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Improve pork quality Reduce PSE and other defects

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The United States has one of the highest incidences of poor-quality pork carcasses in the world. As foreign markets for American pork develop, producers can no longer afford to produce hogs with poor-quality carcasses. Producers and packers can reduce or eliminate many factors contributing to poor-quality carcasses with a minimum of commitment and effort.

Background

Pork producers have dramatically reduced the fat content of pork carcasses over the past 40 years. This trend will continue as consumers increase their demand for lean, nutritious pork. The evolution of the pork industry in the 1970s toward a leaner, heavier-muscled, more-efficient animal increased the incidence of porcine stress syndrome (PSS), which in turn led to an increase in pale, soft, and exudative (PSE) pork carcasses. Today, although the incidence of PSS is greatly reduced in the U.S. pork industry, the packing industry is still plagued by poor-quality carcasses, including PSE carcasses.

PSE pork is the most common problem associated with carcass quality. Nationally, PSE pork occurs in 8 to 10 percent of all carcasses and costs the pork industry \$30 million to \$40 million annually. In Idaho packing plants, PSE carcasses occur less frequently than in most major packing plants.

PSE carcasses must be handled differently from normal-quality carcasses and lose 25 percent of their value. Other carcass-quality problems can lead

to condemnation of the entire carcass. The producer, in turn, receives lower live-hog prices. As the packing industry moves to more value-based marketing programs, consigning producers will pay the costs of PSE and other low-quality carcasses.

PSE pork

Physical characteristics

Pork muscle quality is judged by color, firmness, closeness of structure, moisture content and holding capacity, and amount of marbling (intramuscular fat). High-quality fresh pork is grayish pink, firm, free of surface moisture or exudation, and contains modest amounts of marbling. Poor-quality pork, particularly PSE pork, has the following characteristics:

- Muscles are soft, mushy, loose-textured, pale, and aesthetically unappealing.
- Individual muscles become acidic, causing protein in the muscle to lose the ability to retain juices.
- Muscles have little or no marbling.
- Carcasses lose significant amounts of moisture, particularly when they are further processed. Moisture loss continues in the package, and the shelf life of PSE pork is shorter than normal.
- Manufactured products shrink excessively, lack uniform cured color, and sometimes taste dry. Individual muscles separate.

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- Frozen cuts lose excessive amounts of moisture when thawed.

PSE pork is unattractive at the retail meat counter due to its pale color, soft texture, and fluids that accumulate in the package. Consequently, consumers reject PSE pork and select other meats. In addition to its lack of visual appeal, PSE pork loses some water-soluble proteins in the fluids that drain from the muscle. Tenderness, which has rarely been a problem with pork, is another problem with PSE muscle.

Curing and smoking pork products can overcome some of this quality loss. However, hams from PSE carcasses may lose as much as 10 percent of their weight during curing and smoking, which is costly to the packer and consequently the consumer. Cured products produced from PSE pork tend to be drier, and the cured color is often pale or two-toned and uneven.

Causes

Historically, a majority of PSE carcasses were attributed to hogs that carry PSS. PSS is a nonpathological genetic disorder that predisposes affected animals to extreme excitability, often leading to PSE carcasses or sudden death. PSS animals develop these conditions because of extreme lactic acidosis and high body temperature caused by rapid, excessive glycogenesis.

Animals with PSS usually are very heavy muscled; move in short, stiff-legged strides; and are very nervous and excitable. Classic symptoms of PSS include frequent twitching of the tail; open-mouthed breathing; red, blotchy skin; and body temperatures sometimes in excess of 106°F. Fortunately, the incidence of PSS has been greatly reduced in recent years, and the majority of PSE carcasses today are not from hogs susceptible to PSS.

PSE carcasses are caused by a variety of factors besides genetics. These include handling in the stunning chute, rest before stunning, transit time, time off feed, fighting, handling on the farm and at the packing plant, ambient temperature, and weather fluctuations. The majority of these factors are related to stress of one form or another. Still, some breeds, such as the Pictrain, and some lines are more predisposed to PSE carcasses. The heritability of the PSE condition is 50 to 60 percent in some breeds and lines. Consequently, selective breeding against PSE carcasses, and the lines or breeds in which they occur, is very effective and can signifi-

cantly reduce the incidence of PSE in these populations.

