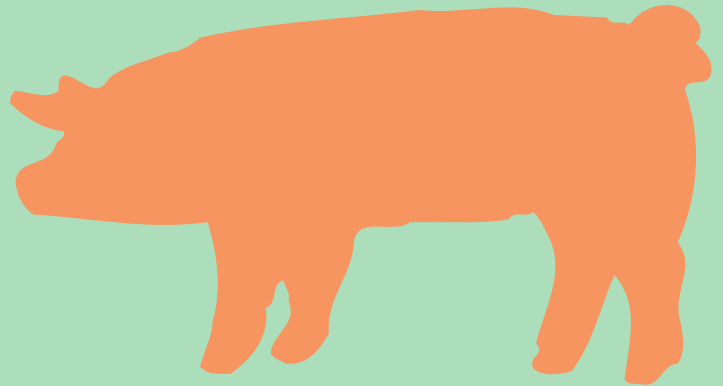
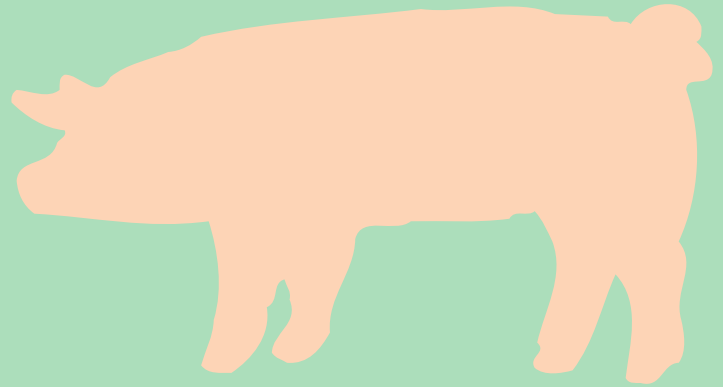
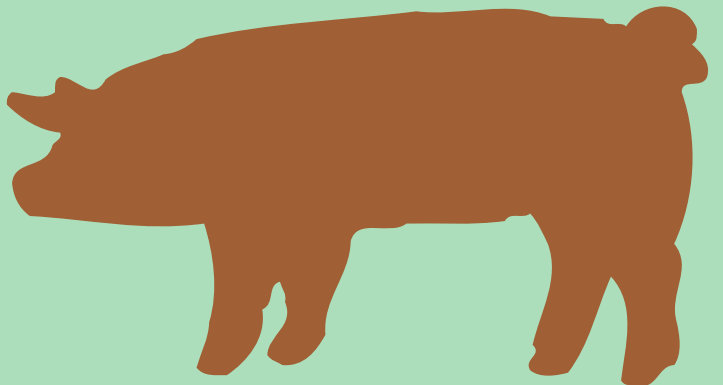


*Animal Care Series:*



**S** **WINE**  
**CARE PRACTICES**



**California Pork Industry Group**  
**University of California • Cooperative Extension**

## SWINE CARE PRACTICES

Animal Care Series  
California Pork Industry Group  
University of California Cooperative Extension

### FOREWORD

Swine Care Practices has been a joint project of University of California Cooperative Extension, industry representatives, and the California Pork Industry Group.

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## INTRODUCTION

There are at least two reasons to give pigs proper care. One is an ethical concern for the pig's well-being. Another is production efficiency.

Management practices that incorporate good animal care are usually also the most effective from a production standpoint. When pigs receive good care, production costs per pound of pork produced are less than when pigs are not well cared for.

If certain management practices conflict with the well-being of the animals, it will be to the producer's long-term advantage to adopt practices that put the animals' welfare ahead of short-term cost savings.

Science has not yet provided all the answers we need to fully understand animal needs, and it may never be possible, or practical, to meet the theoretical limits of pig welfare. However, past research and years of practical experiences have provided a wealth of information that can be applied across a wide variety of pork production systems.

This publication is designed to help producers evaluate their husbandry procedures with respect to the well-being of their animals and to offer production practices that are both ethically acceptable and cost efficient.

## STRESS

Stress is a significant animal welfare concern.<sup>1</sup> An animal is stressed if it is required to make abnormal or extreme adjustments in its physiology or behavior to cope with adverse aspects of its environment or management.<sup>2</sup> Identifying and minimizing stressful situations in pork production improves the well-being of the animal, reproductive efficiency, and growth as well as economic benefits for the producers and consumers. Stress from the environmental and management aspects of pork production may be classified into four categories.

\* **Thermal:** Thermal stress factors include temperature (heat and cold), humidity, wind, and solar radiation.

\* **Physical:** The physical components of a pig's environment include the space available and the surfaces with which the pig comes in contact.

\* **Disease:** Environments (including care, facilities, nutrition, and management) should be designed and maintained to minimize the onset and spread of disease.

\* **Behavioral:** Most forms of normal behavior should be exhibited in carefully designed environments.

Stress, pain, or suffering may be recognized by the following:

- \* Increased susceptibility to disease
- \* Lack of appetite
- \* Retardation of normal growth
- \* Abnormal posture
- \* Restlessness
- \* Elevated respiration rate
- \* Lameness or alteration of gait
- \* Dull or depressed attitude
- \* Abnormal grunting or squealing
- \* Self isolation from penmates

Some pork production practices (e.g., vaccination, castration, weaning, tail docking) can be short-term stressors. However, they provide long-term health and management benefits to individual pigs and their herd mates. Swine producers have responsibility for evaluating their husbandry procedures with respect to short-term and long-term well-being of their pigs and the total management plan.

