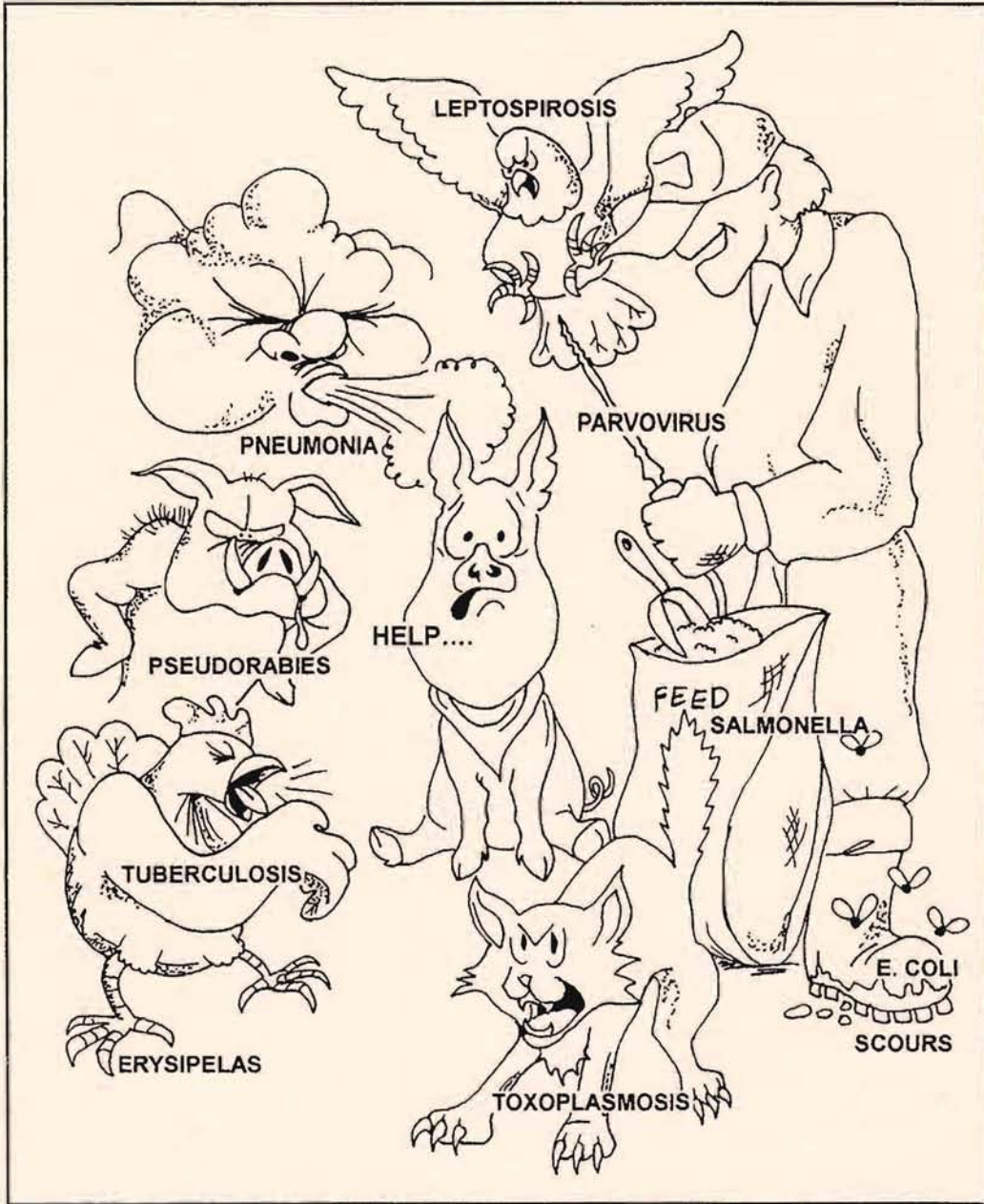


Swine Management Manual



ADAP
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SWINE MANAGEMENT MANUAL

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Swine Management Manual

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A Health Program for Swine

A HEALTH PROGRAM FOR SWINE

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REFERENCES

HEALTH PROGRAM FOR SWINE

INSTRUCTOR'S NOTES

I. INTRODUCTION

- A. Successful swine production requires the application of health-conserving, disease-preventing, and parasite-controlling measures to the breeding, feeding, and managing of the herd.
- B. By nature, pigs possess clean habits. However, in many cases they are kept in old, crowded, and filthy quarters.
- C. Such conditions favor the attack by the common diseases and parasites of swine.

II. SWINE HEALTH GUIDELINES

A. Sows

1. Farrowing quarters

- a. Clean farrowing quarters thoroughly a few days before parturition.
- b. Scrape loose dirt and dust from the ceiling and walls.
- c. Remove litter, filth, and manure from the floor.
- d. Disinfect the floors and walls with a mixture of one pound of lye to fifteen gallons of water.
- e. Disinfect watering and feeding equipment chemically or with scalding hot water.

2. Sow cleanliness

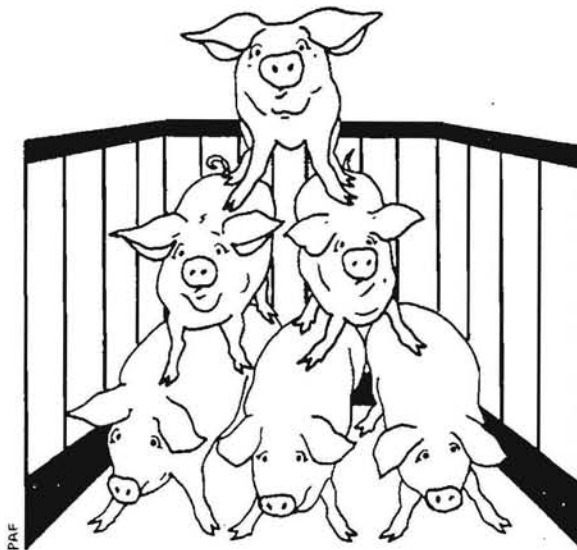
- a. Before moving the sows into the farrowing quarters, scrub them with soap and warm water, especially around the udder and belly.
- b. This removes adhering parasite eggs (especially round worm) and disease germs.

B. Piglets

1. Until the newborn pigs are moved to clean ground, place a little uncontaminated sod in the corner of the pen daily. This precaution will help prevent anemia. Commercially available iron supplements can be given as injections in areas that have access to these products.
2. When the pigs are ten days to two weeks old, haul the sow and litter to a clean pasture, preferably one that has been plowed since it was last used by hogs. (Because of the hazard of worm contamination, haul, don't drive, the animals to the pasture.)
3. Vaccinate all pigs for cholera.
4. When swine erysipelas exists, the baby pigs should receive the serum treatment at a few days of age and again just before weaning time. In highly infected areas where death losses are excessive, vaccination may be used to good effect.
5. In valuable purebred herds, a brucellosis herd test should be made annually and more frequently if the disease is encountered.

C. Housing and lots

1. Satisfactory housing is essential because hogs are more sensitive to extremes of heat and cold than other farm animals.
2. Divide the hogs into small groups based upon size, age, and sex. Young hogs do not thrive when forced to pile up in sleeping quarters or when crowded away from the feed trough by larger animals.



3. Sanitation

- a. Housing should be dry, easy to clean, sanitary, and well ventilated.
 - b. Keep the bedding clean, fresh, and dry at all times.
 - c. Disinfect the floors and walls at frequent intervals. When weather conditions permit, open housing to direct sunlight .
 - d. Avoid muddy lots and wallows. Keep the fence rows clean and free from weeds.
 - e. Do not allow manure, food remains, and other litter to accumulate in the lots. Spread pig manure onto a field where pigs do not run.
 - f. Destroy all rats and burn or deeply bury all carcasses of hogs that die on the farm.
4. If parasites or disease are encountered, isolate the infected animals, consult a veterinarian, and apply the recommended medicine or insecticide.

D. Feeding and watering areas

1. Concrete feeding floor

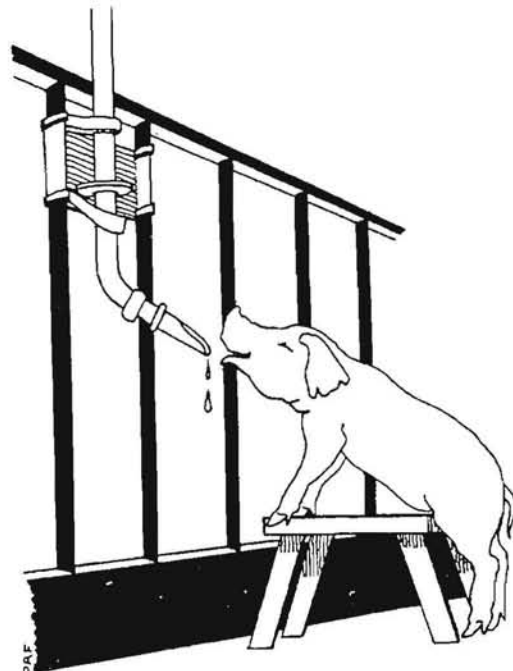
- a. Especially desirable during the rainy season.
- b. A concrete floor is a necessity for successful garbage feeding and it should be cleaned daily.

2. Provide clean fresh water in a suitable trough or drinking fountain.

3. Feed a balanced ration at all times.

4. To prevent contamination by excreta, design the feed and water facilities so the pigs cannot get their feet or bodies into them.

5. Ring the snout in order to prevent rooting.



E. Breeding

1. Avoid both overweight or underweight breeding animals.
2. Select breeding stock from disease-free herds.
3. Quarantine all new animals for at least two weeks before introducing them into the herd.
4. Do not permit commercial truckers of stock to drive on the premises unless the truck has been thoroughly disinfected.
5. Force the brood sows and the herd boar to take plenty of exercise.

III. DISEASES ASSOCIATED WITH FARROWING

A. MMA Syndrome (mastitis, metritis, and agalactia)

1. Causes
 - a. These diseases are particularly prevalent in large intensive swine operations.
 - b. They are frequently precipitated by damp, dirty pens, or drafty conditions.
 - c. Mastitis is caused when the piglet's sharp teeth cut the sow's teats.
2. Symptoms
 - a. In the earlier stages the sow is short-tempered and the piglets do not get enough milk.
 - b. The gilt or sow stops eating, becomes depressed, and has a fever.
 - c. With mastitis, it may be possible to detect a swollen part of the udder and clotted milk may be expressed.

3. Prevention and treatment

- a. These conditions respond to antibiotic treatment but it is important to treat them early to avoid loss of milk to the baby pigs.
- b. Keep the sow on a laxative diet at farrowing time. Maintain a regular exercise schedule.
- c. Scrub the farrowing pens to avoid the build-up of infection.
- d. Piglets from severely affected sows can be saved by artificial rearing with cow's milk with 5% dried milk added. They can also be cross-fostered if sufficient foster sows are available.

B. Abortion

1. Causes

- a. There are many causes of abortion and its presence may reflect a general disease throughout the herd.
- b. A rate of 2% is acceptable; a higher rate demands attention.
- c. In many parts of the world, porcine brucellosis causes sows to abort and piglets to be born weak. Adult boars may show an enlargement of one or both testes.

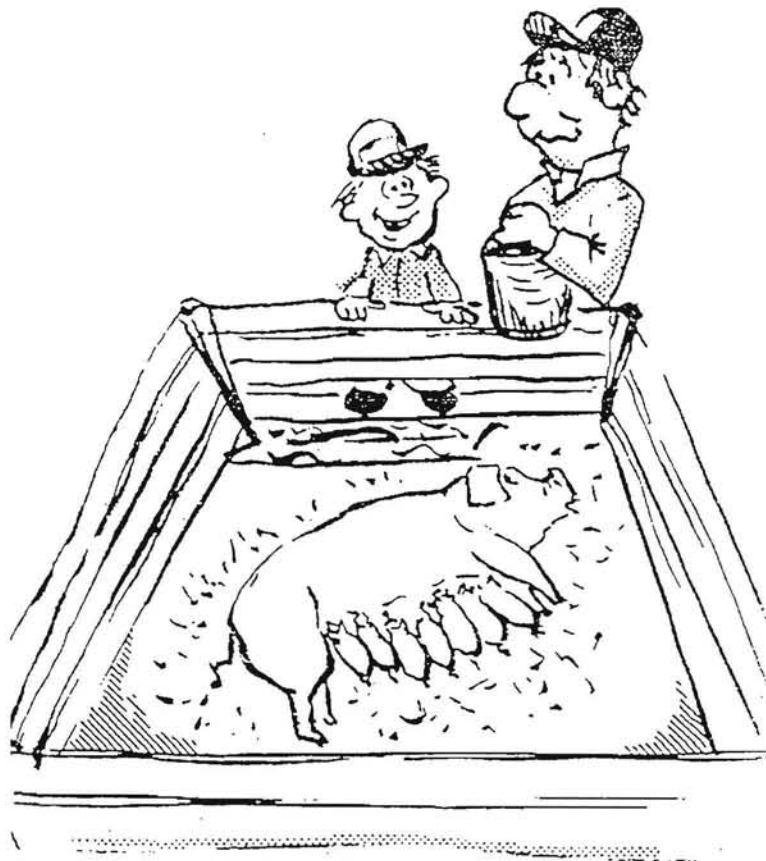
2. Treatment

- a. There is no appropriate treatment but prevention can be ensured by selecting pigs from brucellosis-free herds, preferably with initial blood testing.
- b. In all cases of abortion, fetuses and membranes should be carefully disposed of either by burning or deep burial.

IV. DISEASES OF BABY PIGS

A. Early death

1. Some piglets die when the sow crushes them, especially when the farrowing pen has no guard rail or when the piglets are weak because the sow is not producing enough milk.
2. Crushing may also occur in very hot weather when the piglets lie scattered on the floor of the pen.



B. Scours

1. Causes

- a. Early death is often caused by an *E. coli* infection which is picked up from the dam's milk, uterine discharges, or dung.
- b. Within the first week of life, apparently healthy pigs become dull; they may scour, develop a subnormal temperature, and die.
- c. A similar but less acute attack may be seen at about three weeks when the immunity provided by the colostrum begins to weaken.

2. Treatment and prevention

- a. Antibiotic treatment of infected pigs is a temporary cure.
- b. Long-term strategies
 - i. Leave disinfected farrowing pens empty for at least a week before putting in the next sow.
 - ii. Avoid drafts and chills by supplying sufficient bedding and a cover for the creep area where day and night temperatures fluctuate considerably.
 - iii. Avoid buying new sows that may carry infection. Buy weaner stock and rear sow replacements.
 - iv. For certain strains of *E. coli*, vaccines are available and may be helpful if administered by a veterinarian to the sows during pregnancy.

C. Transmissible gastroenteritis

1. This is a very acute scour caused by a virus which kills young piglets quickly after the onset of a greenish diarrhea with excessive thirst and vomiting.
2. Older pigs may show diarrhea with no fever.
3. Treatment is of little use, although isolation of affected pigs can be tried.
4. Once the disease has occurred in a herd, it is unlikely to strike again except when new gilts are introduced. Expose them to the disease in early pregnancy on entering the dry sow house.

D. Anemia

1. If piglets have no access to soil, they require paste or preferably an injection of iron within the first week of life.
2. Piglet anemia causes a failure to thrive and yellowish scours at 2-3 weeks of age.

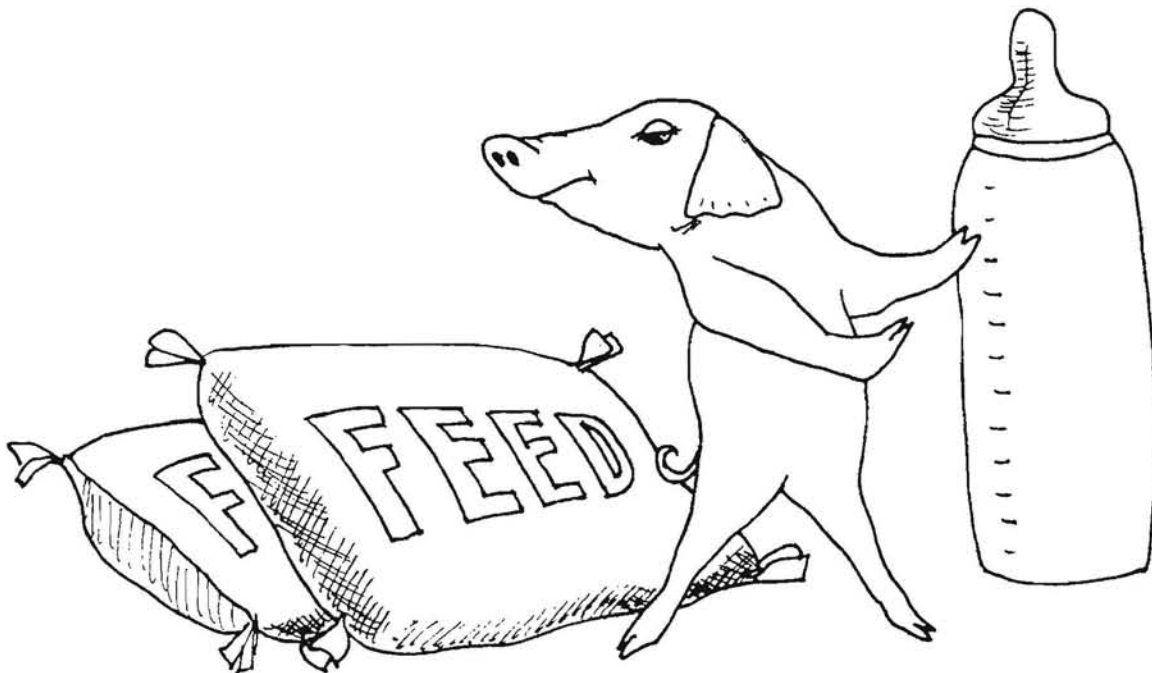
E. Genetic diseases

1. Watch for litter abnormalities; they are often caused by a particular boar.
2. Defects include scrotal and umbilical hernias, absence of the anus, and splay legs.
3. Replace the suspect boar at once and check the new boar on the same sows.

V. PROBLEMS ASSOCIATED WITH WEANING

A. Stress reactions

1. Stress caused by taking the piglets from their mother and putting them in a different environment can trigger various disease conditions, especially those associated with the rapid build-up of *E. coli*.
2. Affected pigs may scour, become dull, refuse to eat, and even die. Some recovered pigs fail to thrive.
3. With edema, one or two deaths occur, some piglets show unsteadiness of the back legs, and there is a noticeable change in the sound of the pig's squeal.
4. Treatment
 - a. Remove the piglets from the sow gradually to avoid a sudden change in diet. Use an easily-digested starter or creep-feed.
 - b. For edema, do not feed the piglets for 12 hours but give them plenty of clean water. Keep the food laxative for a couple of days even to the extent of adding magnesium sulphate to the feed. Follow with a period of restricted feeding.
 - c. For post-weaning scour, antibiotics may be used but they are costly. Examine your management practices first to see if improved sanitation and diet control will solve the problem.



B. Salmonellosis

1. The disease is introduced by infected carrier pigs or in feed.
2. The acute form causes high fever, bloody scour, and some deaths.
3. A laboratory culture of the feces is necessary for diagnosis.
4. Antibiotics are of limited use and they do not prevent the development of carrier animals which excrete the disease organism.
5. Good sanitation is very important in preventing the disease. Vaccines are available for some *Salmonella* infections if other measures are inadequate.

C. Vibrionic scour

1. This bacterial infection may be started by introduced weaners, however, poor management will make outbreaks more severe.
2. The disease manifests as diarrhea with blood stains which may become black and watery in consistency.
3. Fever is transitory. A hemorrhagic and necrotic lining of the lower bowel is characteristic at postmortem.
4. Treatment
 - a. Forms of treatment include Dimetridazole, Tylosin, and arsenicals.
 - b. They should be given in water rather than feed, because affected animals are more likely to drink than to eat.
 - c. It may be necessary to continue the treatment at a low level for several months to prevent reoccurrence of the disease.

D. Enzootic pneumonia and other respiratory diseases

1. Enzootic pneumonia is widespread in the tropics and affects pigs of all ages. Coughing is the main symptom.
2. It occurs through close contact between healthy and infected pigs and is prevalent in densely-stocked intensive units.
3. The sow passes the infection to her litter during the suckling period. Weaners may contract the infection when mixed with pigs from another source.

4. The disease is associated with retarded growth and is a cause of considerable economic loss to the pork producer.
5. Secondary bacterial infection may cause a sudden onset of acute pneumonia which is made worse by a change in ventilation or weather conditions. It quickly leads to death unless treated immediately.
6. Treatment
 - a. Enzootic pneumonia is more prevalent in herds with many young and newly-introduced sows. Careful husbandry to extend the useful breeding life of sows and limiting importation will assist the development of a resistant herd.
 - b. To eliminate the disease it is necessary to start with disease-free stock which may not be readily available.
 - c. Alternatively, older sows may be bred in isolation and their litters checked for infection by clinical and laboratory tests. This requires a considerable long-term effort.
 - d. Treatment of the chronic pneumonia is of little use unless you ensure an environment that is draft-free and dry to maintain the pig's natural resistance.

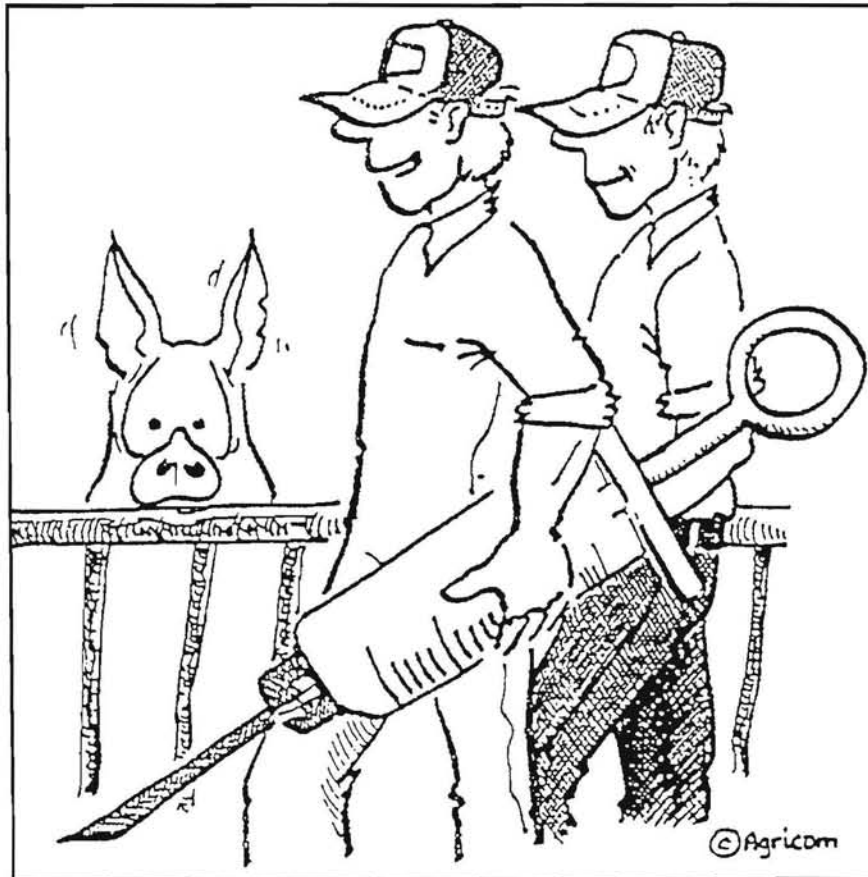
E. Erysipelas

1. The bacterium that causes this disease originates in the soil but it is also carried by individual pigs.
2. In young pigs, the infection causes a batch of dull animals with a fever, suppressed appetite, redness of the skin, and frequently a number of deaths.
3. In older pigs, the fever is associated with raised, red, diamond-shaped patches on the skin.
4. In adult pigs, a chronic infection causes sore joints and heart valve lesions which lead to blue extremities and difficulty in moving around, particularly in pregnant sows.
5. Where the disease is present, vaccinate all pigs over weaning age. Penicillin is effective in the acute stage of the disease.

