SWINE PRODUCTION

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CONTENTS

I. BREEDS OF SWINE

1. Origin and Characteristics of the Breeds

1) Berkshire

This English breed is one of the oldest breeds of swine.

Druing recent years the other breeds have been improved, and now several other breeds had longer carcasses and produced carcasses with less back fat.

The breed is black, with white marking usually on the feet, head, and tail; it has long been characterized by a short snout and a wide dished face.

Berkshires are slightly smaller at maturity than some of the other breeds. Mature boars weight 900 pounds or more.

2) Duroc

The ancestry of this breed is not entirely known, but the Jersey Reds of New Jersey, the red Durocs of New York, and the red Berkshires of Connecticut have contributed to the formation of the breed. The breed was first called the Duroc Jersey. Standards were established for the breed in 1885.

The Duroc is red in color, with the shades varying from a golden yellow to a very dark red. A medium cherry red is preferred. The breed is prolific, and the sows are good mothers. They have good dispositions and produce large quantities of milk.

The Duroc is large and has excellent feeding capacity. Most test related to rate of gain that have been made by agricultural experiment stations have indicated

that the Duroc is a very rapid gainer.

3) Hampshire

This breed was developed in Boone County, Kentucky from hogs probably imported from England in the early 1800's. The foundation stock, known as the Thin Rinds and Belted hogs, had been raised in the New England states.

The Hampshire is black hog with a white belt encircling the body and including the front legs. The back legs are usually black, and no white should appear above the hock. The head and tail are black, and the ears are elect. No white should show on the head.

4) Landrace

Landrace hogs originated in Denmark. The Landrace has white hair, and the skin is usually white. Small black spots, however are common. The breed is extremely long, deep sided, and well hammed. Usually the aminals are flat and sometimes low in the back. The ears are very large and cover much of the face. Many of the Landrace breed have weak pasterns. The breed is prolific and efficient in the use of feed.

5) Yorkshire

The Yorkshire was considered by many as the best bacon-type breed. The breed is raised in large numbers in Canada, England, Scotland, and Ireland. It is a native of northern England.

The Yorkshire is white in color but occasionally has black pigment spots in the skin. These spots are objectionable. The ears are erect. Nature boars weigh from 700 to 1000 pounds.

The Yorkshire is extremely long and deep, and is

firm fleshed.

Chester White, Poland China, Spots, Tamworth etc. are other established breeds of swine.

Table 1. Ranking of Breeds for Production and Carcass Traits

(WAJIMA)

Item \ Breed	B	L	Y	H	D
Production traits					
Litter size	L	H	H	L**	M
Birth weight	M	H	M	H	H*
Milking ability	L	H	M*	M	M
Pigs weaned/litter	L	H	H	L**	M
Daily gain	L	H	M	M**	H
Feed efficiency	L	H	M	M**	H
Soundness					
Vigor	H	M	M**	M	H
Feet and leg soundness	M**	L	M	M	M*
Carcass traits					
Back fat thickness	L	M	M*	H	M**
Length	L	H	H	M**	L**
Percent of ham	L	M**	L	H	H
Lean cut percentage	L**	M**	M	H	H*
Loin-eye area	H**	M**	M	H	M**

H = High, M = Medium, L = Low

** Higher level in the grade

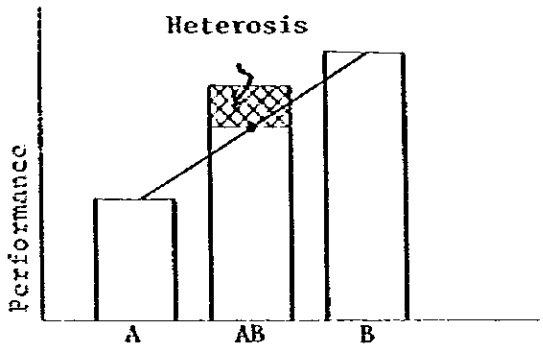
* Lower level in the grade

2. Hybrid Hogs

1) Hybrid defined

A hybrid is produced by crossing two or more inbred lines. Hybrid hogs are produced in much the same manner as is hybrid corn. Lines of hogs are inbred for several generations and then crosses are made of the inbred lines. The extent that the hybrid hog is more productive than the average of the parent stock is dependent upon the genetic make up of the various lines, and how well they supplement each other when they are brout together.

Figure 1. Heterosis



2) Hybrid vigor or heterosis

The crossing of two breeds of hogs has been a popular procedure in commercial hog production. The

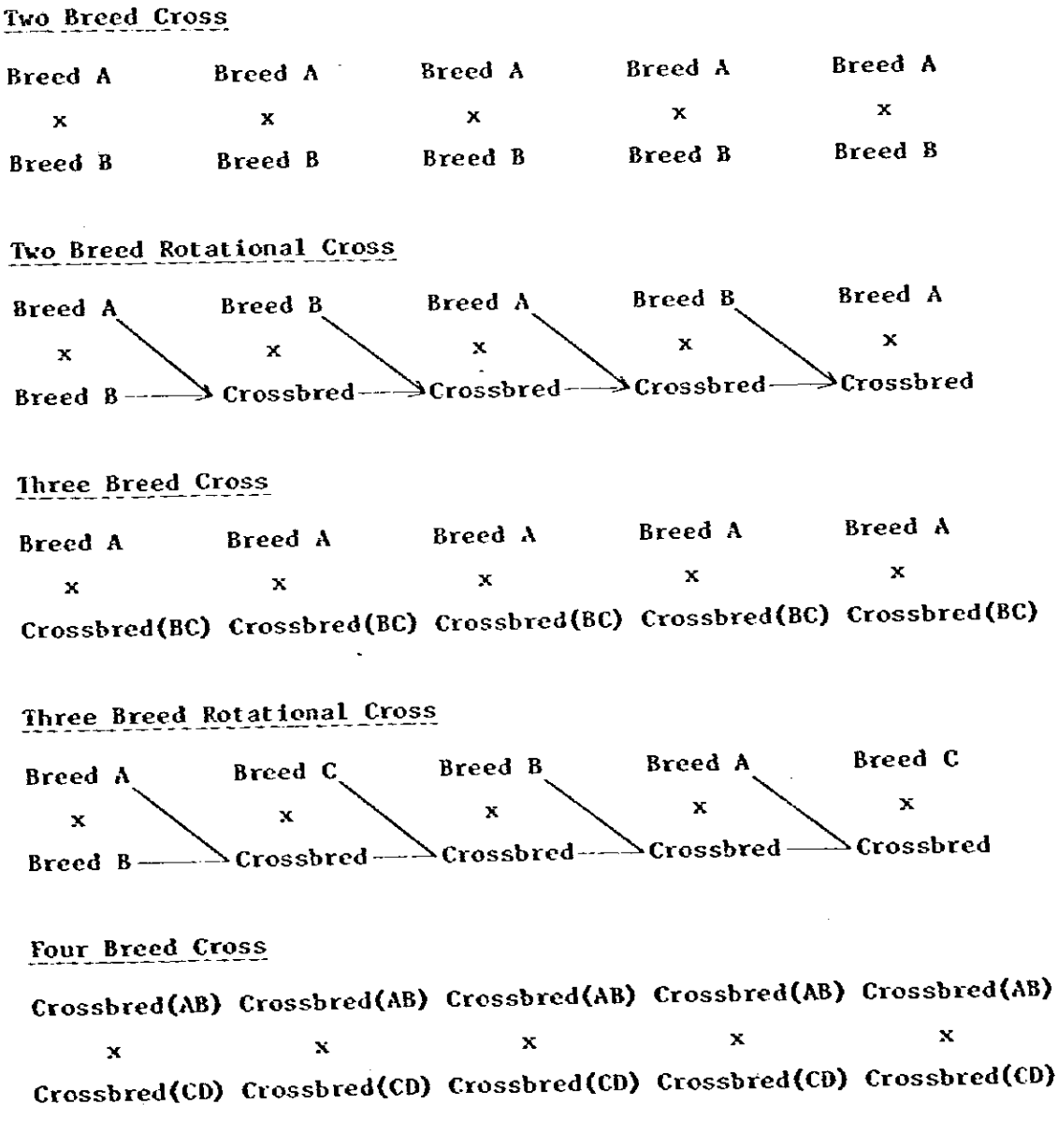
Table 2. Heterosis of the Crossbred

Item \ Crossbred	Two Breed Cross A x B	Three Breed Cross AB x C
No. of Pigs (Birth)	-	(+)
" (8 wks)	+	(+) +
Litter weight (8 wks)	+ +	(+) + +
Feed Conversion	±	±
Carcass Traits	-	-

(+) Maternal heterosis

offspring usually make rapid and economical gains and have excellent constitutions. The crossbred gilts farrow and raise larger litters than do noncrossbred sows. This increase in vigor, growth rate and productiveness is called hybrid vigor or heterosis.

Figure 2. Systems of Crossbreeding



3) Hybrid hog production

(1) Produce heterosis effects

(2) The compensation of some deficiencies in each breeds.