This publication describes and evaluates factors affecting the pig's well-being in a variety of management systems and situations.

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<sup>1</sup>The following section on stress was been adapted for pigs from a paper on stress by Stull, C. and D.A. McMartin. 1990.

<sup>2</sup>Frazer, D., Ritchie, J.S.D., and Fraser, A.F. 1975. The term stress in a veterinary context. Br. Vet. J. 131:653- 662.

## CARE AND MANAGEMENT

### Behavior

Pigs have very good frontal vision but poor peripheral vision. This is the reason they often are difficult to move and become upset easily. Producers can facilitate movement and handling of their pigs by taking a few precautions. One method is to have the pig heading in the direction of desired travel before attempting to move it. Also, pigs are gregarious and move better in groups.

Small square plywood panels are effective portable barriers when moving pigs. Loading chutes should be approximately 20 inches wide (width of one pig). This prevents the pig from turning back and guards against injury. Facilities designed for easy movement of pigs are good investments.

All classes and groups of pigs form an order of social dominance. These orders are formed by competition soon after birth, or when the pigs are first grouped together. Adding new pigs or regrouping pigs will usually lead to struggles until a new social order is established.

Regrouping should be minimized to reduce stress. When regrouping is necessary, it should be done during the cool of the day in a pen or other area new to both groups. Younger pigs adjust to new groupings more easily than older pigs. Avoid regrouping pregnant females to prevent potential harm to unborn pigs. Adult boars that have not been living together should not be regrouped because of possible injury or death from intense competition and struggles.

### Practices Related to Production Systems

Since pigs are kept in a variety of production systems, management techniques will vary. Each system requires a degree of management sufficient for the pigs to experience a reasonable level of comfort and well-being. Particular practices to be noted include the following:

- \* The daily care schedule should be consistent enough to allow the pigs to develop a routine.
- \* Extremes in climatic changes should be anticipated as much as possible so appropriate provisions can be made to modify wide environmental variations.
- \* Swine care personnel must take precautions against the transmission of pathogens between pens and between facilities. Disinfectant foot baths used by personnel moving between buildings or premises are important to reduce disease transmission.
- \* Pigs should be closely observed and their well-being assessed at least once, and preferably twice, each day.
- \* When feed is delivered to swine housing or individual pens, care should be taken to minimize dust.
- \* Pens should be kept clean to provide for the comfort and health of the pigs. If pigs are kept on concrete or other solid flooring, daily scraping or washing of manure may be necessary. Slotted floors or flushing gutters will minimize the need for this labor-intensive practice and aid in keeping pens clean.

## Breeding

Females can be bred to farrow at any time of the year. Piglets born in the fall and spring require fewer environmentally controlled facilities because of usually moderate weather.

Most gilts (young females) display their first heat (estrus) at five to eight months of age. It is suggested that gilts be bred on the third observed heat period to allow for additional growth and an increased ovulation rate. Gilts should be mated to boars of small to moderate size to prevent injury during mating.

Four to seven days after piglets are weaned, sows usually display a fertile heat and can be bred. Breeding should be delayed if unfavorable conditions exist, e.g. thin body condition or very hot weather.

Sows may be housed individually or in groups during the breeding period. When sows are grouped, individual feed areas may be advisable to eliminate competition during feeding.

Yearling and mature boars should be housed individually because of their intense desire for social dominance which causes aggressive behavior.

**Breeding Systems.** There are four common breeding systems in pork production: pen mating, individual mating, hand mating, and artificial insemination. Pen (unobserved) mating utilizes one boar with a group of sows. For each group of ten sows, use one mature boar (over one year of age) per 21-day breeding period. Decrease the ratio to 4 to 6 sows for each young boar (less than one year of age). Individual mating involves one sow and one boar in a pen, and the mating is generally unobserved. Hand mating occurs when a boar and a sow or gilt are placed together, and the mating is observed. Artificial insemination uses either frozen semen which is thawed before insemination or fresh semen collected from boars and used immediately or preserved for short periods of time with extenders. Artificial insemination reduces the possibility of injury during breeding to both the sow or gilt and the boar.

The mature boar should not breed more than two females a day. Sows may be bred twice daily for as long as they will accept a boar in hand-mating systems. Each of these breeding systems, when appropriately managed, is acceptable. Attention must be given to preventing fighting and injuries. Breeding difficulties are reduced if males and females are similar in size.

## Farrowing

As the sow approaches farrowing time, several management practices should be carried out to improve survival and well-being of the newborn pigs. Farrowing environments should be cleaned and thoroughly disinfected before the pregnant sow is allowed to enter. Sows are normally placed in their farrowing area three to five days before the estimated date of delivery. Before farrowing, sows should be treated for internal and external parasites to keep the newborn pigs free of lice, ticks, and worms. Any vaccinations should be scheduled well in advance of the farrowing date to allow the accumulation of desired antibodies in the colostrum.

Approximately 24 hours before farrowing, the female will appear nervous and may exhibit signs of nest building. Pawing motions with the front feet are a nest building sign shown by sows or gilts in confined farrowing areas. Small amounts of straw or shavings placed in the area will help satisfy the nest building desire. Twelve hours before farrowing, milk may appear in the udder; however, gilts may not show signs of milk as soon as sows. Some producers closely attend the sow at farrowing time, while others check periodically to be sure there are no problems. Attention, care, and observation are beneficial to the well-being of both the sow and her pigs.