VI. DISEASES THAT AFFECT PIGS OF ALL AGES

A. Swine fever

1. This viral disease causes many deaths. It can be confused with acute erysipelas
2. Symptoms include a reduced appetite and rough appearance followed by swaying of the back legs, diarrhea, and sometimes a cough.
3. African swine fever, carried by native pigs and transmitted by the flea, is similar to acute swine fever.
4. Notify veterinary authorities if either one of these diseases is suspected.
5. Treatment is of little use, but infected pigs should be isolated and, in the case of swine fever, the clean pigs vaccinated.
6. Pigs vaccinated against true swine fever are still susceptible to the African disease.



"I LOVE the look on their faces when I walk in here with this fake needle."

B. Foot-and-mouth disease

1. This viral disease is highly infectious. It causes fever and listlessness.
2. Blisters may appear on the feet, snout, udder, and mouth. Secondary infection frequently leads to such extreme lameness that there may be an actual separation of the claw.
3. Primary infection is usually caused by the feeding of infected bones or meat waste. Boil all feed of this nature until it is fully cooked.
4. Secondary infection is frequently caused by birds or people moving between units.
5. If you suspect the disease, inform a veterinarian and stop all stock movement.
6. When the infected area is emptied, disinfect the pens and yards and leave them vacant for one month.
7. Vaccines are available to help control this disease.

C. Anthrax

1. When sudden death occurs in healthy weaner and adult pigs, anthrax should always be considered as a possible cause.
2. Some cases of anthrax cause swelling under the jaw but at death there is little to see except perhaps a blood-stained discharge from the mouth or anus.
3. Infection is caused by the ingestion of *B. anthracis* spores from contaminated feed or pasture. Exercise extreme caution because the spores are lethal to humans.
4. Where facilities are available, smears of the pig's blood should be tested for the anthrax bacillus.
5. To avoid releasing the spores if the test results are positive, do not open the carcasses. Burn or bury them deeply.
6. Formalin is the disinfectant of choice, but hypochlorites (bleaches) may be more practical under certain circumstances.
7. The disease is unlikely to be other than sporadic but vaccination should be used to protect a herd.

D. Worms

1. Occurrence

- a. Worm infestation is a common hazard in all livestock.
- b. In the tropics there is a particular danger in pastures because the climate is conducive to the infective worm larvae which hatch from eggs passed in the feces.

2. Round worm (*Ascaris lumbricoides*)

- a. This worm causes ill-thrift and coughing in young pigs during larval migration through the body.
- b. Growth rates are reduced in weaner pigs once the adults worm migrate through the lungs and liver and settle in the small intestine.
- c. Eggs passed in the feces are fairly resistant to drying out and young pigs are easily infected by the mother.

3. Stomach worm (*Hystrongylus*)

- a. This worm occurs in older pigs.
- b. It causes ill-thrift and excessive wastage of feed.

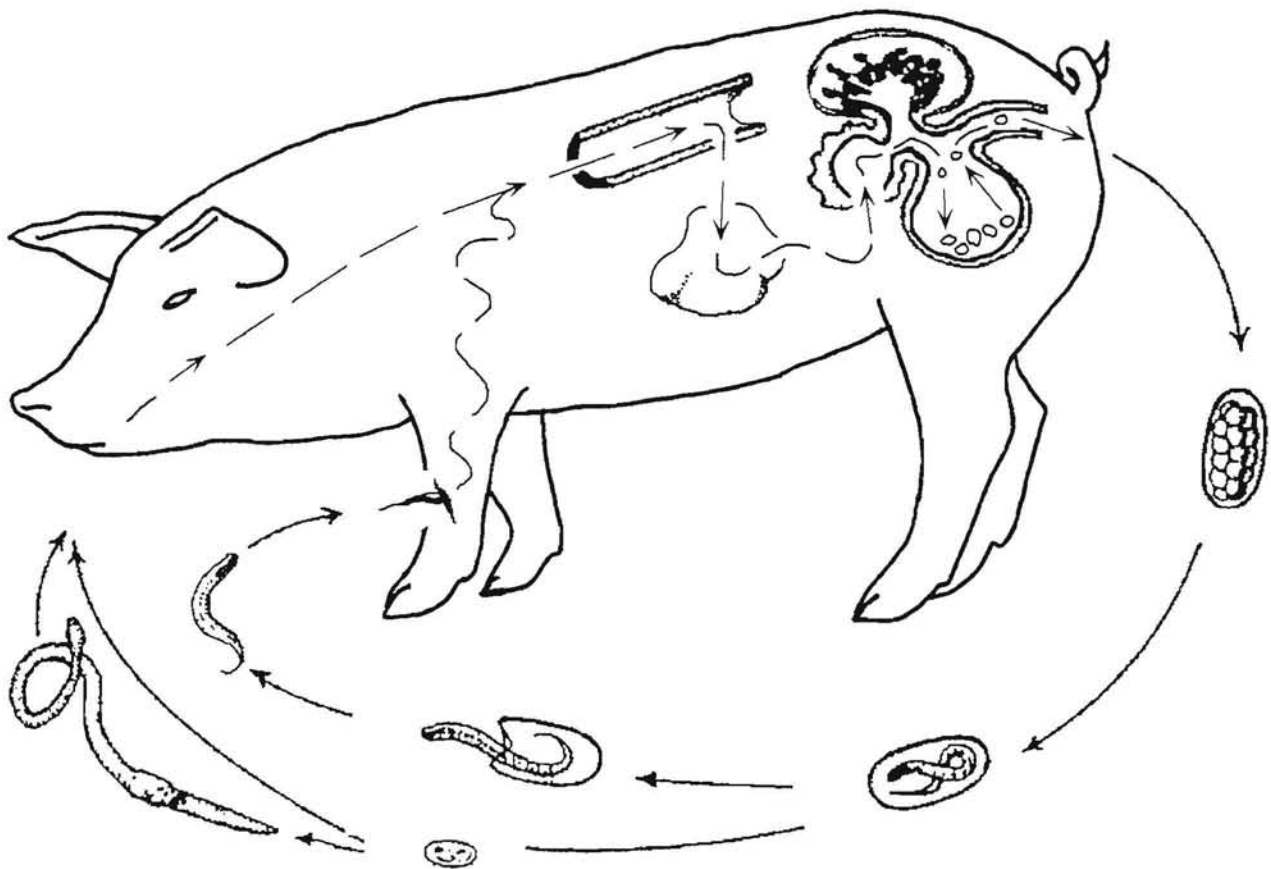
4. Lungworms

- a. Lungworms cause coughing and predispose the pigs to secondary pneumonia.
- b. The worms are visible at post-mortem if a lower tip of a lung is cut and the bronchi squeezed. A mass of white hair-like worms will emerge.

5. *Trichinella*

- a. The encysted larvae are found in the muscle.
- b. The parasite is rarely diagnosed during the life of the pig but it is a public health hazard.

6. The nodular worm (*Oesophagostomum*) frequently causes anemia and scours that are sometimes bloody.
7. The whip worm lives in the large intestine and causes diarrhea and weight loss.
8. Kidney worm (*Stephanurus dentatus*)
 - a. The eggs are excreted in the urine and hatched larvae migrate through the pig.
 - b. The worm causes tissue damage to the liver and kidneys.



LIFE CYCLE OF KIDNEY WORM (*Stephanurus dentatus*)

9. Treatment and control of worms

- a. Good management is essential for effective worm control. Badly surfaced and poorly drained yards are difficult to manage properly.
- b. Clean the pens with washing soda or disinfectant.
- c. Regularly move pigs at pasture to avoid the buildup of too many infective larvae. This is particularly important in the control of kidney worms.
- d. Strategic treatment is useful and frequently necessary. Piperazine is only of use against the round worm and nodular worm. Broader spectrum anthelmintics such as Thibendazole are necessary for effective treatment of the other parasites.
- e. Fecal examinations for worm eggs and post-mortem checks are useful in detecting the type of infection.
- f. Worm sows and gilts one or two weeks before farrowing.
- g. Dose young pigs with Piperazine at seven weeks and again six to eight weeks later.
- h. Routinely dose all pigs that are introduced to the unit.
- i. Practice strict rodent control to prevent *Trichinella* infection.

E. Skin parasites

1. Sarcoptic mange

- a. Sarcoptic mange is perhaps the most common of the skin conditions of pigs.
- b. The mites burrow into the skin and cause severe irritation. The area around the ear is the most affected.
- c. The skin eventually crusts over and the condition of the animal deteriorates.
- d. Older, healthy carriers may pass the infection to piglets.
- e. If young animals have their resistance lowered by other disease or by management factors, they may become severely infected with mange and may even die.

- f. Treatment
 - i. Treatment with sprays or Ivermectin injection is effective.
 - ii. Treat all gilts and sows with an anti-mange preparation before putting them in a clean pen.
 - iii. Scrub and disinfect all houses including outside yards between each batch of pigs.

2. Lice

- a. Lice are picked up from other infected pigs since they can live only on the pig.
- b. They suck the animal's blood and cause severe itching. They are also the vectors for pig pox.
- c. Several preparations are effective for treatment and introduced stock should be treated upon arrival.

VII. CONDITIONS ASSOCIATED WITH MANAGEMENT

A. Heat stroke

1. Causes

- a. Inadequate shade or ventilation may cause pigs to become comatose. It is most common with heavier pigs.
- b. Lame heavy animals become too weak to seek the shade.
- c. Large White and Landrace breeds are particularly susceptible.

2. Prevention and treatment

- a. Provide adequate shade and ventilation.
- b. Sprinkle affected animals. To avoid shock, make sure the water is not too cold.
- c. Sprinkling is a useful preventive measure when heat is excessive.

B. Lameness

1. Causes

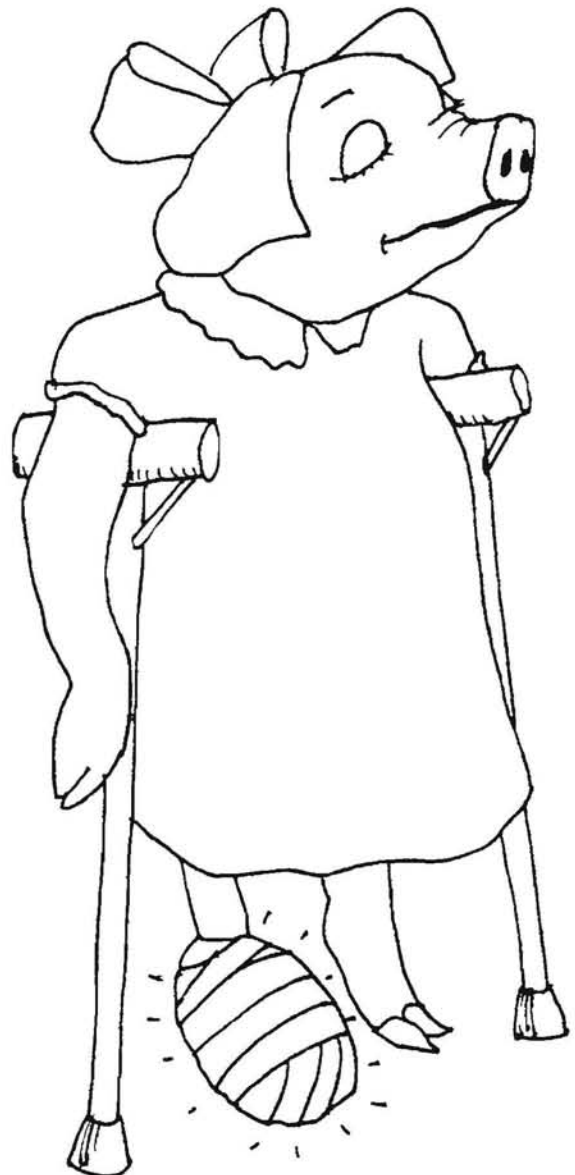
- a. This is frequently a problem of heavier pigs housed on concrete or rubble floors.
- b. Confirm that the trouble lies in chronic foot lesions rather than post-erysipelas, arthritis, or bacterial joint infection in the younger pig.
- c. A sudden onset of lameness in a batch of pigs may indicate foot-and-mouth disease.
- d. The most persistent lameness causes cracks and infection in the wall and sole of the feet.

2. Prevention

- a. Eliminate or resurface excessively rough concrete floors.
- b. Drain soggy areas and fence off stony ground.

C. Routine use of drugs in the feed

1. The inclusion in the feed of low-level antibiotics as growth promoters has become a common practice.
2. The benefits are most evident where husbandry is poor or there is sub-clinical disease.
3. Disease organisms may become resistant to the antibiotics.
4. Sick animals may not be eating, therefore combine in-feed medication with oral dosing.



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Vaccination and Parasite Control

VACCINATIONS AND PARASITE CONTROL

WORKSHOP OUTLINE

I. VACCINATION PROGRAMS

- A. Introduction
- B. Gilts and Sows
- C. Boars
- D. Piglets

II. ADMINISTERING MEDICATION

- A. Injections
- B. Sprays
- C. Administering medication in feed
- D. Administering medication in water

III. DISEASES THAT CAN BE CONTROLLED WITH VACCINES

- A. Erysipelas
 - 1. Cause
 - 2. Symptoms
 - 3. Treatment and control
- B. Leptospirosis
 - 1. Cause
 - 2. Symptoms
 - 3. Treatment and control

C. Porcine Parvovirus (PPV)

1. Cause
2. Symptoms
3. Treatment and control

D. Pseudorabies (Aujeszky's Disease)

1. Cause
2. Symptoms
 - a. Pigs less than 3 weeks old
 - b. Pigs 3 weeks to 5 months old
 - c. Mature pigs
3. Transmission
4. Control

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A. External parasites

1. Characteristics
2. Hog lice
3. Mites
4. Fleas
5. Ticks
6. Screwworms

B. Internal parasites

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 - b. Life cycle
 - c. Symptoms
 - d. Transmission and control
2. Lungworms
 - a. Characteristics
 - b. Life cycle
 - c. Symptoms
 - d. Transmission and control
3. Whipworms
 - a. Characteristics
 - b. Symptoms
 - c. Prevention and control
4. Trichinosis
 - a. Cause
 - b. Symptoms
 - c. Transmission and control
5. Other internal parasites

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1. Considerations when choosing disinfectants
2. Safety precautions
3. Disinfectant procedures

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1. Buy healthy stock
2. Test breeding stock
3. Identification and delivery
4. Isolation
5. Farrowing area
6. Visitors

C. Sanitation practices

1. Vacate facilities
2. Cleaning and disinfecting
3. Footbaths
4. Farrowing area
5. Dead animal disposal

REFERENCES

VACCINATIONS AND PARASITE CONTROL
INSTRUCTOR'S NOTES

I. VACCINATION PROGRAMS

A. Introduction

1. Vaccinations are medications that protect against a specific disease. They are available for a number of diseases that affect swine.
2. Vaccination programs need to be tailored to each operation and should be developed in consultation with a veterinarian.
3. Vaccinations only raise the pig's level of resistance. If other important management procedures are neglected, even this elevated level of resistance may be inadequate to prevent disease.

B. Gilts and sows

1. Vaccinate sows for parvovirus and leptospirosis at least two weeks before breeding and against erysipelas two weeks before farrowing.
2. Treat the sows for worms and mange before moving them to the farrowing area.
3. Vaccinate gilts for parvovirus, leptospirosis, and erysipelas at 6 months of age or at least five weeks before breeding.

C. Boars

1. Treat boars twice a year for worms and mange and, if needed, trim their tusks.
2. Vaccinate them for parvovirus, leptospirosis, and erysipelas.

D. Piglets

1. At three days of age, piglets should receive an iron injection. At 3-7 days, they should be vaccinated against transmissible gastroenteritis (TGE).
2. Other management practices that should be considered are teeth clipping, tail docking, ear notching, and castration.

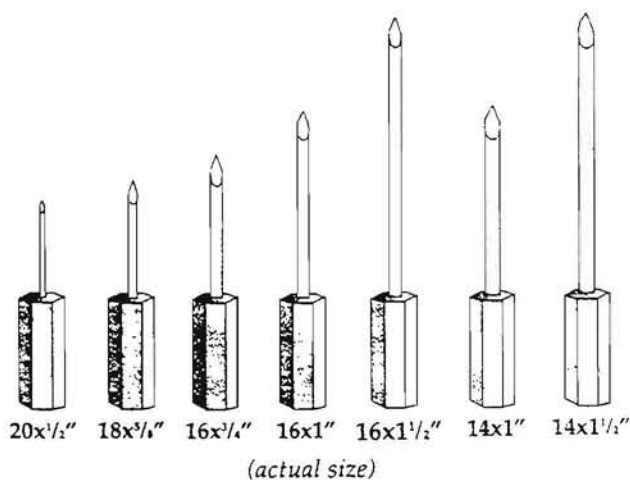
II. ADMINISTERING MEDICATION

A. Injections

1. Modern health practices require many types of injections. They provide pigs with iron, antibiotics, vaccines, anti-inflammatory drugs, and vitamins.
2. Injection guidelines
 - a. Sudden animal movement is the leading cause of inaccurate dosage.
 - b. Restrain pigs to ensure that they receive the proper dose at the correct site and to reduce needle breakage.
 - c. Mark treated pigs and keep accurate records to avoid marketing pigs before the proper withdrawal periods have expired.
3. Vaccines
 - a. Never mix different vaccines in the same syringe.
 - b. Mixing them may save time, but vaccines are formulated to induce a specific immune response when administered according to the label directions.
 - c. Mixing vaccines can inactivate one or both of the vaccines and can cause tissue irritation and abscesses.
4. Antibiotics
 - a. Do not mix antibiotics in the same syringe before injection.
 - b. Antibiotics are chemical compounds that have unique characteristics.
 - c. Mixing them may cause chemical reactions that inactivate one or both compounds.

INJECTION NEEDLE GUIDELINES

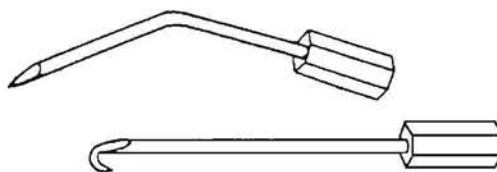
Use Proper Needle Sizes:



Intramuscular Injection		
	Gauge	Length
Baby Pigs	18 or 20	5/8" or 1/2"
Nursery	16 or 18	3/4" or 5/8"
Finisher	16	1"
Breeding Stock*	14 or 16	1" or 1-1/2"
* depends on backfat depth and method of restraint		
Subcutaneous Injection		
		Length
Nursery		1/2"
Finisher		3/4"
Sows		1"

Avoid Bent or Broken Needles:

- Ensure proper restraint of the animal prior to injection.
- Replace bent needles as they are prone to breaking.
- Replace needles every 20 pigs.

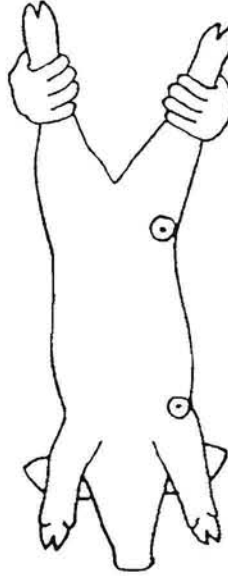


INJECTION METHODS

SUBCUTANEOUS (SQ):

Deposits the Drug Under the Skin:

- Inject only into clean, dry areas.
- Use the loose flaps of skin in the flank and elbow of small pigs.
- Use the loose skin behind the ear of sows.
- Slide needle under the skin away from the site of skin puncture before depositing the compound.



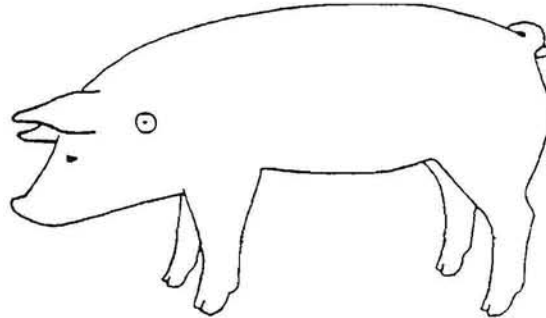
Correct Injection Techniques:

- Ensure proper restraint of the animal prior to injection.
- Ensure proper syringe adjustment.
- Ensure proper needle placement onto the syringe.
- Avoid swelling and/or abscessation at the injection site.
- Use properly cleaned needles.
- Inject only into clean and dry areas.
- Prevent contamination - don't use the same needle to inject pigs and remove product from multi-dose vials.
- Consult with your veterinarian about potential adverse drug and vaccine reactions.

INTRAMUSCULAR (IM):

Deposits the Drug Into the Muscle:

- Use a spot on the neck just behind and below the ear.
- The neck area should be used for IM injections.
- Damage to the ham can result in condemnation of the meat cut.
- Use proper needle size to ensure medication is deposited in the muscle.



INTRAPERITONEAL (IP):

- Should be used only upon veterinary instruction and guidance as serious injury to abdominal organs can occur.

B. Sprays

1. The effectiveness of the spray treatment depends on good restraint to allow complete coverage of the animal.
2. Spraying poses a danger to careless managers who breath the spray or wear contaminated clothing.
3. Mix the product completely prior to spraying to avoid overdosing the pigs.
4. Observe the withdrawal period for each product used.

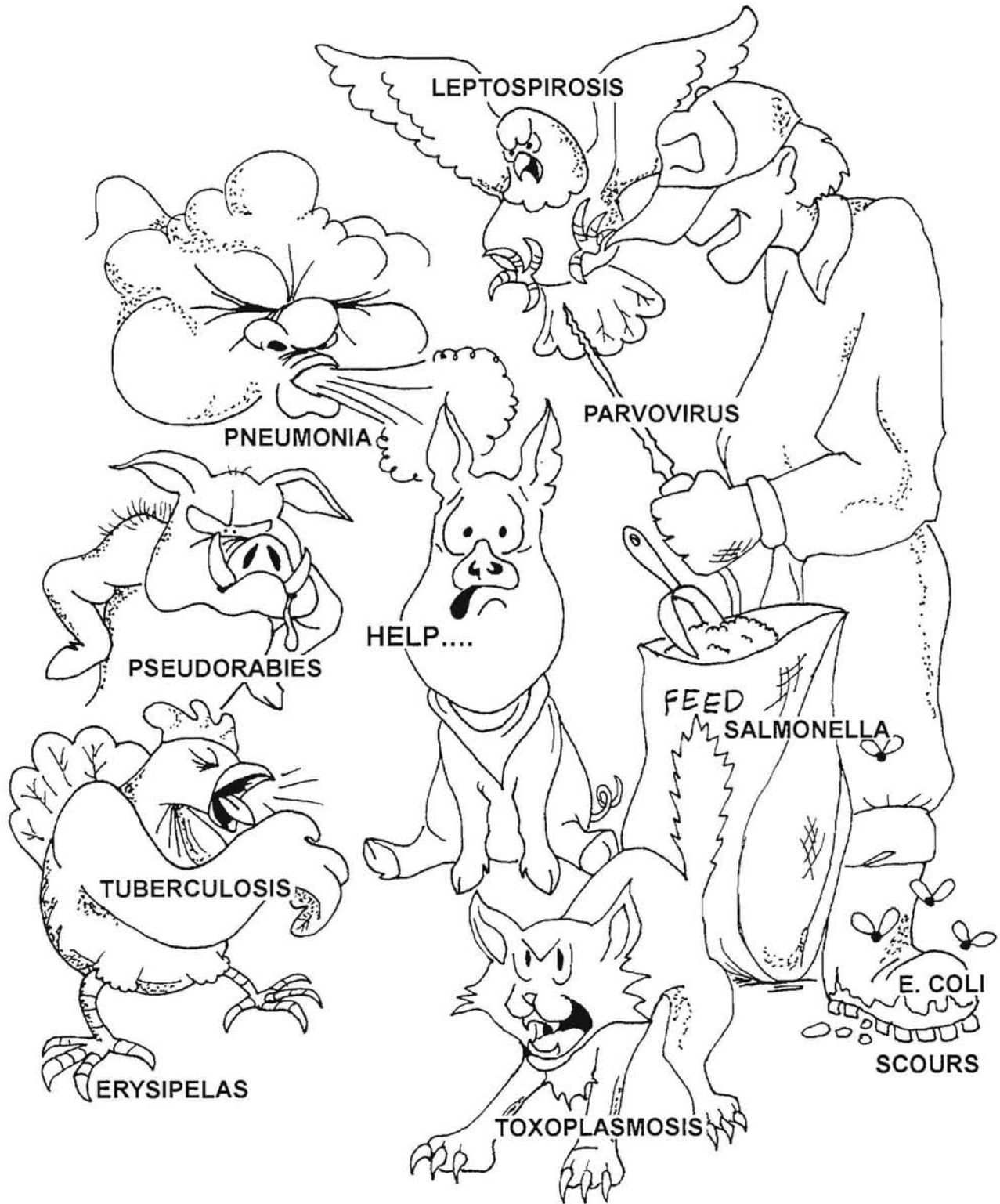
C. Administering medication in feed

1. Mix feed additives properly to prevent tissue residues.
2. Drug carryover in feeders, bulk bins, feed mixers, and in animal manure may also result in residues.