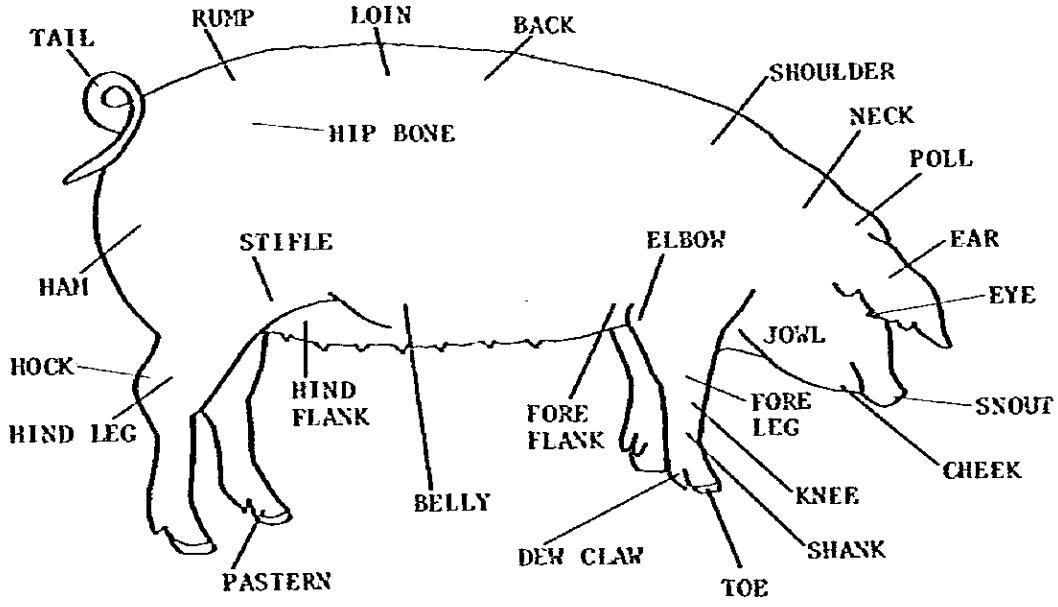
(3) Utilize of maternal or paternal effects.

II. PARTS OF HOGS

1. Parts of Hogs

Farmers, breeders, and packers use much the same terms in describing hogs. Since these terms will be used repeatedly in the following paragraphs, the reader should become familier with them. Figure 3 shows the various parts of the body.

Figure 3. Parts of a Hog



2. The Ideal Type and Conformation

Breeders of pure breeds and commercial pork producers usually have some ideal in mind in selecting breeding and feeding stock. Usually they do not find animals that possess all the characteristics that they are looking for, and must select those that are nearest their ideal. Not all breeders and feeders agree as to what makes up the ideal type and conformation of a hog.

The ideal type changes from time to time with change in market demand.

III. SWINE BREEDING

1. Female Reproductive Organs

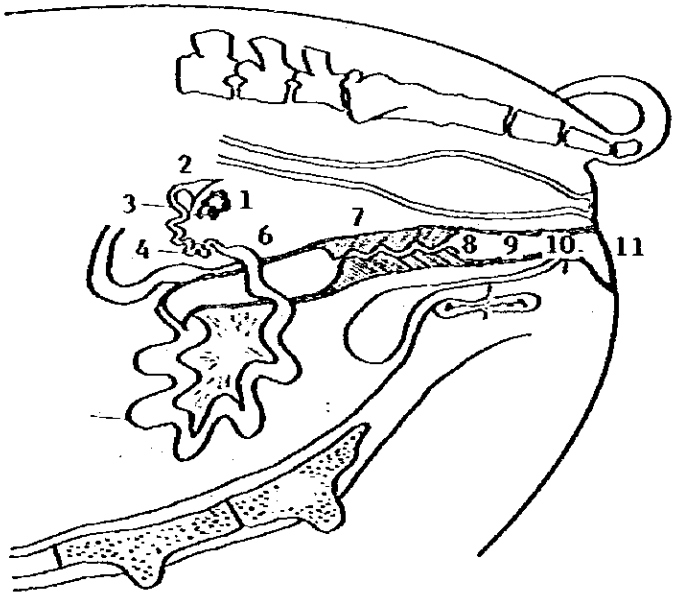
As shown in Figure 4, the reproductive system of the sow consists of the ovaries, the oviducts, the uterus, the vagina and valva.

(1) Ovaries

These two glandular organs are located in the sub-lumbar region and produce the eggs. As the eggs mature, they are dropped into the oviduct. The process is called ovulation.

The heat period usually occurs every 21 days, but the interval may vary from 18 to 24 days. Ovulation - the liberation of the eggs - usually occurs at about 31 hours (from 26 to 36 hours) of the heat period. Each follicle in the ovary contains

Figure 4. Reproductive Organs of a Sow



1. Ovaries
2. Fimbria
3. Ampulla
4. Isthmus
5. Uterine Horn
6. Uterine Body
7. Uterine Cervix
8. External Orifice of Uterus
9. Vagina
10. Vagnal Vestibule
11. Vulva

one egg. Gilts will produce from 10 to 15 and sows an average of 17 eggs during each period. Eggs can live for 5 or 6 hours.

Breeding should be timed so that the sperm is in the oviduct when ovulation occurs. It normally requires 15 hours to reach the ovum. It is thought that sperms can live in the female for 25 or 30 hours.

(2) Oviducts

These tubes lead from the ovaries to the horns of the uterus. The fertilization of the eggs usually takes place near the upper end of the oviduct. Several billion sperms are deposited by the boar in one service. Only one sperm can fertilize each egg.

(3) Uterus

The fertilized eggs move from the oviduct into the uterus and become attached to the wall. The fertilized eggs develop in the uterus.

(4) Vagina

The vagina connects the vulva and the cervix.

(5) Vulva

Both the urinary and reproductive organs of the female terminate in the vulva.

2. Male Reproductive Organs

(1) Testis

Sperm cells are produced in the two testicles, which are suspended in the scrotum.

(2) Deferent ducts

These tubes connect the testicles with the urethra.

Sperms pass through and may be stored at the upper end of these tubes.

(3) Seminal vesicles

These glands open to the urethra and secrete a fluid.

(4) Prostate

The prostate gland is located near the bladder and the urethra. It produces a secretion that becomes a part of the seminal fluid.

(5) Bulbourethral gland

These glands secrete a fluid that precedes the passage of the sperm cells down the urethra.

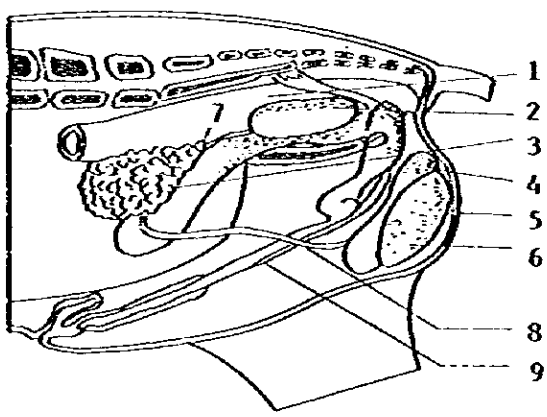
(6) Urethra

This long tube extends from the bladder to the penis and carries both urine and semen.

(7) Penis

This organ deposits the sperm cells within the female reproductive system.

Figure 5. Reproductive Organs of a Boar



1. Rectum
2. Bulbourethral Gland
3. Seminal Vesicle
4. Epididymis
5. Scrotom
6. Testis
7. Prostate
8. Deferent Duct
9. Penis

