Biosecurity Guidelines for Pork Producers

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**Introduction**

It is economically and technically infeasible for producers to exclude all pathogens from their herds. Instead producers aim for minimal disease status; expending resources to exclude specific pathogens and control the ones they already have. Maintaining a minimal disease status is important for pork producers: sick pigs can die, do not perform as efficiently as their contemporaries, are expensive to treat, create an animal welfare problem and may result in a product that is rejected by (e.g., abscesses) or detrimental to (e.g., Salmonella) the consumer. Consequently, producers implement biosecurity procedures to minimize long- and short-term disease losses and help ensure a more profitable future for the enterprise. The objective of a biosecurity program is clear: it must reduce the cost of lean meat production and help provide a product that does not jeopardize consumer health or the image consumers have of the product and how it is produced. The success of a biosecurity program depends on the resources the farm manager is willing to devote to the prevention and monitoring of diseases.

Before deciding on the resources to allocate to a biosecurity program consider the costs of an outbreak. Because most pig production occurs within a pyramid of production (nucleus farms at the top, then multiplier farms, then commercial farms) an outbreak high in the pyramid can affect many farms beneath it. An estimate of disease cost within a system must consider how many farms will be affected and the short- and long-term costs including the costs of treatment and control. A major factor is the time it takes to identify and control the disease. Costs can vary tremendously depending on how far the disease spreads through the system and the virulence of the outbreak. Certainly, disease costs the American pork producers millions of dollars each year and estimates have been made of the cost of an outbreak in individual farms (Table 1).

Should a pathogen be introduced to a commercial finisher or nursery, there is a good possibility that the disease may be contained to one site and flow out of the system as the pigs are marketed. This is not the case in sow farms. Sow farms are continuous flow and may harbor disease for years once they are contaminated. A PRRS infected sow farm can
produce PRRS infected nursery pigs for years and this becomes the major cost. The higher up the pyramid a pathogen infects a system the more extensive the loss.

Pathogen exposure

Some types of contacts are more likely to result in infection than others; the movement of pigs is the most notorious. Most system exposures are due to the inadvertent introduction of an infected pig into the system. Pig contact with livestock transports that previously carried infected pigs are the next most likely to result in an exposing contact. The mechanical transfer of pathogens by people, feed trucks, equipment, and supplies is the least likely to result in system exposure. Efficient managers allocating resources to biosecurity where they have the most impact: primary, secondary, and tertiary exposure in descending order.

Primary exposures occur when system pigs contact infected pigs. For example, when replacement giltts are infected and introduce a new pathogen into the system. Secondary exposures are the indirect contact of system animals. For example, when a sow farm employee enters a contaminated truck and then enters a sow farm, exposing system animals. Secondary exposures are always less likely to infect pigs. Some managers are concerned with tertiary exposures but the risk is low and should receive the fewest resources. For example, a sow-farm employee’s spouse (who works at an abattoir) transfers a pathogen from pigs at the abattoir to the sow-farm employee, who then carries the pathogen into the sow farm and infects the sows. Tertiary exposures are much less likely to result in infection than secondary exposure. Thus, producers are more likely to prevent disease by focusing on primary exposures than secondary or tertiary exposures.

**Table 1. Cost of Diseases**

<table>
<thead>
<tr>
<th>Disease</th>
<th>Approximate Cost, $ per sow per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal diarrhea</td>
<td>$23.00</td>
</tr>
<tr>
<td>Reproductive tract discharges</td>
<td>$48.60</td>
</tr>
<tr>
<td>Coccidiosis</td>
<td>$11.50</td>
</tr>
<tr>
<td>Increased post weaning mortality from 2% to 4%</td>
<td>$32.00</td>
</tr>
<tr>
<td>Growth rate reduction in finishers from 1.65 to 1.60 lb/day</td>
<td>$70.00</td>
</tr>
<tr>
<td>Feed conversion change from 2.5 to 2.6 for the growing herd</td>
<td>$34.00</td>
</tr>
<tr>
<td>Mange</td>
<td>$30.00-$60.00</td>
</tr>
<tr>
<td>Ileitis</td>
<td>$20.00</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>$45.00</td>
</tr>
<tr>
<td>TGE, 1 month outbreak</td>
<td>$60.00</td>
</tr>
</tbody>
</table>