Several distinct events take place during the farrowing process. Two to six hours before the first pig is born, labor will begin and the sow's respiration rate will increase. Once the first pig is born, the remainder of the litter will usually be born in one to four hours. Factors that usually affect the interval between the first and last pig born include the size of the litter and the number of litters the sow has previously delivered. The end of farrowing is signaled by the delivery of the placental membranes (afterbirth). If more than one hour elapses between pigs or between the last pig born and passing of the placental membranes, assistance may be needed.

During the farrowing process, keeping the sow quiet and maintaining quiet surroundings are important. The sow will remain calmer if attendants stay behind her. Noises, dogs, strangers, and other distractions must be minimized. Every effort should be expended to make the sow comfortable and at ease.

Draft-free environments are very important during farrowing because newborn pigs have a poor ability to regulate their own body temperature. After the pigs are born, they can be dried off by rubbing them with shavings, cloths, or paper towels. Then place them at the sow's udder and, if necessary, help them begin nursing. Nursing stimulates the release of the hormone oxytocin (needed for milk letdown, uterine contractions, and calming) into the sow's system. This hormone reduces the total time in labor and promotes pig welfare. A restless sow can sometimes be calmed by rubbing her udder to simulate nursing. If the sow is excited and cannot be calmed, it may be necessary to remove the pigs for their protection until farrowing is completed. Gilts, in particular, may sometimes eat or lie on their young.

To maintain the 90°F comfort zone (Table 4, Environment) for newborn pigs, it may be necessary to provide supplemental heat through heat lamps or heat pads specially designed for swine farrowing areas. Do not use ordinary household heating pads. Hovers, designed to capture body heat, may also be used to keep the newborn pigs warm while still maintaining a cooler environment for the sow.

#### Management of Newborn Pigs

Most producers utilize several management procedures soon after farrowing. Some are essential, while others are optional.

**Navel Disinfection.** During pregnancy, the unborn pig receives nutrients and voids body waste through the navel (umbilical) cord. At the time of farrowing the cord is severed, but the remaining navel cord can be an entry for pathogens into the piglet's body. To prevent infection, soon after birth the navel should be treated with tincture of iodine.

**Needle Teeth.** A newborn pig has eight needle teeth. These teeth are very sharp and can cut other pigs when fighting or playing occurs, as well as lacerate the udder of the sow if they are not removed. Soon after birth needle teeth should be clipped to prevent these injuries.

**Iron.** Newborn pigs have a low reserve of iron. Iron is essential for red blood cell production. Supplemental iron is given by injection, orally, or as an udder spray and must be given within 3 to 4 days after birth to be most effective.

**Castration.** Castration is needed to facilitate safe handling, good management, and to ensure carcass quality. Intact males become extremely aggressive as they approach puberty. Increased aggressiveness results in disruption and fighting within the herd or group and increases danger to the animal handler. In addition, meat from boars has an objectionable odor caused by an increase of male sex hormone levels in the intact male.

Pigs should be, and usually are, castrated when they are very young. This is much less traumatic for the pig and the operation is easier to perform. Castration and weaning should not be performed at the same time. Castration is best completed before the pig is a week old. Only clean instruments should be used. To allow proper drainage of the body area, the incision should not be sutured. The incision site should be treated with an iodine-based antiseptic. If mature pigs must be castrated a local anesthetic should be used.

**Identification.** Pigs require permanent identification for management records. Several methods may be used such as ear notching, ear tattoos, electronic transponders, or ear tags. Ear notching should be performed within the first week of age. When done at this age, ear notching may be the least traumatic means of identification. Other forms of identification, such as ear tags, may be torn from the ear during playing and fighting, or be caught on feeders or fences.

**Nose Ringing.** Nose ringing may be necessary when pigs are maintained in pastures or dirt lots. The nose ring discourages "rooting" behavior in pigs, which can be very destructive. Rooting may also result in pigs escaping from their lot or pasture which could result in the pigs becoming lost, injured, or harmed. Rooting may also increase the incidence of internal parasites when internal parasite larvae or eggs are ingested by the rooting pig.

**Tail Docking.** As pigs come in close contact with each other they may at times attempt to bite or chew on their penmates-- a natural behavioral action. An undocked tail is a common target. Once blood has been drawn on a tail, further biting may result, sometimes leading to cannibalism of the victim pig. To prevent tail biting, tails are docked (a portion of the tail is removed) shortly after birth. Some producers leave one inch of the tail after docking but removing the last one-third to one-half of the tail is satisfactory. Tail docking should be done within the first 24 hours after birth for because the pig is small, easier to hold, and the action less stressful; littermates are less likely to bite at the wound on the docked tail at this age; and the piglet is protected by antibodies from the sow's milk. Sterilized side cutters should be used, and the remaining tail treated with an antiseptic.

## Weaning

Historically, pigs have been weaned at approximately eight weeks of age. However, improved management, proper nutrition, and controlled environments may allow commercial producers to wean earlier. When a warm, dry, and draft-free environment is provided along with proper nutrition, early weaning may be very successful and not detrimental to the growth, health, and well-being of the pigs. Earlier weaning may also reduce the stress placed on sows and gilts as older and heavier pigs continue to nurse. Weaning may take place at two to eight weeks of age, with three to five weeks being common.

Weaning is easier when the sow is removed and the pigs remain in a familiar area for several days. Litters that have been grouped together and remain together as they grow will also adapt to weaning easier and faster. An adequate supply of water must be provided at all times. Adequate sanitation measures should be followed.