Table 3. Farrowing Production Schedules

Farrowing Dates : 114 Days

Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates	Breeding Dates	Farrowing Dates
Jan. 1	Apr. 24	Feb. 11	June 4	Mar. 24	July 15	May 4	Aug. 25	June 14	Oct. 5	July 25	Nov. 15	Sept. 4	Dec. 26	Oct. 15	Feb. 5	Nov. 25	Mar. 18
2	25	12	5	25	16	5	26	15	6	26	16	5	27	16	6	26	19
3	26	13	6	26	17	6	27	16	7	27	17	6	28	17	7	27	20
4	27	14	7	27	18	7	28	17	8	28	18	7	29	18	8	28	21
5	28	15	8	28	19	8	29	18	9	29	19	8	30	19	9	29	22
6	29	16	9	29	20	9	30	19	10	30	20	9	31	20	10	30	23
7	30	17	10	30	21	10	31	20	11	31	21	10	Jan. 1	21	11	Dec. 1	24
8	Mar. 1	18	11	31	22	11	Sept. 1	21	12	Aug. 1	22	11	2	22	12	2	25
9	2	19	12	Apr. 1	23	12	2	22	13	2	23	12	3	23	13	3	26
10	3	20	13	2	24	13	3	23	14	3	24	13	4	24	14	4	27
11	4	21	14	3	25	14	4	24	15	4	25	14	5	25	15	5	28
12	5	22	15	4	26	15	5	25	16	5	26	15	6	26	16	6	29
13	6	23	16	5	27	16	6	26	17	6	27	16	7	27	17	7	30
14	7	24	17	6	28	17	7	27	18	7	28	17	8	28	18	8	31
15	8	25	18	7	29	18	8	28	19	8	29	18	9	29	19	9	Apr. 1
16	9	26	19	8	30	19	9	29	20	9	30	19	10	30	20	10	2
17	10	27	20	9	31	20	10	30	21	10	Dec. 1	20	11	31	21	11	3
18	11	28	21	10	Aug. 1	21	11	Jul. 1	22	11	2	21	12	Nov. 1	22	12	4
19	12	Mar. 1	22	11	2	22	12	2	23	12	3	22	13	2	23	13	5
20	13	2	23	12	3	23	13	3	24	13	4	23	14	3	24	14	6
21	14	3	24	13	4	24	14	4	25	14	5	24	15	4	25	15	7
22	15	4	25	14	5	25	15	5	26	15	6	25	16	5	26	16	8
23	16	5	26	15	6	26	16	6	27	16	7	26	17	6	27	17	9
24	17	6	27	16	7	27	17	7	28	17	8	27	18	7	28	18	10
25	18	7	28	17	8	28	18	8	29	18	9	28	19	8	Mar. 1	19	11
26	19	8	29	18	9	29	19	9	30	19	10	29	20	9	2	20	12
27	20	9	30	19	10	30	20	10	31	20	11	30	21	10	3	21	13
28	21	10	31	20	11	31	21	11	Nov. 1	21	12	Oct. 1	22	11	4	22	14
29	22	11	July 1	21	12	June 1	22	12	2	22	13	2	23	12	5	23	15
30	23	12	2	22	13	2	23	13	3	23	14	3	24	13	6	24	16
31	24	13	3	23	14	3	24	14	4	24	15	4	25	14	7	25	17
Feb. 1	25	14	4	24	15	4	25	15	5	25	16	5	26	15	8	26	18
2	26	15	5	25	16	5	26	16	6	26	17	6	27	16	9	27	19
3	27	16	6	26	17	6	27	17	7	27	18	7	28	17	10	28	20
4	28	17	7	27	18	7	28	18	8	28	19	8	29	18	11	29	21
5	29	18	8	28	19	8	29	19	9	29	20	9	30	19	12	30	22
6	30	19	9	29	20	9	30	20	10	30	21	10	31	20	13	31	23
7	31	20	10	30	21	10	Oct. 1	21	11	31	22	11	Feb. 1	21	14		
8	June 1	21	11	May 1	22	11	2	22	12	Sept. 1	23	12	2	22	15		
9	2	22	12	2	23	12	3	23	13	2	24	13	3	23	16		
10	3	23	13	3	24	13	4	24	14	3	25	14	4	24	17		

IV. NUTRIENTS REQUIREMENTS OF SWINE

Breeding management practices and environment each affect requirements for specific nutrients, and specific physiological functions require different dietary requirements. For example, the pregnant sow's nutritional priority is for the developing

Table 4. Suggested Dietary Amino Acid Requirements and Protein and Energy Allowances for Swine

	Animal Weight or Phase of Production				
	Starter	Grower	Finisher	Breeder[1]	
	10 to 30 lb.	30 to 120 lb.	120 lb to mkt. wt.	Gestation	Lactation 2)
	(percent of diet)				
Amino Acids[3)4)]					
Lysine	1.00	0.74	0.60[5)]	0.42	0.60
Methionine[6)]	0.60	0.50	0.30	0.28	0.36
Trytophan[7)]	0.14	0.11	0.07	0.07	0.13
Arginine	0.37	0.25	0.15	-[8)]	0.34
Histidine	0.34	0.23	0.14	0.13	0.26
Isoleucine	0.76	0.52	0.35	0.37	0.64
Leucine	0.84	0.67	0.40	0.35	0.99
Phenylalanine[9)]	0.79	0.54	0.32	0.33	1.00
Threonine	0.66	0.45	0.37	0.34	0.51
Valine	0.67	0.46	0.28	0.46	0.68
Protein[10)]	20	16	14[11)]	12[12)]	14
Energy, kcal/ lb. of diet dry matter					
Digestible	1,680	1,670	1,670	1,650	1,670
Metabolizable	1,560	1,580	1,590	1,580	1,580

1) Amino acid requirements for the boar have not been determined. For maximum gain and efficiency, a boar should have about two percentage points more dietary protein than a barrow littermate. A diet adequate for the gestating gilt should be adequate for the mature boar.

2) A minimum of 28 days lactation is assumed.

3) The values here, unless otherwise indicated, were based on the dietary levels that produced maximum productive and reproductive efficiency.

4) Amino acid values for gestating and lactating animals are based on estimated and determined amino acid needs for maintenance plus either embryo development or milk production.

5) This amounts required for maximum (1) gain per unit of feed fed and (2) maximum lean tissue development. Maximum daily gain can be realized at a level of 0.52%.

6) Cystine can supply up to 56% of the need for suggested allowance for methionine. Thus, the values given here represent a methionine-plus-cystine allowance.

7) Biological activities for the growing pig of synthetic L-, DL- and D-tryptophan are 100,80 and 60%, respectively.

8) Recent research indicates dietary arginine is not essential for satisfactory reproduction.

9) Tyrosine can satisfy 30% of the values for phenylalanine.

10) These allowances were determined with use of fortified corn-soybean meal diets. Substitution of other grains for corn or other proteins for soybean meal should be made on amino acid basis.

11) This is a minimum allowance for excellent meat-type herds. If barrows and gilts are fed separately, 13% and 15%, respectively, may more specifically satisfy the requirements since gilts produce leaner carcasses than do barrows.

12) Animals should be fed a minimum of one-half pound of protein per day.

fetus to safeguard the reproduction of the species. In growing finishing swine, the requirements for maintenance must be satisfied before productive growth, expressed as increase in body weight, can be realized. It must be recognized, too, that biological availability of specific nutrients varies among feedstuffs, and, further processing and processing techniques can modify, either favorably or unfavorably, that availability. It is economically important that sources of nutrients and dietary formulation be combined to provide the best nutritional value at the least cost. Knowledge of the feeding value of different feedstuffs is essential if appropriate choices of ingredients and formulation are to be made. Energy for maintenance and weight increase can be supplied by carbohydrates, fat and protein (amino acids). In properly formulated diets, protein (amino acids) would not be used as an energy source, but the amino acids would be used in synthesis of body protein.

Lysine, methionine plus cystine, and tryptophan are the amino acids of primary consideration in swine diet formulation. If they are adequate, rarely would any other indispensable amino acid be in insufficient amount. Thus, in Table 4, these amino acids are listed first.

Table 5. Vitamin Allowances for Swine in Confinement

In diet	Animal Weight or Phase of Production				
	Starter	Grower	Finisher	Breeder[1]	
	10 to 30 lb.	30 to 120 lb.	120 lb. to mkt. wt.	Gesta-tion	Lacta-tion
Fat Soluble					
Vitamin A I.U./lb 2)	1,500	1,500	1,500	2,500	1,500
Vitamin D I.U./lb.	300	150	75	150	150
Vitamin E I.U./lb.3)	5	5	5	5	5
Vitamin K mg/lb. 4)	1	1	1	1	1
Water Soluble					
Riboflavin mg/lb.	1.5	1.0	0.8	1.0	1.0
Nicotinic acid mg/lb. 5)	12	8	6	8	8
Pantothenic acid mg/lb.	6	5	5	5	5
Choline mg/lb.	600	400	350	400[5]	400[6]
Vitamin B_{12} mcg/lb.	9	6	4	6	6

1) Vitamin levels adequate for the gestating gilt should be adequate for the mature boar.

2) It is suggested that in diet formulation corn not be credited for any vitamin A potency. This is based on the fact that (1) the carotene value can deteriorate with storage and (2) 1 mg of carotene may be equivalent to less

than 500 I.U. vitamin A activity for the pig. The levels indicated here should be supplied in the vitamin supplement.

3) These are not defined requirements, but are levels that have been used to alleviate apparent vitamin E deficiency symptons under field conditions. It is assumed that sufficient selenium (0.045 mg per lb. of diet) is present in the dietary ingredients.

4) Supplemental level.

5) The niacin content of corn, wheat and milo is considered essentially unavailable to the pig. Thus, the levels indicated here should be supplied by the vitamin supplement.

6) These values should be considered minimum. Precise requirements have not been determined.

The dietary crude protein levels indicated in Table 4 are based on corn-soybean meal or amino-acid-equivalent diets. The mixture of corn and soybean meal for the protein percent indicated will provide adequate amounts of the essential amino acids for the weight of animal or phase of production indicated. Substitution of other grains for corn or other proteins for soybean meal must be done on an amino acid basis if amino acid deficiencies are to be avoided. The relationship of amino acids and energy becomes increasingly important as refinements of dietary requirements are realized. The digestible and metabolizable energy densities recommended in Table 4 are in keeping with present information. These values are on a dry matter basis since the dry matter content of mature corns is essentially of the same energy value, although moisture level of the corns may vary from 12% to 30%. It is to be noted, however, that improper drying, storage or processing of these grains can reduce their feeding

value. For example, roasting corn to temperatures (kernel temperature) above 150°C (300°F) can reduce biological availability of lysine.

Table 6. Mineral Allowances for Swine in Confinement

	Animal Weight or Phase of Production				
	Starter	Grower	Finisher	Breeder[1]	
	10 to 30 lb.	30 to 120 lb.	120 lb. to mgt. wt.	Gestation	Lactation
Calcium percent of diet	0.80	0.60	0.60	0.75	0.75
Phosphorus percent of diet[2]	0.60	0.50	0.50	0.50	0.50
NaCl(salt)[3]	0.50	0.50	0.35	0.50	0.50
Trace minerals (for all ages)[4]	mg/lb. of diet - or - ppm.				
Iron[5]			32.0	70	
Copper			2.7	6	
Manganese			9.0	20	
Zinc			23.0	50	
Iodine			0.1	0.22	
Selenium			0.045	0.10[6]	

1) Recent research data indicates these listed allowances are adequate for maximum rate of gain in growing boars. Higher levels, however, may be needed for maximum strength (as measured by weight required to break carcass, femur or metatarsal bones) of bone. Dietary levels of minerals adequate for gestating guilts should be adequate for sexually mature boars.

