

Livestock Case Scenario

Pasture-reared pigs have become a niche market for small producers catering to changing consumer attitudes. Mark Norris lives on a 160-acre farm in the southeastern United States that has been in his family for 5 generations. Like many small, farm holders, Mr. Norris works a day job for steady income, but for the past several years has wanted to see the family farm productive again. Historically, the farm has grown, at one time or another, tobacco, a variety of vegetables, grass hay, and peanuts, as well as finished both hogs and cattle for market. After attending extension classes to understand best practice management for free-range pigs and studying both the fiscal and physical feasibility of running a free-range pig operation, Mr. Norris is in his second year of raising pigs on pasture.

The operation consists of 20 sows, 2 per 1-acre paddock; and 2 boars, 1 per 1-acre paddock. Two sows are bred every 5 weeks. Gestation is 16 weeks and average litter size is 10. Piglets are weaned after 3-4 weeks nursing and take approximately 6 months to reach market weight. Larger paddocks are available for finishing the pigs. The sows are bred back the week after they wean so expect 2 litters/sow/year.

Depending on ground cover within the paddock, pigs are rotated between paddocks as needed, except when farrowing and nursing. Ground cover is Bermuda grass. To minimize destruction of the grass, water dispensers and feeders are placed on opposite ends of the paddock to prevent the pigs from preferentially staying in one area. Perforated slats are placed under feeders and drinkers to prevent soil compaction. Consideration is given to the contour of the land to orient paddocks to minimize erosion and nutrient run-off. Grass filter-strips, 50 feet wide, are placed between paddocks to manage erosion and nutrient run-off. Paddocks are fenced with wire mesh sheep/goat panels, 16 feet by 52 inches, attached to 6-foot high T-posts. Two strands of electric wires are run 6 inches and 18 inches from the ground.

Pigs enjoy rooting in the ground and wallowing. Both behaviors can damage vegetation and cause soil erosion. Hay bales or rounds can be added to distract pigs from rooting. Wallows need to be placed in an area that will not contribute to erosion and managed to avoid water stagnation.

What are the environmental considerations for raising pigs on pasture?

How does natural pig behavior influence pasture management?

During the Thanksgiving holidays, a sow is having trouble delivering. Mr. Norris' sister and her family are visiting. John, his 10-year-old nephew, has small hands and arms. He is eager to see if he can help the sow by pulling any piglets lodged in the birth canal. He pulls the first two and six more are delivered without assistance. All are stillbirths. Mr. Norris is not unduly concerned. This is the first litter for this sow, and the other experienced sow bred the same week had a healthy litter of 11 piglets three days earlier.

New Year's eve, a second sow delivers seven stillborn piglets. Mr. Norris is now concerned that there may be a problem. Because of the holidays, he waits to contact his extension agent, Tim Jackson, January 2nd. Tim asks if PLE vaccinations are current. The PLE vaccine protects against porcine parvovirus, *Erysipelothrix rhusiopathiae* and *Leptospira canicola*, *L. grippotyphosa*, *L. hardjo*, *L. icterohaemorrhagiae*, and *L. pomona*. All of these agents can cause abortions and stillbirths. Mr. Norris is current on his vaccine protocol, vaccinating gilts at 5 months and boosting 4 weeks later. Sows are vaccinated approximately every 6 months prior to breeding. There have been no new additions to the herd since the 20 gilts/sows and 2 boars were acquired. The herd is free of the virus that causes Porcine Reproduction and Respiratory Syndrome (PRRS). All sows, the two boars, and finishing hogs appear healthy.

Tim then asks Mr. Norris if he saved any of the stillborn piglets or afterbirth. He did not. The agent recommends if there are any future stillbirths or abortions, submitting samples to the state diagnostic laboratory. This is the best chance to make a diagnosis. Both Tim and Mark Norris hope this will not be necessary, but the next day, another sow delivers 6 stillborn and 2 very weak, stunted piglets that die within a few hours. Mr. Norris places each piglet and the placenta in a sealable plastic bag. Specimens are placed in a cooler on ice. Mr. Norris drives the 3 hours to the state diagnostic lab.

Create a timeline for the sequence of events. Why do you think a veterinarian has not been contacted?

Every discipline has its own language. Based on your background, are you familiar with terms like farrow, gilt, or sow? Discuss within the working group how previous experience helps to inform your perspective on a problem. Also include your familiarity with the infectious diseases and in what context? *Erysipelothrix* and *Leptospira* can infect people and other animals besides swine.

Explain if parvovirus, erysipelas, and leptospirosis can be eliminated as differentials.