Physiological basis

PSE muscle develops when excessive glycogenesis just before slaughter forms large quantities of lactic acid in the muscle fibers. Lactic acid causes the pH of the muscle to drop rapidly to a much lower than normal level immediately after slaughter. The drop in pH breaks down proteins in the muscle fibers and causes the muscle to lose its water-binding capacity. It also creates the pale color associated with PSE pork. Large muscles such as the loin and center ham muscles are most susceptible because they have relatively higher rates of glycogenesis and produce more lactic acid.

Preventing PSE carcasses on the farm and in the packing plant

A high percentage of PSE carcasses result from stress on the hog immediately before slaughter. Many of these stresses can be lessened or eliminated through proper handling.

Temperature — The temperature of the hog's environment can have a significant effect on the incidence of PSE carcasses. The percentage of carcasses exhibiting PSE characteristics often rises dramatically in late spring and early summer when hogs are first exposed to extremely hot weather. Some plants report PSE carcass rates as high as 20 percent for a daily kill and as high as 80 to 90 percent for individual lots. Producers and packers should keep hogs cool and comfortable, particularly just before slaughter.

Handling — Hogs raised in confinement are often more difficult to load and move than hogs raised outdoors. Confinement hogs should be accustomed to people and handling as much as possible. Giving hogs a chain, ball, or rubber hose to play with and entering their pen routinely will lessen the shock of the sudden change in surroundings associated with marketing. So will playing a radio. Gentle handling in the packing plant will also reduce the incidence of PSE carcasses.

Eliminating electric prod use — Hogs are sensitive to electric shock. An electric prod causes extreme excitability and increases heart rate in virtually all hogs. Excessive use of a prod can eventually kill a hog. Hogs should be moved with a soft slapper or pig board. Excessive use of a prod

just before slaughter can significantly increase the incidence of PSE carcasses.

Feeding and resting — Keeping hogs off feed for 8 to 12 hours before slaughter will lower the glycogen level in the muscle and lower the incidence of PSE. Do not withhold food for more than 12 hours, and provide water at all times. Hogs also should be rested for 1 to 4 hours before slaughter, depending on their dispositions, environmental conditions, and other factors.

Transporting — Overloading trucks or trailers, hauling hogs in extreme temperatures, or both will increase death loss and PSE carcasses. Trucks and trailers should be loaded and unloaded promptly, and the hogs should be kept cool and comfortable.

Mixing hogs — If possible, avoid mixing hogs during transport or at the packing plant. This will reduce the level of fighting and reduce the incidence of PSE pork, bruises, and other meat-quality problems.

Handling facilities — Facilities should be designed properly to ease hog movement and reduce stress. Use proper specifications for sorting and loading chutes, crowd pens, and all floor surfaces.

Other carcass-quality problems

Various other quality problems occur in hog carcasses. Among them are abscesses, frostbite and freeze damage, bruises, whip and slapper abuse, and electric prod abuse. Each causes some degree of hemorrhaging in the muscle resulting in incomplete bleed out and trim loss. Many of these abuses can lead to condemnation of the entire carcass.

Long-term stress, particularly without feed, often increases the incidence of dark, firm, and dry (DFD) carcasses. Long-term stress depletes the glycogen reserves in the muscle, which leads to reduced lactic acid production and a dark carcass. DFD carcasses are most common in animals associated with livestock shows and animals that have been transported long distances.

Occasionally, carcasses have an excess of intramuscular fat or marbling. These carcasses are not desirable, but they are difficult to predict or prevent.

Summary

Carcass-quality problems continue to plague the pork industry in spite of the reduction of porcine stress syndrome (PSS). The primary quality problem remains PSE carcasses. Patient, gentle handling combined with a short period off feed and a cool, comfortable environment will greatly reduce the incidence of PSE carcasses. Other carcass-quality problems can also be lessened or eliminated through reduction of stresses and handling abuses associated with the movement and marketing of live hogs. Modern producers can no longer afford to produce hogs with inferior-quality carcasses.

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