D. Administering medication in water

1. Large numbers of animals may be treated for a wide variety of bacterial and parasitic diseases quickly, economically, and easily.
2. Treatment via water is more effective than in feed because the animals will continue to drink water after they have stopped eating.
3. Make sure the water has no strong taste or odor after the medication is added. Otherwise, the animals will not drink it.
4. It is difficult to ensure that all animals in a pen receive the correct amount of medication because water consumption varies with pig size, stage of production, and environmental temperature.
5. To reduce the possibility of drug carryover, flush the water lines, tanks, and drinking cups after administering medication in drinking water.

DISEASES THAT AFFECT PIGS



III. DISEASES THAT CAN BE CONTROLLED WITH VACCINES

A. Erysipelas

1. Cause

- a. Erysipelas is caused by a bacterium that is harbored primarily by swine.
- b. It is also found in the feces of wild and domestic animals (primarily turkeys) as well as in contaminated soil and fish meal.

2. Symptoms

a. Acute form

- i. There may be high fever, loss of appetite, depression, skin lesions, and sudden death.
- ii. Diarrhea may be seen in younger pigs and abortion may occur in gestating animals.

b. Chronic form

- i. The primary chronic sign is lameness. The joints enlarge and are usually hard to the touch.
- iii. Heart valve lesions may cause difficult breathing after mild exertion, coughing, and fatigue.

3. Treatment and control

- a. Vaccinate pigs at weaning or when they leave the nursery.
- b. Vaccinate breeding stock before breeding.
- c. Use injectable penicillin and erysipelas antitoxin during an outbreak.

B. Leptospirosis

1. Cause

- a. Leptospirosis is caused by several closely related organisms that infect a variety of host species.
- b. It contaminates feed and water after being released in the urine of infected rodents, domestic, and wild animals.
- c. Infection can occur through intact mucous membranes (mouth, nose, eyes), breaks in the skin, or at breeding from infected urine or semen.

2. Symptoms

- a. The disease is mild and often overlooked.
- b. Late gestation abortion, stillborn, or weak pigs may occur in a susceptible herd.
- c. Fever and lack of appetite may appear in swine of all ages and a nervous form of the disease may affect suckling pigs.

3. Treatment and control

- a. Avoid bringing infected pigs into a healthy herd.
- b. Buy animals from lepto-free herds. Blood test them before buying. Testing identifies hogs that have had the disease, but it does not identify carriers.
- c. Isolate sows that abort, bury or burn all aborted material, and disinfect housing.
- d. Keep swine away from other animals.
- e. Avoid urine contamination of feed and watering equipment.
- f. Keep stock out of poorly-drained pastures, slow-moving streams, and ponds.
- g. Practice strict rodent control.
- h. Injectable dihydrostreptomycin is the drug of choice. High feed levels of tetracycline may be used as an additional preventive measure in a high-risk herd.
- i. Vaccinate with a 5-strain leptospirosis vaccine 2-3 weeks before breeding.
- j. Consult a veterinarian in case of a disease outbreak.

C. Porcine Parvovirus (PPV)

1. Cause

- a. The disease develops mainly when sero-negative sows are exposed oro-nasally to the virus during the first half of gestation.
- b. Fetuses are infected before their immune system develops.
- c. There is no evidence that infection of swine other than during gestation is of any clinical or economic significance.
- d. The virus is common among swine and is enzootic in most herds that have been tested.

2. Symptoms

- a. The major clinical response is maternal reproductive failure.
- b. The pathologic sequence depends on when exposure occurs during gestation.
- c. Dams may return to estrus, fail to farrow despite being anestrous, farrow few pigs per litter, or farrow a large proportion of mummified fetuses. These signs can reflect embryonic or fetal death or both.
- d. The only outward sign may be a decrease in maternal abdominal girth when fetuses die at mid-gestation or later and their associated fluids are reabsorbed.
- e. Other manifestations are maternal infertility, abortion, stillbirth, neonatal death, and reduced neonatal vitality but they are a minor component of the disease.
- f. Mummified fetuses in a litter can prolong gestation and the farrowing interval.
- g. There is no evidence that fertility or libido of boars is altered by the infection.

3. Treatment and control

- a. Vaccination is the only way to insure that gilts develop active immunity before conception.
- b. Vaccinate several weeks before conception but after the disappearance of passively acquired colostral antibodies that could interfere with the development of active immunity.
- c. Vaccinate boars to reduce the spread of the virus.

D. Pseudorabies (Aujeszky's Disease)

1. Cause

- a. Pseudorabies is caused by a herpes virus which affects the nervous and respiratory systems. Severe itching and self-mutilation are seen in most species, but rarely in swine.
- b. Aujeszky first recognized pseudorabies as a disease of cattle and dogs in Hungary in 1902.
- c. It is an acute, frequently fatal disease that affects most species of domestic and wild animals. Man and certain apes are resistant to it.
- d. Swine are the natural hosts of the virus and they can die as a result of the disease. Abortion is sometimes caused by pseudorabies.

2. Symptoms

- a. Pigs less than 3 weeks old
 - i. The disease is characterized by sudden death with few, if any, clinical signs.
 - ii. Death is usually preceded by dullness, loss of appetite, vomiting, weakness, incoordination, convulsions, and a fever which may exceed 105° F.
 - iii. If vomiting and diarrhea occur, the disease closely resembles transmissible gastroenteritis (TGE).
 - iv. In pigs less than two weeks old, death losses frequently approach 100%.
 - v. Pigs that become infected before birth, die within two days after being born, occasionally after violent shaking and shivering.
 - vi. Pigs infected immediately after birth may show clinical signs within the first two days of life and usually die before they are five days old.
- b. Pigs three weeks to five months old
 - i. After three weeks of age, pigs develop some resistance and mortality may decrease from 50% to less than 5%.
 - ii. Death losses vary with different strains of the virus. Severe losses may occur even in grown pigs.

- iii. Fever is the most prominent clinical sign. It is followed by loss of appetite, listlessness, labored breathing, excessive salivation, vomiting, trembling, and incoordination of the hind legs.
 - iv. Sneezing, rubbing of the nose, and coughing may occur along with a clear to yellowish nasal discharges.
 - v. Convulsions precede death.
 - vi. Infected pigs that recover will be slow to reach market weight.
- c. Mature pigs
- i. The disease is not as severe but death may occur with some strains of the virus.
 - ii. Symptoms include fever, nasal discharges, sneezing, nose rubbing, coughing, vomiting, and diarrhea.
 - iii. Trembling, incoordination, and itching occasionally occur, and blindness may follow pseudorabies infection.
 - iv. Sows infected in the early stages of pregnancy may return to heat because of death and reabsorption of their fetuses.
 - vi. Sows infected in mid-pregnancy may eventually abort mummified fetuses, whereas sows infected late in pregnancy often abort or give birth to weak, shaker, or stillborn pigs.

3 Transmission

- a. Pseudorabies is spread mainly by direct contact between swine; the nose and mouth are the main entry points for the virus.
- b. Nasal discharges and saliva contain the virus. Drinking water, bedding, and other objects such as clothing and instruments may become contaminated.
- c. The virus may be spread by the movement of air within buildings, and for short distances outside depending upon climatic conditions.
- d. Recovered pigs remain carriers of the virus and may infect susceptible pigs or cattle. Severe cattle losses have occurred as a result of contact with carrier swine.

4. Control

- a. Minimize infection by strictly controlling the movement of people, animals, and objects onto swine premises.
- b. Disinfect work clothes and boots. Keep cats, dogs, and other animals away from pigs.
- c. Add breeding stock only from herds that are free of pseudorabies. Test all new stock, isolate them for at least 30 days, and then retest them.
- d. Never bring untested feeder pigs onto premises where farrowing operations exist.
- e. During an outbreak
 - i. Quarantine the premises; control all movement of people and animals.
 - ii. Separate the healthy pigs from the sick and control movement between them.
 - iii. Dispose of dead pigs by deep burial or incineration.
 - iv. To prevent spreading the infection to other farms, sell recovered pigs only for slaughter.

IV. PARASITE CONTROL

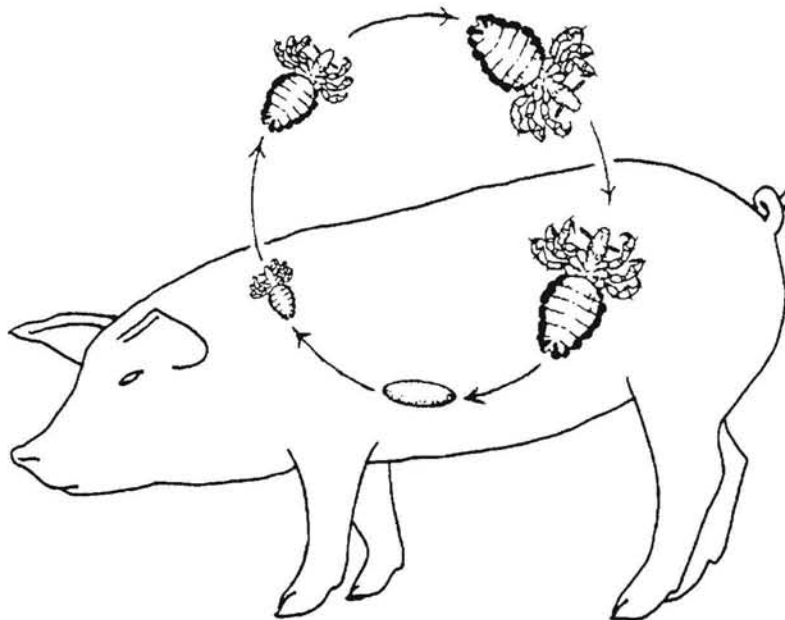
A. External parasites

1. Characteristics

- a. External parasites of swine live on or below their skin.
- b. Lice, ticks, fleas, and mites are the external parasites that have the most economic impact on the swine industry. Some species of biting flies and screwworms (fly larvae) are included in this group.
- c. Most external parasites feed on the blood and tissue fluids of the host. Lice and mange mites are so dependent upon their hosts that if removed, they die in a short time.
- d. Many external parasites carry disease-producing organisms. Some cause skin irritations which become infected.

2. Hog lice (*Haematopinus suis*)

- a. Lice are nearly 1/4 inch long and slate blue in color.
- b. They are first noticed inside hog's ears or in the folds of skin of the neck. They are also found inside the legs, near the body.
- c. Lice torment hogs and cause their skin to become thick, cracked, tender, and sore. They pierce the animal's skin and suck their blood.
- d. Treatment and control
 - i. Control lice with chemicals that can be purchased as emulsifiable concentrates, wettable powders, or dusts. Follow label recommendations.
 - ii. Spray the pigs in small groups. Confine them to facilitate proper treatment.
 - iii. Use equipment large enough to wet the animals thoroughly. If the temperature is low, they can be sprayed or dipped, then held until dry.
 - iv. To control the swine mange caused by hog lice, spray the facilities at the same time the animals are treated.
 - v. Repeat the treatment after 14-21 days if needed.



LIFE CYCLE OF HOG LICE (*Haematopinus suis*)

3. Mites

- a. Mites can be seen through a good magnifying glass.
- b. They spread rapidly and cause hogs to rub and scratch. Hair bristles become stiff and stand upright.
- c. The skin around the eyes, ears, and along the top of the neck and back becomes scruffy, inflamed, scabby, raw, and cracked.
- d. Mites burrow into the skin, making thread-like tunnels up to an inch in length.
- e. Follow the same treatment and control program used for lice.

4. Fleas

- a. Any type of flea can infest swine. The flea which attacks man and the sticktight flea of poultry are the most common in swine herds.
- b. Flea bites cause severe irritation to the skin of infested swine. The consequences of an irritation are anemia, restlessness, poor growth, and poor feed conversion.
- c. Treatment and control
 - i. Treat the infested hog as well as the breeding places of the fleas.
 - ii. Burn or treat infested bedding, litter, trash, and dirt.
 - iii. Practice good management and sanitation because fleas may survive for several months without an animal host.

5. Ticks

- a. Ticks may be found on any part of the hog's body but are often seen around the ears, neck, flank, anus, and vagina.
- b. They are a source of annoyance and irritation and are vectors for disease. They can cause serious economic losses.
- c. Anemia will occur if ticks are present in sufficient numbers because they suck the animal's blood.
- d. Tick saliva contains a local irritant which they inject into the site of attachment. The saliva also contains a systemic toxin which causes paralysis and nervous system problems.
- e. Severely infested swine try to alleviate the irritation by rubbing, scratching, licking, or biting themselves. This results in raw areas which are susceptible to secondary bacterial invasion.
- e. Treatment and control
 - i. A combination of good swine management and sanitation will reduce tick infestations.
 - ii. Eliminate the parasites on the animal by using a chlorinated hydrocarbon insecticide.
 - iii. Apply the insecticide to the premises and to hedgerows, grassy plots, and pastures.

6. Screwworms (Myiasis)

- a. Cause
 - i. Screwworms result when fly larvae invade the hog's tissue or organs.
 - ii. Adult flies are attracted by cuts, scratches, and wounds, especially the umbilical cord of the newborn.
 - iii. The flies lay eggs in the cuts and the larvae invade the injured tissue.

b. Treatment and control

- i. Good management practices and the effective use of insecticides are the most effective prevention.
- ii. Use a larvicide which kills the screwworms but is not toxic to the pigs. Chlorinated hydrocarbon smears are very effective.
- iii. Keep the facilities repaired so that hogs do not cut themselves and become infected.
- v. Clip the milk teeth of newborn pigs to avoid injury to the sow's teats and udder.
- vi. Perform castration and ear tagging when the screwworm problem is at a minimum.

B. Internal parasites

Internal parasites spend part of their life cycle inside the body of the animal. They cause serious economic losses and can kill swine.

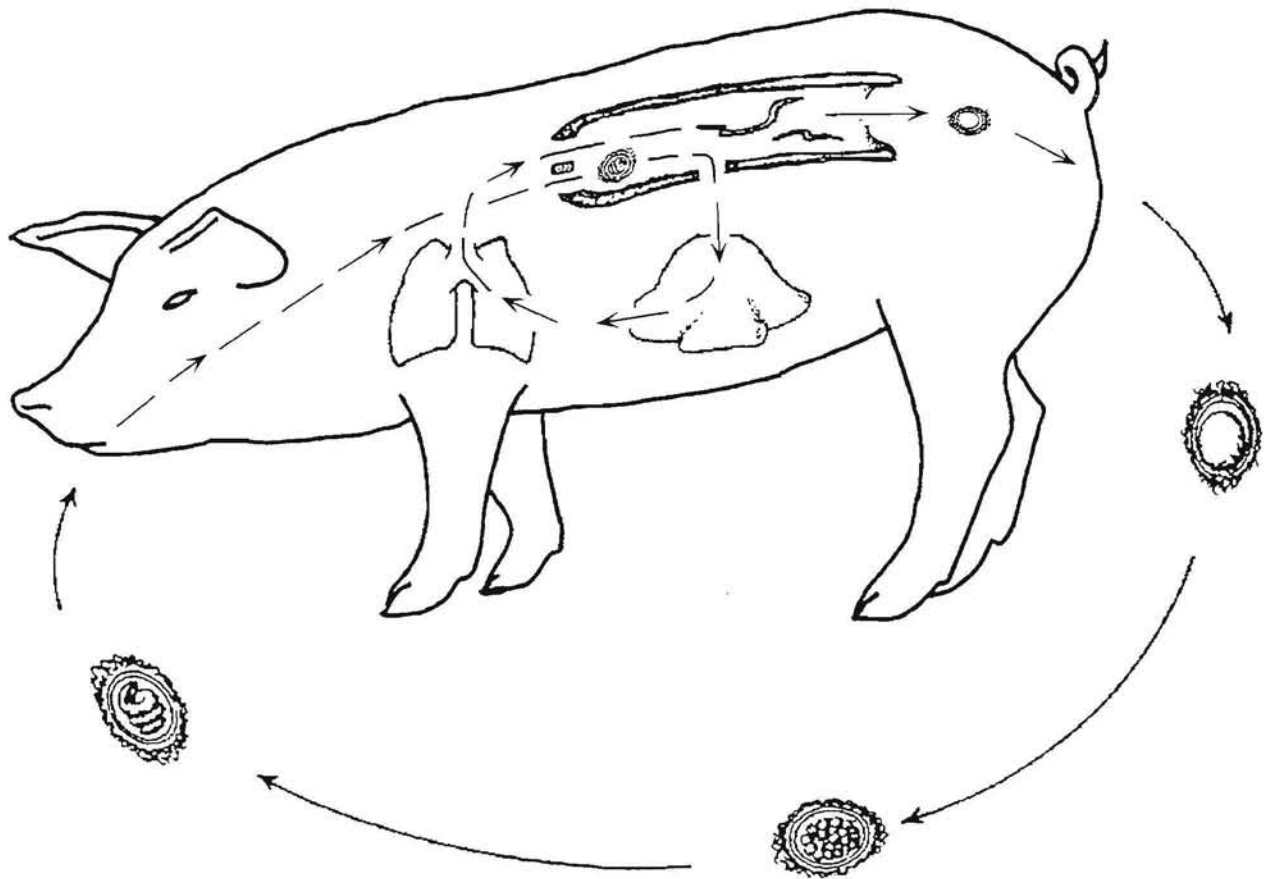
1. Roundworms (Ascarid)

a. Characteristics

- i. Roundworms are found wherever swine are raised but they can also infect cattle, sheep, and squirrels.
- ii. The larvae infect and undergo partial development in almost any mammal which ingests the eggs.
- iii. Roundworms are the internal parasite that have the most economic impact on the swine industry.

b. Roundworm life cycle

- i. Pigs eat embryonated roundworm eggs which hatch in the small intestine.
- ii. During the next week, larvae bore into the lining of the gut, enter the blood vessels, move to the liver, and travel to the lungs via the blood.
- iii. The larvae grow and change in the lungs. About two weeks after the ingestion of the embryonated egg, the larvae migrate to the trachea and are swallowed.
- iv. They reach the small intestine where they mature and rapidly reach adulthood. The adults produce more eggs and the cycle is complete.
- v. The life cycle from egg to egg takes about 50 days. Infected swine sometimes pass eggs or adult worms.



LIFE CYCLE OF ROUNDWORM (*Ascaris suum*)

c. Symptoms

- i. Signs of the disease are most noticeable when it occurs in young pigs.
- ii. A soft, moist cough starts one week after the pigs are infected.
- iii. About four days after infection, there is a fever of 105° F which lasts for several days.
- iv. Failure to gain weight, lack of appetite, an unthrifty appearance, and jaundice all may be symptoms of roundworm infestation.
- v. The presence of runts in a number of litters is also an indication of the disease.
- vi. Tissue changes caused by roundworm invasion are most easily seen in the liver and lungs.
- vii. The liver shows gross scarring which appears as white or gray areas on the surface.
- viii. The lungs may show small hemorrhages or evidence of pneumonia.
- ix. There is little evidence of damage to the intestine except when the number of adult worms becomes so great that the gut is completely blocked.

d. Transmission and control

- i. Transmission occurs between pigs via the infective roundworm egg.
- ii. Roundworm control includes a systematic worming program, good sanitation, and proper animal husbandry for all the swine in an operation.
- iii. Deworm sows prior to farrowing to reduce infection in baby pigs.
- iv. It may be helpful to raise the swine in total confinement on a cement or slatted floor.
- v. Scrub the farrowing pens and hog houses as often as possible.

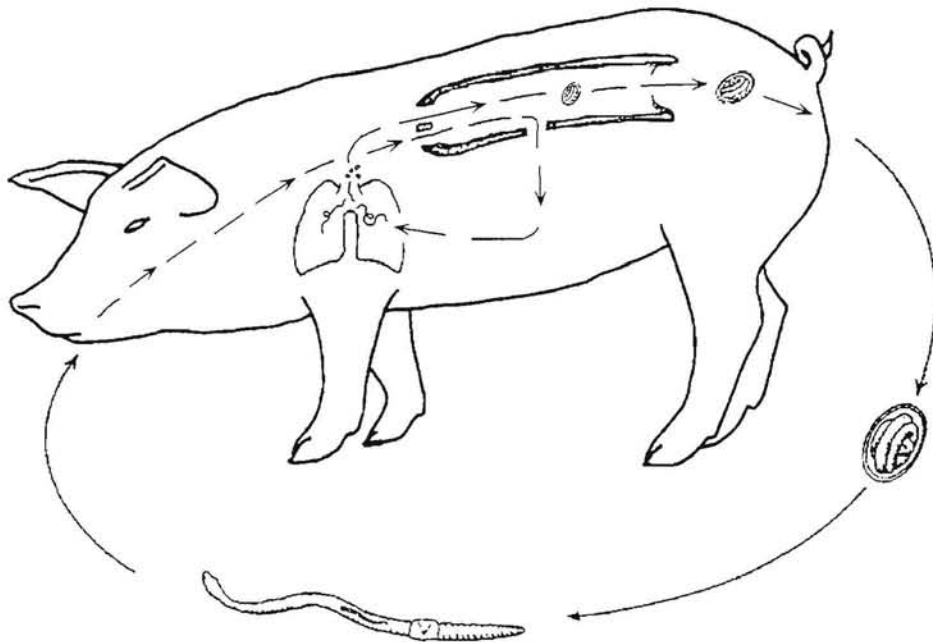
2. Lungworms (*Metastrongylus spp.*)

a. Characteristics

- i. Lungworms are parasites of the respiratory and circulatory systems of mammals.
- ii. Earthworms serve as the intermediate host and are necessary for the complete development of the lungworm.

b. Life cycle

- i. Adult lungworms live and produce embryonated eggs in the lungs of the pig.
- ii. The pig coughs up, swallows, and passes the eggs in the feces.
- iii. The embryonated eggs are ingested by the earthworm where they go through a series of larval stages.
- iv. The pig swallows infected earthworms, digestion frees the lungworm larvae, and the larvae penetrate the pig's intestinal wall.
- v. The larva travel through the lymphatic system, escape to the bloodstream, and proceed to lungs where they complete their life cycle.