As pigs grow and mature following weaning, they are often combined in larger groups according to body size. Pigs grouped according to size are less likely to have growth or health problems resulting from social dominance of one pig over another. Pigs should remain in groups sorted for body size through the growing and finishing phases of development. Larger pigs are able to adapt to a wider range of environmental and nutritional levels. The pigs normally reach market weight at approximately six months of age.

## FEEDING AND NUTRITION

### GENERAL PRINCIPLES AND GUIDELINES

#### Feeds

Sound feeding practices that provide for adequate nutrient needs are integral to general health and well being of pigs.

Swine are raised on a variety of feeds, including numerous agricultural by-products. Because of their simple monogastric stomach, pigs require more concentrates and less fibrous roughages than cattle, sheep, and horses. Because single concentrate feedstuffs are not suitable as the sole ration ingredient for pigs, swine can utilize a variety of feeds. Most concentrate feedstuffs are deficient in one or more nutrients, making it necessary to rely upon fortification or "balancing" with nutrients from other feed sources.

By-product feeds are often used to lower ration costs. They, like any feed, should be introduced into a diet gradually to avoid digestive upsets or the risk of appetite loss. Increased sanitation measures will be necessary when using high moisture feeds or animal by-products because spoilage can be a problem.

Feedstuffs should be free from molds, toxins, or other harmful impurities. Feed with unknown nutritional value and lacking in wholesomeness should not be used.

#### Nutrients

The diet must meet the nutritional needs of the pigs and fit the purpose for which it is being fed (e.g., growth, reproduction, and lactation). To meet nutritional needs, required nutrients must be supplied in amounts that cause neither deficiency or toxicity from excess consumption. Palatability and digestibility of the feeds are important.

Examples of publications which list and discuss these nutrient requirements are referenced in the bibliography section of this publication. Especially recommended is the National Research Council publication, *Nutrient Requirements of Swine*. Feeding pigs for optimum growth and production will also provide for their nutritional welfare.

The following nutrients and nutrient groups must be available to swine within balanced ranges:

**Energy.** Energy requirements are affected by factors such as age, activity of the pig, level of production, and temperature of the environment.

**Protein.** Critical not only in quantity but also in quality, where the amounts and ratios of component amino acids must be considered, especially the essential amino acids.

**Essential Fatty Acids.** Normally adequate in most practical swine diets.

**Minerals.** Inorganic elements that are not only dietary essentials but may be toxic in excess amounts.

**Vitamins.** Organic entities that, like minerals, often must be considered in quantitative ratio to other vitamins and minerals as well as in relation to minimum amounts.

Water. Should be clean, cool enough to drink in the summer, protected from freezing during the winter, and readily available.

### Providing Balanced Diets

With so many different nutrients being essential in swine diets (e.g. 10 amino acids, 13 minerals and 14 vitamins) and important both in quantity and relative proportion, meeting these needs presents a challenge. This is especially important if the goal is maximum production at minimum cost. Fortunately,

- \* physical welfare dietary needs are less stringent than those for maximum production.
- \* a practical mixed-ingredient diet should provide most nutrients in acceptable quantities.
- \* commercially prepared feeds and supplements are generally available to provide for these needs, and
- \* professional nutritional advice is readily available, often at no cost, to the swine producer. When in doubt, contact such a consultant. The University of California livestock advisor in your county is a good starting point.

### Recognizing Nutritional Imbalances

Even if it is believed that the feed supply is nutritionally adequate, the producer should always be alert for signs to the contrary. Producers should know:

- \* The normal size and weight for pigs of a given age, sex, and productive stage.
- \* Expected ages of puberty, length of estrous cycle, gestation length, and litter size.
- \* Expected rate of gain for growing and finishing pigs.
- \* Expected feed-consumption rates.
- \* Symptoms of deficiency and/or toxicity of specific nutrients.

All of the above measures are described in tables that appear in the references listed in the bibliography. All are indicators of the nutritional welfare of pigs.

### Feed Additives and Injections

Compounds, such as antibiotics, which are approved to be added to feed or water or injected into the pig must be used only when absolutely necessary and only as recommended by the manufacturer. Such products can help ensure the health and well being of pigs and, when used strictly according to recommendations and regulations, will ensure a safe and wholesome product. Simple rules should be followed:

1. Label instructions must always be read and followed completely regarding dose, frequency and timing of use, and withdrawal intervals before marketing.
2. Use only under a veterinarian's supervision if this is indicated on the product label.
3. The use of antimicrobial drugs helps to keep harmful microbes under control when pigs are raised in confinement. Subtherapeutic use of antibiotics should be kept to a very minimum. Therapeutic antibiotic use is more efficacious when subtherapeutic levels are not used or used at a very minimal level.

4. When in doubt, seek professional advice.
5. Do not use any product for which clear instructions are not available.

#### Feeding Practices

A variety of feeding systems and practices can be used and still be consistent with the health and welfare of pigs:

- \* Feeding one or more times per day, or having feed available ad libitum (feed is always available).
- \* Feed may be placed on a clean floor, in a trough, or in a self-feeder.
- \* The system should be designed to keep noise levels at a minimum for the comfort of both pigs and producer.
- \* Pigs, by nature, will consume feces. Feeding the solids separated from manure is an industry practice that provides natural inoculants and builds immunity against endemic pathogens.

