PIC® 2014

WEAN TO FINISH MANUAL

WELCOME TO THE 2014 EDITION OF THE PIC WEAN TO FINISH MANUAL

Thank you for choosing PIC to be your genetic partner. Our evolving science focuses on delivering high quality pork production with industry-leading economic performance.

This publication offers guidelines to help you maximize your return on genetic investment, from weaning through marketing. These recommendations draw from best practices drawn from our own research, generally accepted industry standards, and production experience. The information covered throughout this manual is based on a "Full Program" PIC genetic profile designed to gain the highest possible results.

As you'll see, successful wean-to-finish involves a great deal of science, which we've spelled out in easy to follow formulas and charts. But it all boils down to this:

Adherence to these basic principles is fundamentally critical to the vitality of the growing pig. With this in mind, we've developed this manual to give you specific, measurable recommendations. The recommendations will not only meet the "BIG 4" requirements, but also help you define further practical strategies to optimize husbandry and management practices.

We're here to help, so please don't hesitate to contact your PIC representative when questions or concerns arise.

PART 1:

PIC OPTIMIZED PERFORMANCE

The table on the next page outlines expected results of the PIC Full Program. **Optimized Performance** reflects optimized health and environment. **Expected Performance** show you today's system averages, and should be easily repeatable. **Intervention Levels** represent thresholds where detailed troubleshooting and specific action planning should be considered.

TABLE 1: PIC FULL PROGRAM EXPECTED RESULTS

PART 2:

FEED

Today 60-65% of what you spend to raise a weaned pig to market weight goes toward feed. PIC has developed recommendations for reducing feed waste and making the process more efficient. Factors include:

- Feeders
  - Bunk Space Per Head
  - Pan Coverage
  - Feeder Type
  - Bulk Capacity
- Feed Form and Particle Size and
- Feed Quality

FEEDERS

Although feeders, by design, aim to minimize waste while serving up food to the pig, there are a number of adjustments you can make to optimize the process and your return on investment. Consider PIC's recommendations in Table 2 on the next page.

TABLE 2: PIC FEEDER RECOMMENDATIONS

Feeders come in various shapes and sizes. The recommendations shown above take into account several different feeder types.

PICTURE 1: LOW PROFILE FEEDER HOLE DIVIDERS

PICTURE 2: FEEDERS WITH SIGHT GUARDS

PICTURE 3: WET-DRY FEEDER

PICTURE 4: TUBE FEEDER

BUNK SPACE

Bunk Space is defined as "the linear inches of bunk or trough space allotted to each individual pig within a pen (Feeder Length/Head on Feeder)".

Reasons behind PIC recommendations for bunk space:

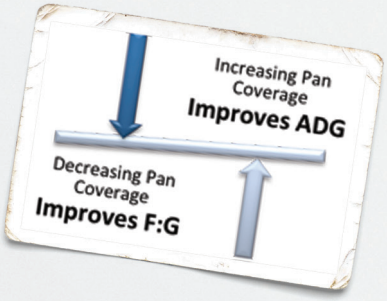
- Allows appropriate shoulder room so that multiple animals may feed at the same time. 15 inches (38 cm) should be the minimum shoulder allowance of large market weight animals.
- The general guideline of 2 inches (5 cm)/pig allows feed pans to be appropriately adjusted to minimize the feed waste without decreasing the pigs' average daily intake.

PAN COVERAGE

Pan coverage refers to the percentage of the feed pan's flat portion that is covered by feed. Each speck, dusting or mound of feed counts in the pan coverage percentage.

PIC's pan coverage guidelines reflect several considerations:

- With the appropriate bunk space, optimal pan coverage ensures both feed access and minimal waste.
- When giving pelleted feeds, having appropriate bunk space mitigates the creation of fines, or destroyed pellets.
- Appropriate pan coverage minimizes the plugging of feeders, which could cause feed outage events within a pen or feeder.
- Feeder settings are designed to achieve optimal pan coverage, and are determined largely by feed form or particle size. Daily evaluation and management of feed pan coverage should be taken to maintain constant pan coverage and optimized performance.
- Pan coverage's impact on feed efficiency and average daily gain are inverse, and should be considered for each operation.



PICTURE 5: TOO MUCH

PICTURE 6: JUST RIGHT

PICTURE 7: NOT ENOUGH

Practical Considerations

- If pigs are not eating their daily caloric requirements to achieve optimal growth due to temperature, diet design, or compromised pen or bunk space, the following adjustments should be considered:
  - Increase pan coverage to achieve appropriate feed intake. However, this will come with negative side effects, including:
    - Pellet quality and fines percentage will likely deteriorate, leading to sorting and associated consequences.
    - Feed conversion will likely be compromised independent of feed form.
  - Install short-term supplemental feeders to provide additional bunk space.

FEEDER CAPACITY

Feeder capacity is one of the largest limiting factors compromising the feed availability cornerstone of production.

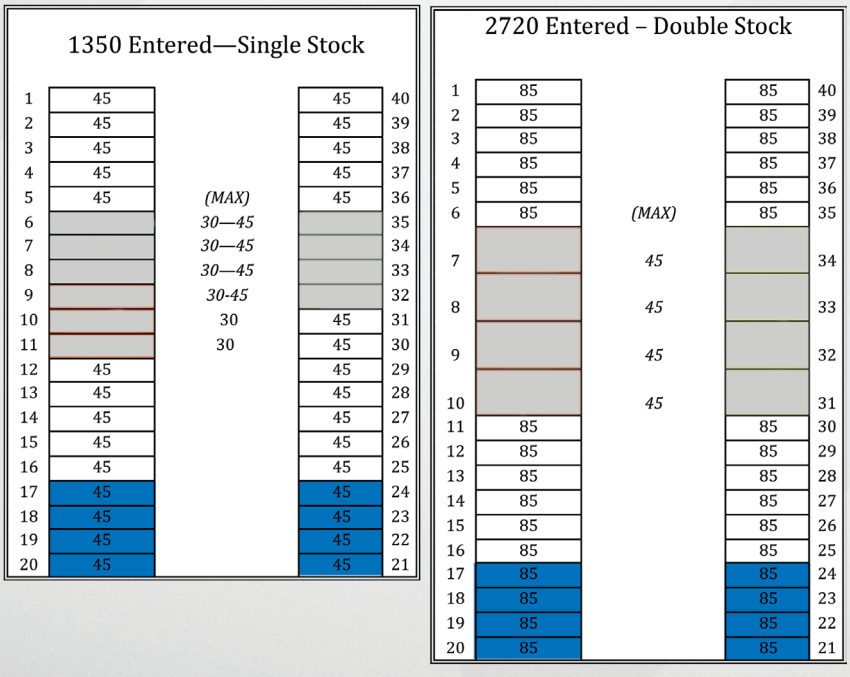
PIC's recommendations for feeder capacity are made with the following considerations in mind:

- The need to provide 24 hours of available feed to each individual within the barn
- Potential issues that may arise with automated feed systems
- Timely detection of maintenance issues within the feed system without compromising feed availability
- The ability to effectively transition between diets and feed-form changes without blending
- Feed flow is improved when large volumes of feed is removed from outside bins during each filling cycle
- Availability of feed to pigs during peak intake hours, which vary seasonally
- The desire to minimize or eliminate hemorrhagic bowel syndrome, twisted gut, ulcers and tail-biting often triggered by out-of-feed events
- Desire to promote a predictable feed ordering pattern as well as minimized variable daily feed intake.

Practical Considerations

- During the finishing phase, each pig is recommended to have 7 lbs (3.2 kg) of allotted feeder capacity.
  - This means a 60 inch (152 cm) double-sided feeder
  - 60 head; 2 inches (5 cm) of bunk space per pig
  - (7x60=420 lbs, 3.2x60 =192 kgs of feed)
- Some feeders are barely rated for that capacity.
  - Consider installing multiple tubes — 2-3 per feeder to optimize the manufactured capacity.
- Some feeders are short on capacity.
  - Consider installing feeder extensions to appropriately size the feeder to recommended capacity.
  - Consider the installation of surge hoppers within barns to assure that at minimum the feed is out of the bin and inside the barn for on-demand delivery.
- Optimize management.
  - Routinely service mechanical components of the feed system.
  - Appropriately rotate tandem bins to avoid feed spoilage and diet blending, and to use the oldest feed first.
  - Keep all bins in proper repair to avoid the presence of moisture and pests.
  - Utilize auger controllers appropriately.
    - Use delay and auger run-time controls to minimize the number of times the auger fills per day, while maximizing the auger run time to assure proper fill.
  - Keep the last 2 feeders of each auger, as indicated in blue in Figure 2, fully stocked until marketing to assure the proper feeding of the site.

FIGURE 2: KEEP BLUE PENS FULLY STOCKED



PARTICLE SIZE

Particle size is a critical factor in optimizing feed efficiency. 100 microns of feed particle size translates to a 1-2% change in feed efficiency due to improved digestibility. Here are PIC's recommendations for particle size (mash feed):

TABLE 3: PIC RECOMMENDATIONS FOR PARTICLE SIZE (MASH FEED)

FINISHED COMPLETE FEED	CORN GRIND MICRONS	GEOMETRIC MEAN STANDARD DEVIATION (RO-TAP)	CORN GRIND OVER 1000 MICRONS	UNDER 300 MICRONS	UNDER 150 MICRONS
Average	Average	<2.5	US Sieve #16	US Sieve #50	US Sieve #100
<600 microns	400-600 microns		Tyler Sieve #14	Tyler Sieve #48	Tyler Sieve #100
			<10%	<30%	<7.5%

PIC's recommended particle size takes into account:

- Considerations for standard deviation of particle size, assuring the proper flow of feed through standard feeding systems.
- The decreased digestibility of large particle sizes and their reduced nutritional value.
- The negative impacts of blending large and small particle sizes and its role in separation throughout feed delivery mechanics including the feed pan.
- The need to procure appropriately sized products such as soybean meal, DDGS, etc. and their impact upon complete feed digestibility and feed flow.

Practical Considerations

- PIC recommends that roller mill feed manufacturers make, at a minimum, a once-daily check with a 2-pan quick testing kit, continually adjusting rolls until <600 microns are achieved.
- We also advise that routine finished-feed samples are taken at the feeder and submitted to similar testing procedures.
- Only particle sizes less than 250-300 microns are attributed to issues involving feed flow and ulceration; maintaining appropriate standard deviations (a measure of particle size variation) assures the optimization of feed conversion while avoiding negative effects.

FEED FORM – PELLETS VS. MASH

- Feed form is generally variable throughout the industry, both regionally (due to feedstuffs) and structurally (due to feed manufacturing infrastructure).
- Pellets allow users to include several more ingredients than mash rations due to the particle size of specific ingredients.
- Pelleting has demonstrated an improved impact on ADG and F:G when the percentage of fines within the pan are less than 20%.
- PIC recommends the use of high-quality pellets during the first two phases of nursery diets.
  - This recommendation is based upon the feedstuffs used and the improved palatability, and thus intake, of weaned pig pellets.

FEED QUALITY

- Elevated moisture directly correlates with diminished feed conversion through the replacement of energy with water, and should be routinely monitored.
  - A 1% increase in moisture content of feed results in a 1-2% or 0.02 change in feed conversion, resulting in a $0.60-$0.80 increase in cost per pig.
- The presence of toxins can have a negative effect on growing pigs, including tail biting.
  - Consult the following table outlining PIC's recommendations for toxin levels within feed.