LIFE CYCLE OF LUNGWORM (*Metastrongylus spp.*)

c. Symptoms

- i. The signs of lungworm disease include severe coughing, difficult breathing, loss of appetite, and poor weight gain.
- ii. The pulmonary air passages may become dilated and firm grayish nodules appear near the swollen margins of the lungs.
- iii. Severely infected pigs may develop parasitic pneumonia and secondary bacterial pneumonia which can cause severe economic loss and be lethal.
- iv. Diagnosis of the disease is based upon the history and clinical symptoms, but most of all upon post-mortem examination.
- v. Microscopic examination of the feces helps in diagnosing lungworm disease.
- vi. Swine seem to develop an immunity to lungworm as they get older.

d. Transmission and control

- i. Total confinement, good management, sanitation, and proper nutrition will help prevent lungworm and other external parasitic diseases.
- ii. Try to eliminate contact between young pigs and earthworms.
- iii. Well-drained, clean pastures reduce the number of earthworms.
- iv. Provide a balanced ration and nose-ring swine on pasture to prevent rooting.

3. Whipworms (*Trichuris suis*)

a. Characteristics

- i. Whipworm occurs in pigs worldwide. It also affects man, wild boars, and monkeys.
- ii. The colon is the main organ involved in whipworm infection.

b. Symptoms

- i. The clinical signs are slow weight gain, rough skin, and an unthrifty appearance.
- ii. Excess mucus production and nodular formations may occur in the colon.

ii. Cell death, fluid infiltration, and hemorrhaging of the colon lining are noticed at necropsy.

iv. Diagnosis involves finding parasite eggs in the swine feces or on postmortem examination.

c. Prevention and control: Follow the standard sanitation methods that control other parasites and diseases.

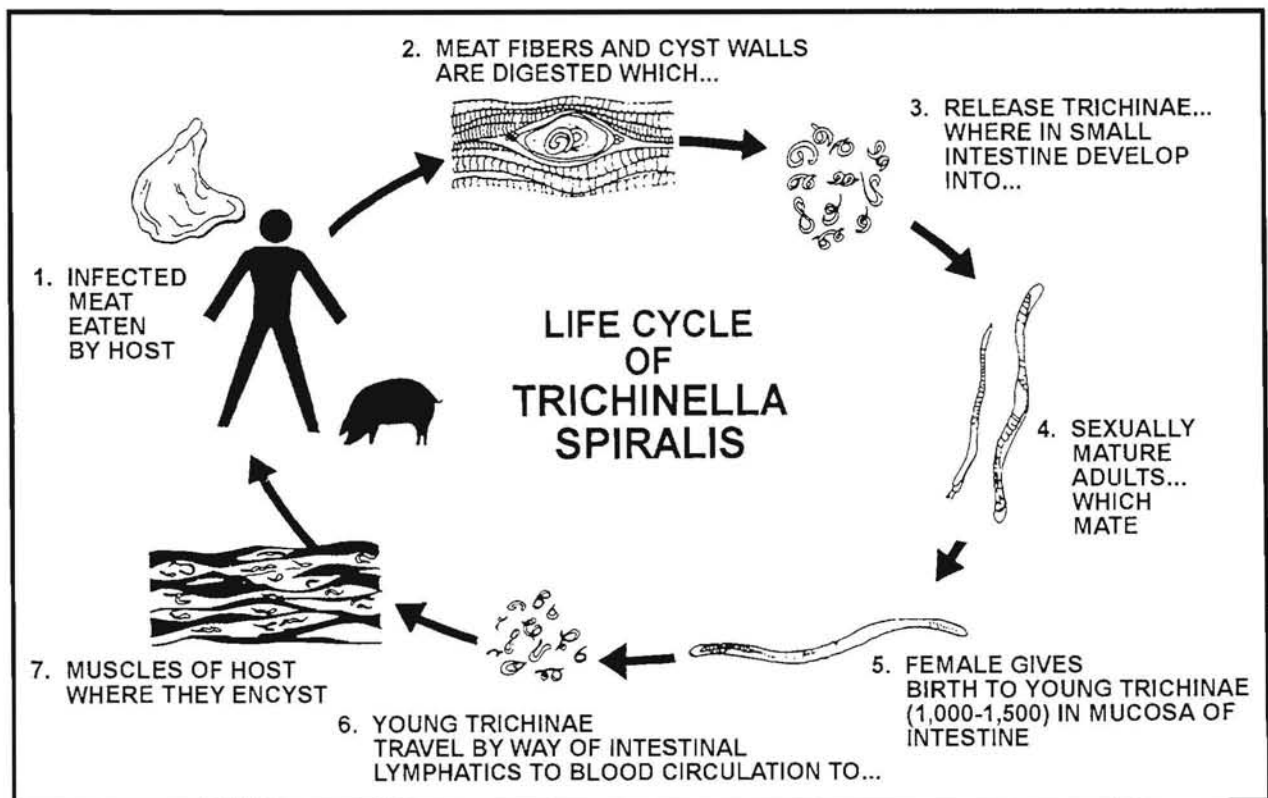
4. Trichinosis (*Trichinella spiralis*)

a. Cause

i. Trichinosis is caused by the trichina worm. The disease is found in pigs, man, and in many other species including wild mammals.

ii. The worm exists wherever swine are raised and its appearance is associated with the feeding of uncooked garbage to swine.

iii. As many as 50 million Americans may have trichina larvae in their muscles.

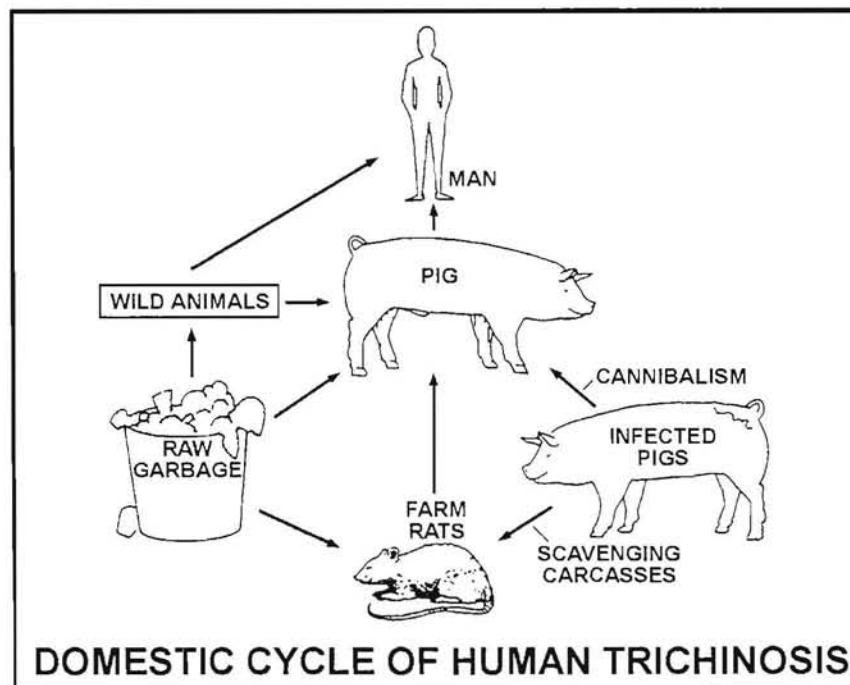


b. Symptoms

- i. There are seldom any symptoms observed in swine.
- ii. Cysts appear in the skeletal muscles of the pig when trichina are present.
- iii. Cysts containing live larva may remain intact for years in the muscle but calcification usually destroys the larva.

c. Transmission and control

- i. To control trichinosis in pigs, thoroughly cook all garbage that is fed to them.
- ii. Practice strict rodent control and promptly remove all dead pig carcasses.
- iii. Trichina is passed to man and other animals when they ingest uncooked or improperly cooked pork products.
- iv. Trichina larvae are killed when pork products are cooked until the core temperature is raised to 137° F.
- v. Education concerning the importance of properly cooked pork products, prevents the spread of the disease to man.



5. Other internal parasites

- a. Liver flukes and tapeworms also infect swine but they are of minor importance in swine parasitology.
- b. In most cases the pig is not the normal host but rather an accidental host.

V. PREVENTIVE MEASURES

A. Disinfectants

1. Factors to consider when choosing disinfectants

- a. Germicides for disinfecting a building should work well in the presence of organic matter, be compatible with soaps or detergents, harmless to building materials, and relatively non-toxic.
- b. Chemical properties
 - i. High temperatures drive off the active ingredient from disinfectants containing chlorine or iodine.
 - ii. Some disinfectants are affected by the pH balance and hardness of the water.

2. Safety precautions

- a. Many cleaners and disinfectants are poisonous.
- b. Store in tightly closed containers in a safe, locked area out of reach of children and other unauthorized persons, and away from feed and other supplies.
- c. NEVER mix bleach and ammonia, they form a highly toxic substance when combined.
- d. Keep the labels on all containers and observe safety precautions. Avoid skin contact and breathing of spray mists or fumigants. Wear goggles and gloves.

3. Disinfectant procedures

- a. Laboratory testing for the effectiveness of disinfectants is complicated and can be misleading if disinfection is not done thoroughly.
- b. Veterinarians can provide a practical, simple, and inexpensive method.

B. Management practices

1. New animals added to the herd are a potential source of new diseases. Buy healthy animals and avoid mixing animals from multiple sources.
2. Test breeding swine for brucellosis, leptospirosis, and pseudorabies. Obtain a health certificate showing all tests and vaccinations at the time of purchase.
3. Make sure the swine are properly identified and delivered in a clean disinfected truck.
4. Isolate newly purchased swine for 30-60 days and keep them at least 300 feet from other swine. Retest for disease before adding them to the herd.
5. Never bring newly purchased sows or boars into a farrowing house or expose baby pigs to new animals.
6. Keep visitors out of hog lots and swine facilities. Keep rubber boots, disinfectants, and a change of clothing available for those who must enter the premises.

C. Sanitation practices

1. Vacate the facilities
 - a. This technique breaks the disease cycle especially when combined with thorough cleaning and disinfecting.
 - b. Keep the facility empty for 3 weeks or longer for best results, but even a few days are helpful.
 - c. Rotate pastures, feeding floors, and farrowing pens to reduce the number of parasite eggs and infectious agents.
2. Cleaning and disinfecting
 - a. Good sanitation controls the spread of disease-causing microorganisms.
 - b. Sometimes it provides the only successful solution to breaking the disease cycle.
 - c. Use a disinfectant appropriate for your facility.

3. Footbaths

- a. This practice helps prevent the spread of diseases between production units or farms when visitors must enter the premises.
- b. Cresols, synthetic phenols, aldehydes, and chlorhexidine are satisfactory disinfectants for use in footbaths.
- c. Keep the disinfectant solution fresh; replace it frequently or whenever organic material accumulates.

4. Farrowing area sanitation

- a. Wash sows with warm water and soap or mild germicidal solutions before placing them in farrowing stalls.
- b. Cleaning the sow, removes parasite eggs and minimizes exposure of newborn pigs to microorganisms during nursing.
- c. Equip the farrowing house with a washing stall for cleaning the sows before they enter.

5. Dead animals and afterbirths

- a. Carcasses and afterbirths are a source of disease.
- b. Disposal options
 - i. Have them removed immediately by a licensed rendering company.
 - ii. Burn them completely.
 - iii. Bury them at least three feet underground and away from any source of drinking water. Cover them with quicklime before adding fill dirt.
- c. Prevent pets and predators from carrying dead animals between farms.

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Swine Nutrition

SWINE NUTRITION
WORKSHOP OUTLINE

I. NUTRIENTS AND DEFICIENCY SYMPTOMS

A. Energy

1. Function
2. Factors that affect energy requirements
3. Deficiency

B. Protein and amino acids

1. Function
2. Composition
2. Deficiency

C. Vitamins

1. Function
2. Deficiency

D. Minerals

1. Function
2. Deficiency

E. Water

1. Function
2. Deficiency

II. NUTRITION AND HEALTH

- A. Nutrition and immunity
- B. Effects of disease and parasites on nutritional needs

III. RATION FORMULATION

- A. Adequate energy and protein
- B. Ration calculations
- C. Palatability and digestibility

IV. FEED SOURCES

- A. Energy foods
- B. Protein sources
- C. Commercial premixed supplements

V. NUTRITION THROUGHOUT THE LIFE CYCLE

- A. Growing pigs
- B. Nutrition during breeding
 - 1. Gilts
 - 2. Gestation
 - 3. Lactation
 - 4. Weaning to rebreeding
 - 5. Effects of inadequate nutrition
 - 6. Feed problems

SWINE NUTRITION
INSTRUCTOR'S NOTES

I. NUTRIENTS AND DEFICIENCY SYMPTOMS

A. Energy

1. Function

- a. Pigs need energy for almost all body processes. They cannot digest or eliminate feed without energy.
- b. Energy is supplied by carbohydrates (feed grains), fats, oils, and amino acids. Ingredients that supply energy may also provide other feed nutrients.

2. Factors that affect energy requirements

- a. The size of the animal is very important because energy is needed for maintenance.
- b. The productive state of the animal is also an important factor. A lactating sow requires more energy than a gestating sow since she is producing large quantities of milk each day.
- c. A pig that is gaining weight requires more energy than the one that is not growing.
- d. The pig's environment is also important. In cold, wet, or drafty conditions pigs need more energy to maintain a constant body temperature. If pigs can huddle together in cold weather, their energy requirements decrease.

3. Deficiency

- a. Clinical signs: Weakness, low body temperature, loss of weight, coma and death.
- b. Sub-clinical signs: Poor growth; low milk production; reduced blood glucose, calcium, and sodium; loss of subcutaneous fat; hypoglycemia; elevated hematocrit and serum cholesterol.

B. Proteins

1. Function

- a. Proteins are essential because they are the main component of muscles, internal organs, skin, hair, and hooves.

- b. Some proteins take the form of enzymes that help digest food and ensure proper metabolism. Blood hemoglobin is a protein; it supports cell metabolism by transporting oxygen from the lungs to the tissue.
- c. Blood also contains proteins which transport certain vitamins or minerals.
- d. Immunoglobins circulating in the blood protect animals against specific diseases. Colostrum milk contains proteins and antibodies that nourish newborn babies.

2. Composition

- a. Proteins are made of long chains of amino acids. Twenty five amino acids have been identified.
- b. Amino acids are strung together to form proteins, like letters are combined to form words. If an amino acid (or letter) is missing, it is impossible to make the protein (word).
- c. Pigs can make some of the amino acids in their bodies but 10 “essential” amino acids must be supplied in their diet. The correct mix of amino acids enables pigs to make proteins and to grow properly.

- 3. Deficiency symptoms: Impaired growth, unthriftiness, reduced resistance to bacterial infection, Kwashiorkor-like signs in baby pigs, reduced serum protein and serum albumin, anemia, gross edema, and increased liver lipid concentration.

C. Vitamins

1. Function

- a. Pigs need vitamins to support or stimulate the many chemical reaction that take place in the body as part of normal metabolism.
- b. Vitamins provide a defense against disease, promote growth and reproduction, and contribute to the general health of the animal.
- c. Although vitamins are present in small quantities, they perform important functions.
- d. Vitamins A, B complex, D, and E are essential for good swine health and must be supplied in the diet. The B complex group includes thiamin, riboflavin, niacin, pyridoxine, pantothenic acid, choline, biotin (vitamin H), pyracin, para-amino benzoic acid, inositol, and folic acid.



- e. Pigs make Vitamin C in their bodies. Vitamin B₁₂, vitamin K, and some of the folic acid are produced by bacteria that live in the pig's gut.
- f. If the pig is fed antibiotics, the manufacture of vitamins by intestinal bacteria may be reduced and more vitamins must be supplied in the diet.

2. Deficiency

- a. If vitamin A is lacking, animals fail to reproduce, eyesight is impaired, and growth slows down.
- b. If the B-complex group is not provided, appetite fails and disease may become a problem. Vitamin B₁₂ improves the assimilation of protein in feed.
- c. A lack of vitamin E may cause a failure of the reproductive system.

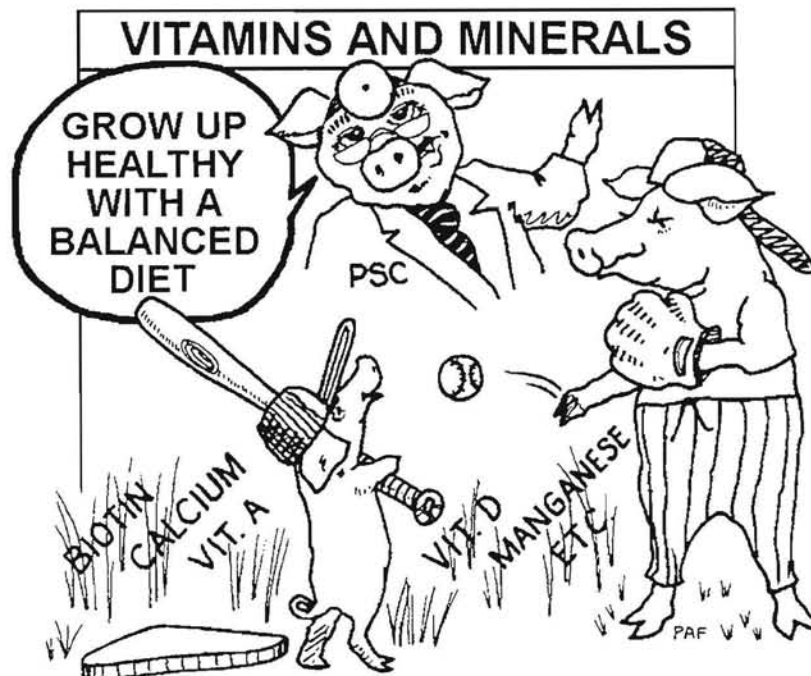
D. Minerals

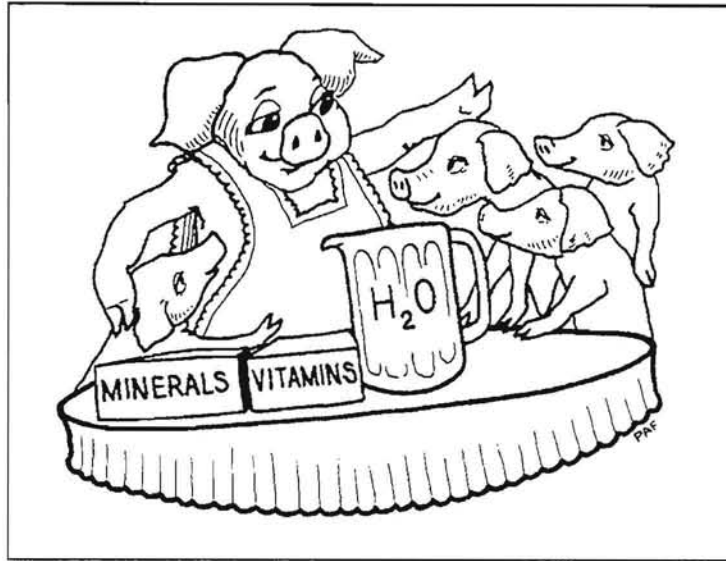
1. Function

- a. Minerals are used primarily in the bones and teeth; they are also an important part of the blood.
- b. The heart depends upon a proper mineral balance to maintain its regular beating.
- c. Minerals are divided into major minerals and trace minerals.
 - i. The major minerals, salt, calcium and phosphorus, are needed in the greatest quantity and are most likely to be lacking in the feed.
 - ii. The trace minerals are needed in very small amounts but they are essential to the health of the animal. They include iron, copper, iodine, manganese, cobalt, sulfur, magnesium, zinc, potassium, boron, and selenium.

2. Deficiency

- a. Teeth and bones will not function properly without calcium and phosphorus.
- b. Minerals have other important functions to fulfill if the pig is to grow rapidly and efficiently. Many enzymes will not function unless certain minerals are present.
- c. Muscles cannot contract and send signals in the absence of minerals.





E. Water

1. Function

- a. Water is often called the “forgotten nutrient” because it is so often ignored. It is difficult to think of a body function that does not require water. Clean fresh water should always be available.
- b. Water makes possible the movement of food through the stomach and intestines. It transports nutrients and hormones around the body via the blood and intracellular fluids. It lubricates the joints and helps to maintain a constant body temperature.
- c. Water makes up over 50% of the body of market hogs while newborn piglets consist of about 80% water. Fat contains very little water; as the animal matures and body fat reserves increase, water as a proportion of total weight decreases.
- d. Water is as important as any other nutrient and must be supplied in sufficient quantities to ensure maximum productivity. When using an automatic watering system, water should be available at a rate of 1 cup per minute for growing pigs and 2 cups per minute for lactating sows.

2. Deficiency

- a. A slight deficiency of water will result in a reduced feed intake.
- b. If access to water is restricted, pigs receiving excess salt in the diet may die.
- c. Water deficiency may result in dehydration, fever, and low milk production.

II. NUTRITION AND HEALTH

A. Nutrition and immunity

1. A proper nutrition program is effective only if the animals have adequate health care. The higher the productivity in a herd, the more important the nutritional health care and management programs become.
2. Animals fed properly are more resistant to many bacterial and parasitic infections. This is due to higher body tissue integrity, more antibody production, more immunity to diseases, greater detoxifying ability, increased blood regeneration and other factors.
3. There are indications that well-fed animals may be more susceptible to certain viral diseases because these viruses need a well-nourished body cell in which to grow and reproduce. Even though this may occur, it is apparent that proper nutrition is beneficial to recover from all diseases, including those caused by viruses.
4. Mucous membranes and the animal's skin are a first line of defense. Many nutrients are important in keeping the skin healthy.
5. Protein, B-complex vitamins, and other nutrients are essential in the production of antibodies and phagocytes which serve as a secondary defense against infections.
6. Adequate nutrition also enables an animal to properly respond to vaccination.

B. Effect of disease and parasites on nutritional needs

1. Certain diseases increase the need for various nutrients.
2. This can be due to a reduced feed intake, fever, diarrhea, vomiting, decreased absorption of nutrients, and other causes.
3. Because sick pigs often have a reduced appetite, putting medication in their water is more effective than putting it in their feed.

III. RATION FORMULATION

A. Adequate energy and protein

1. Pigs need energy to maintain bodily processes, to grow, and to reproduce. Carbohydrates from cereal grains are the most abundant energy source. Fats and oils have more energy than carbohydrates per unit weight.
2. Protein can serve as an energy source if supplied in excess but it is usually more expensive than other sources.

3. From a nutritional standpoint, there is not a single best formula. Ingredients should be selected on the basis of availability, price, and quality.
4. Corn, barley, sorghum, and wheat are the primary energy sources in commercial feed for swine that weigh more than 5 kg. These grains are low in protein, certain essential amino acids, inorganic elements, and vitamins.
5. Soybean meal, oil seed meal, and animal protein meal are commonly used for supplemental protein.
6. Vitamin/mineral premixes, salt, calcium, and phosphorus can be added to the pig's diet to provide the required nutrients.

B. Ration calculation

1. A balanced swine ration contains the proper nutrients in the correct ratios.
2. Steps in formulating swine feed
 - a. Identify animals by age, weight, function, and specific conditions under which they are fed.
 - b. Select the most appropriate set of nutrient requirements or allowances.
 - c. Select suitable ingredients to ensure that the ration is nutritionally balanced, palatable, and economical.
 - d. Determine the necessary amounts of ingredients and then add the protein supplement to provide the desired protein level.