2) Availability to the pig of phosphorus from different supplements varies and should be taken into account.

3) Recent published information indicates that 0.25% dietary salt would satisfy the Na and Cl requirements for growing-finishing swine.

4) These are often provided by use of trace mineralized salt formulated specifically for use in swine diets.

5) Iron in ferrous sulfate, ferrous fumerate and ferric ammonium citrate preparations is quite efficiently utilized. The availability of iron from various ferrous carbonates is variable, but usually very low. The iron inferrous or fer ferric oxide has essentially no nutritional value for swine.

6) Maximum allowable level in a mixed diet for swine. Added selenium must be in the form of sodium selenite or sodium selenate.

Table 7. Digestible and Metabolizable Energy Values for Certain Feedstuffs in Diets for Swine

Feedstuff	kcal/lb. of dry matter[1)]	
	Dig. energy	Met. energy
Barley, ground	1,612	1,498
Corn, ground	1,684	1,634
Corn (Opaque-2), ground	1,700	1,650
Milo, ground	1,717	1,634
Oats, ground	1,372	1,317
Oats, rolled	1,918	1,768
Soybeans	2,016	1,766
Soybeans, extruded	1,960	1,740
Wheat, ground	1,735	1,634
Alfalfa meal	736	636

Feedstuff	kcal/lb. of dry matter Dig. energy	Met. energy
Dried skim milk	1,890	1,775
Dried whey	1,750	1,544
Wheat bran	1,234	1,135
Wheat middings	1,575	1,516
Wheat shorts	1,434	1,362
Corn gluten feed	1,384	1,190
Distillers dried grains	915	822
Distillers dried grains with solubles	1,370	1,230
Torula yeast	1,555	1,507
Cottonseed meal	1,388	1,180
Fish meal		
Menhaden	1,661	1,362
Herring	1,730	1,453
White	1,600	1,360
Meat and bone scraps	931	726
Rapeseed meal	1,494	1,270
Soybean meal		
49% crude protein	1,920	1,634
44% crude protein	1,871	1,590
Tankage	1,234	1,000
Molasses	1,490	1,390
Peanut meal	1,584	1,448
Rice bran	1,750	1,680
Sesame meal	1,705	1,560
Coconut oil	4,450	-
Corn oil	3,460	3,340
Lard	3,530	3,500
Soybean oil	3,440	3,300
Tallow	3,690	3,590

1) These values were selected on the basis of a compilation of results from several different determinations and estimates.

Table 8. Suggested Feeding Levels and Performance Criteria for Swine

Animal weight or production phase	Number of days	Average daily feed, lb.[1]	Average daily gain, lb.	Feed per lb. of gain, lb.
20 to 45 lb.	23	1.85	1.10	1.68
45 to 120 lb.	50	4.00	1.50	2.67
120 to 220 lb.	55	6.50	1.80	3.60
Gestation				
Gilts	114	4.0 [2]	0.90	-
Sows	114	4.0 [2]	0.60	-
Lactation	21-42	7.0-10.0[3]	-	-
Boars[4]				
Inactive	-	4.0- 5.0[5]	-	-
Breeding	-	5.0- 7.0[5]	-	-

1) Corn-soybean meal, or equivalent, diets of about 90% dry matter and 1,500 kcal digestible energy/lb. are assumed.

2) This level usually adequate when animals are in a comfortable environment. Levels would need to be suitably adapted for different environments to ensure desired body weight gain.

3) Lactating sows need sufficient energy and nutrients to satisfy needs for body maintenance and milk production. Body size, length of lactation period and number of nursing pigs are primary factors affecting total need.

4) Diets nutritionally adequate for gestating gilts should be adequate for mature boars.

5) These levels minimize excess body weight and size. Environment and intensity of use affect total needs.

Vitamin (Table 5) and mineral (Table 6) allowances suggested here are believed to be adequate for swine raised in confinement. The energy values (Table 7) represent a compilation of available research data, with certain values representing averages for several different determinations or estimates from limited data available.

The information in Table 8 is intended as a guideline for evaluating feeding and performance of swine in confinement. If average performance of a herd does not meet these performance levels, the feeding and management practices should be critically evaluated. If average performance of a herd exceeds these guideline values, excellent nutrition and superior management are surely evident.

The values in the accompanying tables are based on available research information. For nutrients for which requirements have not been established, the allowances indicated represent estimates based on the limited information available. A minimal margin of safety is included to provide for variations (1) in management and environments and (2) in biological availability of certain nutrients in commonly used feedstuffs. These allowances, based on the use of corn-soybean meal, or equivalent, diets are believed to meet the needs of healthy swine in confinement. In some instances, individual values may be borderline or slightly deficient for diseased or stressed animals.

V. NUTRITIONAL DEFICIENCIES IN SWINE

1. Deficiencies in Minerals

(1) Calcium and phosphorus

Calcium and phosphorus promote bone formation and growth. The calcium and phosphorus levels pigs need for optimum daily gain and feed efficiency may not be the same as levels they need for normal bone formation. Retarded growth, lameness, stiffness, weak bones and poor reproductive performance indicate a calcium or phosphorus deficiency.

(2) Salt

Salt deficiency signs include slow growth and reduced appetite. Adding salt at 0.5 percent of the swine diet should correct salt deficiency. Salt deficiency usually doesn't occur unless produces restrict water.

(3) Iron

Iron deficiency is common in young pigs. Sometimes this deficiency causes scours in young pigs. Reduced growth rate, listlessness, wrinkled skin, thumps, scours and death also can occur. It is important that producers give newborn pigs supplemental iron, either in an injectable or oral form. Weaned pigs and breeding stock also need supplemental iron in their diets.

(4) Zinc

Slow growth, lameness, stiffness, diarrhea, dermatosis and parakeratosis can indicate a lack of zinc. When calcium levels go above 0.8 percent of the diet and zinc levels are low, parakeratosis - a skin disease similar to dermatosis - may result.

(5) Manganese

Pigs deficient in manganese may have lameness, stiffness, weak bone structure, retarded skeletal growth and increased fat deposition. In addition, estrus may be irregular or delayed and new-born pigs may be weak.

(6) Copper

Pigs lacking copper may have anemia, leg joints that lack rigidity, hind legs that are extremely flexed and crooked front legs, as well as retarded growth.

(7) Iodine

Pigs deficient in iodine may grow slowly, show retarded food intake, poor hair coats and skin condition and develop goiters. Breeding and gestation are reduced. Pigs from females deficient in iodine during gestation may be hairless at birth and possibly stillborn.

(8) Selenium

Selenium deficiency is characterized by liver necrosis, a brownish-yellow discoloration of the fat, muscle tissue degeneration, edema and sudden death.

2. Deficiencies in Vitamins

(1) Vitamin A

Vitamin A deficiency may result in poor conception rates, pigs born weak or dead and boar sterility. Incoordination, paralysis, night blindness and total blindness also can indicate lack of vitamin A.

(2) Vitamin D

Vitamin D deficiency causes a disturbance of calcium-phosphorus absorption and metabolism, reducing bone calcification. In young, growing pigs it can cause rickets. In mature animals a reduction of bone mineral content causes some larger bones to fracture spontaneously.

(3) Vitamin E

Vitamin E deficiency during gestation can increase chances of embryonic death, while lactating females may have pigs that lack coordination. Less use of pasture for pigs and more artificial grain drying has resulted in a lower vitamin E intake, leading to more deficiency symptoms occuring.

(4) Vitamin K

Usually, bacterial synthesis in the pig's intestine fulfills vitamin K requirements. However, sometimes pigs need more vitamin K than this synthesis provides. The deficiency is characterized by vascular fagility, lameness, hyperirritability, hemorrhaging and extended blood clotting time, blood tinged urine and death.

(5) Riboflavin

Slowed growth rate, immature, weak or dead offspring at birth and reduced reproductive performance characterize riboflavin deficiency. Reduced growth rate, lowered fertility, incoordination, stiffness and goosestepping reflect a pantothenic acid deficiency.

(6) Niacin

Because niacin is naturally bound in cereal grains, it is largely unavailable to the pig in corn, grain

sorghum and wheat. Signs of niacin deficiency include slow growth, some vomiting, diarrhea, dermatitis and hair loss. Sometimes the animal becomes spastic.

(7) Vitamin B12

Vitamin B12 deficiency reduces growth, lowers reproductive performance, and produces a rough hair coat and anemia.

3. Deficiences in Protein

Twenty-two amino acids occur naturally in protein. Of these, eight to ten are essential in swine for optimum growth, maintenance and reproduction. Lysine, threonine and tryptophan are the three most essential amino acids for swine. Pigs can get non-essential amino acids directly from the diet or manufacture them from nitrogen supplied in the diet.

A protein deficiency is caused by the lack of essential or non-essential amino acids in the diet. A dietary nitrogen deficiency also can prevent a pig from synthesizing non-essential amino acids.

