

## What is Porcine Stress Syndrome?

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Porcine Stress Syndrome (PSS) is an inherited genetic disorder caused by a recessive gene. Animals with this condition can experience heat stress, labored breathing, muscle rigidity and death. To quote Judge et al. (1992):

The porcine stress syndrome (PSS) is a disorder that was a major concern to the pork industry in the 1960s and the 1970s, and has again become a significant problem. The disorder, when present, is usually associated with heavily muscled animals and results in sudden and unexplained death losses. Animals having PSS often show signs of nervousness and may have muscle tremors indicated by a rapid tremor of the tail. When exposed to stressful situations such as a change in surroundings, a sudden change in the weather, vaccination, castration, estrus or mating, the pigs often respond by becoming overly excited and developing reddish blotches on their skin and by experiencing muscle rigidity followed by rapid, labored breathing. Their body temperature also begins to rise and they begin to show signs of heat stress even in cold weather. At this point, many producers have attempted to save them by spraying with water, but the condition progresses so rapidly that it is virtually impossible to cool the pigs fast enough.

Death losses from PSS usually occur during the process of sorting and delivering animals for slaughter. In addition, death losses are higher in the summer months when temperatures are higher and pigs are unable to rid themselves of body heat.



Figure 1. Rapid death of PSS positive pigs can occur when these animals are stressed. From: *Porcine Stress Syndrome and Its Effects on Maternal, Feedlot, and Carcass Quantitative and Qualitative Traits*, Ken Stalder and Glenn Conatser, University of TN Extension Publication # PB 1606.



Figure 2. Hogs with two copies of the PSS gene characteristically have "basketball" shaped hams. Frequently, the seams separating muscle groups can be noted, as seen on the hams of the Pietrain pigs in this photo. From: *Porcine Stress Syndrome and Its Effects on Maternal, Feedlot, and Carcass Quantitative and Qualitative Traits*, Ken Stalder and Glenn Conatser, University of TN Extension Publication # PB 1606.

What happens to the hogs when they exhibit signs of stress?

Judge et al. (1992) related that PSS hogs lack the ability to properly bind calcium in certain muscle structures. Calcium is integrally involved in muscle contraction. Higher levels of unbound calcium trigger excessive muscle contraction (especially when exposed to stress like exercise, heat, or fighting), mobilizing energy stores in the muscle and leading to a large accumulation of lactic acid in the muscle and blood. Because such huge quantities of lactic acid are produced by PSS hogs, they are unable to properly remove it from the muscle and blood like normal hogs. The lactic acid builds up in the blood until they develop a condition in the blood called metabolic acidosis. Collapse and death quickly follows. There are only a few remedies to reverse PSS symptoms when the animal starts showing signs of stress. One remedy is to administer dantrolene sodium in the vein. This is a muscle relaxant which will affect muscle cells, but not heart and digestive tract muscles.

Although hogs carrying either one or two copies of the recessive PSS gene are leaner, have less backfat, and a larger ribeye area, they often have less average daily gain and are more susceptible to heat stress. Additionally, negative carcass traits occur quite frequently in PSS hogs, particularly a condition known as PSE (Pale, Soft, and Exudative). Some of the negative characteristics of PSE meat are described in the Purdue University publication entitled *Procine Stress Syndrome* by Judge et al. (1992). The meat is paler in color than normal pork meat, is soft, mushy and lacks firmness, and oozes water (exudative). Also, very little marbling is present in meat. Meat in the case affected with the PSE condition has a shorter shelf life and can turn gray in color. The condition appears more frequently in loin and outer ham muscles, giving a two-toned appearance to many pork cuts. When the cuts are thawed following freezing, excessive amounts of juice are liberated, making for an unpleasant eating experience. Smoked hams may separate around muscle groups and be difficult to slice.