TABLE 4: TOXIN LEVELS WITHIN FEED

PHASE FEEDING:

- Utilize PIC nutrition recommendations to ensure optimized performance.
- Strive for and measure budget accuracy in the following categories:
  - Accuracy of lbs. delivered to the site (budget vs. actual)
  - Rotation of tandem bins.
    - Example: If tandem bin slides remain open throughout the duration of a finishing cycle, the effects may include: 4 extra days to a common weight and 0.05 poorer feed conversion.
    - Accurately rotating bins minimizes mold and feed flow concerns.
    - Single-bin sites should have bins emptied every other week at a minimum.
  - PIC recommends the development of a budget defined by the pigs' cumulative intake rather than estimated weight.
  - Ordering feed is most effective if the producer focuses on disappearance, relying on a consistent feed budgeting program that automatically changes diets based on actual intake.
- PIC's nutrition guidelines and nutritional technical services staff are sources of support in creating best-cost budgeting and nutritional requirements.

PART 3:

WATER

Water is the most critical nutrient to sustain life. It is the largest single component of body composition, comprising between 80-50% of body content depending on age. Generally, pigs will consume 2 to 3 lbs (0.9-1.4 kg) of water for every pound of feed eaten per day. At any time, if the pig does not ingest an adequate amount of water, feed intake and subsequent growth performance will be reduced.

PIC stresses the importance of **detailed water management** to ensure water availability to growing pigs, focusing on:

- Water Quantity (Pigs/Source)
- Water Flow Rate
- Water Pressure

Table 5 on the next page outlines our guidelines to maintain optimal pig health and growth.

TABLE 5: GUIDELINES FOR MAINTAINING OPTIMAL PIG HEALTH AND GROWTH

WATER QUALITY

- Water quality is often variable based on geographic region, source and pH.
- Water quality should always be considered when encountering problems with feed intake, diarrhea, or unexplained challenged performance.
- Refer to Appendix A of this manual for PIC's recommended mineral and solids thresholds.

Practical Considerations

- During overstocking, general Wean-to-Finish pens would not provide adequate water sources per 10 pigs.
- Consider the temporary addition of extra swinging nipples, gate mounted nipples, or water bars (several nipples on a pipe) during the overstocking period.
- Upon weaning, consider trickling water out of nipples or cups to entice pigs to take water early, as the transition off of the sow can cause dehydration due to an unfamiliar environment.
- Early hydration of the weaned pig is critical to early success. It's helpful to add extra water troughs or \ bowls in the first 24 hours.
- Monitor water flow rates using a 4 ounce cup (125 mL) timed to 8 seconds to get ideal water flow rates within finishing barns.
- Between groups, assure that 100% of nipples or cups are flowing properly; meanwhile, audit 5-10% of nipples weekly during the growing period.
- Daily water meter monitoring is good practice, as changes in daily water intake can indicate changes in health status or water waste.

PART 4:

AIR

The management of the environmental conditions within the barn is critical to optimized performance. Ideal temperature and humidity encourages feed intake, avoids excessive burning of calories to maintain body temperature, and minimizes the growth of disease.

Major factors to control:

- Air temperature
- Moisture level
- Air temperature uniformity
- Air speed across animals
- Airborne dust and disease organism levels
- Odor and gas concentrations
- Combustion fumes from unvented heaters
- Moisture condensation on surfaces

BASIC RECOMMENDATIONS

The removal of heat and humidity are essential to maintaining optimal barn conditions. PIC recommends keeping humidity below 65%.

Below in Table 6 are the recommended barn temperatures and minimum air exchange rates for the growing pig (please note that with the use of brooders we can decrease the room's desired temp). Further recommendations are noted in Appendix B of this manual.

Note: CFM is defined as Cubic Feet of air exchanged Per Minute.

- The recommended CFM is a calculated estimation of the required air exchange to maintain humidity and temperature.

TABLE 6: RECOMMENDED BARN TEMPERATURES AND MINIMUM AIR EXCHANGE RATES

HEAT & HUMIDITY REMOVAL

- As the pig grows, it produces an increasing amount of heat.
- According to Brown-Brandl, in today's production environment, the pig produces an additional 200 btu/hr for each 60-80 lbs (27-36 kg) of growth (See Graph 1).
- To maintain desired room temperatures, you need to raise the CFM to properly exhaust the excess heat and replace with cooler, dryer air.

GRAPH 1: ESTIMATED TOTAL HEAT PRODUCTION BY GROWING PIGS, SENSIBLE PLUS LATENT HEAT

Brown-Brandl, et al Transactions of the ASAE 47(1):259-270

RELATIVE HUMIDITY

Relative humidity refers to the percentage of a given air temperature's fraction of dew point. As temperature rises, air has the capacity for increasing amounts of water. This relationship is demonstrated in Graph 2 below.

- Example: Air at 0°F (-18°C) holds 12% of the water as air 50°F (10°C) at the same relative humidity.

GRAPH 2: IMPACT OF AIR TEMPERATURE ON WATER HOLDING CAPACITY

AIR TEMPERATURE

When humidity levels are greater than 65%, and if outside temperatures are below set point, PIC recommends increasing ventilation rates to effectively decrease humidity within the barn.

- When outside temperatures exceed desired room temperatures, increasing ventilation rates will not improve humidity within the barn.

AIR SPEED

It is important to maintain ample air speed to effectively mix cooler air sourced from inlets. This will eliminate drafts and areas of condensation upon slats.

- Air speed is measured in feet per minute (FPM).
- An air speed of 800 is optimal for elevated fan stages, while 400 FPM is much more practical in minimum ventilation stages.
- PIC recommends the routine evaluation of air speed coming from inlets to ensure the proper mixing of air within the facility.

HEATING

Each facility requires the addition of supplemental heaters to assure the control of lower critical temperatures. This is particularly important in certain situations:

- Young pigs
- Inadequate Insulation
- Outside winter temperatures
- Decreased stocking (during filling and marketing periods)

PIC general recommendations for heaters:

- Three 250,000 Btu Heaters/1200 Weaned to Finish Spaces
- Two 250,000 Btu Heaters/1200 Feeder to Finish Spaces
- One 17,000 Btu Brooder/160 Hd (2 weaned to finish pens)

Avoiding Heater Overshoot

- If the heaters are set too close to set-point (the point at which variable stage fans increase speed), excessive Liquid Propane or Natural Gas will be burnt.
- PIC recommends a minimum of 2-degree spacing of heater off-set below the set point.
  - Example: If the set point is 70°F (21°C), then heaters turn on at 67°F (19°C) and off at 68°F (20°C).

Brooder use

- By using mats and brooders, producers can decrease room temperatures without compromising piglet comfort.
- Ideal mat temperatures = 95°F (35°C) for 7-21 days, directly beneath the brooder.
- Weaned pigs require 0.4 square feet (0.04 square meters) of mat space per pig to maximize comfort and eliminate drafting.

GRAPH 3: VARIABLE FAN PERFORMANCE

FAN STAGES

Variable speed fans are used during minimum ventilation and early fan stages. There are several important things to note here:

- 50% fan speed does not equal 50% CFM.
- Motor curve is defined as the relationship between the voltage supplied to the motor and the resulting RPM.
- Motor curves correspond to differing fan sizes.
  - When motor curve and fan size are incorrectly matched, one of two things can happen: (1) the fan may burn up, or (2) a 60% fan speed setting may result in 90% fan speed
- Fan staging is designed to progressively remove more heat and humidity as the barn warms. Increased air exchange rates are required as the following occur:
  - Rise in outside temperature throughout the day.
  - Increased heat production and decreased optimal temperature throughout the pigs' growth.
  - Increasing heat production due to activity from resting state (evening) to elevated activity (day).
  - Rising outside temperature from winter to summer.
- Fan sizes and their CFM exhaust rates must be considered when staging fans.
- When outside temperatures are below typical desired room temperatures (DRT):
  - PIC recommends moderately increasing CFM across stages.
  - Avoid exceeding the doubling of CFM across stages.
- When outside temperatures exceed set-point as daily highs:
  - PIC encourages aggressively addressing heat removal across stages.
  - Table 7 describes the rated CFM for variable fan sizes.

TABLE 7: RATED CFM FOR VARIABLE FAN SIZES

Table 8 is an example of a practical approach to staging fans, and the facility requirements to support effective cooling:

TABLE 8: STAGING FANS & REQUIREMENTS FOR EFFECTIVE COOLING

- Each square inch of ceiling inlet provides approximately 4.5 cubic feet of air per minute (1 sq in = 6.5 sq cm).
- Each square inch of eave inlet provides the attic 2.5 cubic feet of air per minute (1 sq in = 6.5 sq cm)
- Providing optimal environments for pigs requires multiple aspects to operate in harmony. Critical items to measure:
  - Available attic inlet area;
  - Room inlets and air speed; and
  - Fan staging (CFM) vs. room temperature.
- PIC provides customers with a ventilation diagnostic modeling program that may be obtained upon request.

WATER USE

- Using misters in growing finishing pigs is recommended considering the evaporative heat loss that can be created.
- General guidelines:
  - Pigs should be over 100 lbs (45 kg) in weight.
  - Water should be applied 15 to 20 degrees above set point.
  - PIC recommends slats to be nearly dry before an added application of water.
  - Keep the ratio to 35 pigs per mister to avoid competition.

TROUBLESHOOTING

When evaluating fans and their exhaustive output, there are several factors to consider and troubleshoot:

- Dirty louvers and fan blades may decrease fan efficiency by as much as 30%.
- Leaking pit pump-out covers drastically affect the exhaustion of air from the barn.
- Adding fan cones improves the fan's output CFM by 10-20%.
- Excessive static pressure — >1000 feet per minute (>300 m/min) air speed or 0.1 inches (0.25 cm) of water — severely affects a fan's exhaustive CFM rating.
- Wet floors
  - This is a major factor to overall pig comfort. Wet floors can make pigs feel 9 degrees cooler with same air temperature.
  - To solve this challenge, consider increasing the minimum ventilation rates, assuring proper airspeed from inlets, and increasing barn temperature until the wet floors are properly dried.
  - Slipping fan belts decrease RPM and thus decreases exhaustive output. This issue is easily detected with the use of an infrared thermometer. If the pulley is 7 degrees warmer than room temperature, the belt is slipping and should be immediately addressed.

PART 5:

STOCKING DENSITY AND PLACEMENT PLANNING

Placement planning and stocking density are critical to the overall performance of PIC genetics.

STOCKING DENSITY:
Below are the recommendations for PIC stocking densities:

TABLE 9: PIC STOCKING DENSITIES

These stocking densities are based upon internal research to provide optimal economic return. Compromising your stocking densities can cause these and other issues:

- Decreased gain and conversion.
- Increased aggression and associated vices.
- Increased mortality and morbidity rates.

STOCKING PLAN

PIC advises a stocking plan to be created well before pigs arrive. Factors to keep in mind:

- Percentage of health-challenged pigs, required pens and the optimal barn location.
- Knowledge of age and weight to assure that the proper diet may be provided for incoming pigs.
- The removal of previous turn's associated feed.
- If multiple barns are to be filled with a known capacity, planning can be made for proper inventory within each barn.
- Pig weight and associated health status should be known to assure that optimal temperature and minimum ventilation considerations can be made in the facility.
  - This includes the vaccination status and understanding of further requirements of protocols to be completed.
- Utilization of barn map:
  - See Appendix C for an outline of a barn mapping strategy
  - Begin with a known inventory
  - You need to know the number of pens to be initially filled and the number of pens to be saved for intensive care.
  - Calculate the number of pigs per pen before the initial pull.
  - Count pigs into each pen, making adjustments when necessary.
  - Initially fill some of the hospital pens.
  - Count the inventory per pen within the barn and balance pen inventories to assure uniform stocking densities (one feed line at a time during extended fills).