A protein deficiency in baby pigs can reduce growth rate and feed consumption, while hindering muscular and body development. It also can produce a rough hair coat. This deficiency occurs most commonly when a sow is a poor milker and the baby pigs receive no supplementary feed.

Protein deficient growing-finishing pigs also suffer from reduced growth rate, lowered feed consumption, reduced muscular body development and a rough hair coat.

Gestating gilts and sows fed a protein deficient diet may show poor reproductive performance, farrowing small pigs and small litters.

Lactating sows fed a diet lacking protein may wean lighter weight pigs.

Pigs in any stage of reproduction should not be fed more protein than they can use. Over-supplying protein is both costly and wasteful.

4. Deficiencies in Energy

A baby pig can suffer energy deficiency when:

---its mother has too little milk or stops giving milk; the baby pig becomes chilled, causing the body to use energy to maintain warmth;

--improper body metabolism exists;

--scours and dehydration occur;

--the dam lacked energy during gestation. Consequently, the unborn pigs could not build up any energy reserve, making them small, weak pigs at birth.

No replacement equals a sow's colostrum. If the newborn pig doesn't get colostrum, he has less chance for survival. An orphan pig can get colostrum if he's placed with another sow that has just farrowed. If another sow isn't available, feed the orphan pig a milk replacer.

If growing-finishing pigs are fullfed normal diets, they shouldn't develop an energy deficiency. If an energy deficiency does exist, it will retard growth and reduce fat deposition.

Gilts and boars experiencing an energy deficiency can be delayed in reaching sexual maturity. In addition, gilts may not cycle regularly and boars may have decreased sex drive. However, it's important to keep replacement gilts and boars from becoming over-fat.

Insufficient energy in the diet, extreme cold weather

or disease can cause an energy deficiency during gestation.

Energy deficiency during gestation can cause fetal resorption, mummies, stillborns, small litters and small, weak pigs. It can lower conception rate and hinder cycling regularity in females and reduce breeding herd longevity.

Sows fed an energy deficient diet during lactation may decrease milk production or stop giving milk. Many swine producers put lactating sows on a full-feed diet five to seven days after farrowing. It's possible that a pig's genetic growth potential may exceed the milk produced by the dam. He may need supplemental feed during lactation.

VI. SWINE DISEASE GUIDE

This disease guide is a compilation in chart form of the more common disease and parasite conditions observed in swine. This information is generally available from many sources. Proper application of preventive measures are best programmed by a veterinarian as he establishes a herd health program for a given production unit. Due to the differences in management, facilities and a host of other factors, no one herd health program can encompass all of the needs of all producers.

The necessity for the prevention of diseases in swine herds is becoming increasingly important. With diseases such as pseudorabies (Aujesky's disease), the introduction of carrier animals into the herd can start a costly disease outbreak for the pork producer. It is also important that the health history of the animals to be added to a herd be known and proper testing procedures be employed before bringing the animals to the production unit. Additionally, a strict isolation procedure should be developed before any new animals are added to the main herd. The veterinarian is the key individual in helping the producer to make knowledgeable decisions on the addition of animals to a herd. Adoption of a "closed herd" philosophy, or as nearly closed as possible, is very important in today's production enterprises.

Table 9. Swine Disease Guide

Boars		
DISEASE/ CAUSE	PREVENTION[5]	TREATMENT[5]
Buy boars early from herds known to be free of disease. Isolate from the swine herd for 2-3 weeks. Prior to using the boars expose them to the females of the breeding unit 30 days before they are to be bred. This may be done by fence line contact. Have sufficient boar power, one boar for each 10 gilts to be bred in a three-week period. Use double mating. Since mating is a learned response, spend sufficient time with the new boars in trial mating to be sure they are capable of breeding.		
Swine Erysipelas: Bacteria Erysipelothrix insidiosa	Erysipelas vaccine, (avirulent)[1)3)] Erysipelas bacterin[1)3)] Oral Erysipelas vaccine	Penicillin[2)] Anti-swine Erysipelas serum[2)] Oxytetracycline injected[2)]
Leptospirosis Leptospira pomona grippotyphosa canicola icterohemorrhagicae and other serotypes	Leptospirosis bacterins[3)] use type according to strain of Leptospirosis diagnosed	Oxytetracycline injected[2)] Streptomycin injected[2)] To reduce chronis carrier state of Leptospirosis Chlortetracycline 200g/ton continuously or 400g/ton at least 14 days Oxytetracycline 500g/ton 7-14 days
Respiratory Infections Pneumonia Influenza: Influenza virus Other viruses	Isolate new animals Avoid drafty conditions	Individual treatment[2)] Penicillin, injected Oxytetracycline, injected

DISEASE/ CAUSE	PREVENTION	TREATMENT
Bacterial infection Stress from environmental changes		Herd treatment[2] Chlortetracycline or Oxytetracycline in drinking water Sulfathiazole in drinking water Tetracycline in drinking water
Arthritis and Lameness (get proper diagnosis) Bacteria Erysipelothrix insidiosa Mycoplasma hyosynoviae (gallinarum) Injuries Foot pads Hoof wall cracks	Sort for good feet and legs, good conformation	Dependent upon diagnosis[2] Tylosin Lincocin Penicillin Anti-swine Erysipelas serum
Brucellosis (Bang's Disease): Bacteria Brucella suis	Buy from validated herds Blood tests before adding animals to herd	None

1) Available through your veterinarian.

2) Follow your veterinarian and the manufacturers' instructions.

3) Slaughter not permitted for at least 21 days after biological products have been injected.

4) Ideally the choice of antibiotics should be based on antibiotic sensitivity tests. Consult your veterinarian for details.

5) Most of the drugs listed should be considered as aids in prevention and treatment of the disease. Combinations of several of these drugs are permitted. See Feed Additive Compendium for any recent changes.

Sows
Pregestation

DISEASE/ CAUSE	PREVENTION	TREATMENT
Brucellosis (Bang's Disease): Bacteria Brucella suis	Buy tested animals only or from validated herds and retest before adding to the herd	None
Leptospirosis: (See Boars)	Vaccination 2-3 weeks prior to breeding [3] repeat at 6 month intervals	Chlortetracycline 200 g/ton continuously or 400 g/ton at least 14 days Oxytetracycline 500 g/ton, 7-14 days approximately one month before farrowing Oxytetracycline injected[2]
Erysipelas: (See Boars)	Vaccination 2-3 weeks prior to breeding[3]	(See Boars)
Respiratory Infections Pneumonia Influenza: (See Boars)	Influenza during or shortly after breeding may produce a reproductive problem.	
Arthritis and Lameness: (See Boars)	Sort breeding stock for good foot and leg conformation.	

Gestation and Farrowing

DISEASE/ CAUSE	PREVENTION	TREATMENT
Non-specific infections causing early embryonic death: Bacteria Viruses	Co-mingle sows and gilts. Expose them to each other 30 days prior to breeding so they will develop immunity to the bacteria and viruses that may be present in the herd. No preventive treatment is available for viral infections.	
MMA Mastitis Metritis: Bacteria E. coli Streptococci sp. Corynebacterium and other bacteria Management factors Nutritional deficiencies Unknown causes	Feed antibiotics[4] which sensitivity testing indicates would be of value in your herd. Vaccination of the sow use mixed bacterins[3] Autogenous bacterins[3] prepared from bacteria involved in the herd problem are best. Use at 6 weeks and 2 weeks before farrowing (two injections) Vitamin E 10,000 - 20,000 units/ton	Streptomycin injec injected[2] Cortico-steroids injected[2]
Agalactia: Constipation	Thyroprotein 100g/ton Oxytetracycline 50g/ 50g/ton Sole ration three days prior to farrowing and for first week of lactation.	Mineral oil by mouth, enemas, Epsom or Glauber salts in feed or water.
Mastitis		See above
Metritis		See above
Hormonal deficiencies		Posterior pituitary extract [1]

DISEASE/ CAUSE	PREVENTION	TREATMENT
	Caution: This drug will increase the metabolic rate. Sows and gilts will become very thin unless pigs are weaned early. Not recommended for routine use. Consult your veterinarian.	
Atrophic Rhinitis: Bacterium Bordetella bronchiseptica Secondary invading bacteria	Nasal swabbing is a method to aid in the diagnosis and the control of this disease. Consult your veterinarian for details To reduce carrier state from sow to pigs, use 1 lb. of sodium sulfamethazine in 600 gal. of drinking water 3 weeks prior to farrowing (Many strains of Bordetella are resistant to sulfa drugs. Keep old sows in preference to gilts to reduce the amount of spread to pigs.)	None
Influenza Pneumonia: Influenza virus Pasteurella and other bacteria	Avoid bringing in new animals. Exposure to viruses, including influenza during gestation may affect the baby pig before birth.	Sulfathiazole[2] in drinking water. Individual treatment[2] Penicillin, injected[2] Oxytetracycline, injected[2] Tylosin, injected[2]

