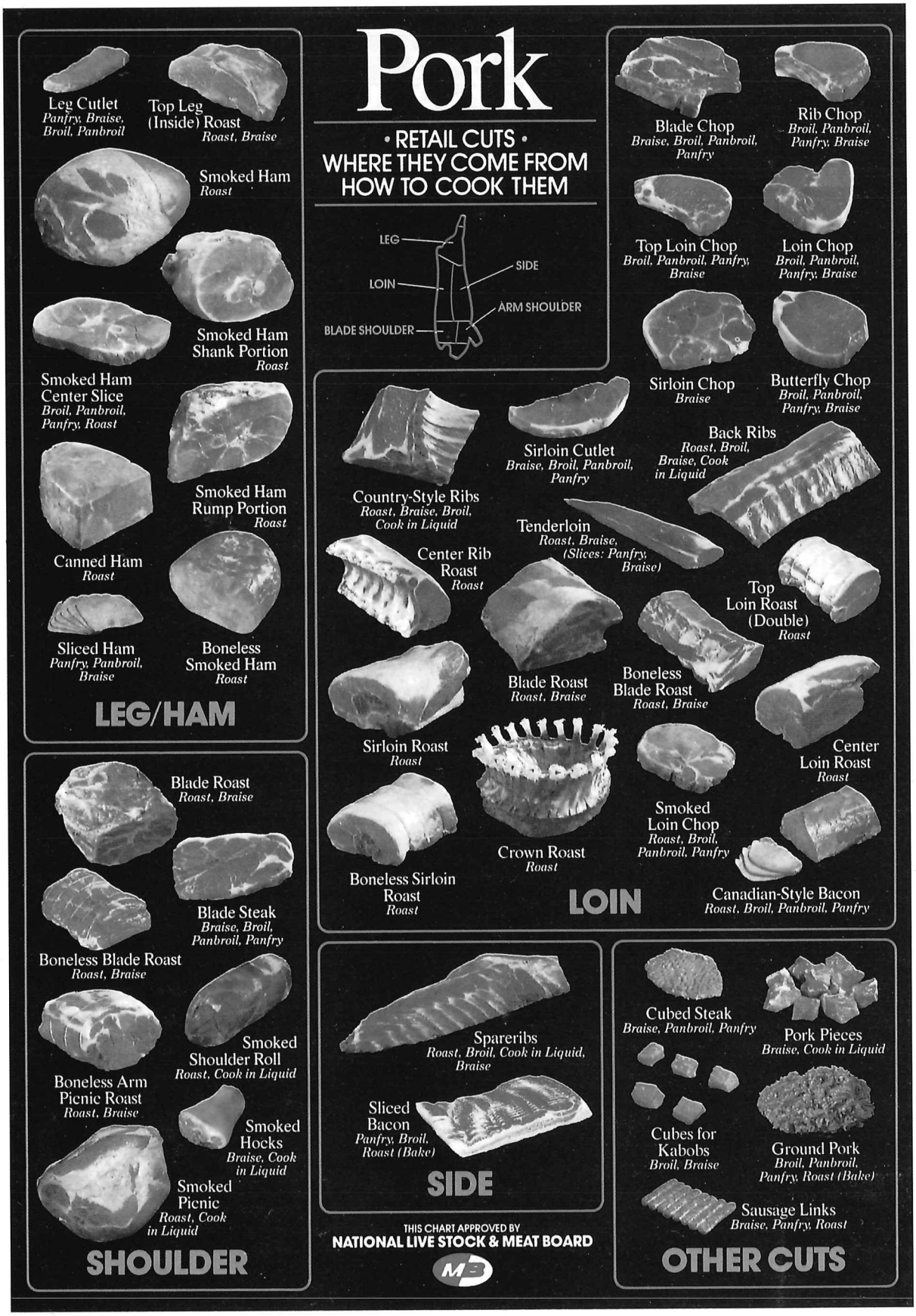
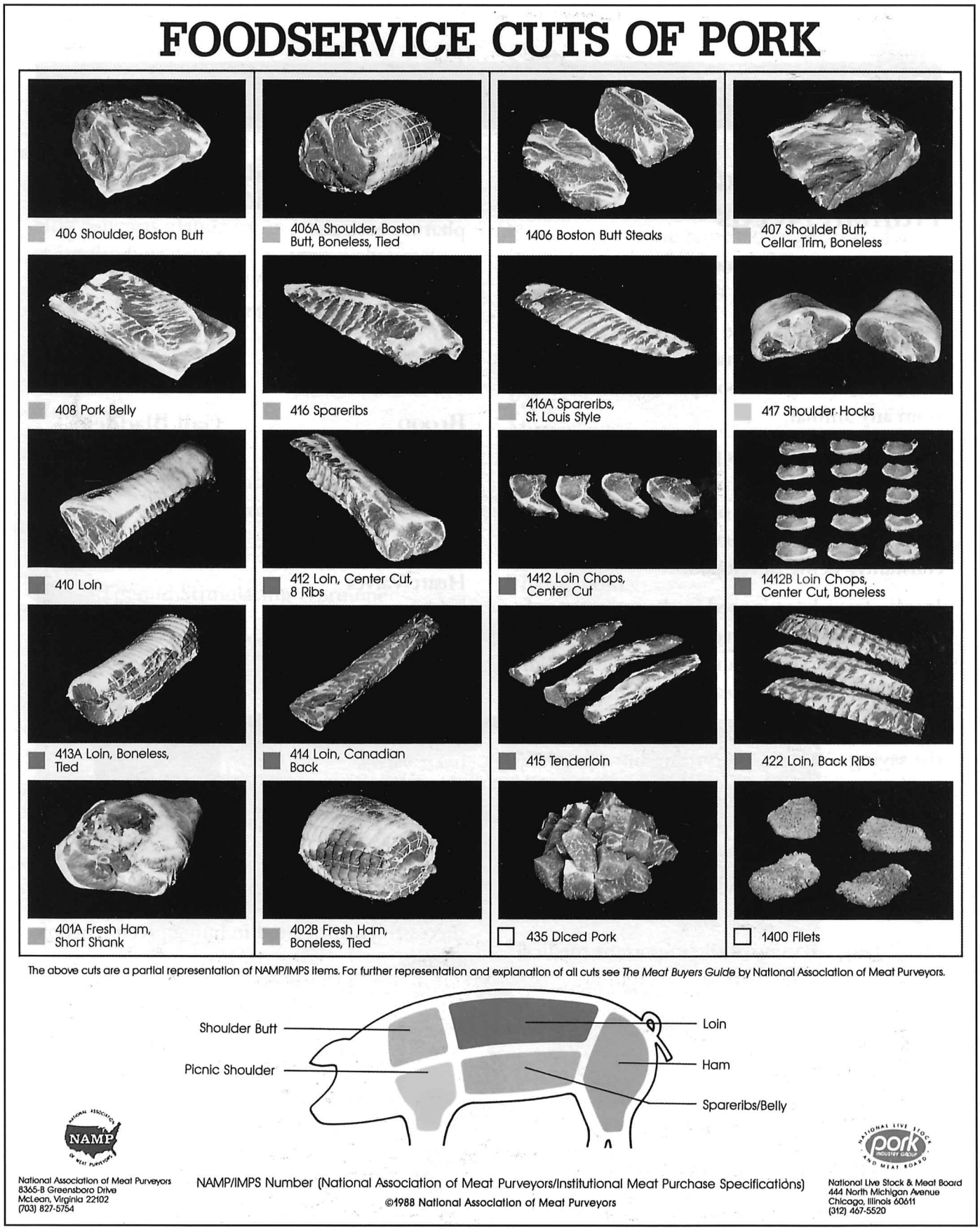


Figure 5.2
Retail cuts of pork



Meat charts and photographs provided by the North American Meat Processors Association, 1920 Association Drive, Suite 400, Reston, VA, 20191-1547 (703) 758-1900.

Figure 5.3
Food service cuts of pork

By-Products from Hogs

Serving Essential Human Needs

No other animal provides society with a wider range of products than the hog.

Hogs are, of course, the source of high quality animal protein in the form of the widest and most varied range of food products available from any animal.

By-products from hogs play a vital, though less visible, role in maintaining and improving the quality of human life. New and different by-products from hogs are constantly being developed.

Insulin from hogs is used in the treatment of diabetes; hog heart valves are used to replace damaged or diseased human heart valves; skin from hogs is used to treat severe burn victims.

The amazing utility of the hog has motivated the saying, "We use everything but the oink."

Viable animal agriculture not only provides an abundant supply of vital nutrients found in meat, but is also a ready source of essential and useful by-products that humanity depends on so extensively.

Listed here are some of the important medical and industrial products we get from hogs.

Pharmaceutical By-Products

Pharmaceuticals rank second only to meat itself in the important contributions hogs make to society. Rapidly advancing science and technology are continually adding to the list of life-supporting and life-saving products derived from the incredible hog.

Hogs are powerful medicine. All told, hogs are a source of nearly 40 drugs and pharmaceuticals.

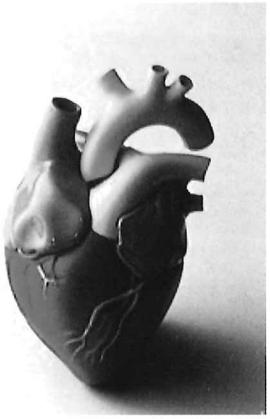
Adrenal Glands
Corticosteriods
Cortisone
Epinephrine
Norepinephine

Blood
Blood Fibrin
Fetal Pig Plasma
Plasmin

Brain
Cholesterol

Gall Bladder
Chenodeoxycholic Acid

Heart
Heart Valves



Hog heart valves, specially preserved and treated, are surgically implanted in humans to replace heart valves weakened by disease or injury. Since the first operation in 1971, tens of thousands of hog heart valves have been successfully implanted in human recipients of all ages.

Intestines
Enterogastrone
Heparin
Secretin

Liver
Desiccated liver

Ovaries
Estrogens
Progesterone
Relaxin

Pancreas Gland
Insulin
Lipase
Pancreatin
Trypsin
Chymotrypsin

Hog pancreas glands are an important source of insulin hormone used to treat diabetics. Hog insulin is especially important because its chemical structure most nearly resembles that of humans.