C. Palatability and digestibility

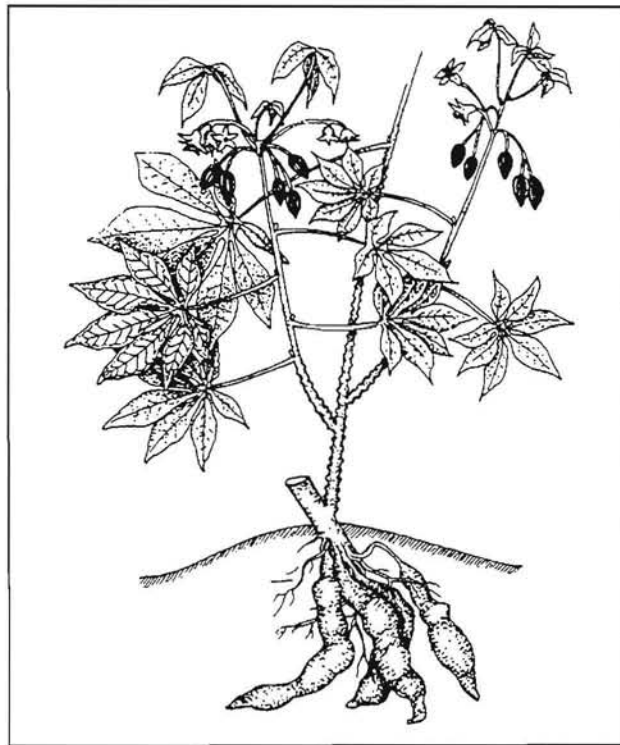
1. Pigs usually eat enough to maintain their energy needs. The amount they eat is proportional to the energy content of the feed.
2. High fiber, low energy feed increases consumption until the stomach capacity is reached.
3. If the feed contains too much fiber or water, pigs get full before they have eaten enough nutrients.
4. Old, contaminated, or moldy feed can have a dramatic impact on consumption. Mold contains vomitoxin which reduces feed intake.
5. Culled vegetables are best utilized by older animals. Starchy crops such as potatoes, bananas, taro, cassava, etc. should be cooked to improve digestibility.

IV. FEED SOURCES

A. Energy foods

1. Cereal grains
 - a. Examples: Corn, sorghum, barley, wheat, oats, and their by-products.
 - b. Grains are the main energy source in most commercial feed.
 - c. They are high in carbohydrates, palatable, and highly digestible.
2. Starches
 - a. Bananas
 - i. Ripe bananas can replace 50-75% of the grain in the diet of growing finishing pigs and dry sows.
 - ii. Fresh bananas have too much water to be used in the diet of starter pigs or nursing sows.
 - iii. Green bananas should be ripened, cooked, or emulsified.

- c. Sweet potato
 - i. Sweet potato can replace up to 1/3 of the grain in the diet of growing finishing pigs and sows.
 - ii. Pigs do better if the potato is cooked or cut and dried.
 - iii. Silage (stem, leaves, toots) can replace up to 40% of the grain.
- b. Cassava
 - i. Cassava meal can replace 40% of the grain in the diets of all swine.
 - ii. Diets high in cassava should be supplemented with additional protein.



CASSAVA

- d. Taro
 - i. Taro must be thoroughly cooked because of its high oxalic acid content.
 - ii. Cooked corms can replace up to 20% of the grain in the diet of finishing pigs and dry sows.
 - iii. Taro leaf silage can replace up to 40% of the grain for finishing pigs and dry and nursing sows.

3. Garbage (food waste)
 - a. Garbage can be a good source of energy and sometimes protein.
 - b. It is available from hotels, restaurants, supermarkets, military establishments, hospitals, and households.
 - c. Pig stomachs are similar to human stomachs so pigs thrive on human food scraps.
 - d. Pigs, especially young ones, do best if the garbage is supplemented with protein.
 - e. Garbage is variable in quality so evaluate each source carefully.
 - f. Limitations
 - i. Garbage must be cooked to prevent the spread of disease.
 - ii. Garbage is 80-90% water so pigs have to eat large quantities to get enough nutrients. The lower the water content, the better the feed.
 - iii. Garbage should only be fed to growing finishing pigs and sows; their stomachs are big enough to tolerate the excess water.
 - g. Avoid garbage with non-food items mixed in (cutlery, packaging, etc.) Toothpicks can injure the pig's mouth and lungs.
4. Molasses
 - a. Sugarcane molasses is a low-cost energy source.
 - b. It can be incorporated at up to 20% of the ration without harm to the health of growing finishing pigs and sows.
 - c. Molasses has a laxative effect and causes loose stools in growing pigs. This effect can be beneficial in farrowing sows.
5. Waste kitchen fats, oils, and tallow are high energy sources. They are especially useful in the diets of very young pigs and nursing sows.
6. Bakery wastes consist of stale bread, cakes, pastries, and dough. They generally have 75-100% of the nutritional value of corn, although the exact value depends on the dry matter and fat content.
7. Culled produce has a low energy and protein value and a high water content. It can replace up to 1/4 of the grain in the diet of finishing pigs and dry sows.

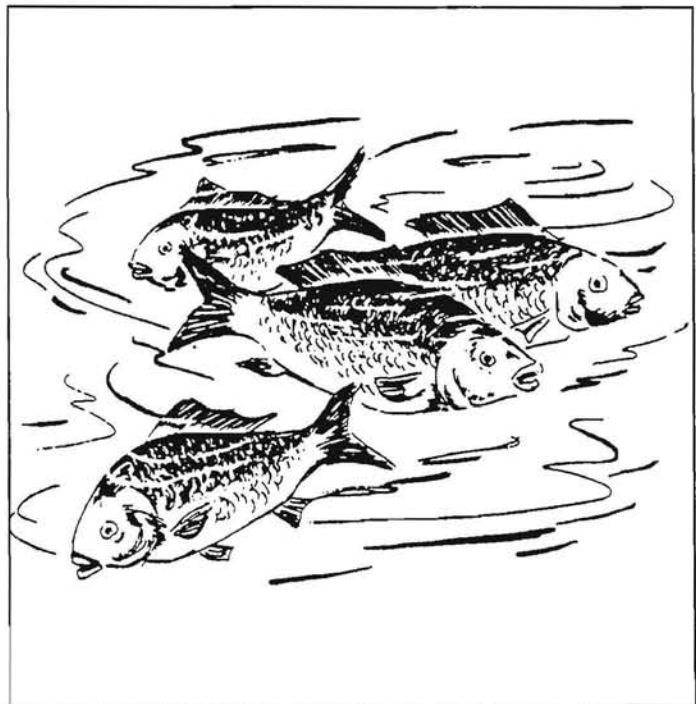
B. Protein sources

1. Oilseed meal

- a. In commercial rations, oilseed meal such as soybean meal provides most of the protein. Soybean meal is 44-48% protein and should be included at about 15% of the total diet.
- b. Commercial supplements provide the required protein, vitamins and minerals when fed at 20-25% of the total ration.
- c. Dairy by-products are expensive but are an easily-digested protein source for newly weaned pigs.
- d. Garbage containing a fair amount of meat or fish may provide protein as well as energy.

e. Fish silage

- i. Fish silage varies from 40-70% good protein and can be fed to pigs of all ages.
- ii. Because it contains 75% water, it must be fed in large quantities to provide enough protein.
- iii. Remove fish silage from the diet of pigs three weeks before slaughter to avoid a fishy flavor in the pork.



C. Commercial premixed supplements

1. Protein-vitamins-mineral supplements contain 36-40% protein as well as vitamins and minerals required by pigs. Feed at 20-25% of the diet with the rest of the diet being one or more energy sources.
2. Vitamins-mineral supplements are usually fed at 5% of the diet with protein and energy sources added to balance the diet.

V. NUTRITION THROUGHOUT THE LIFE CYCLE

A. Growing pigs

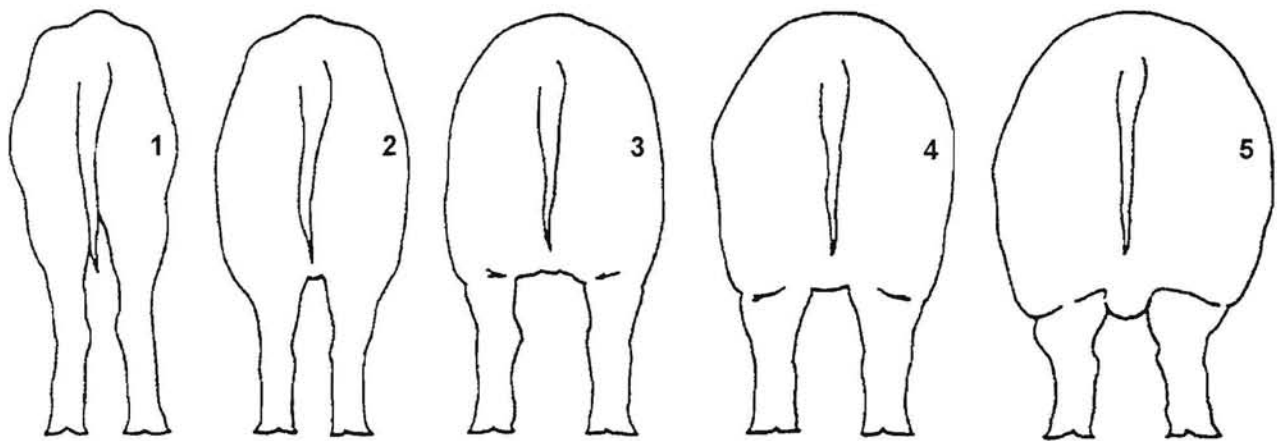
1. Young pigs have higher protein needs than older pigs
 - a. Newly weaned pigs require 20% protein in a starter ration. The protein should be from easily digestible sources such as dairy by-products or fish meal.
 - b. Pigs of 40-120 lbs. need 16% protein in grower feed.
 - c. Pigs over 120 lbs. need 14% protein in finishing or sow feed.
2. Young pigs have small stomachs so they cannot eat feed high in fiber or water. They should be on full feed because they are building a lot of muscle and bone.
3. Older pigs (over 150 lbs.) put on fat as well as muscle. For leaner carcasses restrict their feed to 80-90% of full feed or add ingredients high in fiber and water.

B. Nutrition during reproduction

1. Gilts
 - a. Perform better if kept on full feed (14% protein) until mated.
 - b. Effects of feed restriction before mating
 - i. Delayed puberty (also seen if protein is less than 14%).
 - ii. Reduced calcium and phosphorus intake resulting in lameness.
 - iii. Reduced backfat reserves, which can result in future reproductive problems.
2. Gestation
 - a. Limit feed to 4 to 6 lbs. per day. Increase feed during the last month of pregnancy when fetuses are gaining the most weight.
 - b. Benefits of feed restriction in pregnant sows
 - i. Increased embryo survival.
 - ii. Fewer farrowing problems.
 - iii. Increased feed intake during lactation.

- c. Competition and fighting for feed causes injuries or leads to fat dominant sows and thin timid ones. Sort sows into groups or feed them in separate stalls to avoid these problems.
- d. Condition scoring
 - i. Can be used to adjust feed levels to individual sow needs. A perfect sow should score 4.
 - ii. Sows that are too fat will have more difficulty farrowing, will eat less during lactation, and will lose more weight in lactation.
 - iii. Sows that are too thin will not go into heat or will produce small litters.

CONDITION SCORING OF SOWS



1. POOR - Hips and backbone are prominent
2. MODERATE - Hips and backbone are easily felt without applying palm pressure
3. GOOD - Hips and backbone can only be felt with firm palm pressure
4. VERY GOOD - Hips and backbone cannot be felt
5. FAT - Hips and backbone are heavily covered

3. Lactation

- a. Sows need to be on full feed (11-20 lbs. per day) for best milk production.
- b. A sow produces 15 lbs. of milk per day and therefore has high nutrient requirements. A diet containing 14-18% protein is recommended.
- c. If feed nutrient content or feed intake is inadequate, sows will draw on body reserves (fat off their backs).
- d. Feeding sows twice daily increases feed intake and results in:
 - i. Reduced weight loss.
 - ii. Shorter weaning to conception intervals.
 - iii. Increased milk production.
 - iv. Improved piglet growth.
- e. Adequate water: A flow of 2 cups per minute should be available at all times.
- f. Use antibiotics in the ration if agalactia or uterine infections are a problem.
- g. The addition of bulking agents may increase sow comfort at farrowing.

4. Weaning to rebreeding

- a. Thin gilts and sows should be fed 8-9 lbs. per day.
- b. Gilts in good condition and sows need 6 lbs. per day.

5. Effects of inadequate nutrition

- a. Reduction in conception rates and smaller litters.
- b. Lower piglet birth weight and vigor.
- c. Decreased milk production.
- d. Increase in weaning-to-service interval.
- e. Shortened reproductive life span.
- f. Lameness can be caused by inadequate levels of calcium, phosphorus, vitamin D, biotin, or manganese.

6. Feed problems
 - a. Estrogenic compounds in feed
 - i. Estrogenic compounds from plants (coumestrol in soybeans and alfalfa) or from contamination with molds that produce estrogenic mycotoxins.
 - ii. The compounds mimic the hormone estrogen and interfere with reproduction.
 - b. Bacteria
 - i. Bacteria in the feed can lead to an outbreak of disease.
 - ii. Cooking garbage aids in killing bacteria.
 - iii. Rodents and birds infect feed with leptospira organisms which cause abortion.
 - c. Fungi or molds
 - i. Molds and fungi produce mycotoxins in feed. Good storage reduces the risk of contamination.
 - ii. Zearalenone, produced by *Fusarium* mold, affects feed grains and interferes with reproduction. In sows it causes swollen vulvas and mammary tissue, shrunken ovaries, vaginal or rectal prolapse, enlarged uterus, infertility, abortion, reduced litter size, and small weak piglets. It decreases testicle size in young boars.
 - iii. Ergot alkaloids can cause abortion. Ergot affects triticale and rye, and less often wheat, barley, oats, and corn.
 - iv. Ochratoxin (produced by *Aspergillus*) and tricothecenes (produced by *Fusarium*) can cause birth defects. *Aspergillus* aflatoxin interferes with milk production.
 - v. *Aspergillus* affects corn, rye, oats, wheat, barley, soybean meal, rapeseed, alfalfa, and copra meal.
 - d. Plant toxins
 - i. Some plants contain substances which interfere with reproduction.
 - ii. Example: Mimosine in *Leucaena glauca* reduces conception rate and litter size.

Reproductive Health

REPRODUCTIVE HEALTH **WORKSHOP OUTLINE**

I. REPRODUCTION

A. Boar

1. Sperm production
2. Testosterone
3. Puberty
4. Factors that affect fertility

B. Sow

1. Ova production
2. Hormones and the estrous cycle
3. Puberty

C. Mating

1. Heat (estrus) detection
2. Techniques

D. Pregnancy and the developing litter

E. Farrowing

1. Signs of approaching farrowing
2. Hormones
3. Birth

II. REPRODUCTIVE PERFORMANCE

A. Genetics

1. Breeds
2. Crossbreeding
3. Inbreeding depression
4. Selection
5. Introduction of new genetics

6. Defects

B. Environment

1. Guidelines
2. Mating area
3. Gestation area
4. Farrowing area

C. Health

1. Maintain high levels of resistance
2. Minimize disease challenge
3. Health management

D. Management

1. Social environment
2. Identification of pigs
3. Records

III. REPRODUCTIVE PROBLEMS

- A. Diagnosing reproductive failures
- B. Abortions, stillbirths, mummies, weak pigs, infertility
 - 1. Causes
 - 2. Signs
 - 3. Prevention
- C. Farrowing difficulty
 - 1. Causes
 - 2. Signs
 - 3. Treatment
 - 4. Prevention
- D. Uterine infection after farrowing
 - 1. Causes
 - 2. Signs
 - 3. Antibiotic treatment
 - 4. Prevention
- E. Lactation failure
 - 1. Causes
 - 2. Signs
 - 3. Treatment
 - 4. Prevention

F. Anestrus (no heat)

1. Causes
2. Treatment
4. Prevention

G. Cystitis/nephritis (bladder and kidney infection)

1. Causes
2. Signs
3. Treatment
4. Prevention

REPRODUCTIVE HEALTH

I. REPRODUCTION

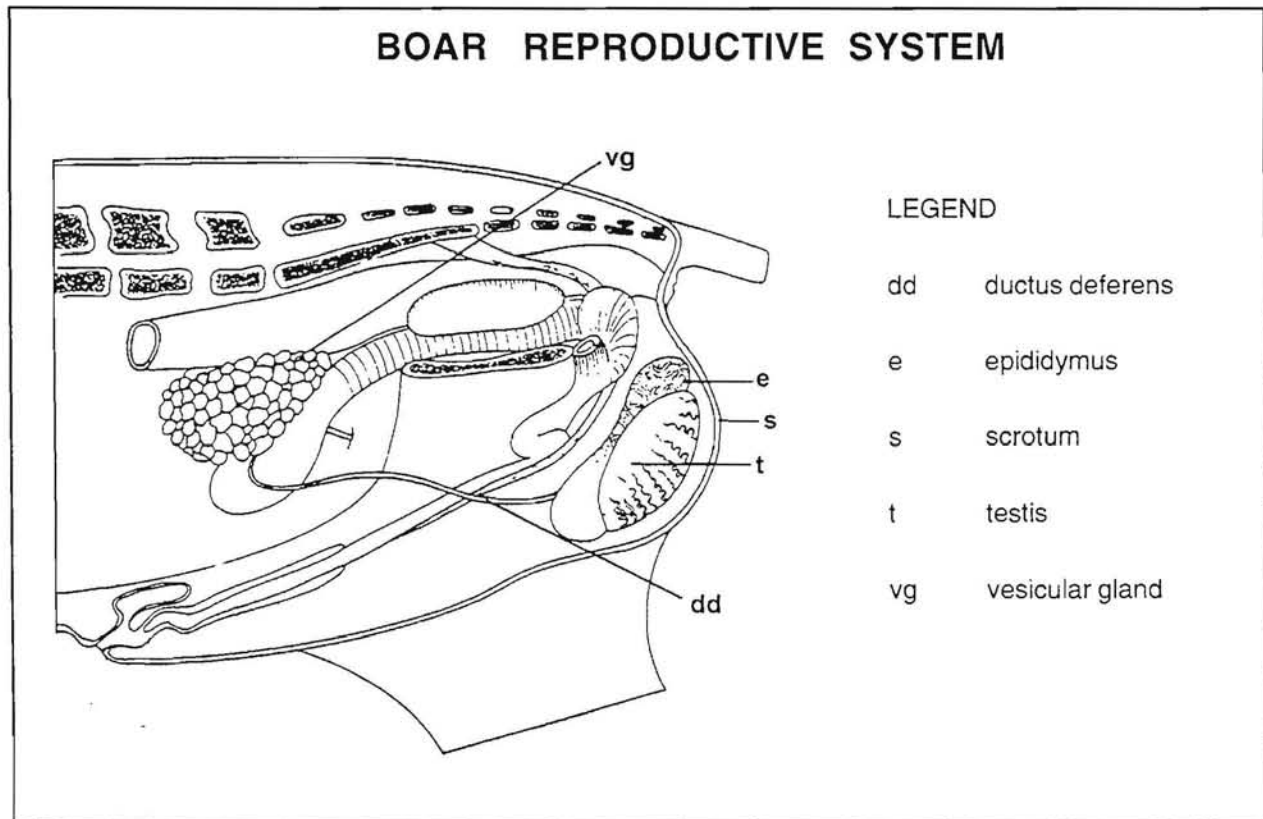
A. Boar

1. Sperm production

- a. Sperm are the cells carrying the sire's genetic material.
- b. They are produced in the testes, but mature and are stored in the epididymis.
- c. The entire process of sperm production and maturation takes 34 days.

2. Testosterone

- a. The male hormone produced by the testes.
- b. It is responsible for male sexual characteristics and behavior.



3. Puberty
 - a. Boars usually reach puberty and are able to mate at 6 to 8 months of age, but sometimes as early as 4 months or as late as 12 months.
 - i. Well-fed boars reach puberty earlier than poorly-fed boars.
 - ii. Boars do not reach full sexual maturity until they are 12 months old.
4. Factors that affect boar fertility
 - a. Genetics
 - i. Genetic effects on boar fertility are fairly low, but the Yorkshire and Large White breeds tend to produce more semen and sperm cells.
 - ii. Inbreeding reduces boar fertility.
 - b. Age
 - i. Boars have their highest fertility from 1 to 5 years old.
 - ii. Younger and older boars tend to be less fertile.
 - c. Nutrition
 - i. Boars can be given the same feed ration as pregnant sows, at a rate of 4.5 to 5.5 lbs. per day.
 - ii. Boars should have a condition score of 2 to 3.
 - iii. Fat boars have less interest in breeding and are harder on the sows at mating.
 - d. Environment
 - i. High temperatures interfere with sperm production and reduce fertility. If disease or high temperatures affect sperm production, a decrease in boar fertility will occur 2 to 9 weeks later.
 - ii. Protect boars from injuries caused by fighting, slippery flooring, sharp objects, or aggressive sows.

e. Health

- i. Physical abnormalities of the penis can lead to breeding problems. They can be corrected with surgery but it is usually more practical to replace the boar.
- ii. A range of disease organisms can infect the sex organs of boars and reduce fertility. The risk of disease transmission by boars is very high because they breed with many sows.
- iii. Vaccinate boars against leptospirosis, parvovirus, and erysipelas.
- iv. A program to control internal and external parasites is also important.

f. Frequency of use

- i. Overuse leads to reduced fertility.
- ii. Boars 8 to 12 months old can generally breed 2 sows per week. Mature boars can breed 2 to 4 sows per week and maintain high fertility.

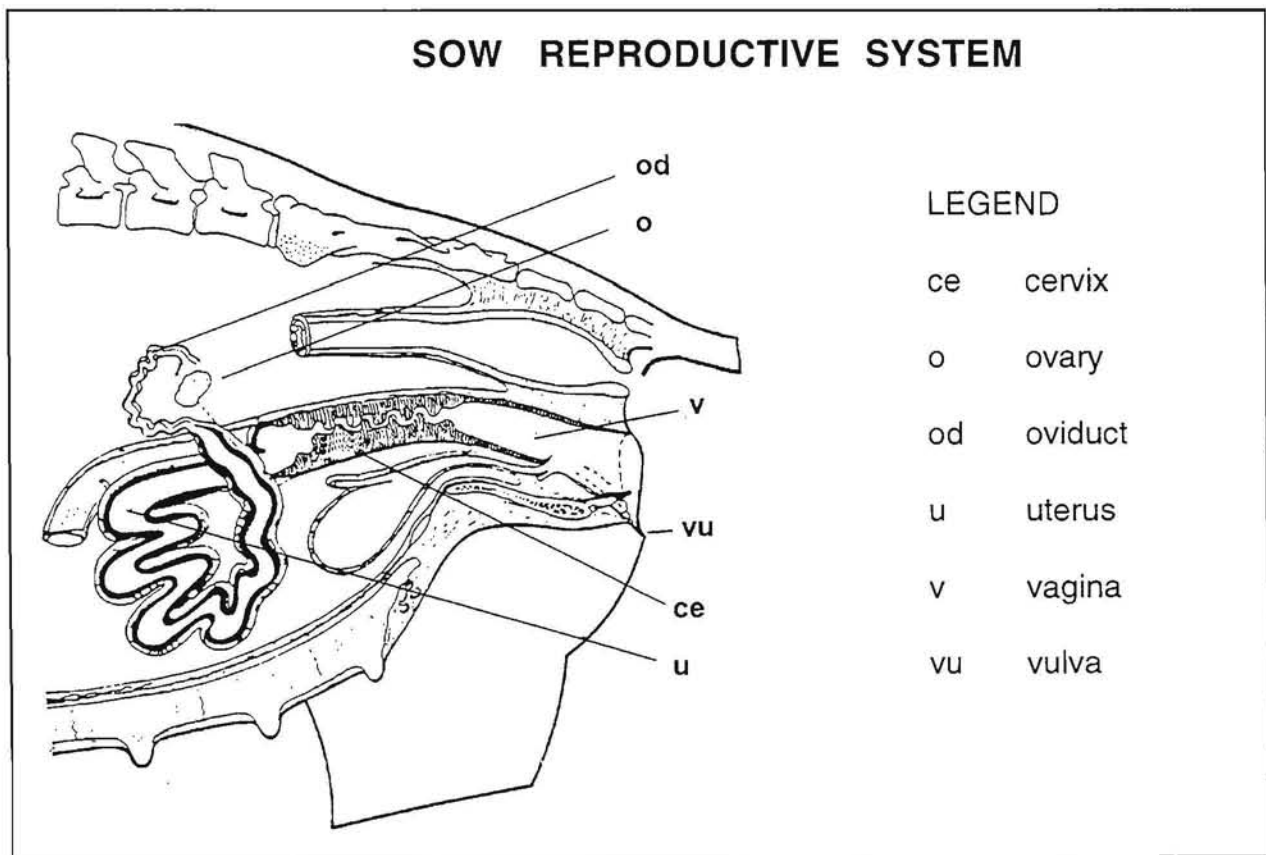
B. Sow

1. Ova production

- a. Ova (singular: ovum) are the female egg cells produced in the ovaries.
- b. The ova are released while the sow is in heat and quickly enter the oviduct.
- c. If the sow has mated and there are fertile sperm present during the first few hours after the ova are released, the eggs are fertilized in the oviduct.
- d. A fertilized egg is called an embryo.
- d. The embryos or unfertilized ova enter the uterus 2 days after the ova are released.