There are three opportunities for preventing disease from affecting a herd:

A. Preventing exposure of the animals to the causal agent (barriers)
B. Preventing the expression of the disease (management)
C. Preventing the disease from expressing its full effect on the animals (treatment)

**Preventing exposure of the animals to the causal agent (barriers)**

Because primary prevention prevents the exposure of the animal to the causal agent it is typically considered the most cost-effective form of health care. There are four basic areas to address:

- Source and handling of primary and replacement breeding stock
- Rules governing the movement of people, vehicles, materials, and pigs.
- Layout of the farm
- Location of a new farm

**Discussing each of these in turn:**

**Source and handling of primary and replacement breeding stock**

Most swine diseases are transferred from one animal to the next by direct contact. Thus, the easiest and most frequent avenue for the introduction of disease into a herd is via the introduction of new replacement boars or giltts. The health assurance team of a breeding stock system has a major responsibility to ensure that the animals they supply or sell are as free from economically damaging disease as practically possible. Purchased semen is also a possible source of exposure and PRRS virus is the major pathogen of concern. Other pathogens that may be carried in semen include *Leptospira spp.* and *Brucella suis*. However, semen is usually treated with antibiotics to prevent bacterial transfers and lengthen the shelf life of the semen.

**What can the producer do to minimize the risk of “buying in” disease?**

a. Limit your genetic supply to as few sources as possible. Aim for only one or two supply herds at the most. The more seedstock herds that
supply a production system the greater the risk.

b. The herd’s veterinarian should keep informed of the health status of all the seedstock suppliers. This is commonly through vet-to-vet communication. In this way, the suitability of the herd as a supply herd can be assessed and monitored. Acclimatization procedures, vaccination, and preventative drug treatment regimens must also be discussed so that the purchased seedstock are given every assistance to survive and meet their full potential at their destination.

c. Isolate all stock for a minimum of 30 days before bringing them into the herd. If PRRS is an issue, then extend this quarantine period to 90 days. Within this quarantine period the animals will often show the signs of any diseases they may be carrying. In addition, it is usually sufficient time for the supplying seedstock herd to experience any disease it may have recently contracted. The full benefit of this isolation period will not be realized unless:

1. The people caring for the stock in isolation do not move unrestricted between the isolation facilities and other herds in the system. There must be a break that includes at least a complete change of clothing. Personnel often work within system herds then work the isolation facilities and do not return to the system herd on the same day. A barrier is created at the isolated site to prevent mechanical transfer of disease organisms into or out of the facility. The barrier must be a break that includes at least a complete change of clothing and a shower before entering other system facilities.

2. The managers and veterinarians of the isolation facility, seedstock and system herds must communicate and agree that nothing significant has happened in the seedstock herd during the isolation herd that would preclude the isolated stock from entering the system herd.

3. Animals are blood tested for appropriate important diseases (e.g., pseudorabies, transmissible gastroenteritis, PRRS) before being admitted.

4. Appropriate medications and vaccinations, as agreed to by the seedstock and commercial herd veterinarians, are administered at appropriate times during isolation to prepare the stock for entry into the system.

Movement and manipulation of animals and semen within the system.

The movement of semen within a system:

Moving semen between farms increases the risk of a PRRS outbreak because the virus can be transmitted via semen. It is especially dangerous because one boar excreting the PRRS virus can infect many sow farms with just one shipment; regardless of whether it is a strain endemic to the stud or a new introduction. Consequently, constant serologic surveillance is justified for any boar stud. Intense isolation regimens are justified before replacement boars are entered into the system stud. However, monitoring semen for PRRSv is expensive and has a turn-around-time of several days. Some producers monitor the semen of some boars every week but a PRRS positive result merely indicates that infective semen has already entered the farms. Semen testing will be effective when the semen of every donor boar can be tested before semen is sent.