#### GUIDELINES FOR SPECIFIC PRACTICES AND ANIMAL CLASSES

##### Boars and Gestating Females

Pigs do not have the ability to select feeds in either quantity or quality to meet their nutritional needs. As a result, ad lib or unlimited amounts of high energy rations cause excessive weight gain during gestation. Restriction of feed below ad lib intake is recommended and required for optimum health and welfare as well as for highest reproductive efficiency. Prescribed nutrition can be accomplished by feeding measured amounts one or two times a day. If fed once a day, avoid feeding during the hottest part of the day. Feeding time should be the same each day.

If the pigs are fed restricted amounts in groups, allow adequate trough length or floor space (at least 10 square feet per head) to prevent hoarding by dominant animals. Individual feeding stalls will reduce hoarding and competition with fewer square feet or total space required. The amount of feed will vary according to condition, size, and reproductive stage of the pigs. Adequate levels of nutrition for the pregnant sow are needed to insure normal development of the fetuses.

##### Farrowing

Care of Sows. Laxative feeds (e.g. bran, alfalfa meal) or additives may be needed to minimize constipation as sows advance in pregnancy. This may be needed both before and after the sow gives birth. Feeding sows twice each day, morning and evening, is recommended.

Feeding of the Litter. Creep feeding of pigs, especially large litters, is recommended. Creep feed in an area where the pigs will be protected from crushing when the sow lies down.

##### Nursery Units

Before weaning and being moved to the nursery unit, pigs should be consuming adequate quantities of a diet similar in nutrient composition to sow's milk.

If litters are to be mixed in the nursery, diets should not be changed until a new social order has been established. Some managers move the sows with their litters, mixing three to four litters in a pen, until the social adjustment is made. The sows are then removed, leaving the pigs in the now-familiar group environment.

Feed can be provided ad lib with adequate feeder space and waterers for unrestricted access by all pigs in the group. Tables 2 and 3 in the Environment section suggest feeder and waterer capacities.

#### Growing and Finishing

For optimum growth rate, pigs should receive a nutritionally-balanced diet as described in the National Research Council's *Nutrient Requirements of Swine*. In practice, these recommendations exceed the nutrient quantities required for the normal growth and well-being of the pig.

Disease prevention, protection from temperature extremes, and provision for an established, tranquil social order should be maintained at all times.

## ENVIRONMENT

Environmental considerations in pork production operations must include the environmental welfare of the pigs as well as facility design to protect air and water quality. Consideration must also be given to the work environment for the owner, manager, and/or employees. Proper design and management of facilities should provide the proper environment for raising pigs and also protect the natural environment.

### Space

The space needed for each pig in a group varies with the class of pig and the type of facility in use. The size and design of pens should provide areas for feeding, resting, defecating, and urinating. Housing and space recommendations for various classes of pigs are shown in Table 1.

Table 1. Housing and space guidelines

Stage of production	Pasture	Intensive rearing facilities
	swine per acre	square feet per head
Pregnant sows	10 or less	15
Sows and litters	7 or less	35-75
Boars	4 or less	15-40
Growing and finishing pigs		
under 40 lb	20-25	2.5-4.0
40 to 100 lb	15-20	4.0-6.0
100 to 150 lb	10-15	6.0-8.0
over 150 lb	5-10	8.0-10.0

*(Handbook for the Small-Scale Pork Producer and Swine Care Handbook)*

Pigs require adequate access to feeders and waterers. Feeders and waterers should be checked routinely to be certain they are functioning properly and are easily accessible to all pigs in the pen. Contamination by feces and urine must be minimized and corrected. Feed delivery systems should minimize dust and noise. If watering nipples are used, they should be spaced far enough apart and have an adequate supply of water to allow simultaneous use of all nipples. If slotted floors are used, locate waterers over the slots to keep resting and feeding areas dry. Some guidelines for feeder and waterer capacities are given in Tables 2 and 3.

Table 2. Feeder and waterer capacities

Equipment	No. of pigs served
Self feeder (1 space)	4
Supplement feeder (1 space)	15
Waterer	30

*(Swine Housing and Equipment Handbook)*

Table 3. Nipple waterer guide

Item	Pig weight, lb.					Sow and Boar
	<12	12-30	30-75	75-100	100-240	
Height, in.	4-6	6-12	12-18	18-24	24-30	30-36
Pigs/nipple	litter	10	10	12-15	12-15	12-15
Min. flow rates, quarts per min.	0.2	0.2	0.4	0.5	0.67	1.0

Install at least two waterers per pen. Locate waterers at least 14" apart for nursery pigs and at least 24" apart for larger pigs. This distance may be reduced some if the nipples are angled away from each other.

(Pork Industry Handbook)

### Shelter

The comfort and well being of pigs is enhanced by an environment that is dry, moderate in temperature and draft-free in winter, and cool and comfortable in summer. Housing or shelter may be needed during extremes in weather—heat, cold, and rain. Providing proper shelter economically is a challenge for every pork producer. Weather conditions in California vary from the extreme heat of the Imperial Valley to the cold wind and rain of the North Coast, and to the snow and freezing conditions of the eastern mountain regions. Swine facilities must moderate these conditions. In addition, pigs in various stages of production require different levels of protection from the environment.