2. Hormones and the estrous cycle

- a. Before the ova are released from the ovaries, the ovaries produce the hormone estrogen, which is responsible for the behavior of sows in heat (or estrus).
- b. After the ova are released, the ovary switches from producing estrogen and starts producing the hormone progesterone. Progesterone is the pregnancy hormone. Progesterone prepares the uterus to receive the embryos and enables it to nourish them throughout pregnancy. Progesterone is essential for maintaining pregnancy.
- c. If the ova were not fertilized by sperm, the uterus sends a “not pregnant” signal to the ovary and progesterone production stops. The next batch of ova matures in the ovary and the sow returns to heat in 18 to 23 days (average of 21 days). This 21 day cycle from one heat to the next in non-pregnant sows is called the estrous cycle.



3. Puberty

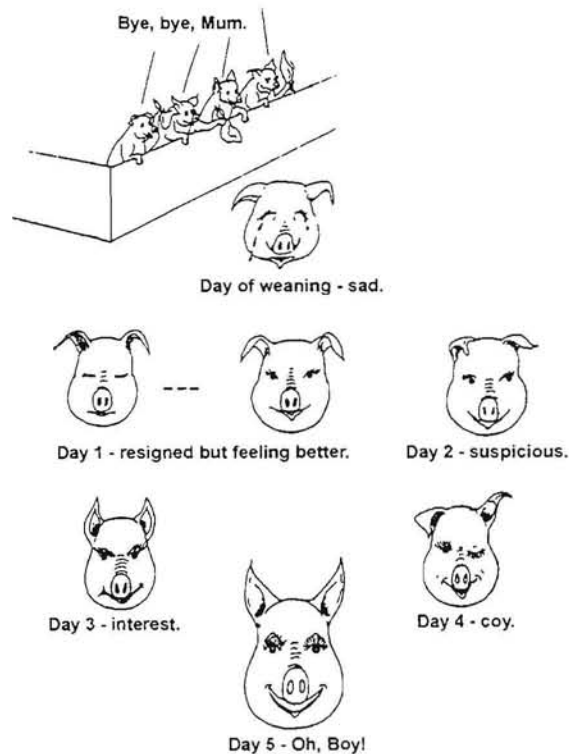
- a. Gilts commonly reach puberty at 6 to 8 months of age, but some will reach it as early as 4 months or as late as 12 months.
- b. Boar exposure will help bring on puberty earlier.
- c. The recommended breeding age for gilts is 6 to 8 months old, at the second or third heat.

C. Mating

1. Heat (estrus) detection

a. Timing of estrus

- i. Sows return to estrus about 5 days after weaning. Non-pregnant animals return to estrus about every 21 days.
- ii. Estrus lasts 40-60 hours in sows, and 24-40 hours in gilts. Ovulation (egg release) occurs about 40 hours after the sow will stand for the boar, or 10 hours before the end of estrus.



TIMING OF ESTRUS

b. Signs of estrus

i. Approaching estrus

- Swollen and red vulva (especially on the inside).
- Restlessness, nervousness, aggressive behavior.
- Honking.
- Mounting or being mounted.

ii. Estrus

- Swelling and redness of vulva reduced.
- Slippery mucus inside of vulva.
- Seeking out boar.
- Standing for back pressure.

c. Detecting estrus

- Checking for estrus is best done every day, or twice a day for gilts and for sows to be artificially inseminated.
- The sight, sound and smell of a mature boar stimulate estrus behavior and make estrus easier to detect.

THE ESTRUS CYCLE

Day	Event
0	Estrus begins
1	Ova (eggs) released and enter the oviduct
2	Ova enter the uterus
3 to 12	Ovaries produce progesterone
12	Uterus signals pregnant or not pregnant
12 to 19	Progesterone production by ovaries declines
19 to 21	Ova mature in ovaries and estrogen production rises
21	Estrus

2. Techniques

a. Pen mating

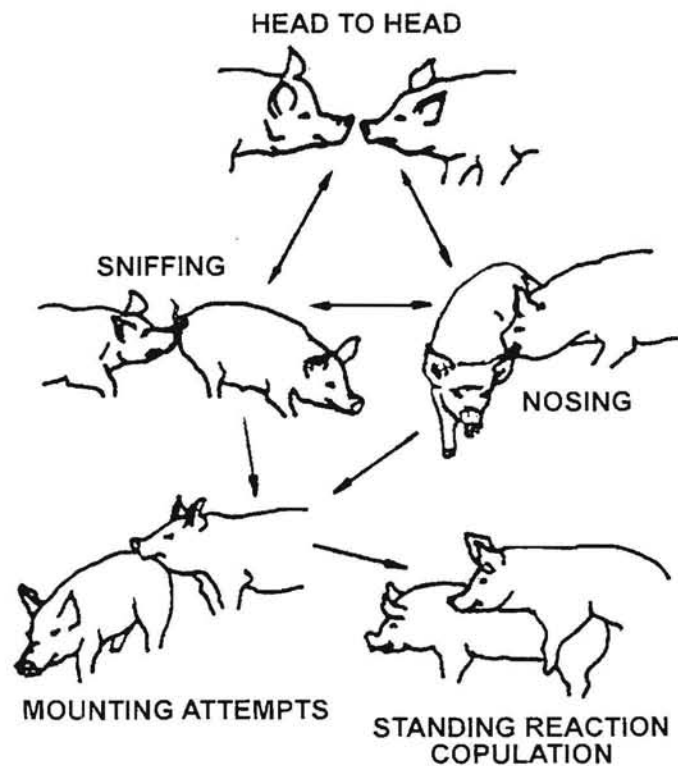
- i. Boars and sows are kept in the same pen.
- ii. Advantages
 - Minimal labor required.
 - No skill needed for heat detection, planning mating, etc.

b. Hand mating

- i. The boar and sow are brought together for supervised mating and separated again when mating is complete. This is repeated daily as long as the sow will stand.
- ii. Advantages

- Breeding date and expected farrowing date are known.
- Better use of boars. Can plan matings to enhance crossbred vigor and avoid inbreeding.
- Faster identification and removal of animals that are non-breeders or produce small litters.
- Boar is rested for the second day of estrus when the sow releases the ova. This results in better reproductive performance.

SEXUAL BEHAVIOR IN SWINE



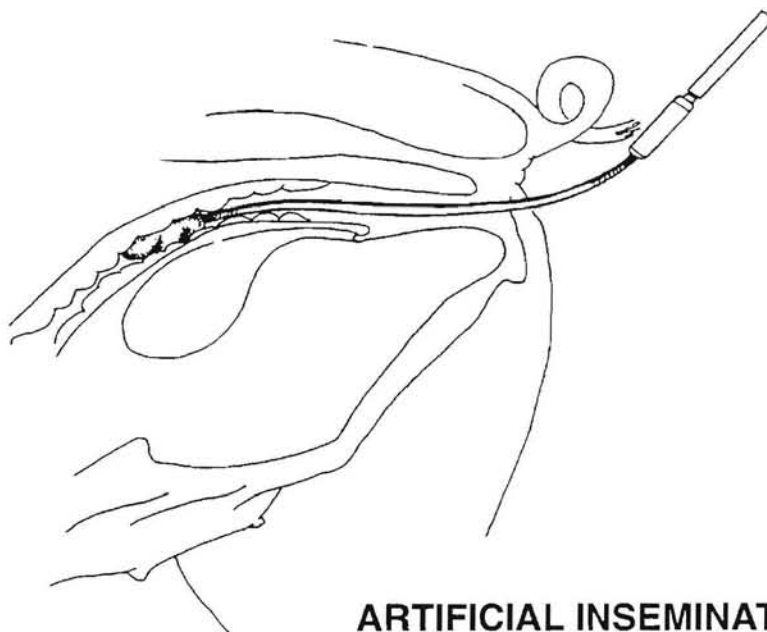
- Less danger of injury.
- Can assist the boar if necessary.
- Faster identification of problems such as bleeding during mating.
- Easier to check for return to estrus.

c. Artificial insemination (AI)

i. The producer breeds sows using semen collected from a boar. Weaning date and semen purchase must be planned in advance because fresh semen will only keep for 5 to 7 days.

ii. Advantages

- Opportunity for genetic improvement. Can use high quality boars.
- Very low risk of transmitting disease, much lower than with natural mating.
- Can use any size boar with any size of sow.
- Semen (sperm) quality checked before use.
- Fresh semen gives conception rate and litter size similar to hand mating.
- Cheaper than using live boars.

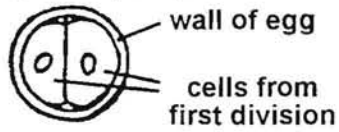


D. PREGNANCY AND THE DEVELOPING LITTER

Stage	Day	Event
Embryo	0	Estrus
	1	Ova (eggs) released and enter the oviduct. Fertilization or conception occurs in the oviduct. Sperm and ova unite to form embryos.
	2	Embryos enter the uterus.
	3	Ovaries start producing progesterone
	5 to 9	Embryos travel through the uterus and space themselves out evenly.
	12 to 14	Embryos attach to the wall of the uterus. This critical process can be disrupted by stress, fighting, or overfeeding the sow, resulting in small litters. Under normal conditions, about 30% of all embryos are lost before the 30th day of pregnancy.
Fetus	35	Skeleton starts to calcify. Usually 1 to 2% of the fetuses die under normal conditions. Fetuses that die appear as mummies at farrowing. Mummies are more common in large litters and older sows.
	70	Placenta (afterbirth) is fully grown
	111 to 113	Ovaries stop progesterone production
	112 to 118	Farrowing (birth). Under normal conditions, 6 to 7% of the piglets die during farrowing and are stillborn. Stillbirths are more common in large litters, in older sows, and in sows that have previously had stillbirths.

STAGES OF EMBRYO DEVELOPMENT

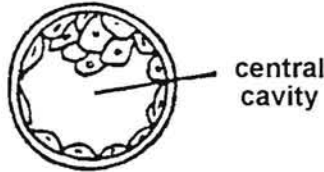
1.
2-cell stage
2 days old (x300).



2.
16-cell stage (x300)
3.5 days.



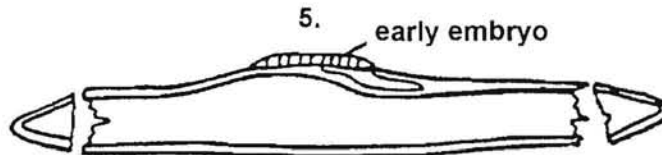
3.
The cavity appearing
(x300) 6 days old.



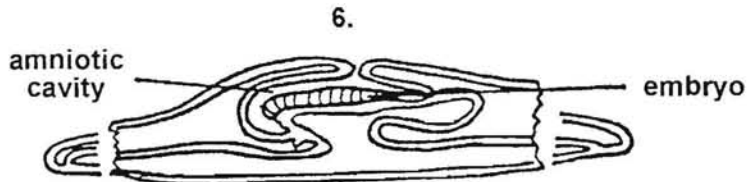
4.
Cross-section (x50)
8 days old.



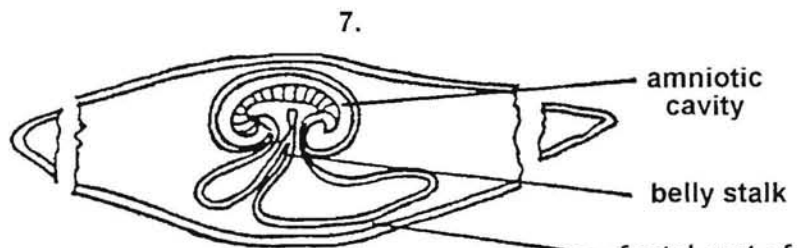
5.
Longitudinal section (x50)
10 days old.



6.
Amniotic cavity forming (x8)
15 days old.



7.
Placenta forming (x5)
17 days old.



E. Farrowing

1. Signs of approaching farrowing

- a. Udder firmness 24 hours before delivery of the first pig.
- b. Restlessness 16 to 9 hours before.
- c. Nest building 16 to 0 hours before.
- d. Increase in body temperature 13 hours before.
- e. Milk can be expressed from teats 24 to 12 hours before.
- f. Rapid breathing 6 to 2 hours before.
- g. Settling down on her side about 3 hours before.
- h. Start of straining about 3 to 1 hours before.
- i. Passage of some fluid about 90 to 15 minutes before.

2. Hormones

a. Farrowing

- i. Fetuses (piglets) signal the mother to release prostaglandin F to start the farrowing process.
- ii. Farrowing can be induced by injecting the sow with prostaglandin F. The level of progesterone drops and the level of relaxin rises and relaxes the birth canal to allow the piglets to pass through. The hormone oxytocin is responsible for contractions.

b. Lactation

- i. During the last month of pregnancy, the placenta (afterbirth) produces increasing amounts of estrogen, which, together with progesterone, causes the udder to develop.
- ii. Just before birth, the release of the hormone prolactin starts milk production. Oxytocin is responsible for milk letdown.

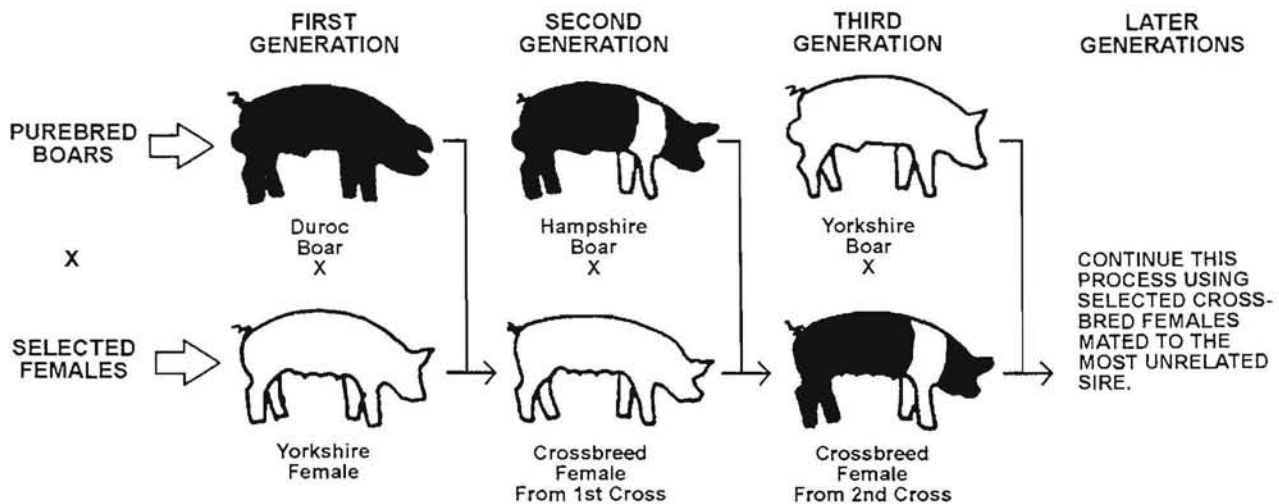
c. Birth

- i. Sows are more likely to farrow in the evening or night. Birth of the litter usually takes 1 to 4 hours, with an interval of 10 to 20 minutes between piglets. Pigs can be born either head or tail first.
- ii. Lack of oxygen is a common cause of stillbirths. Stillborn piglets are more common in large litters and tend to be the last pigs born. Stillbirths can be reduced by assisting sows when the interval between piglets is more than 30 minutes.

II. REPRODUCTIVE PERFORMANCE

A. Genetics

1. Breeds: White breeds (Yorkshire, Landrace) and Chinese breeds generally produce larger litters than colored breeds (Duroc, Hampshire).
2. Crossbreeding
 - a. Litter size can be improved by crossbreeding. Hybrid vigor (crossbred vigor, heterosis) produces crossbred offspring that perform better than the average of the parents.
 - b. Crossbred sows generally produce larger litters and are better mothers than purebred sows. Crossbred litters generally grow faster than purebred litters.
 - c. The crossbreeding system most commonly used on small farms is a rotational cross. Two (two-way rotation) or three (three-way rotation) breeds of boars are used in rotation to produce each new generation of crossbred gilts.
 - d. A crossbreeding system that can be used on larger farms is the terminal cross. All the gilts are produced by crossing two white breeds. The gilts are bred to a colored boar and all the offspring go to market.
 - e. Include white breeds in a crossing system for good reproductive performance. Include colored breeds for good growth and carcasses.



THE TRADITIONAL THREE-BREED ROTATION CROSS SYTEM

3. Inbreeding depression

- a. Inbreeding depression is a reduction in performance of the offspring resulting from breeding related animals. This is the opposite effect to crossbred vigor.
- b. Avoid mating related sows and boars. Mating related sows and boars reduces performance and increases the number of birth defects.
- c. A boar's daughters can reach breeding age about one year after the boar is first used. Farms with only one boar and farms that do not identify their sows should replace boars every year with unrelated boars to avoid inbreeding (father-daughter matings).

4. Selection

- a. Maternal: Select replacement gilts from the largest litters. This requires a method of identifying gilts from large litters.
- b. Paternal: Select replacement boars from the fastest-growing and leanest pigs. This is tricky because boars are normally castrated before weaning. Boars that were too small or sickly to be castrated should not be used for breeding.

5. Introduction of new genetics

Small farms must constantly bring in new genetics to avoid inbreeding depression. Producers can make important improvements in their herds by bringing in tested breeding stock. For example, tested boars have reached a weight of 230 lbs in as little as 128 days (Duroc). A Yorkshire boar has been recorded to increase the number of pigs born alive in his daughters by an average of 1.17.

- a. Breeding stock purchase
 - i. Boars and/or gilts can be purchased.
 - ii. Advantages
 - The animals can be visually evaluated
 - They are usually ready to breed
 - iii. Disadvantages
 - Good breeding stock is very expensive
 - Risk of bringing new diseases or having the new stock infected with a disease that is already on the farm

- b. Artificial insemination (AI)
 - i. Semen can be purchased and used to breed sows on the farm.
 - ii. Advantages
 - Outstanding genetically tested boars are available at a reasonable price.
 - An entire litter of improved animals is obtained.
 - The risk of disease is much lower.
 - iii. Disadvantages
 - Only half the genes come from the semen, half come from the sow.
 - More skill is needed.
- 6. Defects
 - a. Can be genetic or environmental in origin. It is often difficult or impossible to distinguish between the two.
 - b. Reproductive defects such as uterine and penis defects or poor sperm quality prevent sows and boars from breeding or reduce reproductive performance. Identify and cull affected animals. Keep records to identify poor breeders.
 - c. Poor structure of feet and legs, such as small inside toes, is highly inherited.
 - d. Udder defects
 - i. Can interfere with litter growth.
 - ii. Number of teats is highly inherited and should be checked when selecting gilts or boars for breeding.
 - iii. Both genetics and other factors are involved in blind or inverted teats.
 - e. Porcine stress syndrome (PSS)
 - i. Caused by a defective gene.
 - ii. Affected pigs over-react to stress and may die if stressed.
 - iii. They also have pale, soft, and exudative (PSE) or weepy meat at slaughter.
 - iv. The same reactions can be caused in normal pigs if they are over-stressed.
 - v. A genetic test is available to identify carriers of the PSS gene.

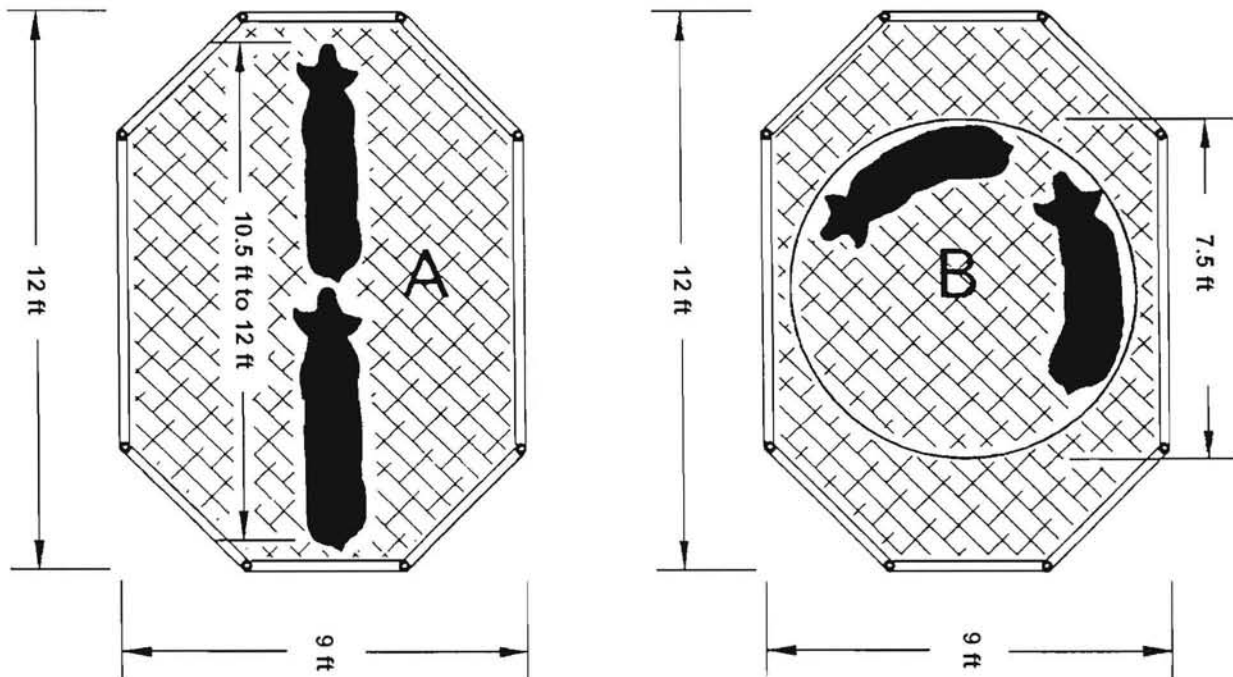
B. Environment

1. Guidelines

- a. The environment should be designed for animal comfort. It should allow normal reproductive behavior and protect animals from undue competition.
- b. Because high temperatures will impair reproduction, breeding stock should be provided with shade and water cooling.
- c. Sanitation is important. Waste removal destroys a reservoir for infectious agents and parasites. Good sanitation reduces infections of the reproductive tract, especially when the cervix opens during estrus and farrowing. A clean farrowing area reduces infection of the udder (mastitis) through the open teat canals.

2. Mating area

- a. Fences should be solid or made of vertical bars. Horizontal bars can lead to leg injury. Corners should be blocked off.
- b. There should be no sharp object or protrusions, and no distractions such as feed.