The movement of animals within a system:

In practice, most of the biosecurity effort is focused on preventing pathogens gaining access to the sow farms, especially the nucleus and multipliers. Live haul vehicle sanitation and use is of major concern and to decrease the risk special attention is paid to routing, assigning trucks to specific runs, specific sanitation after runs, and off loading. The most dangerous runs are those that move pigs to a collection point outside the system, e.g., trucking finishing hogs to a slaughter plant.

Extra care is needed to prevent back hauling pathogens.

To help prevent pathogens returning from the abattoir to the farm, the market trucks are usually housed and washed separate from intersanctum trucks (intersanctum trucks carry pigs between units within a system). Market trucks are usually dedicated only for market runs. Special cleaning protocol and downtime are required to change the status of a truck from market to intersanctum. Other examples of high-risk runs are cull animal runs and hauling dead pigs. These runs are particular high-risk as the truck visits many sites while putting a full load together. The risk posed by these runs can be reduced by routing the runs from the most biosecure point of the system to the least. Sometimes the animals are accumulated in a holding area off the premises of the site so these runs do not enter the grounds surrounding a facility.

Intersanctum runs should be scheduled to expose as few sites as possible. Weaned pig runs operate between one sow farm and one nursery. Feeder pig runs carry pigs from one nursery to a finishing site.
Transportation runs that involve a multiplier are the most protected. Commonly, multiplier sites have their own dedicated transport vehicles; other trucks are not allowed on site. At multiplier sites, culls destined for slaughter are off loaded: a dedicated multiplier truck loads the cull animals, drives off-site and backs up to the truck used by the system for cull runs. The multiplier truck is then washed, sanitized, and dried before returning to the multiplier.

Feed trucks represent little risk compared to live haul as they never contact animals and do not drive through the swine farm; deliveries are made at the perimeter.

2. Rules governing the movement of people, service vehicles, materials, and pigs.

   Disease does not always enter a farm with introduced pigs or semen. Disease can also enter a farm indirectly when it is carried in on contaminated boots, clothing, supplies, or equipment. Therefore:
   a. Producers should always have a set of boots and clothing to wear exclusively in the hog unit after a visitor has showered. Work clothes should never be worn off the unit or where they may come in contact with other hogs, material or objects that have been in contact with other hogs. Personnel that visit several sites should schedule their visits from the most secure herd to the lowest.
   b. If producers take their own hogs to market, the truck must be thoroughly washed and disinfected before it returns to the farm. Likewise, boots and clothing must be cleaned and disinfected. If somebody else collects the hogs for market, producers must insist their truck be cleaned and disinfected before it arrives on the farm. Naturally, the truck should not be carrying slaughter hogs from any other farm. Producers should insist on being the first stop for the contract hauler truck. If the producer can’t get the contract hauler to adhere to these hygiene standards, a shuttle truck should be used. The shuttle truck or trailer is used to shuttle pigs to the contract hauler. The shuttle vehicle should be washed and disinfected away from the farm after hauling is complete.
   c. Producers should adopt a similar attitude to feed, breeding stock, and other service vehicles as they do to slaughter hog trucks. They should insist on being the first delivery for the day and that the truck be washed and disinfected before it arrives. Truck drivers must never enter the hog unit.
   d. Farm visitors must be discouraged. Entry should be allowed only with written permission of system managers. When essential people visit, disposable boots and coveralls should be provided. Many farm managers insist that everyone change and shower before putting on boots and clothing provided by the farm.
   e. Equipment that has been in contact with other hogs, (e.g., ultrasound units) must be thoroughly cleaned and disinfected before it is brought onto the farm.