Pineal Gland
Melatonin

Pituitary Gland
ACTH—Adrenocorticotropic Hormone
ADH—Antidiuretic Hormone
Oxytocin
Prolactin
TSH—Thyroid Stimulating Hormone

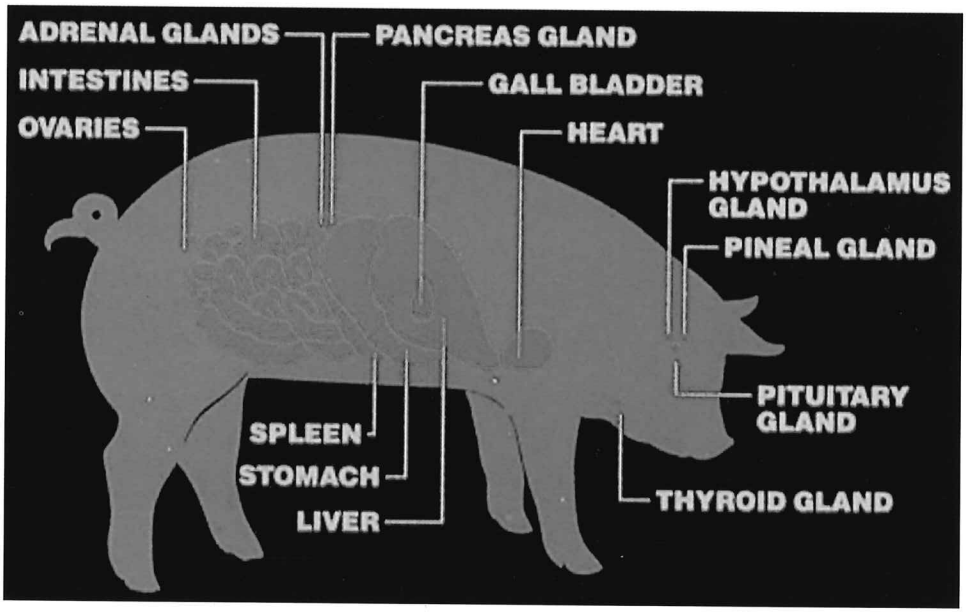
Skin
Porcine Burn Dressings
Gelatin

Specially selected and treated hog skin, because of its similarity to human skin, is used in treating massive burn injuries in humans, that have removed large areas of skin, and in healing persistent skin ulcers.

Spleen
Splenic Fluid

Stomach
Pepsin
Mucin
Intrinsic Factor

Thyroid Gland
Thyroxin
Calcitonin
Thyroglobin



Industrial By-Products

Hogs also make a very significant contribution to the world of industrial and consumer products. Hog by-products are sources of chemicals used in the manufacture of a wide range of products. Pigskin is used extensively as high quality leather for clothing, shoes, handbags, sporting goods, upholstery...the list goes on and on.

Blood

Sticking Agent
Leather Treating Agents
Plywood Adhesive
Protein Source in Feeds
Fabric Printing & Dyeing

Bones & Skin

Glue
Pigskin Garments, Gloves & Shoes

Dried Bones

Buttons
Bone China

Bone Meal

Mineral Source in Feed
Fertilizer
Porcelain Enamel
Glass
Water Filters

Fatty Acids & Glycerine

Insecticides
Weed Killers
Lubricants
Oil Polishes
Rubber
Cosmetics
Antifreeze
Nitroglycerine
Plastics
Plasticizers
Printing Rollers
Cellophane
Soap
Floor Waxes
Water-Proofing Agents
Cement
Fiber Softeners
Crayons
Chalk
Phonograph Records
Matches
Putty
Paper Sizing
Insulation
Linoleum

Gall Stones

Ornaments

Hair

Artist Brushes
Insulation
Upholstery

Meat Scraps

Commercial Feeds
Feed for Pets

Courtesy of the National Pork Producers Council in cooperation with the National Pork Board

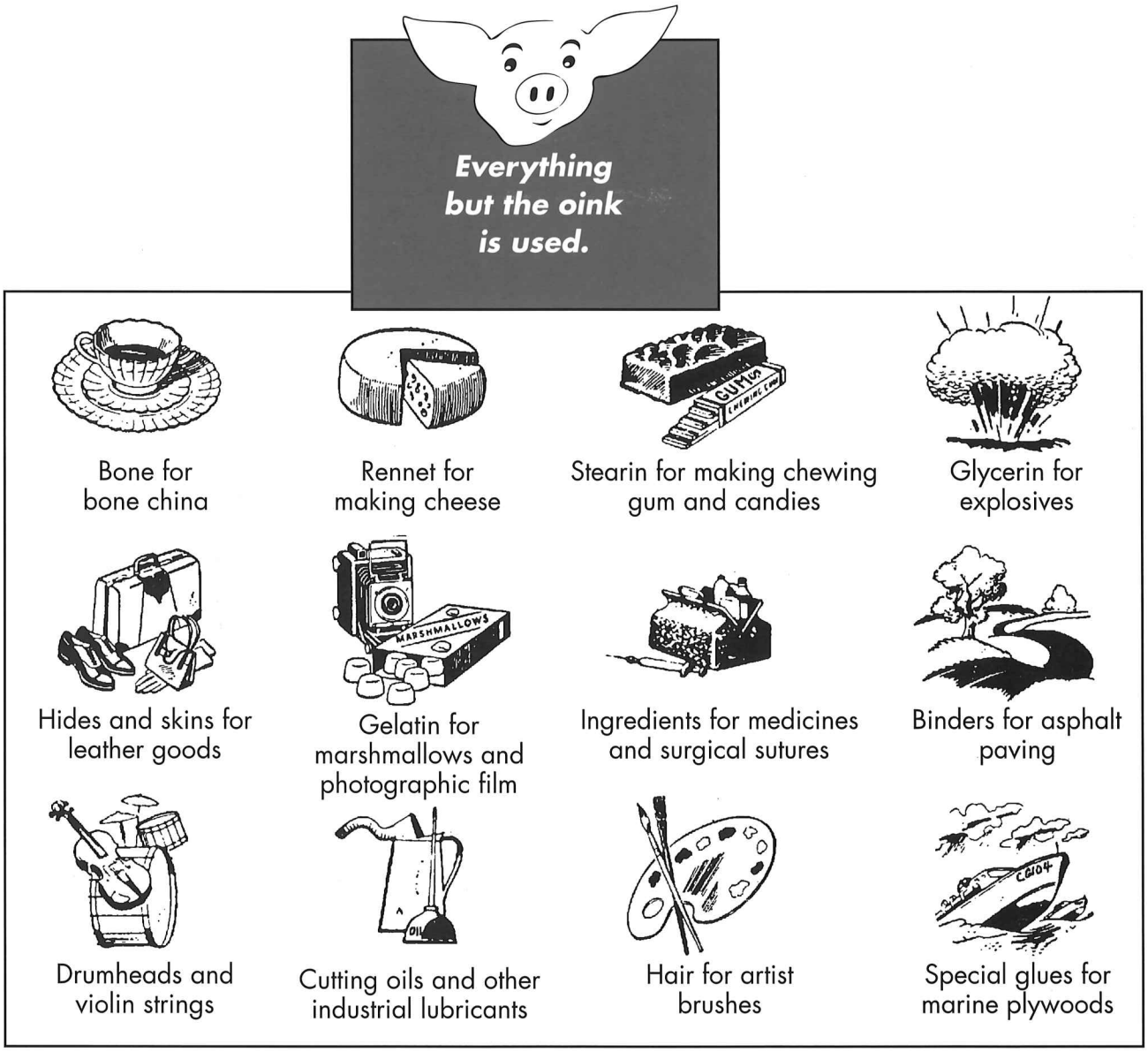
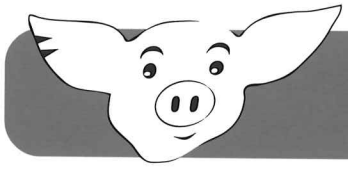


Figure 5.4
Swine by-products



Chapter 6
Nutritional Value

Historically, consumers have not had a good impression of the nutritional quality of pork. Numerous studies have shown that pork products have been viewed as high in fat and cholesterol, difficult to digest, and low in relative value. Fortunately, in recent years, leaner hogs and closer trimming have resulted in much leaner cuts. It has been estimated that pigs are about 23% leaner than those previously produced.

Due to improved education, nutritionists are more aware of the high-quality protein, iron, and B-vitamins supplied by pork products.

Improved genetics for carcass lean have reduced the fat content of pork resulting in diminished consumer focus on fat in pork. This has made the positive nutritional qualities more obvious and more prominent. Today, consumers should not consider closely trimmed pork to be of low nutritional value. There has been a shift of consumer perceptions away from "fat pork" to "lean, healthful pork."

Pork today is leaner and, on average, contains 31 percent less fat, 14 percent fewer calories, and 10 percent less cholesterol than just 10 years ago.

Nutritional Value of Pork

The following information is based on a 3 ounce serving of pork. As you can see these nutrients make pork a nutrient-dense food!

Nutrient	%Daily Value (DV)	Why It's Good for You
Iron	7%	Getting enough iron is a problem for some women, especially women of child-bearing age. Heme iron (found in meat) is absorbed more readily than nonheme iron (found in plant based foods). Thus, anyone who avoids meat without the help of their health professional may increase their risk of iron-deficiency anemia.
Magnesium	6%	Important for the normal function of many enzymes (catalysts for the body's chemical reactions), glucose and muscle action.
Phosphorus	22%	Strengthens bones and generates energy in cells.
Potassium	11%	This mineral, also known as an electrolyte, plays a major role in water balance and helps maintain normal blood pressure.
Zinc	15%	A component of more than 70 enzymes, zinc is a key player in energy metabolism and the immune system.
Thiamin	53%	Without this key mineral, metabolism of carbohydrate, protein and fat would be significantly comprised. Animal protein is one of the best sources of this nutrient, and among the choices, pork is tops.
Riboflavin	19%	Next to milk, there are few foods that have as much riboflavin per serving as pork. Riboflavin has an important role in the release of energy from foods.
Niacin	20%	Important for the normal function of many enzymes in the body and involved in the metabolism of sugars and fatty acids.
Vitamin B_{12}	33%	Helps build red blood cells and metabolize carbohydrates and fats.
Vitamin B_6 (Pyridoxine)	18%	Important for the normal function of enzymes and co-enzymes, which are needed to metabolize protein, carbohydrates and fats. Plus, it plays a critical role in the regulation of glycogen (stored carbohydrates) metabolism.