RECOMMENDED DIMENSIONS OF MATING PENS

- c. The floor should be dry, clean, and not slippery.
 - d. For heat detection, the boar should have head to head contact with the sows.
 - e. For hand mating, pens and alleys should be organized so that animals are easy to move.
3. Gestation area
- a. Should be organized so that fighting can be controlled.
 - b. Protect small, young, and timid sows from undue competition.
4. Farrowing area
- a. Should be organized so that the piglets can be kept warm while the sow is kept as cool as possible. High temperatures reduce sow appetite and milk production.
 - b. Farrowing crates reduce the number of piglet deaths due to crushing by forcing the sow to lie down on her belly before rolling onto her side.
 - c. Mesh floors in the farrowing area keep the pen clean and dry.

C. Health

1. Maintain high levels of resistance
- a. Environmental control
 - i. Proper environmental control minimize stress.
 - ii. Heat stress, fighting, and rough handling lower resistance to disease by suppressing the immune system.
 - b. Nutrition: Poor nutrition lowers disease resistance.
 - c. Stockmanship
 - i. Gentle handling increases reproductive performance and decreases stress.
 - ii. Observation skills are important in recognizing problems before they become serious.
 - d. Parity profile (number of litters) and longevity: Older sows have a higher resistance to disease.

- e. Vaccination and controlled exposure
 - i. Vaccination before breeding protects against diseases that cause losses during pregnancy.
 - ii. Vaccination before farrowing protects against diseases that affect sows and litters and can increase the immunity passed on in the colostrum.
 - iii. Exposing gilts to fence-line contact with sows or sow manure before breeding, gives them an opportunity to develop resistance to the diseases in the herd.

2. Minimize disease challenge

- a. Herd security
 - i. Main sources of new diseases in a herd are new animals brought into the herd. There is always a risk of bringing in disease when bringing in new breeding stock. Risk is reduced by quarantine of new pigs brought into the herd. Wild pigs can also bring disease into a herd (e.g., pseudorabies, brucellosis).
 - ii. People can carry disease into a herd, especially on their footwear (e.g., scours).
 - iii. Diseases can also be transmitted by dogs (leptospirosis), cats (toxoplasmosis), birds (leptospirosis, erysipelas), rats, mice, flies, other pests, trucks, boots, clothing and equipment. Rodent, bird, and fly control helps control diseases.
- b. Sanitation is particularly important in the farrowing area.
- c. Therapeutics
 - i. Treat and separate sick pigs from the herd to reduce disease transmission.
 - ii. Use feed additives to control disease.
- d. Parasite control
 - i. Regular program of parasite control is essential for good health.
 - ii. Controlling parasites reduces stress and increases immunity to other diseases.
- e. Vaccination of boars is important because they can transmit reproductive diseases from sow to sow without showing any signs of disease themselves.

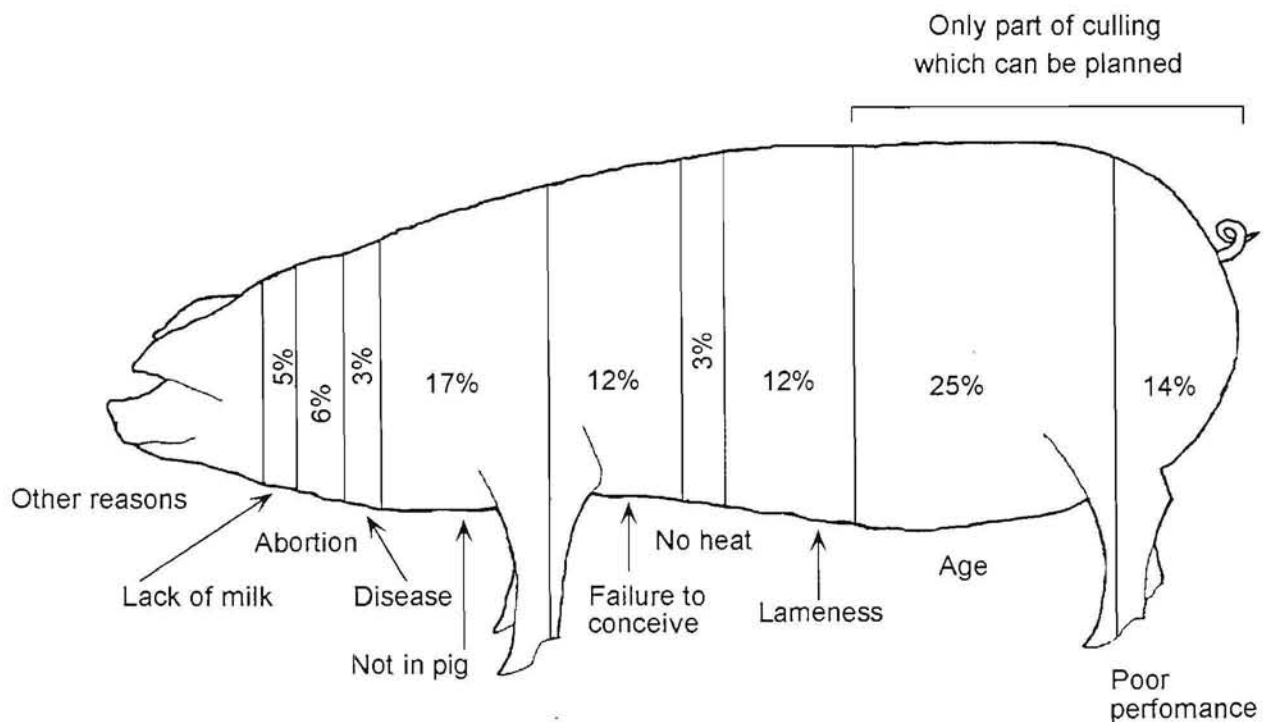
3. Health management

a. Disease recognition

- i. Early identification increases success of treatment and reduces risk of spread.
- ii. Daily observation of each pig is important.
- iii. Use rectal thermometer to identify feverish sows, especially after farrowing.

b. Culling

- i. Reproductive failure, old age and lameness are the main reasons for culling sows.
- ii. Good management and health maintenance can reduce all problems except old age.
- iii. When culling problem sows, observe withdrawal periods for all drugs, vaccines, and parasite treatments.



COMMON REASONS FOR CULLING SOWS

D. Management

1. Social environment

a. Human interaction

- i. Good management means supplying the physical needs of the pigs and handling pigs appropriately.
- ii. Pigs that are treated gently and not afraid of people are easier to handle, have better reproductive performance, and better growth performance.

b. Fighting

- i. Fighting occurs primarily when pigs are mixed, when they establish a “pecking order” that defines where each pig stands on the social scale.
- ii. Pigs that fight and even pen-mates that do not participate in the fighting grow more slowly.
- iii. To minimize fighting, keep pigs in the same groups and avoid adding a small number of pigs to an established group.
- iv. Fighting over feed can occur when gestating sows are on restricted diets. Use feed stalls to reduce problems.

c. Handling

- i. Handling sows should not be stressful on the sows or the producer.
- ii. Wherever possible use fenced alleys to guide pigs. Avoid changes in footing, puddles, shadows, flapping objects, and distractions such as feed.
- iii. Pigs have wide angle vision and can find any escape path. A solid panel or board is very helpful in moving pigs because they will not try to get through it.
- iv. A broom or pail can be used to back up a pig. Never use an electric prod on breeding stock.

2. Record keeping

- a. Simple updated records are more useful than a system that is too complicated to use regularly. Basic records should include information on:
 - i. Breeding
 - Sow, boar, date, and service number.
 - The service number is one (1) the first time a gilt or sow is bred, and is increased by one each time that gilt or sow fails to conceive and returns to heat.
 - ii. Farrowing: Sow, date, number born live, and number born dead.
 - iii. Weaning: Sow, date, number, and notes on piglet condition (runt, big, defects)
- b. Simple calculations from the records
 - i. Farrowing rate: Number of farrowings divided by the number of breedings.
 - ii. Litters/sow/year: Number of litters in a year divided by the average number of sows during that year.
 - iii. Pigs born/litter and pigs weaned/litter.
 - iv. Pigs weaned/sow/year: $\text{Pigs weaned/litter} \times \text{litters/sow/year}$.
- c. Health records
 - i. Record problems and note patterns.
 - ii. Record dates and types of treatments, vaccinations, and parasite control to prevent culled animals from being slaughtered before withdrawal times.

III. REPRODUCTIVE PROBLEMS

A. Diagnosing reproductive failures

1. Breeding herd records
 - a. Compare current and previous performance.
 - b. Compare with other farms.

- c. Productivity differences between gilts and sows.
 - d. Fertility differences between boars.
 - e. Seasonal fertility patterns.
 - f. Chronological sequence of problems.
 - g. Epidemiological features.
 - h. Magnitude and cost of the problem.
2. Management factors
- a. Methods of handling livestock.
 - b. Buildings and environment.
 - c. Effects of seasons of the year.
 - d. Nutrition.
 - e. Disease control.
 - f. Genetics.
3. Serology (blood testing) identifies diseases such as leptospirosis, brucellosis, influenza, pseudorabies, chlamydia, porcine parvovirus, porcine enteroviruses, and eperythrozoonosis.
4. Fetal and placental tissue testing
- a. Tissue testing identifies porcine parvovirus, pseudorabies, and other viruses.
 - b. Microorganisms can sometimes be cultured from the tissues.
 - c. Time of gestation when fetal death occurred can be determined if fetuses are submitted.
5. Other procedures
- a. Examine ovaries, uterus, and uterine contents of sows at slaughter.
 - b. Pregnancy test sows by ultrasound, palpation, or vaginal biopsy.

- c. Measure blood progesterone level twice at 10 day intervals to distinguish among non-cycling, cycling, and pregnant sows.
 - d. Check boars for fertility if females recycle at 21 days or if litter size is low.
- B. Abortions, stillbirths, mummies, weak pigs, infertility
- 1. Causes
 - a. Bacteria: Leptospirosis, uterine infection, and systemic diseases with high fever, e.g., erysipelas.
 - b. Viruses: Porcine parvovirus, pseudorabies, brucellosis, porcine reproductive and respiratory syndrome (PRRS), and encephalomyocarditis (EMC).
 - c. Parasites: *Toxoplasma gondii*.
 - d. Mold toxins
 - e. Stress due to heat and fighting.
 - 2. Signs
 - a. Sow respiratory or neurologic disease with pseudorabies.
 - b. Swollen vulva with mold toxins.
 - 3. Prevention practices related to breeding
 - a. Vaccination of gilts 5 weeks before breeding, of gilts and sows 2 to 3 weeks before breeding, and of boars. Parvovirus, leptospirosis, and erysipelas vaccines strongly recommended for all farms.
 - b. Expose gilts to older sows (fenceline contact or manure) at least 30 days before breeding.
 - c. Test all introduced pigs
 - i. PRRS is a newly identified disease and some islands may be free of it.
 - ii. Two herds in Hawaii have been infected with PRRS and in both cases the source of infection was untested pigs brought in from the U.S. mainland.

B. Farrowing difficulty

1. Causes

- a. Inadequate uterine contractions.
- b. Insufficient room in the birth canal.
- c. Folding of the uterus.
- d. Oversized or deformed piglets or two or more piglets arriving at the same time.

2. Signs

- a. Sow has blood-tinged discharge and strains but no piglets born.
- b. Interval greater than 30 minutes between piglets.
- c. Piglets dried off and sow still straining.
- d. Foul smelling discharge, depression, or exhaustion after prolonged labor.

3. Treatment

- a. Manual removal of piglets
 - i. Wash hind quarters of sow. Scrub and disinfect arm, lubricate with Vaseline.
 - ii. Form the fingers into a cone shape and slide the hand into the birth canal, sliding along the top of the canal (following the curve of the backbone) to avoid the opening to the bladder.
 - iii. Pass the hand through the bony pelvis until a piglet is felt.
 - iv. If the piglet is head first grasp the head or lower jaw; if it is tail first grasp the back legs by the hocks.
 - v. Gently but firmly pull out all piglets within reach.
- b. For weak contractions, use 20-40 units (1-2 ml) of oxytocin. Repeat every 30-60 minutes if necessary. Remove all piglets within reach before injecting oxytocin.
- c. Perform cesarian section if necessary.

4. Prevention: Make sure sows are in good condition at farrowing.

C. Uterine infection (metritis) after farrowing

1. Causes

- a. Retained placenta
- b. Dead piglet remaining in the sow
- c. Unsanitary procedures when assisting sow at farrowing

2. Signs

- a. Fever.
- b. Vulvar discharge that persists for more than 36 hours. Over 60% of normal sows have a vulvar discharge for 24 to 36 hours.

3. Antibiotic treatment.

4. Prevention

- a. Good sanitation.
- b. Assistance in removing pigs during farrowing if needed.

D. Lactation failure: Mastitis metritisagalactia (MMA), Periparturient Hypogalactia Syndrome (PHS)

1. Causes

- a. Infection by *E. coli*, *Klebsiella*, or related bacteria
- b. Management factors: low water intake by sows, over- or under-feeding sows, poor sanitation, stress, vitamin E or selenium deficiency
- c. Hormone imbalance resulting from bacterial endotoxins or management factors

2. Signs

- a. Most common 1-3 days after farrowing.
- b. Red, hot, or hard udder sections.
- c. Hungry or restless litter.

PREVENTION AND CONTROL OF DISEASES THAT CAUSE FETAL DEATH

Disease	Prevention and Control						
	Vaccinate	Expose Gilts	Control Other Animals	Eliminate Positives	Sanitation	Test New Pigs	Antibiotics
Leptospirosis	X		X			X	
Uterine Infection			X			X	X
Erysipelas	X		X				X
Disease w/ Fever						X	X
Parvovirus	X	X					
Pseudorabies	X		X	X	X		
Brucellosis				X			
PRRS							
EMC	X						
Other Viruses		X					
Toxoplasmosis			X				
Mold Toxins							

- d. Sow fever
 - e. Sow off feed or depressed
3. Treatment
- a. Early recognition is essential
 - b. Oxytocin: 5-10 units (.25-.5 ml) every 2-4 hours for 24-36 hours to establish milk flow
 - c. Antibiotics
 - d. Anti-inflammatory agents: flunixin meglumine
 - e. Supplementary feeding of piglets or cross-fostering
4. Prevention
- a. Keep sow water intake high.
 - b. Good sanitation of farrowing area. Clean, dry floors are important. Infection often enters through the teats.
 - c. Gestation feeding to keep sows in good condition (score 3).
 - d. Reduce stress by allowing the sow to get used to the farrowing area before farrowing.

E. Anestrus (no heat)

1. Causes

- a. Puberty
 - i. First estrus normally occurs between 5 and 8 months of age.
 - ii. Gilts reach puberty earlier if they are:
 - Raised outside rather than inside.
 - Crossbred rather than purebreds.

- Raised in contact with a boar rather than in isolation.
 - Exposed to at least 14 hours of light per day.
 - Born in the fall rather than in the spring.
- iii. Some gilts may have reproductive defects that prevent them from ever reaching puberty, e.g., hermaphrodites, pseudohermaphrodites, intersexes.
- b. Nutrition: Undernourished sows may not show estrus.
- c. Management: Inadequate heat detection and inadequate boar contact result in missed heats.
- d. Pregnancy/lactation
- i. Pregnant and lactating sows will not show heat.
 - ii. Sows weaned earlier than 18 days are less likely to return to heat within 7 days.
- e. Pseudopregnancy
- i. If the litter is lost during early pregnancy, the sow may not get a “not pregnant” signal from the uterus and will continue to act as though she were pregnant
 - ii. This can occur with parvovirus or with mold toxins.
- f. Cystic ovaries: If the ovaries develop cysts the sow may either fail to show heat or may act as though she were in heat all the time.
- g. Irregular estrous cycle
- i. Estrus may be missed when sow returns to heat in less than 18 or more than 22 days.
 - ii. Returning to heat in less than 18 days may signal a hormonal imbalance.
 - iii. Returning to heat 25 to 36 days after breeding is usually a sign that the sow has lost her litter.

2. Treatment

- a. Improved management.
- b. Heat checking in the presence of a boar.
- c. Prostaglandin injection to end pseudopregnancy.
- d. Gonadotropin injection to induce puberty.
- e. Culling defective animals.

3. Prevention

- a. Management changes.
- b. Vaccination for parvovirus.

F. Cystitis and nephritis (bladder and kidney infection)

1. Causes

- a. Bacterial infection of bladder and/or kidneys is usually caused by bacteria entering the vulva and ascending to the bladder.
- b. Infection can also be caused by boars during mating and through cuts or injuries to the vulva or tail.

2. Signs

- a. Mild cases
 - i. Discharge from vulva.
 - ii. Blood in urine.
- b. Severe cases
 - i. Loss of appetite.
 - ii. Excessive thirst.
 - iii. Frequent urination.

- iv. Urine may be reddish-brown, and may have fresh pus and ropey strands in it.
 - v. Possible fever.
 - c. Boars: Occasional blood in urine but often no signs.
 - 3. Treatment
 - a. Antibiotics.
 - b. Culling.
 - 4. Prevention
 - a. Sanitation.
 - b. Prevention of injury, especially during mating.

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Baby Pig Management

BABY PIG MANAGEMENT

WORKSHOP OUTLINE

I. INTRODUCTION TO BABY PIG MANAGEMENT

- A. Importance of baby pig management
- B. Preparation of farrowing area
- C. Preparation of sow
- D. Assistance at farrowing
- E. Colostrum
- F. Splay Legs

II. PIGLET HUSBANDRY PRACTICES

- A. Cutting the umbilical cord
- B. Tooth clipping
- C. Tail docking
- D. Pig identification
 - 1. Importance
 - 2. Methods
 - a. Ear tattoo
 - b. Ear tags
 - c. Ear notching
- E. Crushing
 - 1. Incidence
 - 2. Prevention

F. Cross-fostering

G. Chilling

H. Anemia

I. Scouring

J. Castration

III. CREEP-FEEDING

IV. RECORDS

BABY PIG MANAGEMENT

INSTRUCTOR'S NOTES

I. INTRODUCTION TO BABY PIG MANAGEMENT

A. Importance

1. Baby pig management affects the number of pigs weaned per sow per year. This is an important measure of sow productivity and farm efficiency.
3. Careful management during the pre-farrowing, parturition, and preweaning periods can mean an additional 1-2 piglets weaned per sow per litter.

B. Preparing the farrowing area

1. Designate a specific area for the delivery of piglets.
2. Some producers have separate farrowing units with farrowing crates while others practice outside farrowing with minimum shelter.
3. Assure the sow's safety in the pen; make sure the floor is not too slippery.
4. Provide a draft-free, warm, and comfortable piglet area that is separate from the sow.
5. Disinfect the farrowing area, feeders, and waterers. Spray with miticides to prevent mites and lice. Check nipple waterers for good water flow.

C. Preparing the sows/gilts

1. Check the physical condition of the sow as her pregnancy advances.
2. Give more feed to thin sows and put obese sows on restricted feeding. Gradually change their ration during the period between gestation to lactation.
3. Administer preventive medications to sows prior to transfer to the farrowing area
 - a. These may include worm medicines, miticides, and vaccines. Sows must be free of internal and external parasites prior to farrowing so the piglets won't be infected.
 - b. Vaccinate sows so that immunity will pass on to the piglets. Most common vaccination programs include treatment for scours and respiratory diseases. Consult with your veterinarian about the common diseases in your area.
4. One week before farrowing, wash the sows and transfer them to the farrowing area. Get them accustomed to their new environment especially when using farrowing crates.

D. Assistance at farrowing

1. Sows may need assistance during prolonged labor and difficult births.
2. Oversized and malpositioned piglets obstruct the birth canal; a gentle pulling may save the lives of the piglets.
3. Remove mucus from the mouth and nostrils of piglets to clear their respiratory tract. If necessary, revive them by giving them mouth-to-mouth resuscitation with a funnel or by swinging them.
4. The presence of the farmer during farrowing can reduce stillbirths and piglet losses due to suffocation or excessive bleeding from umbilical cords.
5. If necessary, help the piglets find the sow's teats.

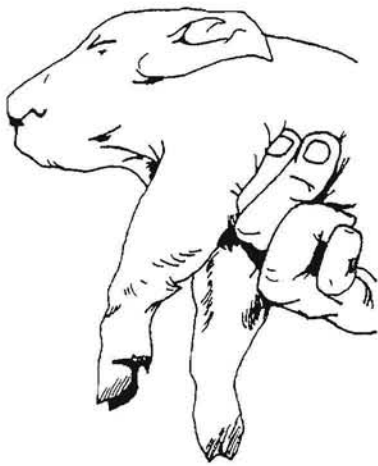


PIGLET MOUTH-TO-MOUTH RESUSCITATION



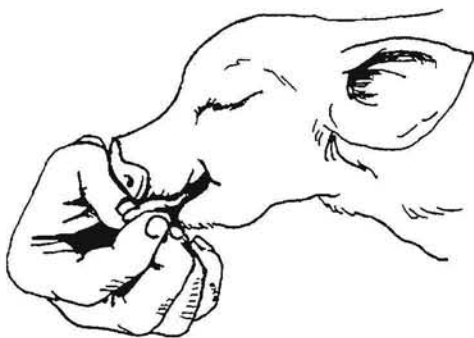
2. Remove mucus from nose and mouth.

1. Check heartbeat.



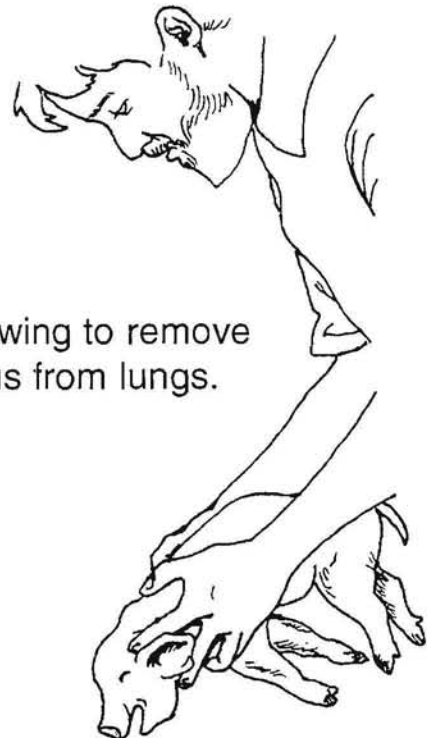
3. Hold by shoulders and support the head.

**SWING
INTO
LIFE**



5. Squeeze nose and tongue to stimulate a sneeze.

4. Swing to remove mucus from lungs.



E. Colostrum

1. Colostrum is the first flow of milk produced by the sow after giving birth. It has a thicker consistency and is more yellowish in color than regular milk.
2. Colostrum is high in fat and protein and it contains antibodies which protect the piglets against common infections and diseases. Piglets that do not consume colostrum milk have a low survival rate and are susceptible to diseases.
3. Guide piglets to the sows' teats to ensure a prompt colostrum intake because the piglet's ability to absorb antibodies decreases rapidly after birth.
4. If runts and weak piglets cannot nurse, milk 10 cc of colostrum from the sow and give it to the piglets with a baby bottle or stomach tube until they can nurse on their own.
5. If the sow dies at parturition or suffers from "no-milk syndrome," foster piglets to other newly-farrowed sows.
6. Freeze colostrum for emergency situations
 - a. Pinch the udder above the teat and gently slide down the teat, catching the milk in a clean container.
 - b. Freeze it in an ice cube tray. One cube of colostrum warmed to body temperature will feed one piglet.

F. Splay legs

1. Some piglets are born with splay-legs that restrict their movements.
2. Tape the legs together in their correct position until the piglet recovers from the condition.
3. Use duct tape and wrap it around the left back leg, up around the right ham, over the back, down over the left ham, and around the right back leg.
4. The tape prevents the legs from sliding forward and outward. Leave the tape in place for 2-7 days and remove it as soon as the piglet is able to walk without assistance.