**Farrowing Stalls/Pens.** A wide variety of choices are available for farrowing facilities. Each has different implications for the well-being of the pigs as well as for management. For example, farrowing can be done in pens or in farrowing stalls. Pens allow the sow to walk and move around freely, but often result in higher newborn pig death loss because the sow may accidentally crush the newborn pigs. Stalls, on the other hand, are small enclosures that allow the sow to stand, lie, eat, and drink, but not turn around. Because there is usually room for pigs to escape crushing when the sow lies down, newborn pig deaths caused by crushing are almost eliminated. Most producers today choose stalls as being both more economical and more humane for newborn pigs.

**Gestation Stalls.** After sows are bred they are usually housed in group pens where they remain until they are due to farrow. A few producers house pregnant sows in individual stalls on solid flooring with whatever additional shelter is required to provide a comfortable environment. Generally, the size of gestation stalls prevents sows and gilts from turning around; however, a recent design does allow the sows and gilts this additional movement. The care of sows housed in gestation stalls can be enhanced in that they can receive individual feed portions, allow individual observation, easier health care, better temperature control, and protection from biting in the vulva area by other sows.

A pig's environment results from a number of interrelated factors, including temperature, air movement, humidity, and insulating effects of the surroundings. Protection from the environment depends on the pig's age, weight, activity level, stage of production, and body condition. Suggested thermal conditions for swine are shown in Table 4.



Table 4. Preferred Thermal Conditions for Swine

Type and weight	Preferred range <sup>a</sup>	Lower extreme <sup>b</sup>	Upper extreme <sup>c</sup>
Lactating sow and litter	60 to 80°F for sow; piglets have 90°F creep area	75°F creep area	90°F for sow; 90°-100°F for piglets
Prenursery, 10 to 30 lb	80 to 90° F	60° F	95° F
Nursery, 30 to 75 lb	65 to 80° F	40° F	95° F
Growing, 75 to 150 lb	60 to 75° F	25° F	95° F
Finishing, 150 to 220 lb	50 to 75° F	5° F	95° F
Sow or boar	60 to 75° F	5° F	90° F

<sup>a</sup>Based on NRC (1981); DeShazer and Overhults (1982); Hahn (1985)

<sup>b</sup>These represent lower extremes in air temperature when pigs are held in groups. Bedding is recommended when air temperature approaches the lower extreme.

<sup>c</sup>Except for brief periods above these air temperatures, cooling should be provided by means such as evaporatively cooled air or spray cooling for growing pigs, or a water drip for lactating sows.

*(Swine Care Guidelines for Pork Producers Using Environmentally Controlled Housing)*

Because older pigs can tolerate a wider range of environmental conditions than younger pigs, their welfare can be provided for more easily. Pen design and spacing is less critical, although many confinement units have adopted common standards.

Shade should be provided in pastures, fields, and outside pens. Trees and other natural objects can provide adequate shade if available. Facilities to provide shade can be constructed so they can also serve as protection from the wind and cold during the winter. Shades with open sides allow for air movement during the warm and hot months; during the cold months solid sides can be added for additional protection.

Ventilation rates in enclosed facilities will require seasonal adjustment. In cold weather, a sufficient rate of air movement to remove water vapor, contaminants, and odors is necessary. During hot weather, higher ventilation rates are needed to provide cooling.

Fans can keep the air moving during hot weather. High temperatures can also be reduced in buildings by using evaporative coolers or by fogging water into the fan's airstream. Sprinklers have been used successfully to provide cooling in outside pens. Concrete "wallows" offer a place for pigs to lie in water, yet prevent muddy areas that may result in odors and fly breeding.

## Manure Disposal

Wastes must be managed in a manner that will maintain sanitary conditions for the pigs, prevent fly breeding, minimize odors, and protect ground water quality. Fly eggs will not hatch when manure is completely dry, nor when it is in a flowable liquid form. A manure handling, storage, or disposal system must aim at quickly converting manure, urine, and other wastes to a very dry form or a very wet form. The very dry and wet forms also minimize odors.

The density of the hog population will help to determine the degree of waste management necessary. If farrowing and growing are carried out in fields or large open areas, manure disposal on a day-to-day basis is essentially a natural function. Some scraping and manure collection in lots may be necessary to maintain a nuisance-free and healthy environment.

Confinement facilities require a waste handling and holding facilities to contain manure, urine, runoff, and wash water. The waste material can be spread on cropland or pastures from the holding facility. Local or county ordinances regarding manure disposal and runoff must be followed.

## Transportation

Safety and comfort must be a primary concern when transporting pigs. Weak or unhealthy pigs should be loaded and transported separately from healthy pigs. Adequate ventilation is essential when pigs are being transported. The floors of trucks and trailers should be slip-resistant. Whenever possible, pigs should be separated into groups of uniform weight. Separating by sex may be necessary when older pigs are being transported. Boars require individual separation to prevent fighting.

Adverse weather can add to discomfort during handling and transporting. When transporting pigs in hot weather, they should be shaded from the sun and bedded with wet shavings or wet sand. When the weather is extremely warm, it may be necessary to periodically stop to provide water mist or fog to cool the pigs. A tank of water, a small pump powered by the vehicle's electrical system, and foggers in the truck or trailer can keep pigs cool during long periods of travel in hot weather.

Pigs transported in cold weather require protection from extreme temperatures. Protection from the chilling effects of the wind should be provided when the air temperature drops below 32°F; however, adequate ventilation for the pigs must still be available. Trucks and trailers should be bedded with dry straw or dry shavings for additional protection for the pigs.

The pigs' condition should be checked often during transit. Every attempt should be made to make the pigs as comfortable as possible during transport.