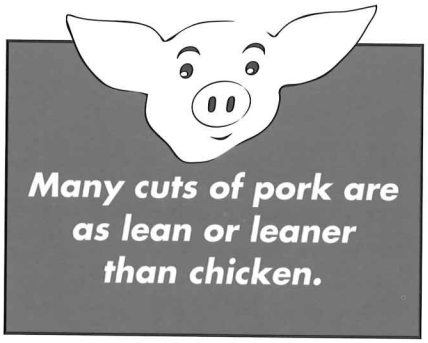
How Pork Compares to Other Meats

How does pork compare to other meats for fat, calories and cholesterol? Pork today compares favorably for fat, calories and cholesterol with many other meats and poultry. Many cuts of pork are as lean or leaner than chicken. Any cuts from the loin, like pork chops and pork roast, are leaner than skinless chicken thigh, according to U.S. Department of Agriculture data. Pork steaks or roasts from the leg ("fresh ham") are also lean choices. Most of the loin or leg cuts contain between 6 and 8 grams of fat per three-ounce cooked and trimmed serving. Pork tenderloin—the leanest pork choice—is as lean as skinless chicken breast, with 4 grams of fat per serving. A serving of lean pork has 34% less cholesterol than skinless chicken, according to recent research at the University of Wisconsin. Most cuts of pork contain less than 200 calories per three-ounce cooked serving.

Pork's Leaner Profile

Pork today is leaner and, on average, contains 31 percent less fat, 14 percent fewer calories, and 10 percent less cholesterol than just 10 years ago. Thanks to modern hog production, pork now compares favorably with other cuts of fresh meat:

	Pork Tenderloin, Broiled, 3 oz.	Skinless Chicken Breast, Broiled, 3 oz.	Beef Tenderloin, Broiled, 3 oz.
Calories	139 calories	139 calories	179 calories
Fat	4.1 grams	3.0 grams	8.5 grams
Cholesterol	67 milligrams	72 milligrams	71 milligrams



Chapter 7
Digestive System

Before studying swine, it is important to understand the animal with which you are working. The pig is a simple stomached animal that is called a monogastric. The pigs' digestive system is very similar in design to another single stomached animal called a human. Humans and swine begin digestion of food in the mouth. The tongue and teeth gather feed and break it down into smaller pieces in order to make it easier for the animal to digest. Next is the esophagus, a long tube that carries the feed from mouth to stomach.

The stomach serves as a reservoir for short term food storage and digestion. In the stomach, digestive enzymes break down the feed components so that they may be absorbed into the blood stream.

The next step in the digestive process takes the remaining undigested feed into the small intestine, where it is broken down further for absorption into the body. After the small intestine has removed the available nutrients from the feed, the remaining material is passed into the large intestine and finally excreted from the body through the rectum or anus. (See Figure 7.1)

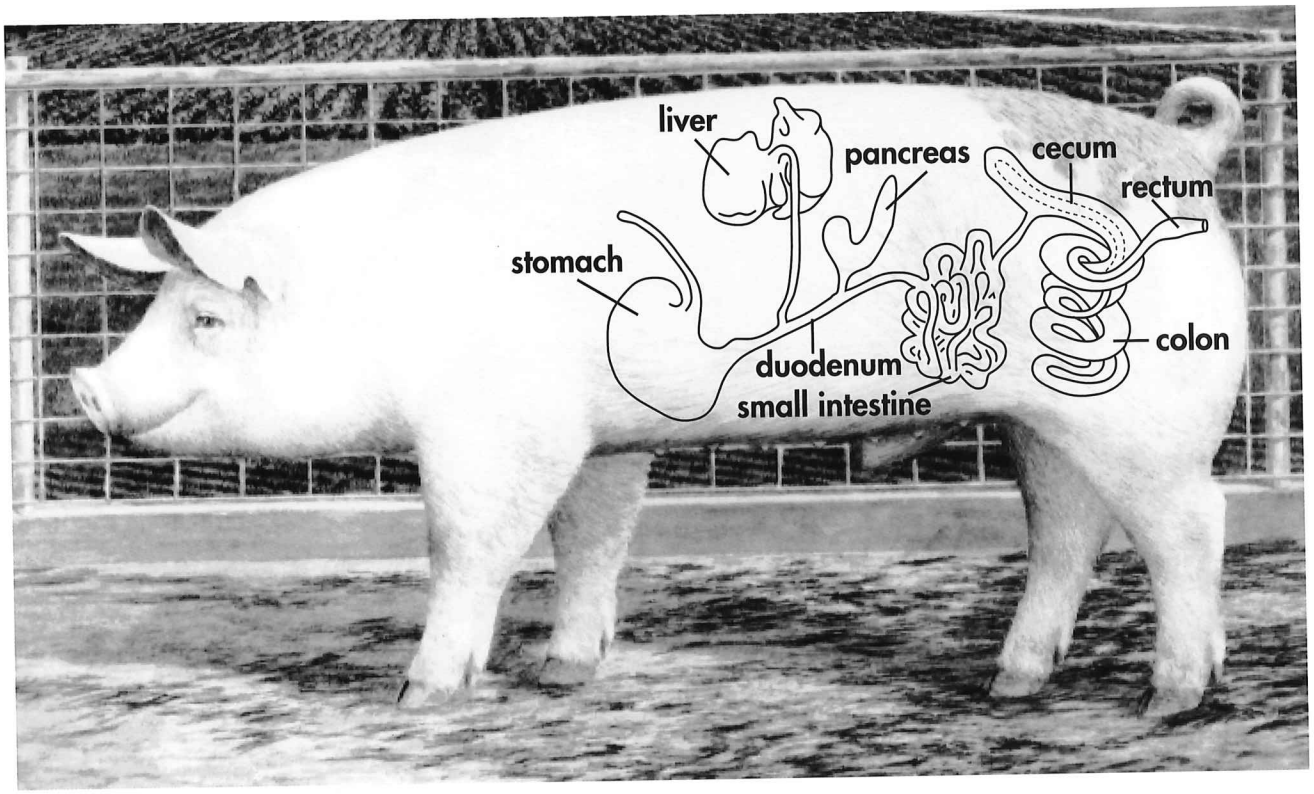
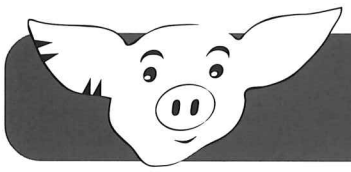


Figure 7.1
The swine digestive system



Chapter 8
Nutrition

Nutrients

Efficient and profitable swine production depends upon an understanding of the influences of genetics, environment, herd health, management and nutrition. These factors work with each other and the end result determines the level of production and profitability.

Feed represents 60 to 75 percent of the total cost of pork production. Therefore, a carefully planned and operated nutrition program is crucial to pork production. You have to supply your animals with the proper nutrients on a regular schedule to allow pigs to grow fast and efficiently in a short time period.

In general, nutrients are divided into five categories: water, protein, carbohydrates, minerals, and vitamins. Except for water, which is largely supplied separately, nutrients are supplied to animals in the food materials we provide them (known as feedstuffs).

For pigs, these feedstuffs usually include corn, soybean oil meal, vitamins and minerals. These feedstuffs contain different amounts of the nutrients. That is why mixtures of feedstuffs are fed to pigs. Mixing feedstuffs to get the right amount of the nutrients that the pigs need is called balancing the ration. The word ration means two things:

1. The quantity of nutrients needed for one pig for one day.
2. The mixture of feedstuffs that will supply the nutrients needed by the pig if he eats a normal amount each day.

Now that we have defined what nutrients are and how they are supplied to pigs, we will look at the five categories, each in turn, to see what they do for the animal and what ingredients or feedstuffs supply them.

Water

Water is so common we seldom think of it as a true nutrient, but it is the most essential and the cheapest of all nutrients.

Water is the largest single component of the pig's body. It also passes through the body, transporting nutrients and removing wastes. Depriving pigs of water reduces feed consumption and limits growth and feed efficiency. Therefore, ample water should be provided continuously. A pig needs to drink two to three pounds of water for every pound of feed it eats.

Water is usually taken into the body at a lower temperature than the body itself, therefore, a portion of the body's heat or energy must be used in warming the water. In hot weather this can be a comforting advantage, but in winter it can be a serious disadvantage. If the water is ice cold, the pig will drink less. Reduced water consumption will limit performance as significantly as a lack of any other nutrient.

It is important, then, that you make certain your animals always have all the fresh, clean water they need and that it is relatively cool in the summer and warmer in the winter.

Protein and Amino Acids

The crude protein content of a diet has been the term historically used as an indicator that indirectly reflects the pig's requirement for amino acids. Proteins are composed of 20 simpler building blocks called amino acids, and it is actually the amino acids that are the essential nutrients. Pigs, in fact, do not specifically need protein, but rather require amino acids for the formation of muscle and other body proteins. Various combinations and arrangements of amino acids produce various proteins just as different combinations and arrangements of letters of the alphabet spell different words.

Ten of the amino acids are called essential, because these cannot be produced within the pig's body. The pig's growth or performance can be limited by a lack of even one of the essential amino acids, even if the other nine are adequately supplied.

For example, a pig will not grow well on corn alone. Part of the reason for this is that corn protein is very low in one of the amino acids, lysine, as well as many other nutrients.

The ten essential amino acids that must be provided in swine diets are: lysine, threonine, tryptophan, methionine, cystine, isoleucine, histidine, valine, arginine, and phenylalanine. Most cereal grains are limiting in lysine, threonine, tryptophan, and methionine. Therefore, when one evaluates feed ingredients, these amino acids are most important in determining protein quality.

Protein quality is a term commonly used to describe the amount and variety of essential amino acids found in protein. The protein quality of common feedstuffs fed to swine would rank in this order:

1. Animal by-products: such as milk products, meat and bone meal.
2. Oil-bearing seeds: soybean oil meal, linseed meal, etc.
3. Cereal grains: corn, oats, wheat, etc.

A corn-soybean oil meal diet is satisfactory in quality of protein for swine feeding because soybean oil meal is rich in the amino acids that are low in corn.

Carbohydrates and Fats (Energy)

Energy is technically not a nutrient but is a result of metabolism of carbohydrates (starch) and fats that are in a pig's diet. Carbohydrates and fats are the main source of energy in the diet. They are the primary fuels that are used in maintaining body temperature and producing muscular movement.

Energy must be provided in large amounts over what is needed for maintenance to achieve optimum growth and reproduction responses. Energy is needed in many chemical changes that occur within the body. Because energy is needed constantly by a growing pig, the body stores some energy in the form of fat. The major source of dietary energy for the growing pig is from the carbohydrate component of grains in their feed. Feedstuffs such as corn, sorghum, and wheat are excellent sources of carbohydrates. Surplus protein in the feed may also be converted to energy.

Minerals

Minerals are needed in body tissues and to assist in some of the body's chemical reactions. In particular, calcium, phosphorus and salt (often referred to as macrominerals) are major needs. Calcium is important in bone formation. Phosphorus is also involved in bone building and assists in energy utilization. Salt is important for maintaining good appetite and water consumption.