DISEASE/ CUASE	PREVENTION	TREATMENT
SMEDI Stillborn, Mummified pigs Embryonic death Infertility: Enteroviruses Influenza virus Pseudorabies virus Parvo virus Hog cholera virus and other viruses which may affect the unborn pig causing early embryonic death or mummification and stillborn or weak pigs at birth.	Co-mingle sows and gilts 30 days before breeding. Give fence line contact with new boars. Avoid exposure of pregnant animals to outside animals. Animals so affected usually will carry normal litters at the next breeding if not exposed to a different virus. This condition may recur in 2-3 years cycles on some farms.	None
Pseudorabies (Aujesky's disease) Virus, produces abortions, mummification of fetuses	Bring in blood test negative animals (SN).	None
Brucellosis: Bacteria Brucella suis Abortions	(See Boars)	None
TGE Transmissible Gastro-enteritis: Virus	Vaccination of the sow twice, [1),3)] 6 weeks and 2 weeks prior to farrowing	None Avoid outside exposures during farrowing periods

DISEASE/ CAUSE	PREVENTION	TREATMENT
Clostridial enteritis Type C: Bacteria Clostridium perfringens Type C	Vaccination of the sow twice,[3] 6 weeks and 2 weeks prior to farrowing	This is a disease of the baby pig which may be prevented by sow vaccination. Schedule the second vaccination as near to 2 weeks prior to farrowing as possible.
Erysipelas: Bacteria Erysipelothrix insidiosa	(See Boars) Vaccination of sow[3] can be done anytime during gestation, prefer before breeding to get maximum protection of sow.	May repeat vaccination 3-4 weeks prior to farrowing to help protect the baby pig (See Boars)
Leptospirosis: Bacteria Leptospira pomona, grippotyphosa, canicola, icterohemorrhagicae and other serotypes	(See Boars) Vaccination of sow[1)3)] can be done anytime during gestation. Prefer before breeding to get maximum protection. (Also see feed recommendations under Boars)	(See Boars)

1) Available through your veterinarian.

2) Follow your veterinarian and the manufacturers' instructions.

3) Slaughter not permitted for at least 21 days after biological products have been injected.

4) Ideally the choice of antibiotics should be based on antibiotic sensitivity tests. Consult your veterinarian for details.

DISEASE/ CAUSE	PREVENTIONS	TREATMENT
5) Most of the drugs listed should be considered as aids in prevention and treatment of the disease. Combinations of several of these drugs are permitted. See Feed Additive Compendium for any recent changes.		
Arthritis and Lameness: (Get proper diagnosis) Bacterium Mycoplasma hyosynoviae (gallinarum) Erysipelothrix insidiosa Mineral deficiencies injuries Foot pads and hoof wall cracks	Good selection practices may be an aid.	Treatment based on diagnosis[2] Tylosin Lincocin Penicillin Cortico steroids Anti-swine Erysipelas serum
	Baby Pigs	
Hypodlycemia Sugar deficiency: Starvation Chilling	Avoid chilling Allow pigs to nurse shortly after birth (Don't keep the pigs away until the sow is through farrowing)	Dextrose or dark syrup by mouth or injected intraperitoneally as dextrose, solution[1]
Transmissible Gastro enteritis TGE Baby pig disease: TGE virus	Avoid exposure. Limit people, animals, trucks on the premises. Don't bring it home from markets or your neighbors. Sow vaccination (See Sows)	No treatment is of value. Normal electrolytes[1] in water will help to replace the fluid loss in pigs. If they are over 2-3 weeks of age you may save a few more pigs. Consult your veterinarian.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Clostridial enteritis: Bacteria Clostridium perfringens Type C	Sow vaccination[3] to protect baby pig through colostrum. (See Sows) Clostridium Type C antitoxin at birth. This may be too late sow vaccination preferred.	None
Pseudorabies (Aujesky's disease) Virus, produces central nervous disturbances, diarrhea, vomiting, severe death losses.	None See Sows Gestation/Farrowing	None
Non-specific diarrheas: E. coli and other	Before farrowing expose the sow and gilt to manure from the farrowing house. Bacterins to the sow (preferably autogenous) may be helpful. Sanitation of the building, wash and fumigate. Wash the sow or gilt when brought to the farrowing house. They may be carriers. Allow an interval between farrowings. Consult your veterinarian for a specific program.	Early treatment (First 24 hours most important) with an antibiotic or sulfonamide drug selected by using a sensitivity test[4] Where the problem exists, treatment at 24 hours whether scours is observed or not is a good practice.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Nutritional anemia: Iron deficiency	Inject with injectable iron compounds at 1-3 days of age. Inject into the muscle of the neck or under the skin of the neck or flank. Give a second injection if pigs are not starting to eat creep feed by 3 1/2 weeks of age. Oral iron dosed individually twice weekly until the pigs are eating will prevent anemia, but it is a time-consuming job. Oral iron in moss or feed is a valuable aid to prevent nutritional anemia.	Once anemia occurs use injectable iron compounds. Add additional iron and copper to the creep rations.
Pneumonia: Bacteria Pasteurella Mycoplasma Secondary to Atrophic rhinitis Drafts	Improve management, avoid drafts and chilling. Bacterins (preferably autogenous) for Pasteurella pneumonia.	Oxytetracycline[2)] Penicillin[2)] Tylosin[2)] These drugs are to be injected. Broad spectrum antibiotics oxytetracycline or chlortetracycline fed at high levels may be valuable in secondary chronic pneumonias.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Atrophic rhinitis: Bacteria Bordetella bronchiseptica	Nasal swabbing of sows. (Consult your veterinarian about the merits and demerits of nasal swabbing.)	Chlortetracycline 100 g/ton Sulfamethazine 100 g/ton Penicillin 50 g/ton
	Rhinitis-free breeding stock.	Chlortetracycline 100 g/ton Sulfathiazole 100 g/ton Penicillin 50 g/ton
	Wean pigs early in infected herds.	
	Save older sows to raise replacement gilts.	
	Avoid stress conditions; enteritis, anemia, pneumonia and parasites which will make the effects of rhinitis more severe.	Tylosin 100 g/ton Sulfamethazine 100 g/ton
	Keep cats and other carrier animals out of the farrowing house, as they Bordetella bronchiseptica. Bordetella bacterin injected at 7 and 28 days of age. Consider only as an aid. Maintain good preventive disease practices as well as good nutritional level.	Use for a minimum of 5 weeks, preferably to at least 75 lb. in weight. Many strains of bacteria are resistant to sulfa drugs. To control secondary pneumonias it may be necessary to use these products to market weight. Antibiotics may be injected for treatment of individuals showing respiratory problems. (See pneumonia, baby pigs)
Inclusion Body Rhinitis (IBR) Virus, may be observed in conjunction with Bordetella bronchiseptica rhinitis	The effects of the disease may be quite severe in very young pigs. Keeping older sows may be of value	None

DISEASE/ CAUSE	PREVENTION	TREATMENT
Arthritis (Pyogenic): Bacteria Streptococci sp Corynebacterium sp Staphylococci sp	Clip needle teeth in first few hours, ear notch and dock pigs in a clean and sanitary manner. Avoid rough floors. Mechanical abrasions of the feet and knees occurs in first few hours of life. Disinfection of navels is important but other sources of infection are the ears, knees and tail in modern swine units. The use of epoxy paints to improve the floor surface may be helpful; avoid excessively smooth floors.	Oxytetracycline[2)] Penicillin[2)] Tylosin[2)]
Lameness: Navel infection Tail docking Foot and leg abrasions Other injuries	(See above) Use a sanitary method to reduce infection and control hemorrhage. Chicken debeakers are useful for this purpose as it cauterizes the tail stump.	Injectable antibiotics (See above)
Bacterial enteritis: Bacteria E. coli most common Erratic diet sow's milk and creep feed Pigs immune system at low point	Avoid chilling and drafts. Keep pens dry. Consider using creep feeds with lower protein levels that have additional lysine and other fortification added. Use nitrafurazone or sulfas in the drinking water at weaning. Carbadox in the feed may be of value. See note concerning the use of carbadox under Weanling Pigs and Finishing Hogs (Necrotic enteritis).	Nitrafurazone or Tetracyclines in pig's drinking water[2)]

DISEASE/ CAUSE	PREVENTION	TREATMENT
Weanling Pigs and Finishing Hogs		
Colibacillosis (Post weaning diarrhea) Feeder pig enteritis Non-specific bacterial enteritis: Bacterial Usually E. coli	Avoid stresses, feed changes. Medicate feed and/or water for 5-7 days during stress periods	See Necrotic enteritis Correct anemia if present Use injectable iron and copper. Normal electrolytes may be of value in the water. Additional fortification with B vitamins in the diet may be helpful at this time.

1) Available through your veterinarian.

2) Follow your veterinarian and the manufacturers instructions.

3) Slaughter not permitted for at lease 1 days after biological products have been injected.

4) Ideally the choice of antibotics should be based on antibiotic sensitivity tests. Consult your veterinarian for details.

