



# PSE – a pork problem

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Consumers today demand lean, high-quality pork. In response to this demand, the pork industry has attempted to produce a "meat-type" hog characterized by heavy muscling and a minimum amount of fat. However, production of "meat-type" hogs has also led to a muscle condition known as PSE (pale, soft, exudative).

Pork muscle quality is judged by color, firmness, closeness of structure, ability to hold moisture and amount of intramuscular fat or marbling. PSE pork is light in color and has little or no visible marbling. Moisture drips from the PSE cuts or collects in the retail package. In contrast, high-quality ham or loin is dark, firm, dry and slightly marbled.

PSE in pork muscle is, at the moment, the most discussed meat quality problem in pork production. It occurs frequently in carcass shows, where hogs with superior muscling have been subjected to stress conditions during the show and subsequent slaughter. Stress pre-conditions the muscle toward PSE.

A condition similar to PSE can be produced by inadequate protein in the diet during the growth period, or by a deficiency of vitamin E and selenium in the ration. However, this condition is described as "muscle degeneration" by meat researchers and is not the same as PSE muscle.

## Characteristics of PSE Pork

PSE pork does not have a desirable shelf-life in the retail meat counter. It does not have the normal gray-pink color of fresh pork and the exudative fluids (meat juices) cause a very unattractive appearance in the pre-packaged meat tray. Therefore, customers reject this type of pork and select other meats instead.

In addition to its lack of appeal, PSE pork loses some water-soluble proteins in the watery fluids that drain from the muscle.

Curing and smoking of pork products can overcome some of the quality loss caused by PSE. However, hams from PSE muscles may lose as much as 10% of their weight during curing and smoking, which is costly to the processor as well as to the consumer. Also, these cured products tend to be drier than normal cured pork and the color of the hams will be pale and usually two-toned or uneven.

Tenderness, which has rarely been a problem with pork, is a problem with PSE muscle. The same body functions that result in PSE are the ones that account for tenderness or lack of tenderness.

## Causes of PSE

PSE muscle structure is caused by formation of large quantities of lactic acid in the muscle fibers just before slaughter. This causes the pH (a measure of acidity or alkalinity) of the muscles to drop rapidly immediately after slaughter to a lower than normal level. The drop in pH breaks down proteins and causes the muscle to lose its water-holding capacity. This reaction also causes light to be reflected more than usual, which makes the meat color seem lighter.

PSE has been found to be 50 to 60% heritable within breeds. Occurrence of PSE is also more common in some breeds than in others. As a result, many commercial swine producers try to avoid this problem by selecting breeds and lines within breeds that are less prone to this condition.

Muscle differences have also been observed within carcasses. Muscles such as the loin-eye and the large inside ham muscle, which have a comparatively low content of muscle pigment, are the most susceptible to PSE. Muscles that contain less pigment tend to produce lactic acid more quickly after slaughter because of greater enzyme activity. Thus, they have a higher tendency toward PSE conditions.

## Stress and Hormones

The frequency of PSE is much higher when pigs are exposed to temperature extremes and excitement just before slaughter. This indicates that adrenal hormones are involved.

PSE pigs have lower blood levels of steroid hormones produced by the adrenal cortex than pigs with normal muscle. These hormones are necessary for adaptation to stress conditions. Among other things, they influence the blood circulation by contracting the blood vessels. If these hormones are not present in sufficient quantity, the pig will have circulation problems when excited or stressed. Then blood and oxygen are not properly distributed to the muscles and muscle fibers, lactic acid accumulates and the PSE condition occurs.

## Preventive Measures

Ironically, heavily muscled hogs are more likely to display the PSE condition than are hogs of lower grade. However, not all heavily muscled hogs exhibit this condition.

Therefore, producers should use carcass evaluation programs to identify breed lines that produce high-quality pork. Selecting boars and gilts from these breed lines is one of the best ways to reduce the frequency of PSE.

Since PSE can be caused by pre-slaughter stress, avoid excitement, exercise, extreme temperature changes and drastic nutritional changes immediately before slaughter.

Stress over a period of several hours before slaughter may result in darker-than-normal color and firm, dry meat surfaces. Therefore, the specific result of stress depends on when the stress occurs before slaughter: PSE is caused by stress immediately before slaughter.

## Carcass Evaluations

When judging carcasses, scores from 1 to 5 indicate degrees of quality. A score of 1 indicates low quality—two-toned color; pale, soft, watery muscles; lack of marbling; loose or open structure as indicated by watery surface and muscle separation.

A score of 5 indicates high quality—dark, uniform color; firm, dry muscles; abundant marbling; closed structure with no muscle separation.

Neither 1 nor 5 is acceptable from a merchandising standpoint. A quality score of 3 has an appearance that is most acceptable to consumers.

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