Practical Considerations

- PIC recommends the process to be repeated when and if overstocked pigs are removed — essentially reclassifying the site.
- Please allow enough hospital pens to ensure you can implement a daily husbandry precaution if needed — including the removal of pigs to an improved environment.
- Hospital pens should be placed toward the center of the barn where there is more consistent/stable temperature and it's generally warmer, which the health-challenged pig requires.
- Even a minimal variation in stocking density can have a large impact; for instance, adding as few as 3 pigs to a pen can change the stocking density by 10%, resulting in compromised performance.
- Using pens as storage areas compromises optimal economic return. In many systems, one pen of 30 pigs may cost $1,200 annually, resulting in no pork marketed and the barn's stocking density to be elevated by 2.5% (40 pen barn).
- It is generally recommended to avoid returning hospitalized pigs back to the general population, as the process may re-aggravate stress, injury, or a health condition.

PEN SIZE

- PIC recommends small pen size as it affects growth rate, feed conversion, and lesions.
- Graphs 4 and 5, below, depict an Iowa State University trial comparing the performance of large pens (>200) vs. small pens (32) performance.
- As a result of this trial and others, PIC recommends pens to be limited to 25-35 head to optimize performance.

GRAPH 4. FINISHING PEN SIZE AND DAILY GAIN

ISU 2012

GRAPH 5: LESION SCORE BY REGION

ISU 2012
R-1 Head and Jowl, R-2 Shoulder, R-3 Side & Loin, R-4 Ham

PART 6:

BIOSECURITY

Biosecurity refers to procedures and protocols that minimize disease transmission between groups of pigs. The most effective biosecurity program is based on precaution versus reaction, and prevention measures should be followed by the production team. All staff members should not only know the procedures, but also have a good understanding of why these precautions are critical.

- Production personnel should avoid contact with any other pigs outside of their workplace if possible.
- Where production personnel have multiple site responsibility, individuals should move from "good health status" pigs to "challenged health status" pigs during the day and/or week; not the reverse.
- Follow the same showering procedure in wean-to-finish facilities that's used in sow farms and boar studs.
- Each site should have designated boots and clothes to be worn in the "clean side" and separate boots and clothes that are worn outside or "dirty side."
- Facilities should be locked when unoccupied by production personnel and biosecurity notation posted at all times.
  - Biosecurity signage should include, at a minimum:
  - "Limited-entry" signs at the site entrance.
  - Posting on the facility's exterior door explaining the company's biosecurity policy.
  - Site entry and shower instructions within the facility.

- Offices and floors should be considered a source of barn/pig contamination. The office will need to be cleaned and disinfected at at least once per barn turn.
- Load-out crews need site specific clothing and boots.
- All equipment utilized throughout production cycle, including loading chutes, should be site-specific and cleaned between groups.
- Every member of the production team (people in direct contact with pigs) should be PQA+ and TQA certified. Periodic biosecurity training is recommended for all personnel.
- PIC advises that all routine visitors or support personnel (electricians, plumbers, etc.) be trained annually and certified for future site visits.
- Visitors and maintenance personnel should have visitor request forms completed and approved by veterinarians or accountable parties before entry is granted to the facility.

SITE PREPAREDNESS

- All buildings should be clean, disinfected, dry, and have passed a pre-pig inspection prior to pig placement (see Appendix D).
- Equipment such as sort boards, rattle paddles, shakers, boots, gruel pans, and carts should be left in the building for power washing and disinfection.
- Disinfectant should be applied at the label rate with a foaming nozzle to all interior surfaces to assure proper coverage. Disinfectant shall also be applied to all loading docks/chutes.
- Any necessary repairs or remodeling to the facility should be completed prior to disinfection. If repairs are made after the facility is disinfected, it will need to be re-disinfected prior to pig placement.
- Facilities should be allowed to dry completely after disinfection and prior to pig arrival.
- It's good practice to install a 3-foot (1 meter) rock perimeter around each building to minimize rodent intrusion.
- All feed spills, garbage, clutter, and debris should be cleaned up daily, as they may attract rodents.

TRANSPORTATION

- Transport personnel should wear a clean pair of coveralls and boots at each point where loading or unloading occurs.
- Clean disposable boots should be applied prior to exiting from the cab at each location.
- Transport personnel should remain on the truck/trailer side and not enter the facility.
- Farm personnel should not enter the trailer. If farm personnel enter a trailer to assist unloading, they should consider themselves dirty, and return to the office to shower and change into clean clothing before re-entering the farm.
- Any market pig(s) that enter the trailer should not re-enter the facility.

MORTALITY DISPOSAL

- PIC recommends composting or incineration to reduce the chance of becoming infected with PRRS or another transmissible disease.
- All compost facilities and incinerators should be maintained in good working order at all times to further mitigate risk. Be sure to keep the compost pile covered and secured to keep predators away.
- Mortalities should be disposed of as the last step of chores — and all producers should consider themselves contaminated following this process.
- Any tools used to transport deceased animals to the door should not be used outside of the facility.
- It is recommended that separate outerwear and tools are used for mortality management.
- Routinely clean all outerwear, tools and equipment (tractors etc.) as they may become the basis of further disease introduction.

PEST CONTROL

- Animals including rodents and birds are a major vector for disease transmission.
- To control these pests, PIC recommends the following measures.
  - Use outside bait stations, and have them checked and filled on a monthly basis.
  - Maintain a 3-foot (1-meter) rock perimeter to minimize vegetation against the building.
  - Weeds and excess vegetation should be routinely mowed and sprayed, and maintained below 4-inch (10 cm) height.
  - Remove unnecessary clutter or debris to eliminate areas of harbor.
  - Put bird netting in place and keep it well maintained to prevent birds from entering the premises.

PART 7:

STANDARD ANIMAL CARE

Daily pig care is the cornerstone to overall performance and optimization of production goals. Daily, weekly, monthly and between-turn routines produce repeatable results and promote the best animal welfare.

DAILY ROUTINES:

- Make sure you allocate the proper amount of time in your daily routine to accomplish all the tasks involved in pig care.
  - To individually evaluate each pig within the facility takes approximately 2 seconds per head or approximately 30 minutes per 1,000 heads.
  - To properly evaluate water, feeders and ventilation, and perform associated tasks, plan on spending 1 hour per 1,000 heads.
- Producers must enter pens daily to conduct a proper pig evaluation and verify water and feed availability.
- Your staff should be equipped with the tools that support efficient care:
  - Syringes, medication and needles;
  - Marking devices (aerosol or paint sticks);
  - Pen and notebook;
  - Hydrometer and thermometer (to check humidity and temperature); and
  - Potentially a panel (sorting board) to sort ill or injured pigs.
- Evaluations include:
  - Identification of ill or injured pigs to treat or remove to a hospital pen.
  - Execution of National Pork Board PQA+ and American Association of Swine Veterinarians (AASV) euthanasia decision trees (CASV and CQA/ACA in Canada).
  - Evaluation and adjustments to produce proper water flow and feed pan coverage.
  - Recording of daily water consumption and temperature variations (highs and lows).
  - Evaluation of humidity and airspeed to determine modifications in ventilation strategy.
  - Recording the number of pigs treated, noting associated medication and dose.
  - Daily evaluation of feed inventory and associated intake to predict upcoming feed orders.
  - Making sure fans and heaters are appropriately functioning to produce optimal environments.
  - Assessment of manure storage structure capability.

- Daily Communications
  - Communication about health challenges and changes with veterinarian and accountable production personnel.
  - Discuss feed quality or quantity concerns.

WEEKLY ROUTINES

Evaluate daily data to understand trends or patterns relating to:

- Water intake
- Health changes
- Feed intake
- Utility use (liquid propane levels, heater run times, temperature probes)
- The availability of proper back-up devices (heater back up thermostats, fan back up thermostats, curtain drop thermostats, high/low alarm thermostats)
- Visitor logs
- Biosecurity of the site – clean shower, entryway, and associated equipment
- Biosecurity and cleanliness of mortality disposal equipment or compost management
- Measurement of remaining manure storage capacity

MONTHLY ROUTINES

- Test emergency devices
  - Curtain drops
  - Alarms
  - Back-up heaters and fans
  - Generators if available
- Monthly maintenance
  - Grease bearings
  - Check fan belts
  - Clean temperature probes
  - Check for sagging curtains or inlet repairs

BETWEEN TURNS

There are critical tasks to be completed between finishing turns to minimize impact on the next batch of pigs within the facility.

- Cleaning
  - It is important the clean the facility inside and out.
  - Clean, dry and disinfect the entire interior including office, shower and all fans and ventilation equipment.
  - Inspect after cleaning and before disinfecting.
  - Clean pit fans, attic inlets, feed pads and bulk bins.
  - Remove decomposed compost material.
- Maintenance
  - Grease all pulleys and gears.
  - Reset all backup devices, being mindful of upcoming changes to ventilation parameters.
  - Test ventilation equipment after cleaning.
  - If appropriate, winterize the site (install insulation, etc.)
  - Review ventilation probe accuracy.

PART 8:

EARLY PIG CARE

Many producers are exposed to weaned pigs only twice per year. The following recommendations provide a loose framework of strategies to begin a wean-to-finish cycle at optimal performance levels.

The **objectives** of early pig care are to:

- Achieve optimized production levels relating to losses (1% nursery mortality)
  - Reduce losses due to failure to thrive syndrome
  - Control and treat secondary infections
- Accomplish optimized nursery average daily gain (ADG) and feed conversion (F:G) levels; ADG=1.20 (545 g); F:G=1.3
- Improve overall cost of production

Different strategies of care are required for varying health status. Following are **factors to consider** for highly health-challenged pigs as well as healthy pigs based upon results relative to goals.

- Optimal temperature and humidity
  - Health-challenged pigs require warmer room temperatures and humidity control, resulting in elevated utility costs.
  - Be highly sensitive to humidity and environmental changes within the barn.
- Effective timing and efficient application of critical care.
  - Challenged pigs require intensive and frequent husbandry. Be prepared to increase the labor effort and oversight accordingly.

- Use of gruel feeding strategies and equipment, to which health challenged pigs respond favorably.
- Facilitation of communication among all levels of the production team. Reaction time to achieve best results is critical.
  - Weaned pigs' progress can change rapidly and producers should respond quickly.
  - Critical personnel include veterinarian, field person, and producer.