5) Most of the drugs listed should be considered as aids in prevention and treatment of the diseases. Combinations of several of these drugs are permitted. See feed Additive compendium for any recent changes.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Edema disease (Enterotoxemia): Bacteria E. Coli Stress such as weaning, shipping, feed changes	Avoid stresses, Use feeds with higher fiber content during this period	Starvation for 24 hours Nitrafurazone or Tetracyclines in pig's drinking water [2]
Parakeratosis: Zinc deficiency High calcium Rations or other minearl imbalances	50 ppm of zinc added to the ration	150 ppm of zinc added to the ration Check the amount of calcium in the ration
Hemorrhagic syndrome (Bleeding disease): Anti-vitamin K factors? Mycotoxins Moldy feeds Unknown causes	Menadione Sodium Bisulfite 2 g/ton of feed	Increased levels of Menadione Sodium Bisulfite in feed and/or water
Jowl abscess (Cervical abscesses): Bacterial Streptococci sp most common Many others also associated with abscess formation	Vaccination at 10-15 weeks of age [1)2)] Chlortetracycline 50-100 g/ton to reduce incidence	Surgically drain abscesses (Limited value on a herd basis) Penicillin [2)] conduct sensitivity tests of bacteria present to determine correct antibiotic [4)]
Erysipelas: Bacteria Erysipelothrix insidiosa	Erysipelas vaccine [1)3)] (Avirulent) Erysipelas bacterin [3)] Oral Erysipelas vaccine	Penicillin [2)] Anti-swine erysipelas serum [2)]

DISEASE/ CAUSE	PREVENTION	TREATMENT
Necrotic enteritis Necro Bacterial enteritis Bacteria Salmonella sp. May be present as a systemic disease with little or no diarrhea present. Contaminated feed sources Carrier animals Isolated new animals for 3-4 weeks before mixing with other swine	Bacitracin 50 - 100 g/ton of feed Chlortetracycline 50-100 g/ton of feed Furazolidone 150 g/ton of feed or Furazolidone 200 g/ton of feed, 2 weeks 150 g/ton of feed, 3 weeks 100 g/ton of feed, 5 weeks	Bacitracin Not less than 100 g/ton of feed Carbadox* 50 g/ton not to be fed to swine over 75 lb. Chlortetracycline 100-200 g/ton feed Furazolidone 300 g/ton of feed feed for 10-14 days Neomycin sulfate 70-140 g/ton of feed Nitrafurazone 500 g/ton of feed 5-7 days water soluble form[2)]
	Oxytetracycline 50 g/ton of feed	Oxytetracycline 100 g/ton of feed Penicillin-Streptomycin combinations Maximum 90 g/ton of feed in combination. Sulfathiazole in drinking water[2)]

At this time carbodox has not been cleared for use in combinations with sulfa drugs. If you need sulfa drugs to add in controlling rhinitis and pneumonia consult your veterinarian for proper application of these products in your herd.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Hemorrhagic dysentery Vibrionic dysentery (Bloody scours): Vibrio coli Large spirochete Possible other unknown causes	Isolate new animals Avoid contaminated trucks and equipment Arsanilic acid or Sodium arsanilate 0.005-0.01 % 45-90 g/ton of feed	Carbadox 50 g/ton. Not to be fed to swine over 75 lb. Arsanilic Acid or Sodium arsanilate 0.025-0.04% for 5-6 days 230-360 g/ton of feed Sodium Arsanilate[2] Water soluble for drinking water 3 Nitro-4 Hydroxy Phenyl Arsonic Acid[2] 0.02% feed for 5-6 days
	Furazolidone 150 g/ton of feed or Furazolidone 200 g/ton, 2 weeks 150 g/ton, 3 weeks 100 g/ton, 5 weeks Lincomycin hydrochloride 40 g/ton	Furazolidone 300 g/ton Feed for 10-14 days Lyncomycin hydrochloride 100 g/ton for 3 weeks, then 40 g/ton Neomycin sulfate 70-140 g/ton of feed Nitrafurazone-water soluble
	Oxytetracycline 50 g/ton of feed Tylosin 100 g/ton of feed for 3 weeks, then 40 g/ton of feed to market weight	Oxytetracycline 100 g/ton Tylosin 100 g/ton of feed for 2-6 weeks after treating with tylosin in drinking water for 3-10 days[2]

DISEASE/ CAUSE	PREVENTION	TREATMENT
	Virginiamycin Aid in the control, in swine up to 120 lb. 25 g/ton	Virginiamycin Treatment and control 100 g/ton 2 weeks followed by 50 g/ton Treatment in non-breeding swine over 120 lbs. 100 g/ton for 2 weeks.
Pneumonias: Secondary to Atrophic rhinitis	See Atrophic rhinitis baby pigs	Individual injected[2] Oxytetracycline Penicillin
Secondary to influenza Pasteurella sp. Mycoplasma (VPP, SEP)	Early treatment Avoid drafts Problem herds can use Pasteurella[3] bacterins Avoid bringing in new animals; isolate all additions to the herd Reduce migration of Ascarids (Round Worms)makes the pneumonia more severe	Herd[2] Chlortetracycline Oxytetracycline Sulfamethazine Sulfathiazole Other sulfa drugs Expectorant drugs All of the above drugs for herd use are to be used in the drinking water. Tylosin plus sulfamethazine 100/100 (g/ton) in feed
Atrophic rhinitis: See baby pigs	Avoid stresses. Enteritis, pneumonia, parasites all make rhinitis more severe. Sulfamethazine, or sulfathiazole in the feed of small pigs, use for at least 5 weeks, preferably to 75 lb. in weight.(Many strains of Bordetella are resistant to sulfonamide therapy).	Sulfathiazole or Sulfamethazine in drinking water

DISEASE/ CAUSE	PREVENTION	TREATMENT
Arthritis:		Tylosin[2]
Bacterial		Lincocin[2]
Mycoplasma hyosynoviae (granularum)		Early treatment essential
Erysipelas		Penicillin[2]
		Anti-swine erysipelas serum[2]

1) Available through your veterinarian.

2) Follow your veterinarian and the manufacturers' instructions.

3) Slaughter not permitted for at least 21 days after biological products have been injected.

4) Ideally the choice of antibiotics should be based on antibiotic sensitivity tests. Consult your veterinarian for details.

5) Most of the drugs listed should be considered as aids in prevention and treatment of the disease. Combinations of several of these drugs are permitted. See Feed Additive Compendium for any recent changes.

DISEASE/ CAUSE	PREVENTION	TREATMENT
Tail biting: Tail biting Injuries Crowding Dietary deficiencies Lack of enough feeders and waterers Lack of bedding (bare concrete floors) Weather changes Manure pit gases Unknown causes	Remove tails on baby-pigs Well fortified rations Avoid crowding	Individual[2)] Penicillin Oxytetracycline Early treatment is essential Herd Organic iodides[2)] Magnesium oxide in feed Hay, paper sacks, tires, bowling balls, to give hogs something to reduce boredom. If closely confined move pigs to a larger pen or outdoors.
Anemia: Nutritional (iron deficiencies) Eperythrozoonosis (blood parasite) Moldy grains (blood loss from hemorrhages) Gastric Ulcers (blood loss) Vitamin K deficiency or interferences with absorption and utilization Post weaning diarrhea (secondary effect)		Acute hemorrhages as from ulcers and the effects of mold are seldom observed early enough to justify treatment. Other anemias are corrected by adding iron and copper to the diet. Injected iron is used in conjunction with other post weaning diarrhea treatments.

Common Parasites - Internal

PARASITES/ CAUSE	PREVENTION	TREATMENT
Ascarids Large round worm: Ascaris suum	Worm the sow prior to breeding and/or 2 weeks prior to farrowing. Wash sow thoroughly before farrowing. Raise pig in cleaned buildings or new hog pastures. Avoid old lots.	Sow Dichlorovos 7-10 days prior to breeding and/ or 2 weeks prior to farrowing. Piperazine in feed or water same schedule as for Dichlorovos Pig Dichlorovos mixed in feed at 4-12 weeks of age. Piperazine compounds in feed or water 6 weeks of age or older. Levamisole Hydrochloride in feed or water at weaning.
	Pigs Hygromycin B 12 g/ton of feed Thiabendazole 0.005 - 0.1% (45.4 - 908 g/ton) in feed. (administer continously, feed containing 0.05 - 0.1 % for 2 weeks followed by feed containing 0.005 - 0.02 % Thiabendazole for 8-14 weeks) Pyrantel Tartrate 96 g/ton (0.0106%) 21-28 day feeding.	Pyrantel Tartrate 800 g/ton (0.0881%)

PARASITES/ CAUSE	PREVENTION	TREATMENT
Lungworms: Metastrongylus sp.	Raise pigs in confinement. Avoid ingestion of earth worms.	Levamisole Hydrochloride in feed or water at weaning.
Whipworms: Trichuris sp.	General swine sanitation	Dichlorovos in feed as needed. Have your veterinarian check for the presence of parasites.
	Hygromycin B 12 g/ton	Hygromycin in feed. (An aid in treatment)
Nodular worm: Oesophogostomum sp.	Hygromycin B 12 g/ton of feed	Hygromycin B in feed Dichlorovos in feed Phenothiazine in feed Piperazine in feed or water Levamisole hydrochloride in feed or water
	Pyrantel Tartrate 96 g/ton (0.0106%) 21-28 day feeding	Pyrantel tartrate 800 g/ton (0.0881%)
Strongyloides: Strongyloides ransomi:	Strict sanitation in the farrowing house. Maintain sows and gilts in clean dry pastures during gestation.	Thiabendazole Baby pigs 1-8 weeks of age 200 mg to each 5-7 lb. of body weight. Repeat in 5-7 days if necessary

CAUTION: In the use of products for mange and louse control, follow manufacturers instructions for proper mixing and application. Avoid medicated hog oils on pregnant animals as abortions may occur. It is not safe to spray small nursing pigs.