Other minerals are needed in small amounts and are called trace minerals or microminerals. These include iron, copper, zinc, magnesium, manganese, iodine, and selenium.

Of all farm animals, the pig is the most likely to suffer from mineral deficiencies. This is due to the following:

1. Hogs are primarily fed cereal grains and their by-products, which are low in minerals (especially calcium).
2. The skeleton of the pig, in contrast to those of other animals, supports greater weight in proportion to its size, which means it needs more mineral content than most animals.
3. Hogs do not consume great amounts of roughages, which would balance the mineral deficiencies of grain.
4. Hogs are fed to grow at a maximum rate and are marketed before they reach full maturity. Emphasis on rapid growth and lean meat production requires adequate mineral concentrations, yet under these conditions, minerals are often overlooked in diet formulations. Most minerals are supplied in purchased supplements.

Vitamins

Vitamins are compounds that assist the body in the assimilation and use of the other nutrients. They are described in two classes, fat soluble (A, D, E, K) and water soluble (the B vitamins). The body can keep reserves of the fat soluble vitamins for a time, but the water soluble vitamins must be supplied in the diet daily. The purposes of the vitamins are as follows:

Fat Soluble

Vitamin A (carotene) is found in feedstuffs like alfalfa and corn (though it deteriorates in storage). Converted by the body from carotene, it assists in maintaining the surface or epithelial cells. Such cells make up the outer skin as well as the lining of the digestive and respiratory tracts. Vitamin D is in compounds that have been exposed to sunlight. Some Vitamin D is fixed in the animal itself during exposure to sunlight. This vitamin assists in the utilization of calcium. Two other fat soluble vitamins usually added to vitamin premixes are vitamins E and K, which are involved in developing and maintaining body tissue. Vitamin E's function is for normal muscle activity and reproduction. Vitamin E helps to prevent the membrane surrounding individual cells from deteriorating, influences the production of various hormones, and defends against infection. Vitamin K's function is to help calcium and Vitamin D metabolism. The blood requires Vitamin K to form clots.

Water Soluble

These vitamins occur or are supplied as chemical compounds in the feeds. They assist particularly in the changes of nutrients into energy for growth. They may also assist in maintaining the health and soundness of the lining of the digestive organs. This group is also called the B-complex group. The B Vitamins generally added to swine diets include thiamine, riboflavin, niacin, pantothenic acid, B_{12}, and pyridoxine.

PIG GROWER
MEDICATED
FOR PIGS FROM 30 POUNDS TO 75 POUNDS

ADMINISTER TO SWINE IN A COMPLETE FEED FOR REDUCTION OF THE INCIDENCE OF CERVICAL ABSCESSES; TREATMENT OF BACTERIAL SWINE ENTERITIS (SALMONELLOSIS OR NECROTIC ENTERITIS CAUSED BY SALMONELLA CHOLERAESUIS AND VIBRIONIC DYSENTERY). MAINTENANCE OF WEIGHT GAINS IN THE PRESENCE OF ATROPHIC RHINITIS.

ACTIVE DRUG INGREDIENT

CHLOROTETRACYCLINE	100 G/TON

GUARANTEED ANALYSIS

CRUDE PROTEIN	MIN 19.00%
LYSINE	MIN. 1.10%
CRUDE FAT	MIN. 5.00%
CRUDE FIBER	MAX. 4.00%
CALCIUM	MIN. 0.60%
CALCIUM	MAX. 1.10%
PHOSPHORUS	MIN. 0.55%
SALT	MIN. 0.40%
SALT	MAX. 0.90%
SELENIUM	MIN. 0.30 PPM
ZINC	MIN. 140.00 PPM

INGREDIENTS

Grain Products, Plant Protein Products, Processed Grain By-Products, Animal Fat, Animal Protein Products, Calcium Phosphate, Lignin Sulfonate, Ground Limestone, Salt, L-Lysine Monohydrochloride, Methionine Supplement, Zinc Oxide, Zinc Sulfate, Ferrous Sulphate, Manganous Oxide, Copper Sulfate, Calcium Iodate, Sodium Selenite, Vitamin A Acetate, Vitamin D-3 Supplement, Vitamin E Supplement, Menadione Dimethylpyrimidinol Bisulphite, Riboflavin Supplement, Niacin, Calcium Pantothenate, Vitamin B-12 Supplement, Thiamine Mononitrate, Folic Acid, Choline Chloride, Pyridoxine Hydrochloride, Biotin, Ethoxyquin (As A Preservative)

FEEDING DIRECTIONS

FEED as the only ration to pigs weighing from 30 pounds to 75 pounds bodyweight.

CAUTION: In order to obtain the desired performance results, the animals should be self fed.

WARNING: Withdraw 10 days prior to slaughter; contains high levels of copper; do not feed to sheep.

MANUFACTURED BY:
SKILLATHON FEED

NET WEIGHT 50 POUNDS (22.7 KILOGRAMS) OR AS SHOWN ON SHIPPING DOCUMENT

How to Read a Feed Tag

Pig Grower Feed Tag Questions

1. What is the main ingredient in this feed?
2. How many active drug ingredients are in this feed?
3. What is the minimum crude protein level?
4. For how many days prior to slaughter should this feed be removed?
5. What is the minimum crude fat level of this diet?
6. Is ground limestone included in the ingredients of this diet?
7. At what stage of growth should this ration be fed?

Pig Grower Answers:

1. grain products
2. 2
3. 19%
4. 10
5. 5%
6. yes
7. pigs weighing between 30 and 75 pounds

Classifying Feed Ingredients Into Nutrient Groups

Energy (Carbohydrates and Fats)[1]

Whole Grain Barley
Whole Grain Oats
Wheat
Wheat Middlings*
Corn
Milo
Beet Pulp
Hay and Hay Cubes*
Molasses
Whole Grain Rye
Whole Cottonseed*
Buckwheat
Soybean Hulls
Dried Whey

Proteins[1]

Cottonseed Meal
Soybean Meal
Linseed Meal
Corn Gluten Meal
Corn Gluten Feed*
Distillers Grain
Brewers Grain
Blood Meal
Fish Meal
Dehydrated Alfalfa Meal Pellets*

Urea (is a non-protein nitrogen source that is used in small amounts for protein in ruminant diets).

[1] A protein supplement is usually defined as a feed containing greater than or equal to 20% crude protein (dry matter basis). Some feeds (for example, those marked with an "*") may be described as protein or energy because they are moderate in fat (energy) and protein or because their concentration of protein may vary to being less than or greater than 20% crude protein. Therefore, those feeds marked with an "*" are most commonly classified as listed above.

Minerals

Bone Meal
Dicalcium Phosphate
White Salt

Trace Mineral Salt
Ground Limestone

Vitamins

None of the feeds listed is a vitamin-only pre-mix.

Water

**The complete pelleted feed is not listed under a specific category because it contains carbohydrates, proteins, minerals, and vitamins.

Reference: "Feeds & Nutrition", 1990, M. E. Ensminger, J. E. Oldfield, and W. W. Heinemann. Ensminger Publishing Company, Clovis CA.

Examples of feed ingredients are on pages 8-6–8-10 of this book.

Feed Identification

These are feedstuffs used throughout the livestock industries. Those that are check marked are commonly used in swine diets.

✔ Indicates This Feed is Used in Swine Diets	Name of Feed	Color	Texture	Other Characteristics
✔	Whole Grain Oats	Brown	Slightly rough with irregular edges	Common cereal grain fed for its fiber
✔	Cracked Corn	Yellow/White	Rough	Whole corn kernels that have been broken; starch may stick to fingers
✔	Soybean Meal	Light brown	Granular to flaky	By-product after removing oil from oilseeds; 44% crude protein (CP) soybean meal=soybean meal plus soybean hulls; 48% CP=soybean meal without hulls
✔	Complete Pelleted Feed	Light brown with yellow spots	Smooth	Tubular shaped particles that may be of varying lengths because of breakage of the pellets
	Dry Molasses	Dark brown	Flaky and/or Granular	Sweet smell; high in sugar; made from sugar beets (most common source) or sugar cane
✔	Whole Kernel Corn	Yellow	Smooth	Most common cereal grain in Ohio
✔	Steam Rolled Oats	Light brown	Flaky	Whole oats that have been steamed and rolled; look for creases in the kernel caused by the roller
✔	Dried Whey	Light brown	Powdery	Smells sweet like milk replacer; by-product from making cheese
✔	Trace Mineral Salt	Bronze	Granular, grainy	Looks like tiny, uniform crystals
✔	Ground Limestone	Light gray	Granular	Looks like small rocks of various sizes
	Dried Sugar Beet Pulp	Grayish brown	Rough	Looks like a dried root; by-product from removing sugar from beets
✔	Steam Rolled Barley	Brown	Flaky	Whole barley that has been steamed and rolled; look for creases in the kernel caused by the roller; darker color and shorter in length than rolled oats
	Hay Cube	Green	Rough	Large cube with noticeable hay particles pressed together
✔	Wheat Middlings	Brown with white spots	Flaky	By-product from removing starch from wheat; looks like crumbled bran cereal
✔	White Salt	White	Granular, grainy	Looks like tiny, uniform crystals

✔ Indicates This Feed is Used in Swine Diets	Name of Feed	Color	Texture	Other Characteristics
✔	Fish Meal	Brown	Powdery	Smells like fish; look for tiny bone chips; by-product from fisheries or removal of oil from fish
✔	Distillers Grains	Brown	Flaky to powdery	Sweet smell; by-product from making alcohol for liquor or fuel
✔	Soybean Hulls	Light brown	Flaky	Look for dark specks from the outer coat of soybeans; by-products of removing oil from soybeans
✔	Corn Gluten Meal	Yellow	Granular to powdery	By-products from removing starch, oil, and germ from corn
✔	Blood Meal	Dark brown to dull red	Granular to powdery	By-products from meat industry
✔	Dehydrated Alfalfa Meal Pellets	Green	Smooth	Tubular shaped particles that may be of varying lengths because of breakage of the pellets
✔	Dicalcium Phosphate	Gray	Granular	Looks like small rocks of uniform sizes
	Urea	White	Granular	Small bead-like particles; used a source of non-protein nitrogen for ruminant animals
	Buckwheat	Brown to light black	Smooth with sharp edges	Grain grown in limited quantities
✔	Whole Grain Wheat	Brown	Smooth with round edges	Look for crease along the middle of one side
✔	Corn Gluten Feed	Brown	Flaky to powdery	By-product from corn milling. Contains corn bran and soluble protein.
✔	Milo (Whole Grain Sorghum)	Reddish brown	Smooth	Round, bead-like grain
✔	Brewers Grain	Brown	Flaky	By-product from making beer from grains; particles more oblong than soybean hulls
	Whole Cottonseed	White	Fuzzy	By-product from removing cotton lint from seeds
✔	Cottonseed Meal	Brown	Granular to powdery	By-product from removing oil from cottonseeds
	Whole Grain Rye	Brownish gray	Smooth with round edges	Particles are longer than wheat
✔	Ground Corn	Yellow	Powdery	Whole corn ground very fine
✔	Linseed Meal	Varies from light to dark brown	Granular	By-product from removing oil from flaxseed. Not commonly used in most areas of the U.S.
✔	Whole Grain Barley	Brown	Slightly rough with irregular edges	Particles are shorter than for oats