3. Layout of the farm

   Although it is often impossible to change the layout of a farm there are times when this is necessary. Sometimes the risk is so great that a major change is warranted.
   a. Load-out facilities should be constructed to minimize the chance of pigs running back into the farm after being loaded onto the truck. Those pigs may carry back onto the farm a disease borne by the last load of hogs hauled. Loading chutes are often overlooked for cleaning as they are outside and the area is not drained; chutes should be washed weekly. Avoid using chutes to hold dead-stock for the dead run.
   b. Dead pigs and afterbirth must be disposed of in such a way as not to attract wild animals. If a dead-stock removal company is used then ensure its trucks do not come onto the farm. Take the dead stock off-site to a container to store the dead until their truck arrives. Ensure no cross-contamination occurs at the dead container that might mechanically transfer pathogens back into a site. The vehicle used to collect and carry the dead should be cleaned before entering the garage. The operator of the dead run should change clothes and shower back into the facility before contacting any swine. Dead runs are usually done at the end of the day.
   c. Avoid a farm layout that allows commercial vehicles (feed, supplies) to drive through the hog facilities. Plan the unit so all deliveries can be made at the perimeter.
   d. Do not have the farm office in one of the pig buildings. Again, locate the office on the perimeter and provide somewhere for farm staff to change from street clothes into farm clothes. Showering facilities increase the security and are appreciated by farm staff.

4. Location of new farm:

   a. Generally, locate a new farm at least one mile away from other pigs.
b. Locate the farm on a dead end road to avoid general traffic flow. Take advantage of terrain that limits the access to facilities. Perimeter fences are a man-made discouragement and vary from 3 strands of barb wire to 10 foot of chain link fencing.

For security, locate the manager’s house on the road leading to the farm.

Additional concerns/issues for Boar Studs

Artificial insemination is valued because a boar can produce more than 2000 doses of semen per year. The downside is that if his semen is contaminated with some pathogen then he could theoretically infect 2000 farms per year. Considering that the average US boar stud houses 160 boars and some have as many as 500 boars the consequences of infection are obvious.

Boar studs should follow the same precautions as outlined above for swine farms generally. Boars should be isolated and tested before entering the stud and similar procedures adopted to minimize the indirect introduction of pathogens.

In addition, managers of boar studs should develop a contingency plan for when things go wrong. As a minimum, the plan should address:

- When to call the veterinarian.
- What to do when a disease enters the boar stud.
- When to stop distributing semen.
- Establish who has the authority to make these decisions.

Additional concerns/issues for foreign animal diseases

If all the security measures detailed above are followed then the risk of a foreign animal disease entering is minimal. In particular, pigs must not be fed food scraps, e.g., leftovers from breakfast, lunch, or dinner. An outbreak of classical swine fever in England in 2000 was presumed to have started when a hiker threw some uneaten sausage over the fence to where pigs were pastured. In addition, the 2001 foot-and-mouth epidemic in England was believed to originate when improperly heat-treated food waste was fed to pigs.

Thus far we have discussed the prevention aspects of a health control program. The other important facet is monitoring. Most producers, when they think of the effects of disease, tend to think only of the direct costs of death and treatment. The major cost is in reduced production; reduced growth efficiency, or reduced farrowing rate for example.

Monitoring farm production trends is an integral part of managing the health/disease status of any herd. To effectively monitor a herd the events must be observed, recorded and then stored in such a way so they can be easily retrieved and used. Spending time with the pigs is the first and most important step in monitoring swine herd health. Recording these observations and the events in the life of a sow, boar, and their progeny forms the basis of a recording program. Computerized production records have revolutionized farm records because they have assisted producers decide what to record, where to record it, and most importantly how to use records to make the farm more profitable.

In summary, producers should divert more resources to primary and secondary prevention techniques. In addition, as primary and secondary exposure are the most likely source of infection then these should receive the most resources. Less emphasis should be placed on the less effective and more costly approach of using drugs and biologics to treat sick animals. How much to divert and the response to expect will depend on the current status of the herd. A record program that can store the necessary information and allow data retrieval in a usable format is the basis of an effective health program.

To access your biosecurity and how it ranks complete the programs on our website:

http://mark.asci.ncsu.edu/Veterinary/Bioindex/biosecurityindex.htm