II. PIGLET HUSBANDRY PRACTICES

A. Cutting the umbilical cord

1. As soon as the piglet comes out and the umbilical cord breaks, cut the chord 1 inch from the base and dip the stump in iodine. To avoid piglet infections, do not leave the umbilical cord uncut or without disinfectant.
2. If the cord does not break naturally, wait 5-10 minutes after the piglet comes out and pull the cord gently until it breaks. If excessive bleeding continues after dipping in iodine, clamp the stump with forceps for 1-2 minutes. Some producers tie the cord with a string.

B. Tooth clipping

1. Piglets are born with 8 sharp teeth located on the sides of the upper and lower jaws.
2. The teeth need to be clipped immediately after birth to prevent pain and injury to the sow's teats when the piglets nurse.
3. The sow's udder may get infected through these small cuts causing severe irritation. A sow in this condition may refuse to nurse the piglets.
4. Clipping the piglet's teeth also prevents cuts during fights.
5. Use sterilized side-cutting pliers to remove half of each of the needle teeth. Do not cut too close to the base of the teeth or injure the gums and tongue.



C. Tail docking

1. Tail docking prevents tail-biting which is common among pigs in confinement. Tail-biting leads to injury, infections, and slower growth rate.
2. When piglets in confinement are 1-3 days old, cut their tails 1/2 to 1 inch from the base. Cut the tail with a pair of scissors or side cutters, dip the wound in iodine, and check for excessive bleeding.
3. Piglets chosen for breeding stock should not have their tails cut. Breeding animals use their tails to drive flies away from the vulva when exudates are present during estrus, farrowing, and infections of the reproductive tract. Intact tails in boars and sows also give them a better appearance.

D. Pig identification

1. Importance

- a. Proper identification allows a good selection replacement program for gilts and boars by tracing their history and bloodlines.
- b. Performance of finishers can be easily traced to sows and boars that have been properly identified.

2. Methods of marking piglets

a. Ear tattoo

- i. Tattoo piglets when they are 2-3 weeks old.
- ii. The equipment consists of pliers, digits (0-9), and tattoo ink.
- iii. Place the proper digits in the pliers and apply pressure to the piglet's ear until the digit marks are visible. Smear ink on the digit marks to produce a tattoo.
- iv. Shine a flashlight from behind the ear to make it easier to read the numbers.

b. Ear tags

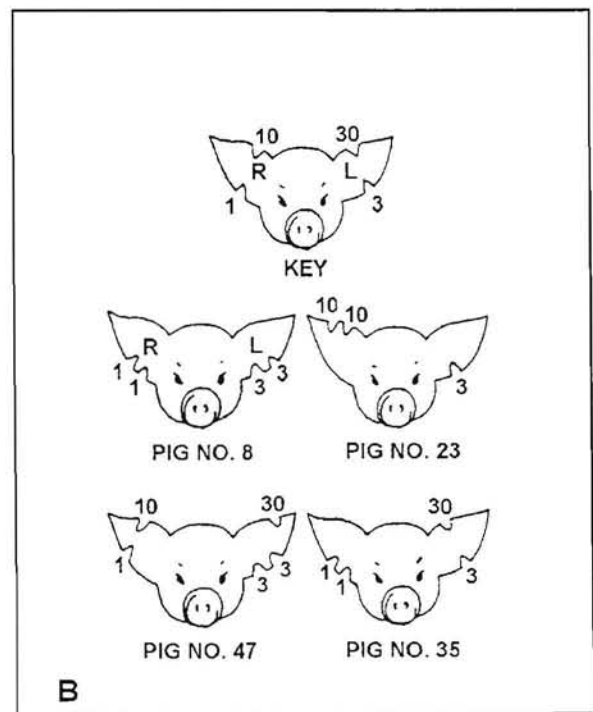
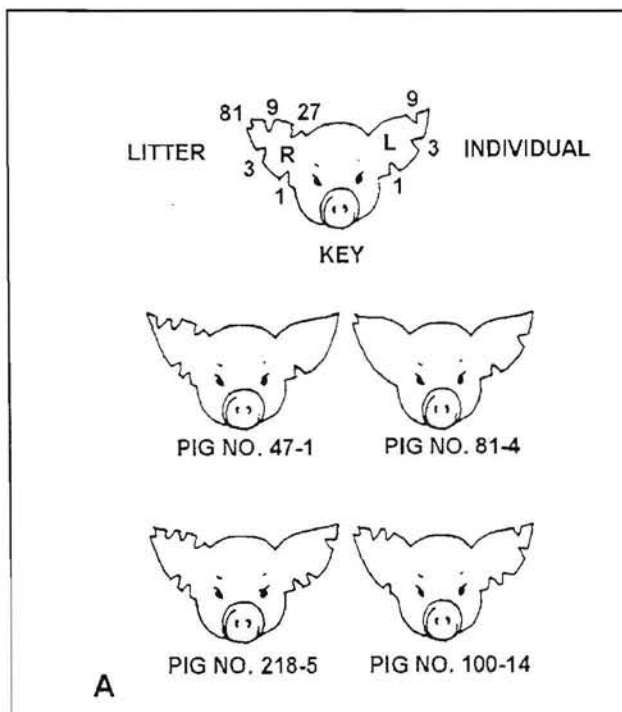
- i. Plastic or aluminum tags are commonly used for replacement and breeding animals. They are easy to read even at a distance.
- ii. Attach the tags to the piglet's ear by using pliers.

c. Ear notching

- i. This is the most common identification practice. It is usually done when piglet's are one day old.
- ii. Use a system with litter and individual pig numbers or just the individual pig numbers. Use a single system to reduce unnecessary notches on the ears.

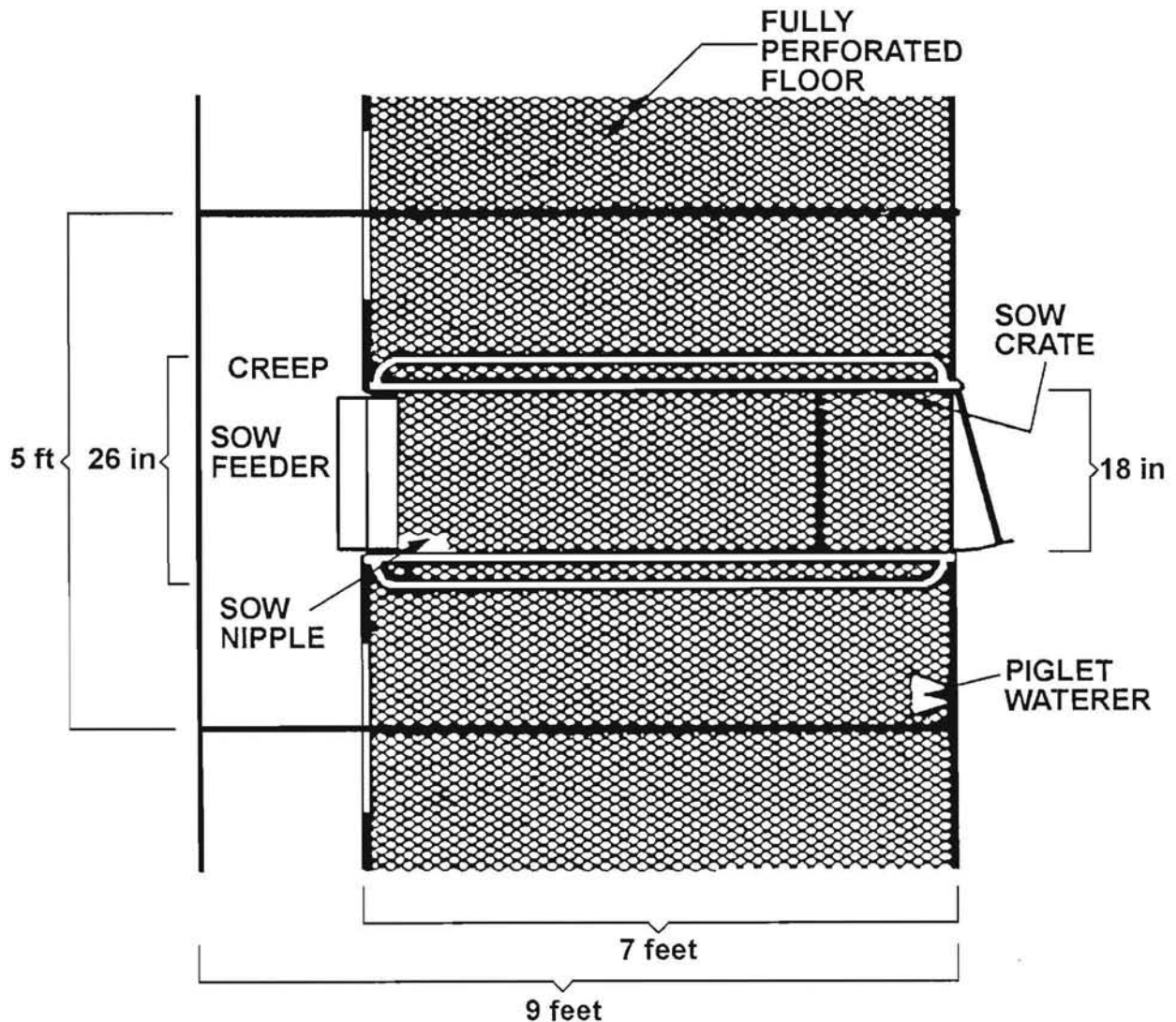
iii. Procedure

- Restrain the piglet.
- Use a V-shaped notcher to notch the number onto each piglet's ear.
- Do not make the notches too deep or too shallow. Leave at least 1/4" between notches to make reading easier.
- Be careful because mistakes become permanent and improper notching makes pig identification difficult.



E. Crushing

1. Studies show that the crushing of piglets by the sow is one of the primary causes of preweaning injuries and deaths. The incidence of crushing is highest during the first five days of life and in open farrowing areas.
2. Prevention
 - a. A farrowing crates is the best way to prevent crushing.
 - b. The crate forces the sow to lie down on her belly before turning on her side. Since she cannot flop down, the chances of crushing the piglets are greatly reduced.
 - c. One week before farrowing, place the sow in the crate so she becomes accustomed to her new environment.



- d. Even small-scale hog producers (less than 10 sows) should use crates.
- e. Iron, metal bars, wood, or bamboo can be used as long as the correct dimensions for the crate size are followed.
- f. Suggested crate dimensions
 - i. Width 18-20 inches, length 60 inches, height 48 inches.
 - ii. The spacing of the side bars can range from 6 to 8 inches as long as there is a sow control bar 16 inches above the floor. The control bar can be made adjustable to accommodate various sizes of sows.
- g. Another way to reduce the incidence of crushing is to place railings 8 inches above the floor around the walls of open farrowing pens.

F. Cross-fostering

1. Cross-fostering is the distribution of piglets among different sows.
2. Reasons for cross-fostering
 - a. Orphaned piglets or litters from sows afflicted with agalactia (no milk production after farrowing) need to be fostered to other sows.
 - b. Piglet size can be made uniform and the number of piglets per sow can be equalized.
 - c. The survival of small or weak piglets is improved if they are nursed as a group separately from large piglets.
3. Cross-fostering can be started any time from a few hours to 3 days after birth.
4. Allow piglets to nurse before transferring them to a new sow. The waiting period improves the chances of acceptance by the new sow.
5. Cross-fostering is most successful when sows farrow at approximately the same time.

6. Milk replacer formula

- a. If cross-fostering is not possible, orphaned piglets and runts can be given milk replacer as supplemental feeding.
- b. Make milk replacer formula by mixing together one quart of milk, one raw egg, and two tablespoons of sugar, and warming the mixture to body temperature.
- c. Use a stomach tube, a bottle, or a pan to feed the piglets.
- d. Prevent piglet diarrhea by not feeding them too much or too fast.

7. Split suckling

- a. Useful when only one sow is available in a large litter.
- b. Put the large piglets in a warm box for one hour three times a day to give the smaller ones a chance to nurse without competition, or split the litter into two groups and alternate their suckling time.
- c. Split suckling improves the survival and growth rates of smaller piglets.

G. Chilling

1. The first five days are critical to piglet survival because they cannot regulate their body temperature. Chilling predisposes them to scouring and respiratory infections.
2. To prevent chilling, quickly dry newborn piglets and clear their lungs of mucus. Keep the piglets dry when bathing the sow or cleaning the pen.
3. The area where piglets are born and raised should be clean, dry, warm, and properly ventilated at all times. Keep the temperature at 90-95° F for the first five days and 70-80° F until weaning.
4. Heating the piglet area
 - a. Electric bulbs ranging from 50 to 100 watts are a good source of heat. Hang the bulbs 10 to 14 inches from the floor and out of reach of the sow.
 - b. Other heat sources include infrared heat lamps, brooders, and mats. Keep the heated area for the piglets away from the sow. The heat source will attract the piglets and reduce the incidence of crushing.
 - c. Place clean feed sacks or old clothing on the floor beneath the bulbs for additional piglet comfort.

5. Observe the behavior of the piglets. If they are too cold, they will pile up under the heat source; if they are too warm, they will stay away from the heat source.
6. The sow's comfort range after farrowing is 55-75° F. An excessively high temperature in the farrowing area decreases her feed intake and milk production.

H. Anemia

1. Anemia is caused by a deficiency of iron in the body. Iron is important for hemoglobin formation in the blood.
2. The signs of anemia in piglets are pale mucous membranes, stunted growth, sudden mortality of healthy looking piglets, and scours in slightly older pigs.
3. Piglets are susceptible to iron deficiency because they are born with low iron levels and the sow's milk cannot support the iron requirements of the fast-growing piglets.
4. In the wild, pigs get iron by eating soil or manure. However, in modern farrowing areas the producer must provide iron injections.

5. Iron injections

- a. There are many commercial iron preparations; follow the label directions.
- b. Administer 100-200 mg. of iron to the piglets 2-3 days after birth.
- c. A single injection of iron is normally adequate but a second injection is necessary if piglets still show signs of iron deficiency. Watch for any signs of anemia prior to the weaning period.
- d. An injection in the neck muscle is preferred because injections in the ham muscle may leave an iron residue that will stain the ham.



- e. Procedure
 - i. Use a 20-22 gauge, 1/2 inch needle for the injection to lessen trauma to the piglets.
 - ii. Hold the piglet in one hand and slowly inject the recommended dose into the neck muscle.
 - iii. Apply temporary pressure to the injection site to prevent the backflow of iron.
- 6. Oral iron preparations are also available but may not be as effective as injectable iron especially in piglets with scours.
- 7. If iron preparations are not available, put a few handfuls of clean soil in the baby pig area until the piglets can start creep feeding.

I. Scouring

- 1. Piglet diarrhea (scouring) is caused by bacteria and viruses.
- 2. Piglets that do not consume enough colostrum right after birth are susceptible to scouring because of their low resistance to disease. Cold and wet floors, dirty pens, and a low level of nourishment can also cause scouring in piglets.
- 3. Scouring is usually caused by various strains of *Escherichia coli* bacteria. *E. coli* is normally found in the intestines of the piglet but it will cause scouring when body resistance is low.
- 4. Scouring causes watery yellow stools. Piglets become severely dehydrated and mortality can be very high if left unattended. Scouring can affect piglets any time from the first day of birth until weaning age.
- 5. Antibiotics
 - a. Oral antibiotics are available for the treatment of scours. They are normally prepared in suspensions that can be administered in calibrated dosages.
 - b. On farms with severe cases of scouring, administer a preventive dosage at birth. Scours spreads quickly so treat all piglets in the affected litter.
 - c. Rotate antibiotics to reduce the development of bacterial resistance.

6. Vaccines

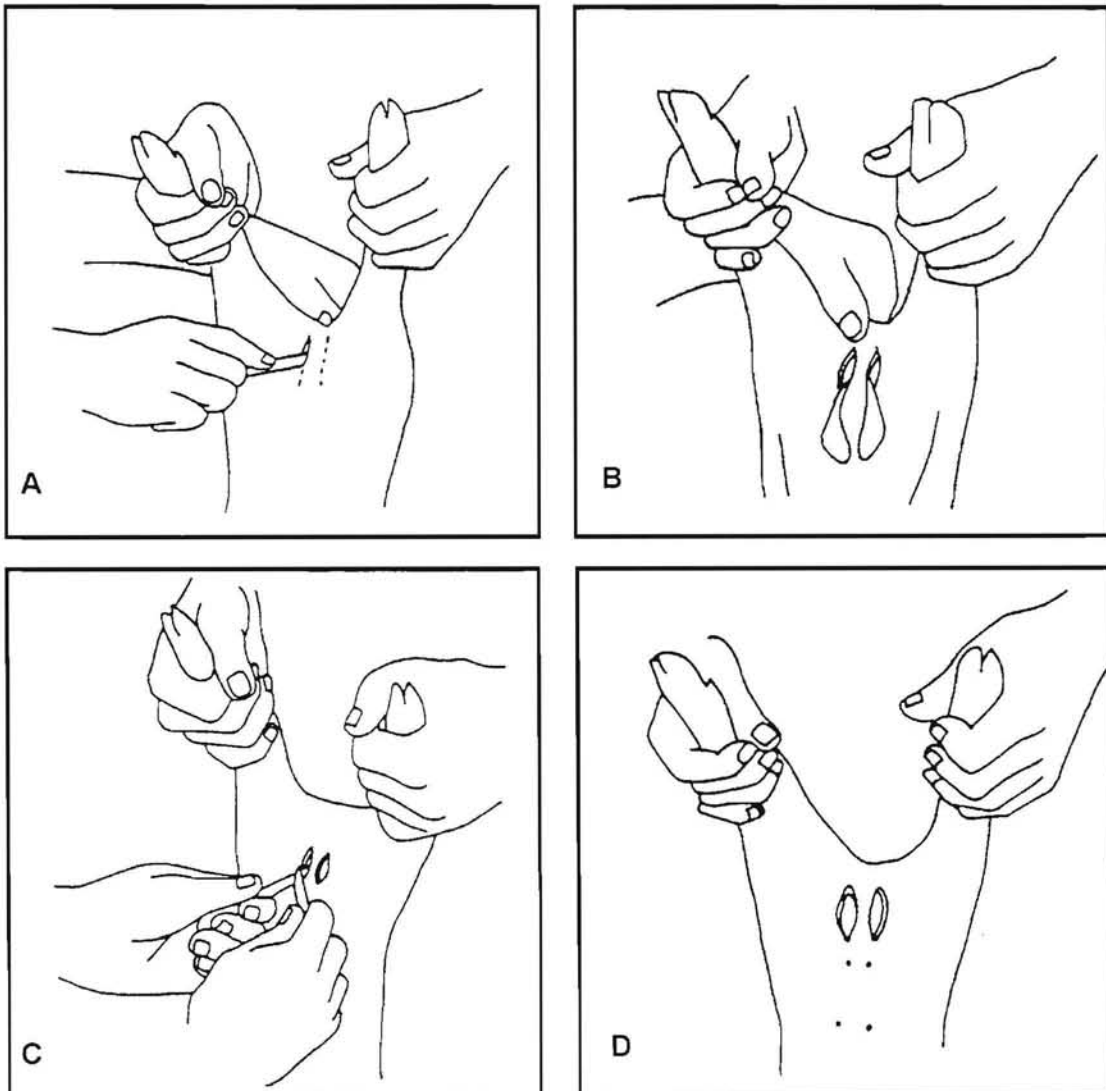
- a. Vaccines for specific strains of *E.coli* are available to control scouring. They are given to the sow late in the pregnancy in two doses, at least two weeks apart.
 - b. The vaccine must protect against the strain present on your farm. The specific strain of *E. coli* is identified by laboratory analysis of stool and other specimens.
7. Medication and vaccinations will not cure scouring piglets if the farrowing area is wet, cold and dirty. Piglets also need colostrum and adequate nutrition to resist infections at this period.

J. Castration

1. Castration is the surgical removal of the testicles. It is performed on male pigs not selected for boar replacement and breeding purposes.
2. Castrated pigs are easier to handle, they grow faster, and their meat has no “boar odor” when they are slaughtered.
3. Castration is best done when piglets are 3 to 14 days old because at that age they are easier to handle, heal quickly, and suffer less.
4. Castration equipment
 - a. Scalpel or side -cutters.
 - b. Artery forceps or clamps.
 - c. Iodine or wound disinfectant.
 - d. Pig holder (optional).
5. Commercial restraining devices make castration a one-person operation. Piglets less than one week old can be held in one hand and castrated with the other.

6. Scalpel method

- a. Restrain the pig and clean the scrotal area with iodine or a mild wound disinfectant.
- b. Examine the testicles; any enlargement can be a sign of hernia. Do not castrate pigs with scrotal hernia unless you are properly trained to do so.
- c. Tighten the skin over the scrotum to keep the testicles in place for the incision.
- d. Make two incisions at the bottom of the scrotum for proper wound drainage.
- e. Make an incision on the midline between the two testicles and expose them by cutting through the membrane that separates them.



- f. Individual incisions can also be made near the center of each testicle.
- g. Cut through the skin and the white sac (*tunica vaginalis*) that encapsulates the testicles. Squeeze and pop the testicles out through the incision.
- h. Firmly pull out the testicles until the chord breaks.
- i. Apply wound disinfectant over the incisions after taking out the testicles.
- j. Observe the piglets for excessive bleeding. The cord may need to be clamped if bleeding persists.

7. Side-cutter method

- a. Using side cutters instead of a scalpel reduces bleeding because the blood vessels are pinched rather than sliced.
- b. Hold the piglet by one leg, belly outward. With the middle finger, make the testicles more pronounced. The resulting fold of skin is where the incision is made.
- c. Position side-cutters approximately 2/3 of the way into the fold and make a clean cut directly through the scrotal tissue (right of the middle). Make another cut to the left of the midline.
- d. Pop out the testicles through the incisions as they are pinched with the thumb and forefinger of the same hand holding the pig.
- e. Grasp the exposed testicle and cords and pull out slowly. There is no cutting of the cords in this method; they are pulled out completely along with the testicles. Do not leave any loose cord tissue outside the incision.
- f. Spray iodine on the incision to prevent infection.

8. Post-castration complications

- a. Scirrhus cord
 - i. This is a rare condition in which the cord stump becomes so large that it makes the producer wonder if the piglet was ever castrated at all.
 - ii. This condition affects piglet performance and growth so remove the stump while it is still small.
- b. Other possible complications are tetanus and infections. To prevent them, keep the piglet area clean and dry until the castration wounds are healed.

III. CREEP FEEDING

1. Give piglets a pre-starter ration (creep feed) from two weeks of age until weaning.
2. Provide small amounts of fresh feed in a shallow pan and increase the amount when the piglets start eating it. Keep the feeding pan out of reach of the sow.
3. Creep feeding enhances piglet growth and it allows their digestive system to adjust gradually as they make the transition from milk to dry feed at weaning.
4. Use commercial pre-starter rations containing 18-21% crude protein or seek the advice of an animal nutritionist on formulating a creep feed.
5. Install nipple waterers in the piglet area to provide potable water at all times.

IV. RECORDS

1. Records are the best tools to analyze the performance of a swine operation.
2. Keep records in a log book that is updated, accurate, and simple to use.
3. Record the following information in the farrowing unit:
 - a. Sow information: ID number, breed, date born, functional nipples, disposal date.
 - b. Litter number.
 - c. Date bred.
 - d. Sire.
 - e. Date farrowed.
 - f. Number of piglets born.
 - g. Average birth weight (lbs.)
 - h. Number of piglets weaned.
 - i. Weaning age (weeks).
 - j. Average weaning weight.
 - k. Causes of piglet death.

SAMPLE RECORD KEEPING FORM

Sow ID Number:	Date Born:					
Breed:	No. of Functional Nipples:					
	F a r r o w i n g s					
Production Record	1st	2nd	3rd	4th	5th	6th
Litter number						
Date bred						
Sire						
Date farrowed						
No. of pigs born						
Avg. birth weight (lbs.)						
No. of pigs weaned						
Weaning age (weeks)						
Avg. weaning weight (lbs.)						
Cause(s) of piglet death						

Sow Disposal Date:	Reason:	Weight:
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