Prepared by: Dr. Maurice L. Eastridge, Dept. of Animal Sciences, The Ohio State University

Figure 8.1
Whole grain oats

Figure 8.2
Complete pelleted feed

Figure 8.3
Whole kernel corn

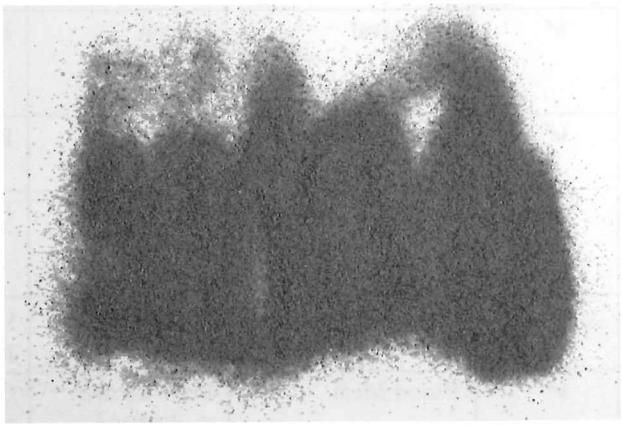


Figure 8.4
Trace mineralized salt

Figure 8.5
Wheat middlings (bran)

Figure 8.6
Fish meal

Figure 8.7
Dehydrated alfalfa meal pellets

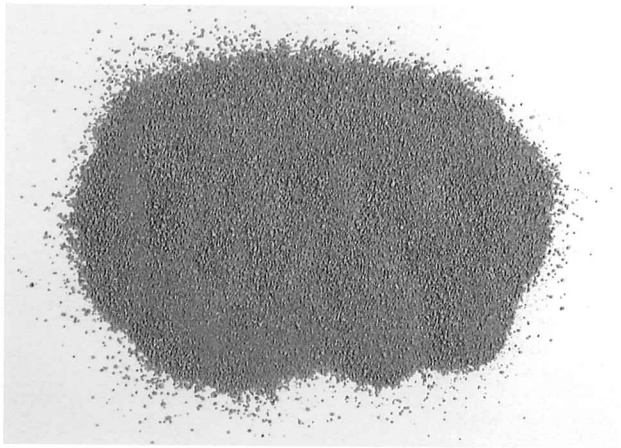


Figure 8.8
Dicalcium phosphate

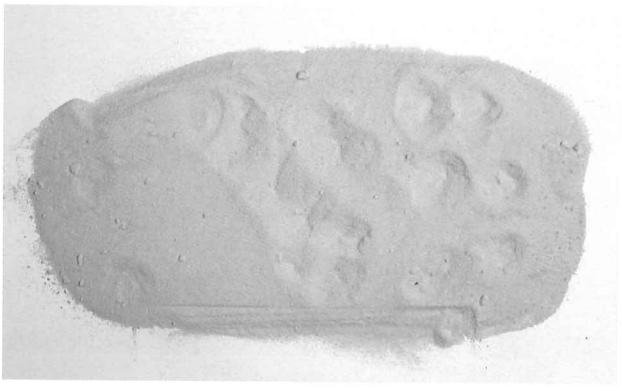


Figure 8.9
Dried whey

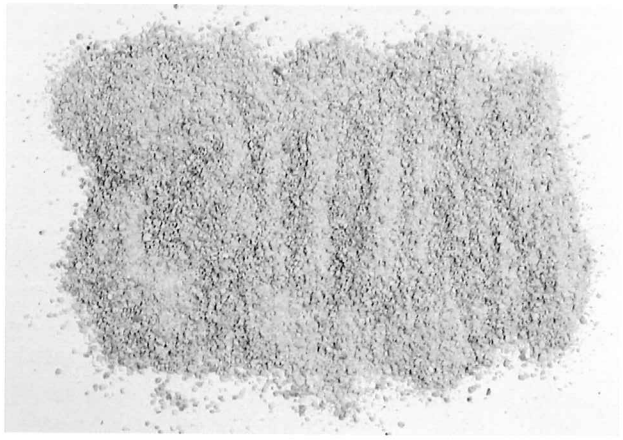


Figure 8.10
Ground limestone

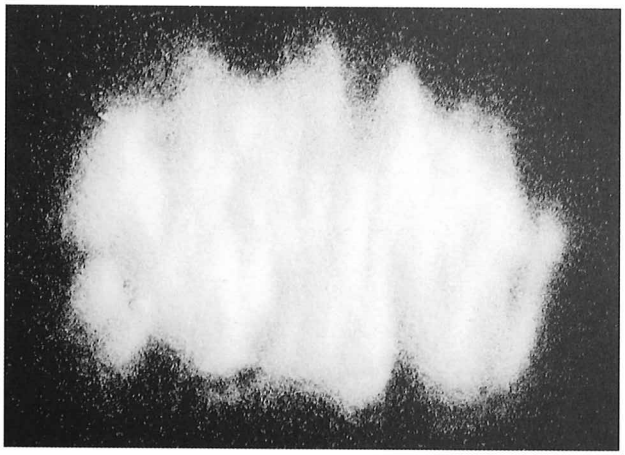


Figure 8.11
White salt

Figure 8.12
Steam rolled barley

Figure 8.13
Whole grain wheat

Figure 8.14
Soybean oil meal

Feeding Your Growing Pigs

The time period you feed your project pigs is during their grower-finisher period. Approximately 75–80 percent of the total feed used is consumed during this period. There are several factors that can influence the pig's growth rate and nutrient requirements including: genetics, sex, health of the pig, the pig's environment, and the stage of development.

Pigs that are bred to be leaner and heavier muscled, like many project pigs, require different nutrient needs than the pigs that are not as lean or not as heavy muscled (Industry's Average Pig). The nutrient needs at different growth stages for leaner (high lean), heavier muscled pigs are shown in Table 1.

Table 1. **Nutrient Recommendations for Grower-Finisher Pigs (High Lean-Gain, High Health)**

	Weight Range							
Weight, lb.:	50 to 100		100 to 150		150 to 200		200 to Market	
Item Sex:	**Gilt**	**Barrow**	**Gilt**	**Barrow**	**Gilt**	**Barrow**	**Gilt**	**Barrow**
	Expected Performance Response[a]							
Daily gain, lb.	1.5-1.8	1.7-2.0	1.6-2.0	1.7-2.0	1.6-2.1	1.7-2.2	1.6-2.1	1.6-2.3
Daily feed, lb.	3-4	3.5-4.5	4-5	4.5-5.5	4-6	4.5-7	4.5-7	5-8
Daily feed, lb. (amount to obtain suggested lysine)	3.6	3.7	4.6	4.7	5.1	5.3	5.6	5.9
Protein, %	18-22	17-20	17-20	16-19	16-19	15-18	14-17	13-16
Amino acids (total)[bc]								
Lysine, %	1.10	0.95	1.00	0.85	0.90	0.75	0.75	0.60
Macrominerals[c]								
Calcium, %	0.72	0.72	0.72	0.72	0.58	0.58	0.58	0.58
Phosphorus (total), %	0.60	0.60	0.60	0.60	0.48	0.48	0.48[e]	0.48[e]
Salt, %	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

[a] A range is denoted that reflects different environmental conditions.
[b] If gilts and barrows are fed together, use an average of the values given.
[c] Values are total dietary levels.

DO NOT FEED THESE LOW Ca and P DIETS to REPLACEMENT GILTS!

Each nutrient required by the pig must be present in the ration in the proper amount or concentration, so that the pig will be able to consume enough feed to meet its nutrient needs.

Several feeding systems can be utilized in a swine production program. These systems include: 1) purchase of a complete feed; 2) use of a corn-protein supplement program; 3) a corn-soybean meal basemix program; or 4) formulating a diet containing corn, soybean meal, calcium, and phosphorus sources and a vitamin-trace mineral premix. For most of you just feeding a few project pigs, and for those of you with only a few sows in your breeding herd to produce your project pigs, the most logical feeding system to use would be either to purchase a complete feed or use a corn-protein supplement program. Both systems are easy ways to provide the proper amounts of nutrients needed for each age of pig when fed according to directions on the feed tag and can be easily purchased in small quantities. If you have questions regarding your feeding program, consult your local county Extension Office. Tables 2 and 3 describe three ration formulations that provide either an 18% or 14% crude protein complete diet when mixed as indicated. These tables show the diets only meeting the protein need in a pig's diet. Protein, while important, is only a part of the diet. Protein supplements are formulated to meet all the nutrient needs for a specific age and size of pig.

If you would rather use a formulated diet containing corn, soybean meal, calcium and phosphorus sources and a vitamin-trace mineral premix you will want to work with your county Extension Office or your local feed dealer. These diets have to be formulated to ensure the final diet meets the pig's nutrient needs. Formulated diets are more precise in meeting the dietary needs of the pig because they can be reformulated as the pig's weight changes. Complete feeds may not always meet or may exceed the nutritional needs of the pig. Table 4 illustrates diets formulated to meet the specific needs of high-lean and industry average genetic lines for the grower pig from 80–150 lbs.