SPECIFIC AREAS OF CONCERN AND CONTROL:

- Receiving from sow farm
  - Pig placement plan and barn maps
  - Water use and acclimatization
- Temperature, ventilation, and humidity control
- Budgeted feed considerations
- Applied specialized nutritional strategies – mat feeding and gruel feeding
- Modified choring procedures and field man interaction
- Veterinary care and herd treatments

RECEIVING:

- Before pigs are received, conduct an audit to assure the cleanliness of the site and biosecurity. Refer to Appendix D for PIC's guidance on critical control points.
- If given the opportunity, it is ideal to receive pigs directly off of the sow (preferably 1 sow farm). This minimizes staging nursery requirements when used in combination a twice per week weaning strategy.
  - The basis of this recommendation is that multiple weaning events create added stressors. Our goal is to achieve stable health status within the barn quickly.
- Space Requirements:
  - PIC recommends 2.8 square feet (0.26 square meter) per weaned pig minimum until the pigs reach 50 lbs (22.7 kg). During the extended nursery period (50-75 lbs/22.7-34 kg) allow 3.65 square feet (0.34 square meter) per pig.
  - For health-challenged pigs, it is also preferred to maximize allotted square footage (+6.5 sq ft/pig (+0.6 sq m) – W-F facility) when given the opportunity. This practice can have significant impacts on mortality and morbidity.
- The facility should be fully warmed to desired room temperature.
  - Health-challenged pigs often require a 5-degree increase in desired room temperature.
  - If brooders are in use, mat temperatures should be at 95°F (35°C), and dry at arrival.
  - This process may require reduced minimum ventilation and the activation of heaters and brooders 4-6 hours prior to arrival.
- Water Availability
  - PIC recommends that pigs have ample supply of water presented in two ways:
  - 1 water source per 10 head within pen (cup, nipple, etc.) flowing at 4 oz./16 seconds or 500 ml/minute.
- Wean-to-finish facilities may choose 4 oz./8 seconds or 1L/minute as the pig over 50 lbs (22.7 kg) requires the associated higher water flow rate.
  - Water should be dripping on the slat for 6 hours post arrival to allow pigs to find the water.
- Inventory within pens:
  - A strategy should be utilized to allow ample space to pull pigs down from the general population into a specific intensive care area.
  - The intensive care area should be located toward the center of the barn, thus minimizing temperature variation throughout the day.
  - Removals from general population should take place at different times:
    - At placement, any challenged piglets should immediately be placed in intensive care pens.
    - During daily choring, animals with compromised body condition should be pulled to the intensive care area for both treatment and gruel feeding.
    - Figure 3 is an example of strategy for filling the barn allowing available space open for intensive care treatment.

FIGURE 3: BARN MAP EXAMPLE

NUTRITION

- It is advised to allocate elevated levels of a high energy, highly palatable diet for the intensive care pig.
  - The degree of allocation may vary by health status and piglet age.
  - The elevated lactose and sugars improve palatability and energy for challenged weaned pigs; this diet is specifically to be placed in intensive care pens.
  - Example ration:
    0.4 lbs (0.18 kg) x 1380 pigs = 552 lbs (250 kg)/6 intensive care pens (each holding 45 pigs) = 2 lbs (0.9 kg) per pig.
  - 20 percent of population would receive this allocation.
  - This means that a 0.4 pound allocation for all pigs equals 2 pounds per pig if only applied to the bottom 20% of the population.
  - This diet is to be utilized in the challenged population to jump-start nutrition and convert the pig from negative energy status to positive.
- PIC recommends filling the barn by feed line so that the proper nutrition can be allocated appropriately.
  - It is important to save phase 1 and 2 allocation from the general population for intensive care pigs. They will need additional amounts of these feeds to reach the desired body weights. (Utilize feed sacks, pails, etc.)
- Recommended starter diet design noted in Table 10:

TABLE 10: RECOMMENDED STARTER DIET

GRUEL FEEDING

- At placement, it is preferable to supply gruel feed to each weaned pig for the first 2-3 days.
  - Each pen should have a 3 gallon (11 L) pan per 15 heads or utilize a PVC trough allowing 3 inches (7.6 cm) of bunk space per pig. (45 head pen requires a 5 ½ ft (1.7 m) canoe per pen – 4-6 inch (10-15 cm) PVC). See examples of both canoes and pans in the pictures to the right.
- The recipe for gruel feeding (per 15 pigs):
  - 24 oz. (750 ml) of water and 8 oz. (227 g) of feed.
  - Gruel feeding should be applied 4 times per day for maximum results.
  - Gruel feed is properly calibrated when the pigs consume all of the mixture within the hour.
  - Gruel feeding is optimized in population for 2-3 days.
- This step is highly labor intensive but is a positive step in early acclimation to a new environment for an already challenged pig. Field results have shown positive economic and performance results.
- Gruel feed within intensive care pens for 7 days.
- As intensive care pigs recover and improve body condition, an evaluation should be made 3 times per week. Recovered pigs should be moved across alleyway to a graduation area free of gruel feeding.

MAT FEEDING

- The goal of mat feeding is to stimulate the activity level of the pigs and act as a "dinner bell" to eat.
- The transition from a sow's 20-24 lactation events per day to an ad-lib environment sometimes challenges piglet feed intake.
- You can simply utilize the feed within the feeder to apply 6 oz (170 g) of feed to the mat 4 times per day.
- You should continue this process for a minimum of 7 days post-weaning; results may improve when piglets are mat fed for 14-21 days depending on piglet activity and the severity of the health insult.
- Schedule
  - Mat feeding and gruel feeding should take place:
    - At the beginning of AM chores
    - At the conclusion of AM chores
    - Noon
    - With evening chores

VENTILATION:

The critical components of ventilation include:

- Desired room temperatures
  - Health-challenged pigs require 2-5 degree warmer barn
- Humidity control
  - It is absolutely critical that the humidity remains below 65%
- Warm & dry mats

PIC generally recommends 2 CFM/pig at placement, however in the case of PRRS-positive pigs it may be necessary to remove air at a higher exhaustion rate to achieve less than 65% humidity.

- Brooders should produce temperatures around 95°F (35°C) directly beneath them. Pigs should remain warm dry and comfortable.
  - To accomplish this we need properly functioning brooders and ample mat space (0.4 ft2/pig, 0.04 m2)
  - An example of warm and dry pigs with ample mat space is pictured at the right.
  - As you can see, piglets are lying evenly and avoiding piling.
  - If mats become wet or caked with feed or manure, flip mats over to regain a dry, black surface that effectively absorbs heat.
  - We may need to extend mat temperatures beyond 95°F (35°C) to accomplish pig comfort.
  - Brooders should be in place and functional for 14-21 days depending on pig comfort and severity of disease.
  - Brooders should be in place within intensive care pens throughout grueling period.

PEN WALKING & FALL BACK/SICK PIG IDENTIFICATION

Pens should be walked daily to:

- Check feeders.
- View every pig from snout to tail, head to toe; rule of thumb is to spend 2 seconds per pig.
  - Identify and pull fall-behinds.
  - Identify, pull and treat sick pigs.
- Check water flow rates.
- Mat feed.

It is important to provide extra care to sick pigs or pigs that are falling behind. This starts with timely identification. Signs of falling back are:

- Rough hair coat or fuzzy appearance.
- Obvious empty abdomen. It's a good idea to pick the pig up and feel for gut fill. A rough looking pig with a full gut is probably okay.
- Depressed or lethargic. Head down or droopy.
- Not active or competing. Often these pigs will be huddled together or off by themselves.
- Temperature above 102°F (39°C).

FALL-BEHIND PIGS:

- Tucked-in flanks and stomach are a good indication that a pig has not been eating.
- There are often several causes of these conditions:
  - Lameness
  - Bacterial or viral infection
  - Anemia
  - Cold temperatures within the site or pen
  - Often the largest weaned pigs are the slowest to adapt to a new environment
- It is critical to observe condition, activity, and dunging patterns to evaluate piglet health rather than size.
- Getting pigs up several times per day is a critical step to effective transition from the sow to the nursery.

HEALTHY PIGS:

Some pigs have rough hair coats — which is typical 3-6 days post wean — but bellies are round indicating that the pigs are on feed and doing well.

VETERINARY SUPPORT AND TREATMENT STRATEGY:

- It is important to utilize the Veterinary-Client relationship during any health challenges.
- A strategy utilizing a combination of water medications, feed grade medications and injectables is a commonly utilized solution when faced with a health challenge.
- Daily choring should include:
  - New needles daily, and assessments and treatments in accordance with National Pork Board PQA+.
  - Treat the intensive care pens at the end of the day.
  - 2-3 times per week assessment of site and progress by field man in collaboration with caretaker.
  - Daily communication of percent treated, percent daily mortality, and percent pulled to intensive care area.

PART 9:

TRANSPORT RECOMMENDATIONS

PIC recommends that every member of the transportation process be trained and pass the National Pork Board TQA animal handling process. Transportation represents the conclusion and realization of food production, but also a change for pigs, which can be managed to eliminate stress and ensure safety.

PREPARING TO LOAD:

- Animals within the facility should have good acclimation to people due to the daily walking of pens and husbandry done within pens.
- Presorting is a viable option for several producers focusing on the improvement of dressing percentage and associated feed savings.
  - If possible, remove feed from pigs 12-24 hours prior to harvest.
  - The final pull or cut from a facility should always have feed removed to minimize challenges at the harvesting facility and improvements in dressing percentage.
- Correct any deficiencies in loading facilities that cause distraction or stress to animals during the loading process.
- Have water source available at every loading chute so pigs or bedding can be sprinkled with water during hot weather.

LOADING:

- Move market animals in small, easily handled groups (≤ 5). The handler should be able to reach the lead pig in a group.
- Two people should always be used to sort pigs out of pens.
- Lower curtains if needed to create equal air pressure inside and outside of the barn. Pigs do not like to walk into strong head winds created by negative ventilation. Use appropriate equipment such as sort boards or folding capes.
- Move animals in a calm, steady manner.
- Never force animals to move faster than normal walking pace.
- Load animals furthest from the chute onto the bottom deck. Load animals closet to the chute onto the top deck. This reduces stress on animals in the back of the barn that have the farthest to walk.
- Never send an animal that is unable to walk, ill, or significantly injured to market channels.
- Limit the use of electric prods.
  - If a pig has to be prodded more than twice, reevaluate loading procedures and facilities.
  - Prod pigs in the center of the back, behind the shoulder blades for less than one second and no more than 2x in a 5-minute period.
- If the outside temperature is above normal, use the trailer sprinkler system to wet pigs and bedding before leaving the farm.

SPACE REQUIREMENTS ON TRUCKS:

- Calculate available square footage for every trailer type.
- Calculate square footage of every compartment and load accordingly.
- Do not calculate available square footage by simply multiplying trailer width by length.
  - Loading density varies based on the weight of pigs.
    - General rule is to load 55-58 lbs (25-26 kg) per square foot.
    - ELANCO® has provided a loading calculator free of charge.
    - Industry recommendations for floor space on a market trailer = 58 lbs per square foot.
- Do not exceed legal load weights.
- Never crowd the trailer.
- Provide appropriate ventilation and bedding for weather conditions.
- Adjust load times for weather conditions.
- Animals should be transported at a steady pace, avoiding unnecessary sudden stops or starts.
- Goal is to keep animals on a trailer for as little time as possible.

UNLOADING:

- Animals should be unloaded at a slow and steady pace.
- Animals should be unloaded in manageable groups to avoid piling.
- If there is a down animal on the trailer, the plant should be informed before unloading begins.
- DO NOT use electric prods during unloading.

TABLE 11: TRANSPORT SPACE RECOMMENDATIONS

TQA version 4

TABLE 12: GUIDELINES FOR TRAILER VENTILATION AND BEDDING TO USE FOR MARKET HOGS

TQA version 4

SYSTEM IMPROVEMENT AND TROUBLESHOOTING:

As you continue to refine management, one of your most significant opportunities is to reduce pig losses during transport. These losses are expressed as DOA and NANI, referring to mortalities and non-ambulatory animals. These losses are often caused at differing points throughout the transportation process. It's good practice to evaluate results and inputs to understand the underlying factors influencing results.

Areas to Measure:

- Building Type – Alley length
- Pen Inventory
- Loading Time
- Weight
- Lighting
- Alley Width
- Chute Type and Angle to Truck
- Outside Temperature
- Time Required to Load
- Duration of Feed Withdrawal
- Trucker
- Inventory per compartment and its square footage.
- Nutrition
- Health
- Load Crew
- Which load or cut out of the site.