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1) Available through your veterinarian.

2) Follow your veterinarian and the manufacturer's instructions.

3) Slaughter not permitted for at least 21 days after biological products have been injected.

4) Ideally the choice of antibiotics should be based on antibiotic sensitivity tests. Consult your veterinarian for details.

5) Most of the drugs listed should be considered as aids in prevention and treatment of the disease. Combination of several of these drugs are permitted. See Feed Additive Compendium for any recent changes.

PARASITE/ CAUSE	PREVENTION	TREATMENT
	Thiabendazole in feed at a level of 0.05 - 0.1 % has been reported to be of value.	

Common Parasites - External

PARASITE/ CAUSE	PREVENTION	TREATMENT
Mange: Sarcoptes scabiei Demodex phylloides	Dip or spray all new animals arriving at the farm. Routinely schedule spraying at 2 week intervals of animals and premise until control is achieved.	Toxaphene Malathion Coumaphos (Do not use on pigs before weaning) Use above as a dip or spray
Lice: Haematophinus suis	Dip or spray all animals arriving at the farm. Routinely schedule spraying at 2-3 week intervals of animals and premise until control is achieved.	Toxaphene Malathion Coumaphos (Do not use on pigs before weaning) Use above as a dip or spray Crotoxyphos (Ciodrin) Fenthion (Tiguvon) Use above as a single application pour on the back line.

VII. BUILDING AND EQUIPMENT

The principles to construct the housing of hogs are:

1. Arrangement of pig houses.
2. Arrangement and number of pen.
3. Width of pen.
4. Form of Roof.
5. Material of floor and it's slope.

Table 10. Standard Height of a Pence of a Pen

Type of Pen	Height	Interval
Farrowing Pen	90 cm	4 - 5 cm
Sow Pen	90	8 - 10
Boar Pen	110 - 120	8
Rearing Pen	85	6 - 7
Fattening Pen	85	7 - 8

Figure 6. Farrowing Pen (Unit : cm)

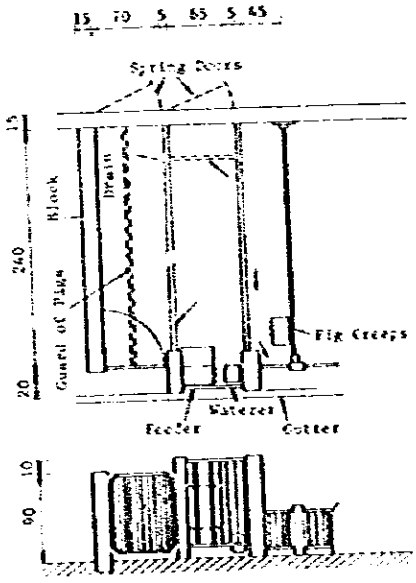


Figure 7. Farrowing Stall (Unit : cm)

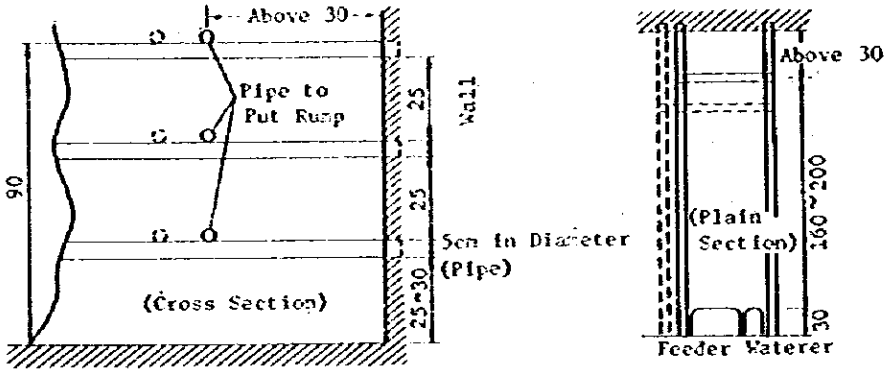


Figure 8. Boar House (Unit : m)

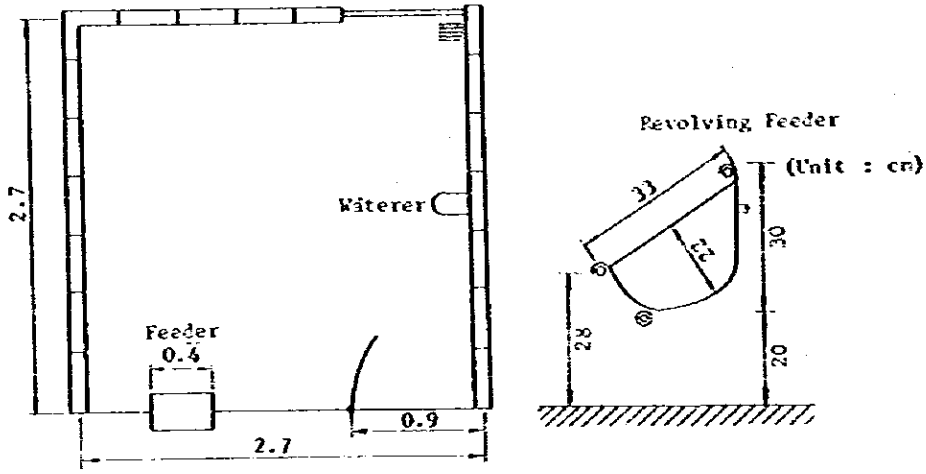


Figure 9. Sow House (Unit : m)

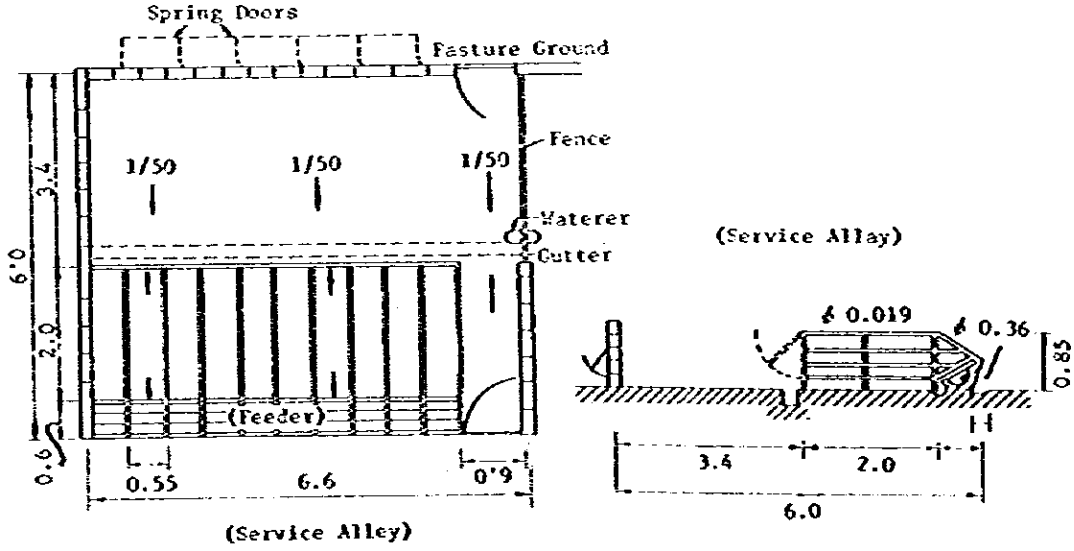
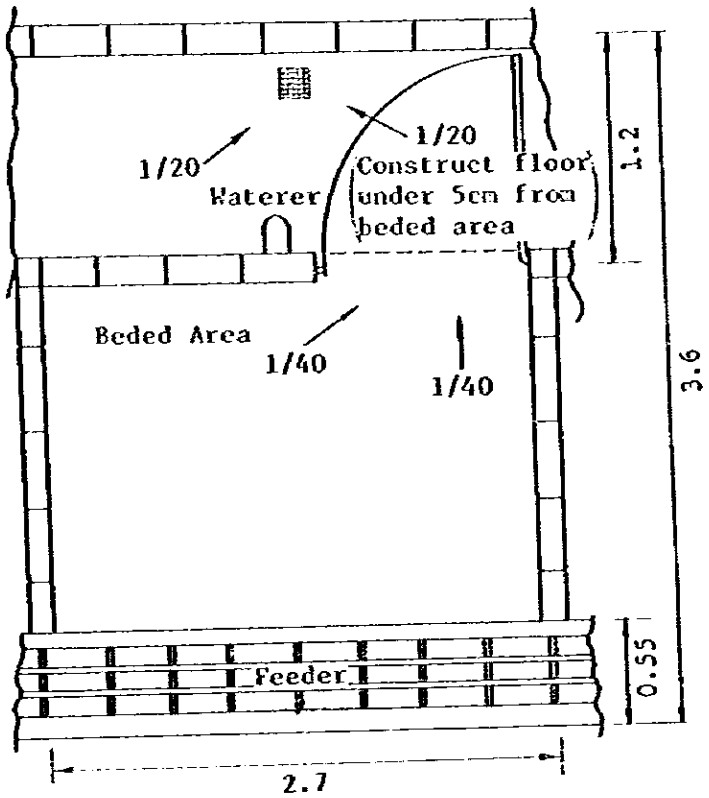


Figure 10. Fattening House (Unit : m)



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