Table 2. **18 Percent Rations**

Ration	% Protein Supplement	lb Protein Supplement		lb Corn	
1	36	34	plus	66	= 100 lb
2	40	30	plus	70	= 100 lb
3	44	26	plus	74	= 100 lb

Table 3. **14 Percent Rations**

Ration	% Protein Supplement	lb Protein Supplement		lb Corn	
1	36	19.5	plus	80.5	= 100 lb
2	40	17	plus	83	= 100 lb
3	44	15	plus	85	= 100 lb

Table 4. **Sample formulated rations for the Grower Stage of production containing corn, soybean meal, calcium and phosphorus sources, and a vitamin-trace mineral premix.**

	High Lean Pig % Lysine		Industry Average Pig % Lysine	
	Barrow	Gilt	Barrow	Gilt
Ingredient, lb/ton	**0.85**	**1.20**	**0.80**	**0.95**
Corn	1575	1337	1620	1501
Soybean Meal 46.5%	365	605	320	440
Monocalcium phosphate	25	23	25	24
Limestone	19	19	19	19
Salt	7	7	7	7
Vitamin premix	3	3	3	3
Trace mineral premix	3	3	3	3
Added synthetic Lysine Hcl[a]	3	3	3	3
Total lbs	2,000	2,000	2,000	2,000
Calculated Analysis				
Lysine %	.85	1.20	.80	.95
Protein %	14.8	19.7	14.3	16.2
Calcium %	.66	.67	.66	.66
Phosphorus %	.59	.62	.59	.59

[a] Synthetic lysine is sometimes cheaper to add than to get your needed lysine from soybean meal. Up to 3.5 lbs of synthetic lysine and 96.5 lbs of corn can replace 100 lbs of soybean meal. Soybean meal may be cheaper as a lysine source than a synthetic form.

Feeding the Developing Breeding Gilt

The nutritional needs of the swine breeding project require the same attention that one spends in getting his/her market project ready for the fair. The difference is the actual nutritional needs of swine at each phase of production. The phases of production within the breeding project are the Gilt Development phase, Gestating and Lactating phase, and the Starter phase for baby pigs.

Several breeds and maternal lines used in today's swine production breeding herd are classified as "high producing" animals. These breeds and maternal lines should be fed diets that will maximize their lean gain during the first six months of life, but once the gilt enters the breeding herd, body fat is emphasized more than during the grow-finish phase. The dietary amino acid needs of the developing breeding gilt change from the lean growth grower-finisher phase to the high-producing replacement gilt phase.

Requirements of breeding gilts for vitamins and minerals are higher than those of grower-finisher pigs. Developing gilts should be fed higher dietary levels of vitamin A, vitamin E, calcium, phosphorus, selenium, copper and zinc than market hogs. This increases their body reserves of these specific nutrients which are needed at higher levels during their future reproductive cycles.

One feeding strategy used with "high producing" breeding gilts is to increase the gilt's body fat content during the pre-breeding period by feeding a lower protein, higher energy diet. The rate of muscle growth will be slightly reduced, but there will be an increase of body fat content. This extra body fat will be of importance during later lactation and rebreeding performance. When gilts are thin at breeding, the provision of a high quantity of feed for 11 to 14 days prebreeding is recommended. This is called flushing and it should result in an increased ovulation rate and litter size.

Feeding the Gestating Sow

The diet fed to the gestating gilt and sow is generally a vitamin and mineral fortified mixture of corn and soybean meal. The primary objectives of nutrition of the gestating gilt or sow are control of weight gain and body condition, optimal fetal development and growth, and development of reproductive tissues. Protein and energy needs of the fetus increase during the last few weeks of pregnancy.

During gestation, the recommended feeding method for gilts and sows is limit feeding. Over-conditioned gilts and sows are common problems in many herds. Excessive energy intake during gestation results in three major problems. High energy (feed) intake: 1) is an unnecessary expense; 2) reduces feed intake during lactation; and 3) impairs mammary development.

The energy content of the diet and the sow's body condition score (Figure 8.15) are the primary factors that determine how much feed should be provided to the gestating gilt (parity 1) and sow (Table 5). Producers commonly feed a gestation diet at about 4–6 lb/day to gilts and sows under most environmental conditions. This amount of feed is only a target and should depend upon the energy content of the diet, sow age, body

weight, housing (inside or outside), and body condition score entering gestation. A pregnant gilt fed during gestation should continue to grow and develop, and gain 90 to 125 pounds during gestation. A sow should gain 75 to 100 pounds during gestation.

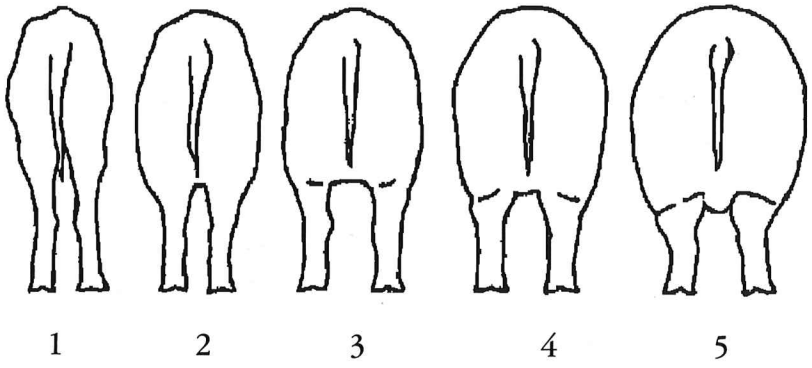


Figure 8.15
Condition scores of sows (Patience and Thacker, 1989)

Score	Condition	Body Shape
1	Emaciated	Hips, backbone prominent to the eye
2	Thin	Hips, backbone easily felt without applying palm pressure
3	Ideal	Hips, backbone felt only with firm palm pressure
4	Fat	Hips, backbone cannot be felt
5	Overfat	Hips, backbone heavily covered

Table 5. **Estimated Feed Intakes for Gestating Sows Fed a Corn-Soybean Meal Diet[a].**

Parity	Gestation Weight Gain (lb.)	Farrow Weight[b] (lb.)	Body Condition Score (1-5)	Approximate Feed Intake, lb.[c]	
				Industry Average	High-Producing
1	90-125	350-400	3	4.0	4.3
2	70-100	380-425	3	4.3	4.6
3	70-100	420-450	3	4.5	4.9
4	70-90	450-480	3	4.8	5.2
5-7	70-90	480-520	3	5.0	5.5

[a] Based upon herd measurement averages, the daily feed intakes should be adjusted to match the housing environment and the sow's body score.

[b] Farrowing weight will reflect the initial breeding weight plus gestation gain. Lean-maternal genotypes may be bred at a heavier body weight without becoming fat.

[c] Estimated gestation feed intakes to achieve the desired measurements. Adjustments may be needed based on body conditioning score.

Critical Points of Gestation Nutrition

Day 0 to 30. Several researchers have reported high feed intake before day 30 of gestation decreased embryo survival.

Day 30 to 75. Feed a constant amount of feed to meet energy requirements of the sow and maintain body condition.

Day 75 to 100. Excess feed may increase fat deposits in the mammary glands and result in lower milk production.

Day 100 to 114. Feed intake should be increased by 2 pounds to prevent sows from losing weight and backfat during this period of rapid fetal growth.

Table 6 gives the nutrient recommendations for gestating gilts and sows based on productivity and age. Table 7 shows an example gestation diet that is designed to be limit-fed at a minimum of 4.5 lbs/sow/day. This diet is formulated to provide all adequate protein, amino acids, vitamins and minerals.

Table 6. **Nutrient Recommendations for Gestation (Based on Productivity and Age).**

Item	Parity 1		Parity 2 and Later	
	Industry Average	High-Producing	Industry Average	High-Producing
	Expected Performance			
Feed Intake, lb.[a]	4.0	4.3	4.3-5.0	4.6-5.5
Feed Intake (2 to 3 wk prefarrow), lb.[b]	4.5-5.0	5.5-6.5	5.4-7.0	5.0-8.0
Gestation gain (0-114 d), lb.	100	125	75-100	90-100
Body score at farrowing (0-5)	3.5	3.5	3.5	3.5
Backfat thickness (last rib), inch.[c]	0.8-1.2	0.8-1.0	0.8-1.0	0.8-1.0
Breeding weight, lb.	240-280	270-320	—	—
	Nutrient Requirements (As-Fed Basis)			
Energy, Mcal ME/lb.	1.4	1.4	1.4	1.4
Protein, %	14	15	12	13
Lysine, %	0.65	0.75	0.55	0.60
Minerals				
Calcium, %	0.90	0.90	0.90	1.00
Phosphorus (total), %	0.70	0.70	0.70	0.80
Salt, %	0.50	0.50	0.50	0.50

[a] Housing outdoors will increase feed (energy) intake requirements. The intake values presented in this table reflect feeding once daily under indoor conditions in individual feeding stalls.

[b] The quantity to be provided will depend upon sow body-fat score. For scores less that 3.5, feed at the upper level; whereas if the body fat score is >4.0, the lower levels should be fed.

[c] Measurements at the end of gestation. If backfat thickness is measured at the 10th rib, the value will be about 10% higher.

Table 7. **Example Gestation Diet**

Ingredient	Amount (lb)
Corn (.25% lysine)	1655
Soybean meal, 44%	260
Dicalcium phosphate (18.5% P; 21% Ca)	52
Limestone (39% Ca)	15
Salt	10
Vitamin premix	6
Trace mineral premix	2
	2000
Calculated analysis	
Metabolizable energy, kcal/lb	1430
Protein, %	13.0
Lysine, %	.55
Calcium, %	.91
Phosphorus, %	.80

Feeding the Lactating Sow

The main objectives for nutrition of the lactating sow are to minimize weight loss and loss of body nutrient reserves and to optimize milk production. Lactating sows produce 15 to 25 lb of milk per day resulting in daily nutrient requirements that are about three times higher than during gestation. Since the sow largely uses dietary nutrients for the synthesis of milk, it is important to provide these nutrients through her diet. If not provided, the body will use tissue reserves in an attempt to meet milk production demands. When this occurs, the sow uses stored fat and muscle to provide these nutrients, resulting in body weight loss and possibly reduced body function. If body reserve losses are excessive, many times the sow does not rebreed back very quickly if she rebreeds back at all. Therefore, it is of utmost importance to feed the sow during lactation for maximum milk production, minimal weight loss and for successful rebreeding after weaning.

Sows that are too fat or over-conditioned when they are in the farrowing house tend to eat less during lactation compared with sows that have a lower body fat content.

It is essential that feeding practices and farrowing house conditions allow the sow to consume a high quantity of feed. Young sows farrowing for the first time generally consume less feed during lactation than older sows. Therefore, it is important that the young sows get enough properly formulated feed to obtain their necessary nutrient levels.

It is recommended that sows during lactation be full-fed in order to obtain the necessary nutrient levels and to obtain maximum milk production. A lactating sow will consume 9 to 15 lbs per day. This intake will depend upon diet composition, sow's condition, previous gestation feed intake, and the environmental temperature of the farrowing facilities.