These evaluations reveal the ideal conditions and personnel repeatedly producing exceptional transportation results, as well as factors causing challenges. From those results, build a plan to improve or eliminate the largest issues, and the system will produce improved results overall.

PART 10:

PIG HEALTH MANAGEMENT

Health management recommendations will depend on the overall health status of the source herd.

Basic vaccination program recommendations are:

- PCV2 vaccination with a one- or two-dose federally licensed product, depending on the owner's preference.
- PIC recommends following label directions with full dose vaccinations.
  - Erysipelas can be given as two doses of an injectable product or one oral.
    - · If you choose the oral product, proper antibiotic withdrawal from the feed and water prior to and following the vaccination are critical to success.
    - · Follow manufacturer directions in the timing of ordering the product and proper storage. Check that the medicator is functioning properly and fully charging the water system to get good protection.

Additional vaccination recommendations will depend on the sow herd health status and regional health challenges.

Other vaccine products to consider are:

- Mycoplasma hyopneumoniae
- Lawsonia intracellaris
- PRRSv

Consult with your herd veterinarian to discuss any further recommendations.

INDIVIDUAL ANIMAL TREATMENT

The more diligent you are with early pig care, the fewer individual treatments will be needed.

- Treatment early in the course of disease will be more effective.
- Selection of the proper drug will depend on the condition you are treating: diarrhea, respiratory, lameness or other conditions.
- Many of the older antibiotics will require daily treatment régimes; newer antibiotics will provide a longer therapeutic level with a single treatment.
- Always record individual identification as required by quality assurance programs (PQA+, CQA).

Remember: antibiotics are not effective against viral infections. They only help to control secondary bacterial infections.

Work with your herd veterinarian in the drug selection process, and follow label dosage and proper withdrawal times.

GROUP OR HERD TREATMENT

- Whether to use barn or room treatment will depend on the number of animals affected.
- If the number of affected animals is greater than 10% of the population, it may be necessary to use water or feed medication.
- Sick pigs will drink before they eat, so water medication may be an effective second step followed by feed medication to complete the treatment.

Again, work with your herd veterinarian to set the treatment interference levels and drug of choice.

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Appendix A:

WATER

TABLE A-1: WATER

PIG WEIGHT	NIPPLE HEIGHT	PIGS PER NIPPLE	DAILY INTAKE
<12 lbs (<5.4 kg)	4-6 in (10-15 cm)	10	0.2-0.5 qts
12-30 lbs (5.4-13.6 kg)	6-12 in (15-30 cm)	10	2-4 qts
30-75 lbs (13.6-34 kg)	12-18 in (30-46 cm)	10	4-6 qts
75-150 lbs (34-68 kg)	18-24 in (46-61 cm)	10	5-10 qts
150 lbs (68 kg) - Market	24-30 in (61-76 cm)	10	6-18 qts

Iowa State University PM 1493, 1992

TABLE A-2: WATER MINERAL CONTENT

TOTAL DISSOLVED SOLIDS (PPM)	RATING	COMMENTS
<1,000	Safe	No risk to pigs
1,000-2,999	Satisfactory	Mild diarrhea in pigs not adapted to it
3,000-4,999	Satisfactory	May cause temporary refusal of water
5,000-6,999	Reasonable	Higher levels for breeding stock should be avoided
<7,000	Unfit	Risky for breeding stock and pigs exposed to heat stress

Adopted from NRD (1974)

TABLE A-3: WATER QUALITY FOR LIVESTOCK

	RECOMMENDED MAX (PPM)	
ITEM	TFWQG[a]	NRC[b]
Calcium	1,000	-
Nitrate-N + Nitrite-N	100	440
Nitrite-N	10	33
Sulfate	1,000	-
Aluminum	5.0	-
Arsenic	0.5	0.2
Beryllium	0.1	-
Boron	5.0	-
Cadmium	0.02	0.05
Chromium	1.0	1.0
Cobalt	1.0	1.0
Copper	5.0	0.5
Fluoride	2.0	2.0
Lead	0.1	0.1
Mercury	0.003	0.01
Molybdenum	0.5	-
Nickel	1.0	1.0
Selenium	0.05	-
Uranium	0.2	-
Vanadium	0.1	0.1
Zinc	50.0	25.0

[a]Task Force on Water Quality Guidelines, 1987
[b]National Research Council, 1974

Appendix B:

DESIRED ROOM TEMPERATURE AND SETPOINT RECOMMENDATIONS

TABLE B-1: RECOMMENDATIONS FOR CURTAIN-SIDED BARNS UTILIZING BROODERS AND NO MATS WITH SLATTED FLOORS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	81°F (27.2°C)	83°F (28.3°C)	81°F (27.2°C)	2.0
8	15 lbs (6.8 kg)	79°F (26.1°C)	80°F (26.7°C)	79°F (26.1°C)	2.0
15	19 lbs (8.6 kg)	77°F (25°C)	75°F (24.9°C)	75°F (24.9°C)	2.0
22	24 lbs (10.9 kg)	75°F (24.9°C)	75°F (24.9°C)	73°F (22.7°C)	2.0
29	31 lbs (14.1 kg)	78°F (25.5°C)	77°F (25°C)	75°F (24.9°C)	2.2
36	41 lbs (18.6 kg)	76°F (24.4°C)	75°F (24.9°C)	73°F (22.7°C)	2.6
43	51 lbs (23.1 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.9
50	62 lbs (28.1 kg)	72°F (22.2°C)	71°F (21.7°C)	70°F (21.1°C)	3.3
57	73 lbs (33.1 kg)	70°F (21.1°C)	70°F (21.1°C)	69°F (20.5°C)	3.9
64	86 lbs (39.0 kg)	69°F (20.5°C)	69°F (20.5°C)	68°F (20°C)	4.5
71	100 lbs (45.4 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.1
78	113 lbs (51.3 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.4
85	127 lbs (57.6 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	5.9
92	142 lbs (64.4 kg)	65°F (18.3°C)	67°F (19.4°C)	65°F (18.3°C)	6.6
99	156 lbs (70.8 kg)	64°F (17.8°C)	65°F (18.3°C)	64°F (17.8°C)	7.1
106	171 lbs (77.6 kg)	63°F (17.2°C)	61°F (16.1°C)	61°F (16.1°C)	7.8
113	186 lbs (84.4 kg)	62°F (16.7°C)	62°F (16.7°C)	60°F (15.5°C)	8.5
120	200 lbs (90.7 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.2
127	215 lbs (97.5 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.9
134	230 lbs (104.3 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	10.6
141	243 lbs (110.2 kg)	61°F (16.1°C)	60°F (15.5°C)	59°F (15°C)	11.2
148	258 lbs (117 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	11.9
155	272 lbs (123.4 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	12.6
162	284 lbs (128.8 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.3
169	297 lbs (134.7 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.9
176	310 lbs (140.6 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	14.6

TABLE B-2: RECOMMENDATIONS FOR CURTAIN-SIDED BARNS UTILIZING BROODERS AND MATS WITH CONCRETE SLATTED FLOORS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	77°F (25°C)	79°F (26.1°C)	77°F (25°C)	2.0
8	15 lbs (6.8 kg)	75°F (24.9°C)	76°F (24.4°C)	75°F (24.9°C)	2.0
15	19 lbs (8.6 kg)	73°F (22.7°C)	71°F (21.7°C)	71°F (21.7°C)	2.0
22	24 lbs (10.9 kg)	71°F (21.7°C)	71°F (21.7°C)	69°F (20.5°C)	2.0
29	31 lbs (14.1 kg)	78°F (25.5°C)	77°F (25°C)	75°F (24.9°C)	2.2
36	41 lbs (18.6 kg)	76°F (24.4°C)	75°F (24.9°C)	73°F (22.7°C)	2.6
43	51 lbs (23.1 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.9
50	62 lbs (28.1 kg)	72°F (22.2°C)	71°F (21.7°C)	70°F (21.1°C)	3.3
57	73 lbs (33.1 kg)	70°F (21.1°C)	70°F (21.1°C)	69°F (20.5°C)	3.9
64	86 lbs (39.0 kg)	69°F (20.5°C)	69°F (20.5°C)	68°F (20°C)	4.5
71	100 lbs (45.4 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.1
78	113 lbs (51.3 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.4
85	127 lbs (57.6 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	5.9
92	142 lbs (64.4 kg)	65°F (18.3°C)	67°F (19.4°C)	65°F (18.3°C)	6.6
99	156 lbs (70.8 kg)	64°F (17.8°C)	65°F (18.3°C)	64°F (17.8°C)	7.1
106	171 lbs (77.6 kg)	63°F (17.2°C)	61°F (16.1°C)	61°F (16.1°C)	7.8
113	186 lbs (84.4 kg)	62°F (16.7°C)	62°F (16.7°C)	60°F (15.5°C)	8.5
120	200 lbs (90.7 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.2
127	215 lbs (97.5 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.9
134	230 lbs (104.3 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	10.6
141	243 lbs (110.2 kg)	61°F (16.1°C)	60°F (15.5°C)	59°F (15°C)	11.2
148	258 lbs (117 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	11.9
155	272 lbs (123.4 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	12.6
162	284 lbs (128.8 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.3
169	297 lbs (134.7 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.9
176	310 lbs (140.6 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	14.6

TABLE B-3: RECOMMENDATIONS FOR CURTAIN-SIDED BARNS UTILIZING NEITHER BROODERS NOR MATS WITH CONCRETE SLATTED FLOORS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	88°F (31.1°C)	90°F (32.2°C)	88°F (31.1°C)	2.0
8	15 lbs (6.8 kg)	86°F (30°C)	87°F (30.5°C)	86°F (30°C)	2.0
15	19 lbs (8.6 kg)	84°F (28.9°C)	82°F (27.8°C)	82°F (27.8°C)	2.0
22	24 lbs (10.9 kg)	82°F (27.8°C)	82°F (27.8°C)	80°F (26.7°C)	2.0
29	31 lbs (14.1 kg)	78°F (25.5°C)	77°F (25°C)	75°F (24.9°C)	2.2
36	41 lbs (18.6 kg)	76°F (24.4°C)	75°F (24.9°C)	73°F (22.7°C)	2.6
43	51 lbs (23.1 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.9
50	62 lbs (28.1 kg)	72°F (22.2°C)	71°F (21.7°C)	70°F (21.1°C)	3.3
57	73 lbs (33.1 kg)	70°F (21.1°C)	70°F (21.1°C)	69°F (20.5°C)	3.9
64	86 lbs (39.0 kg)	69°F (20.5°C)	69°F (20.5°C)	68°F (20°C)	4.5
71	100 lbs (45.4 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.1
78	113 lbs (51.3 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	5.4
85	127 lbs (57.6 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	5.9
92	142 lbs (64.4 kg)	65°F (18.3°C)	67°F (19.4°C)	65°F (18.3°C)	6.6
99	156 lbs (70.8 kg)	64°F (17.8°C)	65°F (18.3°C)	64°F (17.8°C)	7.1
106	171 lbs (77.6 kg)	63°F (17.2°C)	61°F (16.1°C)	61°F (16.1°C)	7.8
113	186 lbs (84.4 kg)	62°F (16.7°C)	62°F (16.7°C)	60°F (15.5°C)	8.5
120	200 lbs (90.7 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.2
127	215 lbs (97.5 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	9.9
134	230 lbs (104.3 kg)	61°F (16.1°C)	60°F (15.5°C)	58°F (14.4°C)	10.6
141	243 lbs (110.2 kg)	61°F (16.1°C)	60°F (15.5°C)	59°F (15°C)	11.2
148	258 lbs (117 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	11.9
155	272 lbs (123.4 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	12.6
162	284 lbs (128.8 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.3
169	297 lbs (134.7 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	13.9
176	310 lbs (140.6 kg)	61°F (16.1°C)	61°F (16.1°C)	60°F (15.5°C)	14.6