Many viruses and bacteria can cause stillbirths and abortions in swine. A good history helps to sort differentials from most probable to least likely. Mr. Norris records what he has previously discussed with the extension agent when he submits his samples to the state diagnostic laboratory. Other than the recent stillbirths, all pigs on the farm appear healthy. His founder stock was acquired from a facility certified free of Porcine Reproductive and Respiratory Syndrome (PRRS) caused by an *Arterivirus*. Vaccinations for porcine parvovirus, erysipelas, and leptospirosis are current. Mr. Norris leaves hoping that he will get an answer soon to his recent loss of pig litters.

Based on the history provided by Mr. Norris, the veterinary pathologist begins to consider possible etiologies. Leptospirosis remains a differential because vaccination with bacterins may provide incomplete protection or animals are infected with a serovar not present in the PLE vaccine. Similarly, PRRS remains a differential because it could have been inadvertently introduced to the farm on the clothing and boots of a visiting farmer. Transmission of this virus is not well understood. Parvovirus is less likely because it causes fetal mummification, which is absent in this case. One would expect clinical signs in the herd if *Erysipelothrix rhusiopathiae* were present. The same would be expected if swine influenza and porcine circovirus 2 were responsible for the stillbirths. Pseudorabies and *Brucella suis* are considered least likely causes of the stillbirths because they have been eliminated from commercial swine operations in the United States.

No apparent lesions are observed on the placenta. Piglets have subcutaneous edema and fluid in the thoracic cavity. Representative placental and tissue samples are collected for histopathology and immunohistochemistry (IHC). Fluid from the thoracic cavity is collected and submitted for bacterial culture and PRRS PCR.

After one week, results for PRRS PCR are negative. Results are also negative for *Leptospira* spp. and porcine circovirus 2 in tissue sections using IHC. There is no growth on any bacterial culture mediums. Mr. Norris can access these results through the diagnostic lab website.

Based on the presented information, rank the possible etiologies (causes) for the stillbirths from most probable to least likely. Explain your rankings.

Describe the timeline from submission of samples to results. What are possible reasons for test results taking a week? Why not screen for all possible differentials?

Some bacteria grow slowly in culture. At 14 days, growth is detected on blood agar plates inoculated with thoracic fluid from the stillborn pigs. The bacteria colonies are identified as *Brucella* spp. Subsequent testing identifies the isolate as *B. suis*. *Brucella* spp. isolated from animals is reportable to state Departments of Agriculture in addition to USDA/APHIS. Mr. Norris can expect a visit from a state veterinarian.

Why so much concern over *Brucella*? What questions might the state veterinarian have for Mr. Norris?

The state veterinarian sets up a meeting with Mr. Norris to discuss the implications of brucellosis in his swine. He informs Mr. Norris that his farm is under quarantine. Fortunately, there are no other swine farms in a 1.5 mile radius that need to be notified of the situation. The big question is how was *B. suis* introduced? Mr. Norris has been asking himself that very same question. He remembers back in mid-October evidence of feral swine in the grass strips between the paddocks. Rooting occurred on both sides of the paddock fences despite electric wires and one fence panel sustained heavy damage, which was severe enough that the two sows could have escaped. Mr. Norris was not sure what he was going to do. Feral swine had not been a problem previously, and he was unaware of feral swine in his area. Signs of feral swine activity, however, abruptly ceased after three days. Mr. Norris had not really thought about it since then until his extension agent told him about APHIS Wildlife Services trapping feral swine on a crop farm 20 miles to the southeast in September.

The state veterinarian gives Mr. Norris two options for managing his herd: 1) Depopulate the entire herd and the let paddocks stand idle for three months before restocking; 2) Screen serum samples from all his pigs to test for reactivity to *Brucella*. Cull reactors and repeat sampling until the herd tests negative. This strategy is only recommended if there are just a few positive animals. Mr. Norris opts for the latter strategy hoping the infection is not widespread yet. He remembers the paddock fence that was damaged was where the sow that experienced the initial stillbirths resided.

The state veterinarian also explains to Mr. Norris that brucellosis is a zoonotic disease and he and his family are at increased risk of infection. He is curious if anyone in Mr. Norris' immediate family have experienced any febrile illnesses in the past few months, and Mr. Norris assures him that his wife and children are fine.

Later that night at dinner, Mr. Norris' wife reminds him that their nephew, who pulled the stillborn piglets, is ill and no one knows what his problem is. Mr. Norris immediately calls his sister.

Develop a timeline for the possible introduction of *B. suis* onto Mr. Norris' farm and add to the earlier timeline for progression of stillbirths. Trying to establish if the sequence of events are consistent with incubation times between exposure and development of clinical signs.

Identify the multiple stakeholders impacted by *B. suis* in this case scenario and what are the possible consequences for each.

Discuss the advantages of a One Health approach in this case scenario.