## Pest Control

Pest management programs are needed to control the infestation of pests on pork production units. Flies, mosquitoes, rodents, and some species of birds are the common environmental pests. Internal and external parasites are discussed in the health section.

In addition to being a nuisance, pests can be a vector for diseases. Entrance points in feed mixing and storage areas should be covered with screen or sealed to prevent entry by pests. The elimination of breeding, roosting, and shelter sites will aid in pest control.

Only approved pesticides, properly applied, should be used in pest control. Guarding against any contamination of feed is essential to eliminate the possibility of unapproved materials being consumed by the pigs.

Pork producers are encouraged to enroll and participate in the National Pork Producers Council (NPPC) Quality Assurance Program. Producers interested in the program may contact NPPC or their local UC livestock advisor for additional information.

#### Air Quality<sup>1</sup>

Air quality is important to the health and well-being of pigs and those humans who manage and tend the swine operation. The measure of air quality relates to the content of certain gases, particulate matter, and airborne microbes in the air around or in swine facilities.

Good ventilation and proper waste management will ensure acceptable air quality. Although a number of gases may be present in swine housing, the most important in terms of air quality are ammonia, hydrogen sulfide, carbon monoxide, and methane. Ammonia concentration in buildings should be less than 10 ppm and should not exceed 25 ppm in tightly closed buildings.

Hydrogen sulfide levels in concentrations of less than 10 ppm are recommended. If manure is stored in pits in buildings, care must be taken during times when the waste is agitated. The concentration of hydrogen sulfide above the floor can rise dramatically and must be expelled.

Carbon monoxide can be lethal to humans as well as to pigs. When gas heaters are used in buildings, the concentration of carbon monoxide in the building is a concern. Gas heaters must be vented or fresh air circulation provided. Concentrations of carbon monoxide should not exceed 150 ppm.

Methane is a product of anaerobic digestion of swine waste. If manure is stored in pits in buildings, methane concentration in the building is a concern. Although methane is not toxic, it can be explosive and concentrations should not exceed 50,000 ppm.

Ventilation rates in buildings should be increased when under-floor manure pits are being agitated or emptied. Evacuating the gases being released from the pits is important for the pigs' well-being as well as for the health of the workers in the area.

Airborne dust in swine buildings is usually the result of movement of feed. Increased animal activity and excessively high ventilation or air movement rates can cause dust particles to become airborne for extended periods of time.

Dust is also a concern where electric motors, such as in the feed milling area, are operating. Dust can be explosive. Care should be taken to reduce dust wherever motors are operating or where electrical sparks may occur.

#### Lighting.

Lighting is important for workers to be able to carry out their normal activities on a pork production unit. It has also been shown that gilts reach puberty at an earlier age if they are housed at 15- to 20-foot candles for 16 hours per day. Recommended lighting levels for various facilities are shown in Table 5.

Table 5. Light levels for swine housing.

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Based on an 8 foot high ceiling. Add lights for specific tasks such as desk work.  
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Application	Illumination foot-candles	Fluorescent watts/ft <sup>2</sup>	Incadescent watts/ft <sup>2</sup>
Farrowing	15	0.6	2.4
Nursery	10	0.4	1.6
Growing-finishing	5	0.2	0.8
Gilt pool	15	0.6	2.4
Breeding-gestation	15	0.6	2.4
Feed storage and processing	10	0.4	1.6
Record keeping/office	70	2.8	11.2
Animal inspection/handling	20	0.8	3.2

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(Swine Housing and Equipment Handbook)

#### Preventing Injuries

Pigs can be injured in many ways. Good judgement must be utilized when designing and maintaining a safe environment for the pig.

During the design process, it is necessary to think about potential problem areas, such as sharp corners, slick concrete, or improper spacings. Existing facilities should be routinely evaluated to insure that they are safe for the pigs. The producer should walk through the facilities often, noting the condition of fences, pens, and flooring and making necessary repairs.

The key to preventing injury to both pigs and employees is being observant.

-----<sup>1</sup>References to specific gas concentrations are from: Christianson, L.L., et al. 1989. *Swine Care Handbook for Pork Producers Using Environmentally Controlled Housing*. Des Moines: National Pork Producers Council.

## HEALTH

For a specific disease to occur, certain combinations of factors involving the pig, the environment, and the disease agent must be present. Proper manipulation of nutrition, husbandry practices, and the environment will help to prevent disease. However, in spite of the best management efforts, certain additional practices are necessary if pigs are to remain healthy. These steps can be divided into offensive and defensive measures.

**Offensive Measures (disease prevention)**  
**Acquisition.** Purchase healthy stock from reputable sources. The best way to prevent having to deal with a specific disease is to never introduce it into the herd. The State of California has certification programs for several of the major swine diseases (Brucellosis and Pseudorabies). If pigs are purchased from a non-certified herd, they should be blood tested for these diseases. Also, it is illegal to transport pigs into California without the appropriate permits.

**Quarantine.** Facilities should be available to keep new and returning pigs separate from the rest of the herd for 30 days. This allows time for observation, for development of clinical disease signs, and for recommended health procedures (vaccination and treatment for internal and external parasites).  
**Sanitation.** Sanitation is the most basic and most important of all the disease control measures. Prompt and proper removal of wastes, and cleaning and disinfection of both equipment and the environment is central to disease control. Normally, the cleaner the environment, the healthier the pigs will be. Although a wide variety of cleaning and disinfecting agents are commercially available, none are effective without first removing organic material.