The feeding practice for lactating sows is to build the lactating sow up to full-feed basis. This is commonly achieved by feeding a minimal amount of feed the first day (3 to 5 lbs) and then increasing that amount by 2 to 3 lbs per day until the sow is at a full feed level. This is usually accomplished by day five of lactation. From this point in lactation until weaning, the sow should be fed all she will consume. Because of the full-feed approach, it is important to assure the feed does not spoil and become moldy in the sow feeder.

The production of milk proteins by the mammary gland is influenced by genetics and the dietary amino acid supply. If the diet does not provide enough amino acids for milk production, body tissue proteins are broken down to provide the necessary amino acids for milk production. However, feeding a diet low

in protein will clearly result in decreased milk production and lower litter weaning weights. The amount of protein (amino acids) provided to the lactating sow is of extreme importance in meeting the needs for milk production. The nutritional requirements of sows of differing productivity for both first and later parities are listed in Table 8. The recommendations reflect normal sow feed intake during lactation.

When constipation is a problem, the addition of a fiber source (wheat bran, beef pulp, alfalfa meal) at a 5 percent level may be helpful. Fiber in the lactation diet will, however, lower the energy value of the diet. Within a few days of farrowing, the fiber should therefore be withdrawn from the diet and replaced with corn as the sow needs additional energy to sustain high milk production.

Sow milk contains both macrominerals and microminerals. Calcium and phosphorus are maintained at a relatively constant concentration in sow milk even when the diet provides an inadequate amount. As during late gestation, if an adequate quantity of calcium and phosphorous is not provided in the lactation diet, the sow will demineralize skeletal tissue to meet her needs for milk production. Consequently, high-producing sows and those lactating for a long time are more prone to leg fractures and/or paralysis of the hind quarter (Downer Sow Syndrome). This situation may be worsened upon weaning or when sows are grouped together or mated to a large boar.

Table 8. **Nutrient Recommendations for Lactation (Based on Productivity and Age).**

	Parity 1		Parity 2 and Later	
Item	Industry Average	High-Producing	Industry Average	High-Production
	Expected Performance			
Daily feed intake, lb.				
0–14 day	8.5–10.0	9.5–10.5	10.5–12.0	11.5–14.0
0–21 day	9.5–10.5	10.0–11.0	11.0–13.0	12.5–16.0
Lysine intake/day, g	35	43	38	50
Lactation weight loss (Farrowing-Weaning), lb.	10–20	15–25	0–15	0–20
Rebreeding interval, days	7 to 12	7 to 12	4 to 7	4 to 7
	Nutrient Requirements (As-Fed Basis)			
Energy, Mcal ME/lb.	1.5	1.5	1.5	1.5
Protein, %	15	18	14	16
Lysine, %	0.75	0.90	0.70	0.80
Calcium, %	0.90	1.00	0.90	1.00
Phosphorus (total), %	0.70	0.80	0.70	0.80
Salt, %	0.50	0.50	0.50	0.50

Swine producers should work with their nutritionists (university or feed company) to ensure that the diets for their reproducing animals are adequately fortified to meet the lactation performance of their sow herd. Table 9 shows an example lactation diet.

Table 9. **Example Lactation Diet**

Ingredient	Amount (lb)
Corn	1420
Soybean Meal	510
Dicalcium Phosphate	39
Limestone	15.6
Salt	8.5
Vitamin Premix	4.9
Trace Mineral Premix	2
	2000
Calculated Analysis	
Metabolizable Energy, kcal/lb	1482
Protein, %	17.7
Lysine, %	.94
Calcium, %	.80
Phosphorus, %	.73

Feeding Starter Pigs

The primary objective for nutrition of weanling pigs is to optimize growth performance during the first few weeks after weaning. The increasing practice of weaning pigs at a young age (10–21 days) has resulted in problems with postweaning lag seen as decreased gains, low feed intake and increased morbidity (sickness) and mortality (death) on many swine farms. Environment, health, management practices and nutrition impact the success of a weaning program.

In addition to other stresses at weaning, the change from liquid sow's milk to a dry starter diet is quite a challenge for the young pig. Information on the characteristics and level of nutrients in sow's milk and the ability of pigs to utilize various nutrients from commonly available feedstuffs has been used to formulate diets that promote satisfactory performance of early weaned pigs.

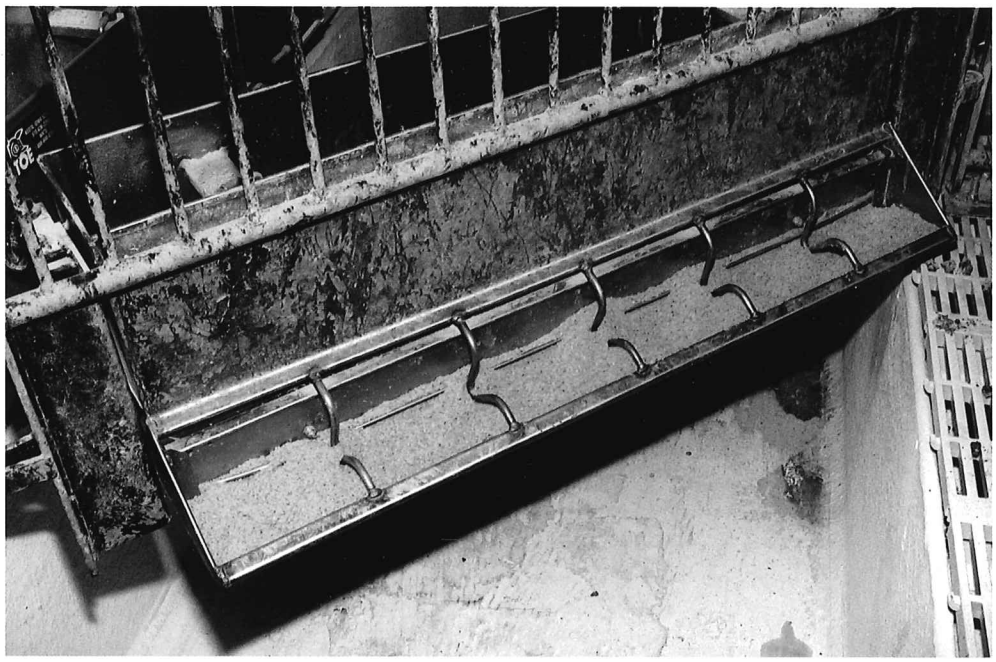


Figure 8.16
Wasting feed! Rule of thumb—if you cannot see the bottom of the feed trough, you are wasting feed

Dried milk products contain forms of protein (casein) and energy (lactose) that are highly digestible by the young pig. Pigs weaned at a young age (<21 days) are very sensitive to anti-nutritional factors present in conventionally processed soybean meal. Thus, the level of soybean meal fed to these pigs should be limited. These young pigs develop an allergy to soybean proteins which increases incidence of diarrhea and reduces growth rate

Figure 8.17
Self-feeder with correct adjustment for proper feed let-down

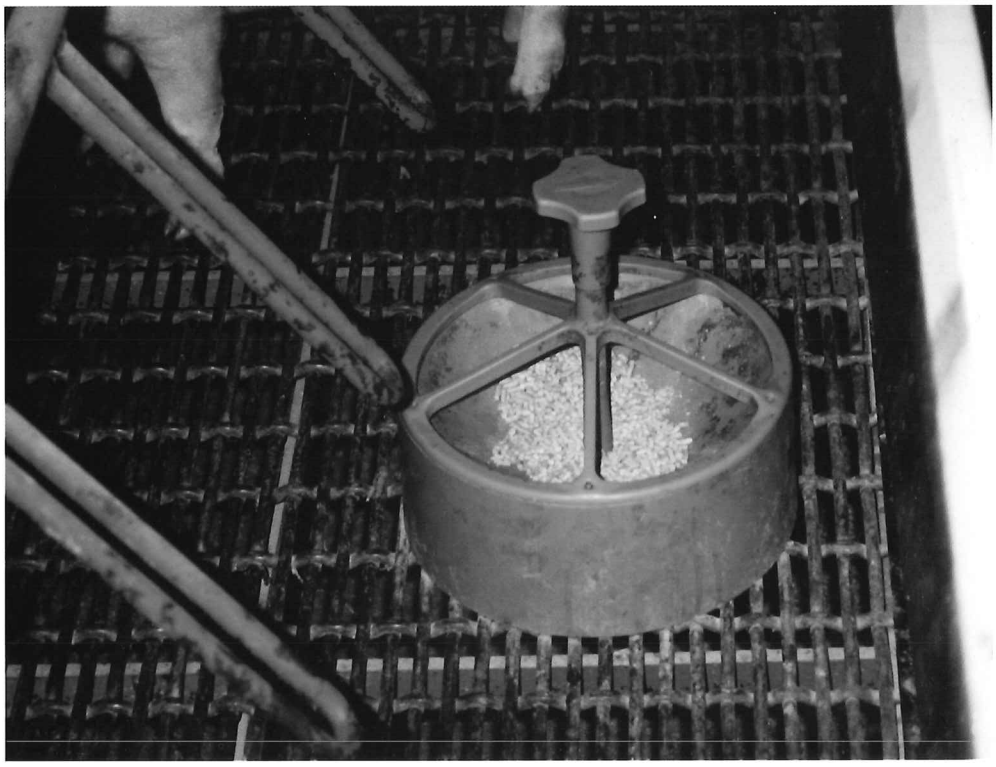


Figure 8.18
Introduction of creep diets to nursing pigs

(postweaning lag). After about 2 weeks, pigs become tolerant of soybean protein, the allergy decreases and growth performance improves. Complex diets containing small amounts of soybean protein are fed to newly weaned pigs to avoid postweaning lag.

Diets containing high levels of dried milk products, specially processed soybean products, animal by-products (i.e., spray-dried porcine plasma, spray-dried blood meal, fish meal), and highly digestible carbohydrate sources (i.e., oat groats) are often called "complex starter diets" in contrast to "simple" corn-soybean meal starter diets. Quality of these specialized feed ingredients varies greatly among suppliers. Use only high quality ingredients in complex starter diets even though they are more expensive than the same ingredients of lower quality. Contact a competent nutritionist for advice concerning quality of specialized feed ingredients for starter pig diets. Feeding complex starter diets to pigs weaned at less than 4 weeks of age results in significantly improved performance compared to simple diets.

As the pig grows, its digestive system can better utilize protein and energy from plant sources and it becomes less sensitive to anti-nutritional factors. Thus, the performance boost gained by feeding complex diets instead of simple diets decreases over time. Furthermore, simple diets are considerably less expensive.