TABLE B-4: RECOMMENDATIONS FOR WIRE FLOORED BARNS AND SOLID-SIDED UTILIZING NO BROODERS OR MATS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	85°F (29.4°C)	87°F (30.5°C)	85°F (29.4°C)	2.0
8	15 lbs (6.8 kg)	83°F (28.3°C)	84°F (28.9°C)	83°F (28.3°C)	2.0
15	19 lbs (8.6 kg)	81°F (27.2°C)	79°F (26.1°C)	79°F (26.1°C)	2.0
22	24 lbs (10.9 kg)	79°F (26.1°C)	79°F (26.1°C)	77°F (25°C)	2.0
29	31 lbs (14.1 kg)	75°F (24.9°C)	74°F (23.3°C)	72°F (22.2°C)	2.2
36	41 lbs (18.6 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.6
43	51 lbs (23.1 kg)	70°F (21.1°C)	69°F (20.5°C)	67°F (19.4°C)	2.9
50	62 lbs (28.1 kg)	69°F (20.5°C)	68°F (20°C)	67°F (19.4°C)	3.3
57	73 lbs (33.1 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	3.9
64	86 lbs (39.0 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	4.5
71	100 lbs (45.4 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.1
78	113 lbs (51.3 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.4
85	127 lbs (57.6 kg)	63°F (17.2°C)	63°F (17.2°C)	62°F (16.7°C)	5.9
92	142 lbs (64.4 kg)	62°F (16.7°C)	64°F (17.8°C)	62°F (16.7°C)	6.6
99	156 lbs (70.8 kg)	61°F (16.1°C)	62°F (16.7°C)	61°F (16.1°C)	7.1
106	171 lbs (77.6 kg)	60°F (15.5°C)	58°F (14.4°C)	58°F (14.4°C)	7.8
113	186 lbs (84.4 kg)	59°F (15°C)	59°F (15°C)	57°F (13.9°C)	8.5
120	200 lbs (90.7 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.2
127	215 lbs (97.5 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.9
134	230 lbs (104.3 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	10.6
141	243 lbs (110.2 kg)	58°F (14.4°C)	57°F (13.9°C)	56°F (13.3°C)	11.2
148	258 lbs (117 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	11.9
155	272 lbs (123.4 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	12.6
162	284 lbs (128.8 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.3
169	297 lbs (134.7 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.9
176	310 lbs (140.6 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	14.6

TABLE B-5: RECOMMENDATIONS FOR SOLID-SIDED BARNS WITH SLATED FLOORS UTILIZING NO BROODERS OR MATS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	85°F (29.4°C)	87°F (30.5°C)	85°F (29.4°C)	2.0
8	15 lbs (6.8 kg)	83°F (28.3°C)	84°F (28.9°C)	83°F (28.3°C)	2.0
15	19 lbs (8.6 kg)	81°F (27.2°C)	79°F (26.1°C)	79°F (26.1°C)	2.0
22	24 lbs (10.9 kg)	79°F (26.1°C)	79°F (26.1°C)	77°F (25°C)	2.0
29	31 lbs (14.1 kg)	75°F (24.9°C)	74°F (23.3°C)	72°F (22.2°C)	2.2
36	41 lbs (18.6 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.6
43	51 lbs (23.1 kg)	70°F (21.1°C)	69°F (20.5°C)	67°F (19.4°C)	2.9
50	62 lbs (28.1 kg)	69°F (20.5°C)	68°F (20°C)	67°F (19.4°C)	3.3
57	73 lbs (33.1 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	3.9
64	86 lbs (39.0 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	4.5
71	100 lbs (45.4 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.1
78	113 lbs (51.3 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.4
85	127 lbs (57.6 kg)	63°F (17.2°C)	63°F (17.2°C)	62°F (16.7°C)	5.9
92	142 lbs (64.4 kg)	62°F (16.7°C)	64°F (17.8°C)	62°F (16.7°C)	6.6
99	156 lbs (70.8 kg)	61°F (16.1°C)	62°F (16.7°C)	61°F (16.1°C)	7.1
106	171 lbs (77.6 kg)	60°F (15.5°C)	58°F (14.4°C)	58°F (14.4°C)	7.8
113	186 lbs (84.4 kg)	59°F (15°C)	59°F (15°C)	57°F (13.9°C)	8.5
120	200 lbs (90.7 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.2
127	215 lbs (97.5 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.9
134	230 lbs (104.3 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	10.6
141	243 lbs (110.2 kg)	58°F (14.4°C)	57°F (13.9°C)	56°F (13.3°C)	11.2
148	258 lbs (117 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	11.9
155	272 lbs (123.4 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	12.6
162	284 lbs (128.8 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.3
169	297 lbs (134.7 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.9
176	310 lbs (140.6 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	14.6

TABLE B-6: RECOMMENDATIONS FOR SOLID-SIDED BARNS WITH SLATED FLOORS UTILIZING BOTH BROODERS AND MATS

DAYS ON FEED	WEIGHT	DESIRED ROOM	WINTER SETPOINT	SUMMER SETPOINT	WINTER CFM
1	12 lbs (5.4 kg)	74°F (23.3°C)	76°F (24.4°C)	74°F (23.3°C)	2.0
8	15 lbs (6.8 kg)	72°F (22.2°C)	73°F (22.7°C)	72°F (22.2°C)	2.0
15	19 lbs (8.6 kg)	70°F (21.1°C)	68°F (20°C)	68°F (20°C)	2.0
22	24 lbs (10.9 kg)	68°F (20°C)	68°F (20°C)	66°F (18.9°C)	2.0
29	31 lbs (14.1 kg)	75°F (24.9°C)	74°F (23.3°C)	72°F (22.2°C)	2.2
36	41 lbs (18.6 kg)	73°F (22.7°C)	72°F (22.2°C)	70°F (21.1°C)	2.6
43	51 lbs (23.1 kg)	70°F (21.1°C)	69°F (20.5°C)	67°F (19.4°C)	2.9
50	62 lbs (28.1 kg)	69°F (20.5°C)	68°F (20°C)	67°F (19.4°C)	3.3
57	73 lbs (33.1 kg)	67°F (19.4°C)	67°F (19.4°C)	66°F (18.9°C)	3.9
64	86 lbs (39.0 kg)	66°F (18.9°C)	66°F (18.9°C)	65°F (18.3°C)	4.5
71	100 lbs (45.4 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.1
78	113 lbs (51.3 kg)	64°F (17.8°C)	64°F (17.8°C)	63°F (17.2°C)	5.4
85	127 lbs (57.6 kg)	63°F (17.2°C)	63°F (17.2°C)	62°F (16.7°C)	5.9
92	142 lbs (64.4 kg)	62°F (16.7°C)	64°F (17.8°C)	62°F (16.7°C)	6.6
99	156 lbs (70.8 kg)	61°F (16.1°C)	62°F (16.7°C)	61°F (16.1°C)	7.1
106	171 lbs (77.6 kg)	60°F (15.5°C)	58°F (14.4°C)	58°F (14.4°C)	7.8
113	186 lbs (84.4 kg)	59°F (15°C)	59°F (15°C)	57°F (13.9°C)	8.5
120	200 lbs (90.7 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.2
127	215 lbs (97.5 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	9.9
134	230 lbs (104.3 kg)	58°F (14.4°C)	57°F (13.9°C)	55°F (12.8°C)	10.6
141	243 lbs (110.2 kg)	58°F (14.4°C)	57°F (13.9°C)	56°F (13.3°C)	11.2
148	258 lbs (117 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	11.9
155	272 lbs (123.4 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	12.6
162	284 lbs (128.8 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.3
169	297 lbs (134.7 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	13.9
176	310 lbs (140.6 kg)	58°F (14.4°C)	58°F (14.4°C)	57°F (13.9°C)	14.6

Appendix C:

SITE MAP

FIGURE C-1: SITE MAP

Appendix D:

SITE INSPECTION CHECKLIST

FIGURE D-1: SITE INSPECTION CHECKLIST

Cleaning Preparation Review	
Was the Wash Crew Approved and Trained	Y N
Was the washing equipment clean and disinfected before arriving to site?	Y N
Last group's known pathogens?	
Date that the last pig was in site?	
Date when all previous mortalities removed?	
Planned site downtime?	
Date that Wash Crew Began?	
Date that the Wash Crew completed?	
Is the entire site cleaned prior to pig entry?	Y N
Are feed bins cleaned prior to pig entry?	Y N
Exterior Inspection	
Fans Cleaned?	Y N
Is exterior debris and harborage removed?	Y N
Vegitation trimmed and maintained?	Y N
3 foot rock perimeter maintained?	Y N
Pit Pump-Outs covered Properly	Y N
Attic Soffits Clean?	Y N
Bin Pads Clean?	Y N
Mortality Management Device Clean & Operational?	Y N
Bait Maintained?	Y N
Bin Pads Clean?	Y N
Loading Chute Clean?	Y N
Is the Loading Chute Shared?	Y N
Curtains and Exterior in Good Order?	Y N
Office Inspection	
Boots Cleaned?	Y N
Coveralls Cleaned?	Y N
Shower and Floor Clean?	Y N
Previous Turn's Garbage Removed?	Y N
Proper Documents and Postings in Place?	Y N
Are all necessary supplies in place?	Y N

Interior Inspection	
Has the building been washed?	Y N
Is building bird free?	Y N
Are ceilings clean?	Y N
Are feed lines clean?	Y N
Are water lines and nipples clean?	Y N
Are all heaters and brooders clean?	Y N
Is the penning clean?	Y N
Are the feeders/gruel pans clean?	Y N
Are the pen side walls and end walls clean?	Y N
Are the slats clean?	Y N
Are all mats clean and water removed?	Y N
Are control panels clean?	Y N
Are all wall fans louvers and blades clean?	Y N
Are the curtains clean?	Y N
Are sort panels clean?	Y N
Is building disinfected?	Y N
Will building be dry at pig placement?	Y N
Is the load-out area clean?	Y N
Notes and Opportunities	

Appendix E:

TREATMENT

FIGURE E-1: TREATMENT

Site		Turn ID		Fieldman						
Source		Caretaker		Date Range						

Week		Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Weekly Total	Cumulative Total
	Number Treated									
	Drug									
	Dose									
	Number Treated									
	Drug									
	Dose									
	Hi Temp									
	Low Temp									
	Water Conusmed									
	Hd. Pulled									
	Initials									
	Number Treated									
	Drug									
	Dose									
	Number Treated									
	Drug									
	Dose									
	Hi Temp									
	Low Temp									
	Water Conusmed									
	Hd. Pulled									
	Initials									
	Number Treated									
	Drug									
	Dose									
	Number Treated									
	Drug									
	Dose									
	Hi Temp									
	Low Temp									
	Water Conusmed									
	Hd. Pulled									
	Initials									
	Number Treated									
	Drug									
	Dose									
	Number Treated									
	Drug									
	Dose									
	Hi Temp									
	Low Temp									
	Water Conusmed									
	Hd. Pulled									
	Initials									

Appendix F:

MORTALITY SHEET

FIGURE F-1: MORTALITY SHEET

Site		*Turn ID*		*Fieldman*		
Source		*Wt. In*		*Inventory In*		
	Date In		*Health Status*		*Day 1 Setpoint*	

Week	*Mon.*	*Tues.*	*Wed.*	*Thurs.*	*Fri.*	*Sat.*	*Sun.*	*Weekly Total*	*Cumulative Total*
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
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28									
29									

Appendix G:

PROPER INJECTION TECHNIQUES FOR PIGS

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Reviewers: Dr. James D. McKean, Roy Henry

Improper injection techniques cost the pork industry thousands of dollars each year. Injection-site reactions, broken needles and lack of product efficacy are consequences of improper injection technique. Everyone involved in treating pigs must understand and use proper injection techniques. Each pork producer should develop an education plan to assure that all animal caretakers understand the responsibilities that go with giving injections to food producing animals.