Certain breeds are more likely to have the PSS gene. Purebred hogs at the National Barrow Show™ were tested from 1991-1993 for presence of the PSS gene. Durocs, Hampshires, Landraces, Yorkshires, and Spotted breeds all had a gene frequency of PSS of less than 10%. However, Poland China hogs had an incidence of 43% of animals with the PSS gene. The breed with the highest incidence of the PSS gene is said to be the Pietrain breed, with an incidence of 50%. The breed with the lowest incidence of the PSS gene is reported to be the Chester White breed. In two different studies, the incidence of PSS in the Chester White breed was reported to be 0%.

What can you do to reduce your chances of buying a show pig with the PSS gene? First, you can avoid the use of breeds (or crosses) known to have a high incidence of the PSS gene (Pietrain and Poland China). If you think you would still like to use these breeds or crosses of these breeds, you can do a DNA test to see if the hog is free of the PSS gene. Although the test is a bit costly (\$20 to \$35), it might be worth the piece of mind you will gain. Something else you can do is to ask the breeder if the sows and the boar are free of the PSS gene and request to see the DNA tests verifying the same. If the breeder is using or has used breeds with a high incidence of PSS and can not provide this type of information, you can request he or she test the sow and boar. If they are unwilling to do this and you still think you want to use their stock, then I suggest that you secure a written agreement that they will refund your money and pay for your DNA test if the test comes up positive for PSS for the pig you buy. You could also have a clause in the agreement that they will replace your pig with a PSS free pig at the same price and that they would pay for any DNA tests to provide you with the same. You would also want them to give you the written lab test verifying that the pig is PSS free.

One thing you should understand is that if both the boar and the sow in a mating have one

recessive gene for PSS (two genes are the maximum possible), 25% of their offspring will contain two copies of the PSS gene, 50% will have one gene, and 25% will be free of the PSS gene.

Some laboratories which can conduct DNA tests for the PSS gene are Marshfield Clinic (800-222-5835), PE AgGen (800-995-2473), and Prairie State Semen (800-282-0428). By stating that these labs exist, this does not mean that they are the only labs doing this test nor does this endorse the reliability of the labs. You can do a web search to identify other labs which may perform this service.

If PSS hogs are handled very carefully, they may not develop the PSE meat disorder. The Purdue publication and recommendations on Dr. Temple Grandin's web page advise the following:

- Avoid overcrowding on trucks and in pens. In holding pens at the meat plant, allow 6 sq. feet per 250 lb. hog. Allow room for the hogs to lay down.
- Avoid excessive mixing of unfamiliar hogs which in turn encourages fighting.
- Don't use electric prods. Handle animals quietly.
- Don't move hogs during the hot time of the day.
- Allow 2 to 4 hours rest before stunning animals at the meat plant.
- Use sprinklers to cool animals when the weather is hot.
- Always allow access to water in the holding pens.

In conclusion, show pigs are already exposed to a great deal of stress. It is a good idea to avoid adding to this stress by using hogs containing the PSS gene. If you are considering using a breed cross with a higher incidence of the PSS gene, you may want to consider using a DNA test to verify the absence of the PSS gene in the pig you buy.

For more information:

*Porcine Stress Syndrome and Its Effects on Maternal, Feedlot and Carcass Quantitative and Qualitative Traits.* 1999. Stalder, Ken and Glenn Conatser. University of Tennessee Agricultural Extension Publication # PB1606. Available at: <http://www.agriculture.utk.edu/ansci/swine/publications.htm>

*Porcine Stress Syndrome.* 1992. Judge, Max D., Lauren L. Christian, Gijs Eikelenboom, and Dennis N. Marple. Purdue University Cooperative Extension # PIH-26. Available at: <http://www.genome.iastate.edu/edu/PIH/26.html>

*PSE.* Temple Grandin's Web Page. Available at: <http://www.grandin.com/meat/pse.html>

*Transporting of High-Muscled Hogs.* Moorman's ShowTec Technical Bulletin. Available at: <http://www.moormans.com/ShowTec/TechBulletins/TransportHighMuscleHogs.htm>

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