Phase Feeding

Due to dramatic changes in digestive capacity and feed intake after weaning, the practice of phase feeding has been developed. Phase feeding involves feeding several diets for a relatively short period of time to more accurately and economically meet the pig's nutrient requirements. Phase feeding programs for starter pigs provide an expensive, complex diet containing a high proportion of high quality ingredients in the immediate postweaning period. High quality, expensive ingredients are gradually replaced with less expensive, lower quality ingredients that the pig can better utilize as it matures. Nutrient and ingredient suggestions for a phase feeding program are presented in Table 10. Example starter diets are shown in Table 11.

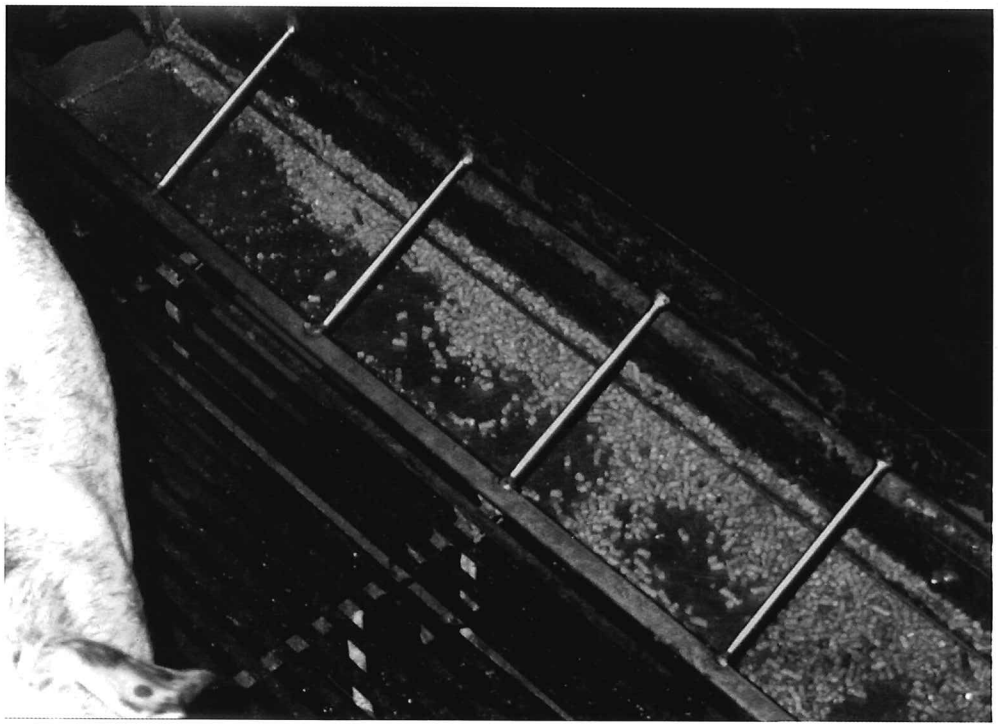


Figure 8.19
Starter diets for weaned pigs

Table 10. **Suggested Nutrient Levels and Ingredients for Phase Feeding Programs for Starter Pigs.**

Item	SEW[a]	Phase 1	Phase 2	Phase 3
Weaning age	2.5 weeks To 11 lb	3 weeks 11-15 lb	4 weeks 15-25 lb	6 weeks or more 25-45 lb
Feeding period	(About 1 week)	(About 1 week)	(About 2 weeks)	(About 3 weeks)
Feed form	Pellet	Pellet	Pellet/Meal	Meal
Nutrient	% of diet			
Lysine	1.70	1.50	1.25	1.25
Methionine + cystine	1.02	.90	.75	.75
Ingredient	% of diet			
Dried skim milk	0-20	1-10	——	——
Dried whey	15-30	10-20	10-20	0-10
Fishmeal	0-10	0-10	0-5	——
Special soy products[b]	0-20	0-20	——	——
Spray-dried porcine plasma	3-10	3-6	——	——
Spray-dried blood meal	——	——	2-5	——

[a] Segregated early weaning.
[b] Soy protein concentrate, extruded soy protein concentrate or isolated soy protein.

The segregated early weaning (SEW) diet should be fed to pigs until they weigh about 11 lbs. It should contain limited amounts of corn and soybean meal and large amounts of highly digestible ingredients such as dried skim milk, fish meal, dried whey and spray-dried porcine plasma. Pigs weaned onto this diet should have very limited exposure to soybean protein because of the relative immaturity of the young pig's digestive system. High quality fat from plant sources (soybean oil, corn oil) is usually added at a rate of 3% to facilitate pelleting. A sub-therapeutic level of antibiotic and copper sulfate are added for growth promotion.

The Phase 1 diet should be fed to pigs weaned at 17–24 days of age. Phase 1 should be pelleted with high levels of dried milk products and plasma. The Phase 1 diet should contain about 10% soybean meal so that pigs become accustomed to soybean protein. This practice should ease the transition to the simpler, corn-soybean meal-based Phase 2. Phase 2 diets are fed for approximately 2 weeks and start the transition from milk-based proteins to plant-based proteins.

Table 11. **Example Phase Feeding Program for Starter Pigs**

Ingredient	Lb SEW	Phase 1	Phase 2[a]	Phase 3
Corn	734	927	1025	1120
Soybean meal (44% CP)	100	200	537	786
Dried whole whey	500	400	300	——
Dried skim milk	200	50	——	——
Spray dried porcine plasma	150	100	——	——
Vegetable fat	100	100	20	20
Fish meal	200	200	——	——
Spray dried blood meal	——	——	60	——
Dicalcium phosphate	3	10	34	37
Limestone	——	——	15	20
Salt	——	——	——	8
Vitamin premix[b]	6	6	6	6
Trace mineral premix[b]	2	2	2	2
DL Methionine	3	3	——	——
L-lysine HCl	1.5	1.5	——	—
Copper sulfate (25% Cu)	1	1	1	1
Antibiotic premix[c]	+	+	+	+
	2000	2000	2000	2000
Calculated analysis:				
Crude protein	24.00	21.60	21.00	22.20
Lysine	1.70	1.50	1.25	1.25
Calcium	.90	.90	.90	.90
Phosphorus	.75	.75	.75	.75

[a] If Phase 2 diet is pelleted, increase fat to 80 lb at the expense of corn.
[b] See Table 10 for suggested vitamin and trace mineral premixes.
[c] Add at the expense of corn.

The phase 3 diet is the last diet before going to a grow-finisher diet phase. It will contain no milk products because the pig should be fully accustomed to a "simple" corn-soybean meal diet. They will perform very well at a considerably lower cost than the previous phase diets. Growth promoting levels of antibiotic and copper sulfate (125 ppm copper) should also be included.

These diets are only examples for the nutritional needs of the young pig. The first one or two phases (SEW and phase 1) should be in a pelleted form for better utilization by the young pig and to prevent bridging in the feeders due to the high level of dried milk products and plasma. Because of the complexity of these diets it is usually better to use already commercially formulated and processed diets. From phase 3 on, these diets may be mixed and processed at the farm or purchased and fed as a grind/mix meal or in pelleted form. Contact your local dealer for the proper diets and availability of feedstuffs for your young pigs.

Ration Considerations

Swine diets and supplements are usually least cost combinations of ingredients that will meet the crude protein, calcium and phosphorus needs of the animal. These diets are designed to permit the maximum rate and efficiency of gain or maximum reproductive performance. Usually, a manufactured complete vitamin premix containing vitamins A, D, E, riboflavin, niacin, pantothenic acid, chlorine, and cobalamin (B_{12}) is added to the diet at a specified level. Also, a trace mineral mixture containing iron, zinc, manganese, copper, iodine, and selenium is added at a specified level or a trace mineralized salt is added at 0.35 percent of the diet. There are a number of commercial premixes available that combine the vitamins and trace minerals. If one of these is used, regular salt should be added at 0.25 percent of the diet. Some commercial trace mineralized salt products do not contain selenium, in which case a separate selenium premix may be used at 0.05 or 0.1 percent of the diet.

Although most swine diets in the United States are based upon corn and soybean meal, grains such as milo, wheat, barley, and oats can be substituted, at least in part, for the corn in the diet. Protein supplements such as linseed meal, cottonseed meal, peanut meal, meat and bone meal, fish meal and tankage may substitute for at least some and in certain cases all of the soybean meal. Availability and cost of ingredients as well as convenience and ease of mixing may dictate the use of different feeds in various amounts. Tallow or vegetable oils are frequently added at 0.5 to 2.5 percent of the diet to reduce dust problems in certain diets.

Fats are added to diets in order to increase energy density during times of stress, (weaning, new environment, hot temperatures etc). Also, sugar and milk by-products are frequently added to increase acceptability of diets by young pigs. Dairy, meat, grain and distiller's by-products often are included as major ingredients in swine diets.

In the corn belt, no combination of ingredients has been found that will outperform the vitamin-mineral-supplemented corn-soybean-meal diet for growing-finishing, gestating or lactating swine. There are circumstances and geographical areas where other ingredients can reduce the feed cost without reducing performance of the animals.

Wet feeding, often referred to as "slopping" your pigs, can also increase gain. When wet feeding, it is important to only prepare enough for the pig to eat and not let it sit. It can spoil and feed wastage can be high. Wet feeding requires feeding the pig several times per day to increase consumption, thus increasing daily gain. Fat sources, flavoring, sugars and milk by-products have all been added to wet feeds to enhance growth for pigs that need the extra pounds of gain to make weight at the fair. The best method of getting pigs to make weight at the fair is first start with the right size pig and to estimate a 1.5 to 2.0 pound average daily gain. Make sure the pigs have a clean dry environment that keeps them cool when extremely hot and warm when it is cold. Lastly, make sure the pig is fed the appropriate diet to maximize gain and be sure clean fresh water is always available.

Nutrition Chapter References

Hill, Gretchen; Rozeboom, Dale; Trottier, Nathalie; Mahan, Don; Adeoli, Layi; Cline, Tip; Forsyth, Dale; and Richert, Brian. 1998. Tri-State Swine Nutrition Guide. Bulletin 869.

National Research Council. 1998. Nutrition Requirements of Swine. 10th revision.

Augenstein, M.L.; Johnstone, L.J.; Shurson, G.C.; Hawton, J.D.; Pettigrew, J.E. 1994.

Formulating Farm-Specific Swine Diets. Minnesota Extension Service Bulletin BU6496-F.

Holden, Palmer; Ewan, Richard; Jurgens, Marshall; Stahly, Tim; and Zimmerman, Dean. 1996.

Life Cycle Swine Nutrition. Iowa State University Bulletin PM489.

Goodband, Robert D.; Tokach, Mike D.; Dritz, Steve S.; and Nelssen, Jim L. 1997.

General Nutrition Principles for Swine. Kansas State University.