INJECTION TECHNIQUES

There are five ways to give injectable medications to pigs:

1. In the muscle (Intramuscularly, also referred to as IM injection):
- Use a spot on the neck just behind and below the ear, but in front of the shoulder.
- Inject only into clean, dry areas.
- To reduce leakage in small pigs, push the skin forward or backward slightly before injection, then let the skin snap back when needle is removed.
- Do not use a needle to inject in the ham or loin. There may be some bleeding, bruising and scarring of the muscle that may blemish the cut of meat. This standard applies to sows as well as to market hogs.
- If a producer considers the use of alternate injection techniques or technologies, the veterinarian and packer should help to determine the acceptability of these techniques. Avoiding carcass defects and/or physical hazards such as broken needles are the paramount concerns.
- Use the proper size and length needle to ensure the medication is deposited in the muscle, not in other tissues.

2. Under the skin (Subcutaneously or SQ):
- Slide the needle under the skin away from the site of skin puncture before depositing the product.
- Inject only into clean, dry areas.
- Use the proper length needle and angle to avoid injecting into the muscle.
- For small pigs, use the loose flaps of skin in the flank or behind the elbow.
- For larger pigs, inject in neck behind the ear at the same location as for IM injections after grabbing the skin to make an elevated area to inject into.

3. In the abdominal cavity (Intraperitoneally or IP):
- This technique should be used under veterinary supervision and guidance as serious injury, including the death of the pig, can occur.

4. In the vein (Intravenously or IV):
- This technique should be used only upon veterinary instruction and guidance as serious injury, including the death of the pig, can occur.

5. In the nasal passages (Intranasally or IN):
- Withdraw the product from the bottle using a syringe and needle. Remove the needle from the syringe. Use the recommended application tip for administering the product.
- Keep the pig's head tilted upward during, and immediately following administration to help the product reach the deep nasal passages.

TABLE G-1: RECOMMENDED NEEDLE SIZES AND LENGTHS

DEVELOPING A STANDARD OPERATING PROCEDURE (SOP) FOR NEEDLE USE

Developing a standard operating procedure (SOP) will help pork producers address needle use in their operations in a logical, consistent way. It will also help animal caretakers, including employees and family, become acquainted with how issues such as needle breakage are to be handled. If needle breakage does occur, producers should encourage honesty, proper identification and reporting. Here are some points to consider in a needle-use SOP:

1. Prevention
- Evaluate the strength and detectability characteristics of the needles used.
- Provide needle-use guidelines to all animal caretakers that address:
  - Proper animal restraint.
  - Proper site and technique for injection.
  - Proper size and length of needle according to the pig's age, the injection site and the characteristics of the product to be injected.
  - Directions with regard to knowing when to change the needle to maintain cleanliness and sharpness.
  - The retrival of dropped needles. Packers report finding a significant number of needles lodged in the tissues around the mouth, throat and jowls of sows and market hogs. It is important that measures are taken to minimize the loss of needles in areas occupied by hogs.
  - How to change bent needles: Bent needles should never be straightened. They should be carefully removed and replaced.
  - Needle reconciliation: Producers should consider the appropriate number of needles that would be reasonable to use for a particular job and reconcile the number of needles at the beginning of the job, the number used and the number of needles at the finish.

2. Identification of hogs that carry or are at risk of carrying a broken needle
- A plan for immediately identifying hogs known or suspected of harboring a broken needle fragment should be established. Permanent identification of the animal, if the identification applied at the time of the incident is not permanent, should be considered.
- Employees should receive appropriate training and incentives to follow training.
- All pertinent information regarding the event should be recorded. This information can include: activity, gauge and brand of needle, location, restraint used, person giving the injection and person who reported the incident.

3. Communications with the packer
- Packers have payment and notification policies for pigs at risk of carrying broken needles. When producers develop an SOP for handling animals suspected of carrying needle fragments, they should consider packer policies including how the hogs should be identified and how packers should be notified.

DISPOSAL OF USED NEEDLES AND OTHER HAZARDOUS MATERIALS

Used needles, knife blades and syringes are called "sharps" and must be disposed of according to state regulations to prevent environmental contamination and injury to fellow workers, children, waste handlers and livestock. Proper disposal involves placing sharps in a rigid, puncture-resistant container immediately after use.

Commercially available containers can be purchased from many farm supply stores, safety supply houses, drug stores or from veterinarians. Some states allow sharps to be placed in containers such as empty detergent bottles made of heavy plastic with screw-on caps. Glass containers are not acceptable for sharps disposal because they are more likely to break in the disposal process.

Regardless of the type of container, it should be suitable to prevent the exposure of needles both on the farm and throughout the transportation to the final disposal location. A sharps container must be clearly labeled as a biohazard waste container. When the container is full, the cap or lid should be securely tightened and sealed with heavy tape. Producers should contact the agency in charge of overseeing the disposal of biomedical wastes in their state to find out about the rules that apply to their operation. The Web site http://www.epa.gov/epawaste/index.htm provides information on agencies that regulate biomedical or infectious waste disposal in every state. Approved sharps collection stations are available in some regions.

Another option may be to ask a veterinarian or a local hospital if their facility accepts farm-generated medical waste.

NEEDLE-FREE TECHNOLOGY

Needle-free injection systems eliminate the issue of broken needles in carcasses. In Pork Checkoff sponsored research, vaccines administered by needle-free injection produced immunity equal to that of conventionally administered vaccines. No injection-site reactions were noted with either the needle-free or conventional methods in this trial.

Effective vaccines and antimicrobials which can be administered through the drinking water also are available today. These products are completely needle-free. As always, contact your herd veterinarian or animal health supplier about such products.

This information was adapted from the National Pork Board PQA Plus™ program.
For more information refer to the PQA Plus manual.

Appendix H:

JAPANESE MRL DATABASE & NEEDLE SIZE

Current Recommended Antimicrobial Products Withdrawal Times for U.S. Pork Intended for International Markets.

UPDATED WITHDRAWAL TIMES FOR TETRACYCLINE (FEED-GRADE/WATER-SOLUBLE) PRODUCTS:
A new pork trade certificate with Russia has been negotiated, establishing guidelines for packers that are exporting to Russia. The Russian Product Verification Program (PVP) is a program to verify compliance with the Russian tetracycline standard. The purpose of PVP is to provide specific product requirements for marketing U.S. Pork and pork products to the Russian Federation under the USDA Export Verification Program. One of the product requirements is a 14-day withdrawal period for all soluble and feed-grade tetracycline products to satisfy Russia's tetracycline minimum residue level (MRL). Your packer may require some type of verification to show this withdrawal period is being met.

Important Note: Although the 14-day withdrawal period for tetracycline products (soluble and feed-grade) is to meet Russian import requirements, it is also the recommended guideline for all U.S. Pork exports. For more information, view the USDA's Product Verification Program on Tetracycline Withdrawal.

TABLE H-1: WITHDRAWAL TIMES FOR TETRACYCLINE (FEED-GRADE/WATER-SOLUBLE) PRODUCTS

Current as of 05/2013.
Please check the current drug withdrawals or seek veterinary assistance as these withdrawals do change.

EXPORT SUCCESS BEGINS AT FARM LEVEL: IMPORTANT FACTS TO KNOW

International markets around the world continue to provide a valuable outlet for U.S. Pork and pork products. For this reason, the federal government, along with the U.S. Meat Export Federation, National Pork Producers Council, the American Pork Export Trading Company and others, work to ensure export customers get a continuous supply of high-quality, safe pork.

The export chain, however, begins at the farm level — meaning every American producer plays an important role in producing safe, nutritious, high-quality pork for the world's growing population.

As part of the ongoing example of how U.S. producers show they care for their animals and the food they produce, they work with their veterinarians to follow the key guidelines associated with the proper use of animal health products.

This close working relationship, typically cited at the Veterinary-Client-Patient Relationship (VCPR) is critical to the ongoing success of U.S. pork exports. This is especially true as international markets evolve over time and may result in trading partners making changes in their requirements of purchasing U.S. Pork. Often, these changes are related to residue levels in meat or meat products, typically called Maximum Residue Levels (MRLs).

The American Association of Swine Veterinarians offers its overview of why it's important to ensure producers take steps to meet all MRLs of antimicrobials related to pork exports.

AASV RECOMMENDATIONS TO MEET EXPORT MRL OF ALL ANTIMICROBIALS FOR U.S. PORK EXPORTS

Background and Goals:

- Protection of export markets and consumer confidence is of critical importance to the pork industry.
- Highest risk to these markets is from mass medication during the finishing period and in the breeding herd.
- Animal care and production may require administering products during the finishing phase or in the breeding herd.
- The National Pork Board's product withdrawal database contains only products for which the manufacturer has supplied specific export MRL withdrawal information. Products without specific export MRL withdrawal information are not listed.

Recommendations:

- Use the best science available to ensure compliance with market specifications.
- If specific withdrawal times for a product have not been supplied by the manufacturer, the product will not be listed in the product/withdrawal database. If a product is not listed in the database, the AASV recommends not using that product during the finishing phase or in breeding animals. This includes proprietary and generic products.
  - A generic product may have a different withdrawal time from its proprietary equivalent. Follow the specific product withdrawal recommendation.
- Follow the recommended product withdrawal to meet the export MRL requirements. Product withdrawal time is based on applying the product at the labeled dosage and route and duration of administration.
- If a compound is given by multiple routes of administration (example: given in water, in the feed and/or by injection) simultaneously, withdrawal time may need to be extended. It's recommended that you contact the product manufacturer(s) about appropriate withdrawal time to meet market expectations.
- Follow appropriate administration techniques.
  - Note the manufacturer's specified location of injection site
  - Note the manufacturer's specified volume of product within one injection site
  - Any change in location, administration, volume or other variance from labeled directions constitutes extralabel use. There may not be specific withdrawal data available for extralabel use of specific products.
- Follow quality assurance procedures to prevent mistakes. Follow appropriate administration techniques.