**Vaccination.** Vaccinations are available for a number of diseases that affect swine. In some cases, vaccination constitutes the major part of the control of the disease. In many other cases, it is only a small part of the control program. Vaccination programs need to be tailored to each swine operation and should be developed in consultation with local veterinarians, Extension personnel, and other swine producers. Remember that vaccination only raises a pig's level of resistance. If other important management procedures are neglected, even this elevated level of resistance may be inadequate to prevent disease.

Vaccines must be stored and administered according to label directions if they are to be effective. Withdrawal time to slaughter must be observed at all times to avoid illegal residues. The most common times for administering many vaccines are before breeding and before farrowing. This protects the sow and passes antibodies to the piglets for their protection.

**External and Internal Parasite Control.** A variety of effective compounds are available that can be administered in several ways. Again, the specific ones used and the timing of their administration should be developed in consultation with local veterinarians, Extension personnel, and other swine producers. As with vaccines, parasite control compounds must be administered according to label directions, and withdrawal times to slaughter must be strictly observed. The most common times of administration are prior to breeding and before farrowing.

**Records.** Records of vaccinations and parasite treatments should be available to help detect health problems. These records do not need to be elaborate, yet are a valuable management tool. The more detail provided, the more likely that problems will be detected early.

**Observation.** Animals should be observed daily for any sign of illness, injury, or unusual behavior.

**Environmental Measures.** Insulation and proper ventilation of buildings will help prevent disease.

**Defensive Measures (disease treatment).**

**Hospital/Isolation.** Pigs that become ill should be isolated. Isolation slows the spread of disease to well pigs and allows increased care for the sick pigs. Hospital/isolation pens need to be protected from extreme weather to aid in recovery of the pig's health.

**Diagnosis (including necropsy of dead pigs).** Whenever possible, precise diagnosis of deaths should be attempted. This allows for a more rational choice of treatment as well as identifying steps that need to be taken to protect pigs that have not been infected. These services are available through local veterinarians and the California Veterinary Diagnostic Laboratory System. Contact names and telephone numbers should be kept in a handy location and also posted.

**Treatment.** Sick pigs should be treated promptly. Drugs must be administered according to label directions. A record of the product used, dose, duration of treatment, and period of withdrawal should be kept. Treated pigs should be identified to ensure that withdrawal times are observed.

**Carcass disposal.** Prompt disposal according to local ordinances of any dead pig is important for animal and human health.

#### **Summary**

Consultation with a veterinarian for help with disease prevention, control, diagnosis, and treatment. A herd health plan including vaccinations and parasite control should be developed and reviewed and updated often. Basic disease prevention and control methods should be used to the greatest degree possible.

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## GLOSSARY

**Abortion.** The delivery of fetuses or fetal membranes between the date of service and up to and including the 109th day of pregnancy.

**Ad-libitum feeding.** Pigs have access to diet at all times.

**Antibiotic.** A substance produced by micro-organisms which has the capability to kill or retard growth of other micro-organisms.

**Antibody.** A protein molecule capable of combining specifically with an antigen.

**Antigen.** A molecule capable of stimulating an immune response.

**Antimicrobial.** Any substance, including antibiotics and chemotherapeutic agents, which can retard or kill micro-organisms.

**Bacterin.** A kill bacterial vaccine, consisting of a suspension of whole bacteria.

**Boar.** Any intact (uncastrated) male pig.

**Crossbreeding.** Mating animals from genetically diverse groups within a species.

**Diet.** The feed fed.

**Disease.** Any morbid condition that impairs the full productive potential of an individual or group.

**Draft.** A current of air in an enclosed space.

**Dust.** Small, relatively dry particles in air or on surfaces, i.e. particulate matter.

**Estrus.** A period of female sexual receptivity to boars.

**Farrowing.** Production of a litter of one or more live or dead pigs on or after the 110th day of pregnancy, i.e. parturition.

**Farrowing pen.** An area in which a sow is confined during farrowing and lactation periods, but in which the sow can turn around.

**Farrowing stall.** A device in which a sow is confined during farrowing and lactation periods and which prevents sow from turning around (synonym: farrowing crate).

**Gestation.** The period of time between conception and farrowing.

**Gestation stall.** An individual stall in which a pregnant sow is held during gestation.

**Hover.** A coverlet suspended over an area in a pen or stall aimed at conserving heat for pigs; it may include a heat source.



**Immunity.** Resistance involving the sum of the host defenses that react either specifically or non-specifically to an antigen.

**Infection.** Invasion of the body by microbial agents or parasites other than insects.

**Litter.** Pigs born to a sow during one farrowing.

**Mating.** The act of insemination.

**Mummified pigs.** The pigs that are born degenerate (discolored and shriveled or decomposed) that died sometime during gestation.

**Parity.** The number of times a female has farrowed.

**Purebred.** An animal eligible for registry with a recognized breed association.

**Ration.** The feed fed to an animal during a 24 hour period.

**Sow.** Any breeding female that has farrowed at least one litter or has reached 12 months of age.

**Stillborn pigs.** Fully developed pigs found dead behind the sow, or in the afterbirth, after farrowing.

**Stress.** Any force causing or tending to cause a change in a pig's function, structure, or behavior.

**Vaccination.** The act of administering a vaccine or antigens.

**Vaccine.** A suspension of attenuated or killed microbes or toxins administered to induce active immunity.

**Weaning.** The act of separating the pigs and the sow.