TABLE H-2: NEEDLE RECOMMENDATIONS

Appendix I:

GROWTH AND FEED INTAKE CURVES

TABLE I-1. GROWTH AND FEED INTAKE CURVES FOR PIC327 SIRED PIGS FROM WEANING TO 28 WEEKS OF AGE

AGE DAYS/WEEKS	WEIGHT LB (KG)	AVERAGE DAILY GAIN LB (KG)/DAY	WEEKLY FEED INTAKE LB (KG)	CUMULATIVE AVERAGE DAILY GAIN LB (KG)/DAY	CUMULATIVE FEED INTAKE LB (KG)	CUMULATIVE FEED CONVERSION
21/3	11.8 (5.3)					
28/4	15.0 (6.8)	0.46 (0.21)	3.27 (1.48)	0.46 (0.21)	3.27 (1.48)	1.02
35/5	19.7 (8.9)	0.67 (0.30)	5.55 (2.52)	0.56 (0.25)	8.82 (4.00)	1.12
42/6	25.7 (11.7)	0.86 (0.39)	7.60 (3.45)	0.66 (0.30)	16.42 (7.45)	1.18
49/7	32.3 (14.9)	1.01 (0.46)	9.80 (4.44)	0.75 (0.34)	26.22 (11.89)	1.25
56/8	42.3 (19.2)	1.36 (0.62)	14.00 (6.35)	0.87 (0.40)	40.22 (18.24)	1.32
63/9	53.0 (24.0)	1.53 (0.69)	16.90 (7.67)	0.98 (0.44)	57.12 (25.90)	1.39
70/10	64.1 (29.1)	1.59 (0.72)	18.60 (8.44)	1.07 (0.49)	75.72 (34.35)	1.45
77/11	76.2 (34.6)	1.73 (0.79)	22.18 (10.06)	1.15 (0.52)	97.90 (44.41)	1.52
84/12	89.1 (40.4)	1.84 (0.84)	25.29 (11.47)	1.23 (0.56)	123.19 (55.88)	1.59
91/13	102.6 (46.5)	1.93 (0.88)	28.25 (12.81)	1.30 (0.59)	151.44 (68.69)	1.67
98/14	116.6 (52.9)	2.00 (0.91)	30.99 (13.06)	1.36 (0.62)	182.43 (82.75)	1.74
105/15	131.0 (59.4)	2.06 (0.93)	33.49 (15.19)	1.42 (0.64)	215.92 (97.94)	1.81
112/16	145.7 (66.1)	2.10 (0.95)	35.71 (16.20)	1.47 (0.67)	251.63 (114.14)	1.88
119/17	160.6 (72.8)	2.13 (0.97)	37.66 (17.08)	1.52 (0.69)	289.29 (131.22)	1.94
126/18	175.6 (79.6)	2.14 (0.97)	39.36 (17.85)	1.56 (0.71)	328.65 (149.07)	2.01
133/19	190.5 (86.4)	2.13 (0.97)	40.82 (18.52)	1.60 (0.73)	369.47 (167.59)	2.07
140/20	205.4 (93.2)	2.13 (0.97)	42.07 (19.08)	1.63 (0.74)	411.54 (186.67)	2.13
147/21	220.0 (99.8)	2.09 (0.95)	43.13 (19.56)	1.65 (0.75)	454.67 (206.23)	2.18
154/22	234.6 (106.4)	2.09 (0.95)	44.03 (19.97)	1.68 (0.76)	498.70 (226.21)	2.24
161/23	248.7 (112.8)	2.01 (0.91)	44.80 (20.32)	1.69 (0.77)	543.50 (246.53)	2.29
168/24	262.7 (119.2)	2.00 (0.91)	45.45 (20.62)	1.71 (0.78)	588.95 (267.14)	2.35
175/25	276.2 (125.3)	1.93 (0.88)	46.01 (20.87)	1.72 (0.78)	634.96 (288.01)	2.40
182/26	289.5 (131.3)	1.90 (0.86)	46.48 (21.08)	1.72 (0.78)	681.44 (309.10)	2.45
189/27	302.3 (137.1)	1.83 (0.83)	46.89 (21.27)	1.73 (0.79)	728.33 (330.36)	2.51
196/28	314.7 (142.7)	1.77 (0.80)	47.25 (21.43)	1.73 (0.79)	775.58 (351.80)	2.56

TABLE I-2. GROWTH AND FEED INTAKE CURVES FOR PIC337 SIRED PIGS FROM WEANING TO 28 WEEKS OF AGE

AGE DAYS/WEEKS	WEIGHT LB (KG)	AVERAGE DAILY GAIN LB (KG)/DAY	WEEKLY FEED INTAKE LB (KG)	CUMULATIVE AVERAGE DAILY GAIN LB (KG)/DAY	CUMULATIVE FEED INTAKE LB (KG)	CUMULATIVE FEED CONVERSION
21/3	12.0 (5.4)					
28/4	14.5 (6.6)	0.36 (0.16)	2.65 (1.20)	0.36 (0.16)	2.65 (1.20)	1.06
35/5	19.0 (8.6)	0.64 (0.29)	5.32 (2.41)	0.50 (0.23)	7.97 (3.61)	1.14
42/6	25.0 (11.3)	0.86 (0.39)	7.70 (3.49)	0.62 (0.28)	15.67 (7.11)	1.21
49/7	32.0 (14.5)	1.00 (0.45)	9.70 (4.40)	0.71 (0.32)	25.37 (11.51)	1.27
56/8	41.5 (18.8)	1.36 (0.62)	13.95 (6.33)	0.84 (0.38)	39.32 (17.83)	1.33
63/9	52.1 (23.6)	1.51 (0.69)	16.70 (7.57)	0.95 (0.43)	56.02 (25.41)	1.40
70/10	63.1 (28.6)	1.57 (0.71)	18.50 (8.39)	1.04 (0.47)	74.52 (33.80)	1.46
77/11	75.1 (34.1)	1.71 (0.78)	21.83 (9.90)	1.13 (0.51)	96.35 (43.70)	1.53
84/12	87.9 (39.9)	1.83 (0.83)	24.96 (11.32)	1.20 (0.54)	121.31 (55.02)	1.60
91/13	101.5 (46.0)	1.94 (0.88)	27.94 (12.67)	1.28 (0.58)	149.25 (67.70)	1.67
98/14	115.5 (52.4)	2.00 (0.91)	30.72 (13.93)	1.34 (0.61)	179.97 (81.63)	1.74
105/15	130.0 (59.0)	2.07 (0.94)	33.25 (15.08)	1.40 (0.64)	213.22 (96.71)	1.81
112/16	144.8 (65.7)	2.11 (0.96)	35.50 (16.10)	1.46 (0.66)	248.72 (112.82)	1.87
119/17	159.8 (72.5)	2.14 (0.97)	37.48 (17.00)	1.51 (0.69)	286.20 (129.82)	1.94
126/18	174.9 (79.3)	2.16 (0.98)	39.20 (17.78)	1.55 (0.70)	325.40 (147.60)	2.00
133/19	190.0 (86.2)	2.16 (0.98)	40.67 (18.45)	1.59 (0.72)	366.07 (166.05)	2.06
140/20	205.1 (93.0)	2.16 (0.98)	41.92 (19.01)	1.62 (0.74)	407.99 (185.06)	2.11
147/21	220.1 (99.8)	2.14 (0.97)	42.98 (19.49)	1.65 (0.75)	450.97 (204.56)	2.17
154/22	234.8 (106.5)	2.10 (0.95)	43.88 (19.90)	1.68 (0.76)	494.85 (224.46)	2.22
161/23	249.4 (113.1)	2.09 (0.95)	44.64 (20.25)	1.70 (0.77)	539.49 (244.71)	2.27
168/24	263.7 (119.6)	2.04 (0.93)	45.28 (20.54)	1.71 (0.78)	584.77 (265.25)	2.32
175/25	277.6 (125.9)	1.99 (0.90)	45.83 (20.79)	1.72 (0.78)	630.60 (286.03)	2.37
182/26	291.2 (132.1)	1.94 (0.88)	46.29 (21.00)	1.73 (0.79)	676.89 (307.03)	2.42
189/27	304.4 (138.1)	1.89 (0.86)	46.69 (21.18)	1.74 (0.79)	723.58 (328.21)	2.47
196/28	317.2 (143.9)	1.83 (0.83)	47.03 (21.33)	1.74 (0.79)	770.61 (349.54)	2.52

TABLE I-3. GROWTH AND FEED INTAKE CURVES FOR PIC280 SIRED PIGS FROM WEANING TO 28 WEEKS OF AGE

AGE DAYS/WEEKS	WEIGHT LB (KG)	AVERAGE DAILY GAIN LB (KG)/DAY	WEEKLY FEED INTAKE LB (KG)	CUMULATIVE AVERAGE DAILY GAIN LB (KG)/DAY	CUMULATIVE FEED INTAKE LB (KG)	CUMULATIVE FEED CONVERSION
21/3	12.0 (5.4)					
28/4	15.1 (6.8)	0.44 (0.20)	3.33 (1.51)	0.44 (0.20)	3.33 (1.51)	1.07
35/5	20.5 (9.3)	0.77 (0.35)	6.60 (2.99)	0.61 (0.28)	9.93 (4.50)	1.17
42/6	26.8 (12.2)	0.90 (0.41)	8.28 (3.76)	0.70 (0.32)	18.21 (8.26)	1.23
49/7	34.0 (15.4)	1.03 (0.47)	10.15 (4.60)	0.79 (0.36)	28.36 (12.86)	1.29
56/8	43.8 (19.9)	1.40 (0.64)	14.60 (6.62)	0.91 (0.41)	42.96 (19.49)	1.35
63/9	54.9 (24.9)	1.59 (0.72)	17.80 (8.07)	1.02 (0.46)	60.76 (27.56)	1.42
70/10	67.0 (30.4)	1.73 (0.79)	20.60 (9.34)	1.12 (0.51)	81.36 (36.90)	1.48
77/11	79.6 (36.1)	1.80 (0.82)	23.08 (10.47)	1.21 (0.55)	104.44 (47.37)	1.54
84/12	93.0 (42.2)	1.91 (0.87)	26.36 (11.96)	1.29 (0.59)	130.80 (59.33)	1.61
91/13	107.0 (48.5)	2.00 (0.91)	29.50 (13.38)	1.36 (0.62)	160.30 (72.71)	1.69
98/14	121.5 (55.1)	2.07 (0.94)	32.40 (14.70)	1.42 (0.64)	192.70 (87.41)	1.76
105/15	136.3 (61.8)	2.11 (0.96)	35.04 (15.89)	1.48 (0.67)	227.74 (103.30)	1.83
112/16	151.5 (68.7)	2.17 (0.98)	37.39 (16.96)	1.53 (0.69)	265.13 (120.26)	1.90
119/17	166.8 (75.7)	2.19 (0.99)	39.46 (17.90)	1.58 (0.72)	304.59 (138.16)	1.97
126/18	182.1 (82.6)	2.19 (0.99)	41.27 (18.72)	1.62 (0.74)	345.86 (156.88)	2.03
133/19	197.4 (89.5)	2.19 (0.99)	42.81 (19.42)	1.66 (0.75)	388.67 (176.30)	2.10
140/20	212.6 (96.4)	2.17 (0.98)	44.14 (20.02)	1.69 (0.77)	432.81 (196.32)	2.16
147/21	227.6 (103.2)	2.14 (0.97)	45.27 (20.53)	1.71 (0.78)	478.08 (216.85)	2.22
154/22	242.3 (109.9)	2.10 (0.95)	46.24 (20.97)	1.73 (0.79)	524.32 (237.83)	2.28
161/23	256.7 (116.4)	2.06 (0.93)	47.06 (21.35)	1.75 (0.79)	571.38 (259.17)	2.34
168/24	270.9 (122.9)	2.03 (0.92)	47.75 (21.66)	1.76 (0.80)	619.13 (280.83)	2.39
175/25	284.6 (129.1)	1.96 (0.89)	48.35 (21.93)	1.77 (0.80)	667.48 (302.76)	2.45
182/26	297.9 (135.1)	1.90 (0.86)	48.86 (22.16)	1.78 (0.81)	716.34 (324.93)	2.51
189/27	310.8 (141.0)	1.84 (0.84)	49.29 (22.36)	1.78 (0.81)	765.63 (347.28)	2.56
196/28	323.4 (146.7)	1.80 (0.82)	49.67 (22.53)	1.78 (0.81)	815.30 (369.81)	2.62

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