Pale, Soft, & Exudative Meat

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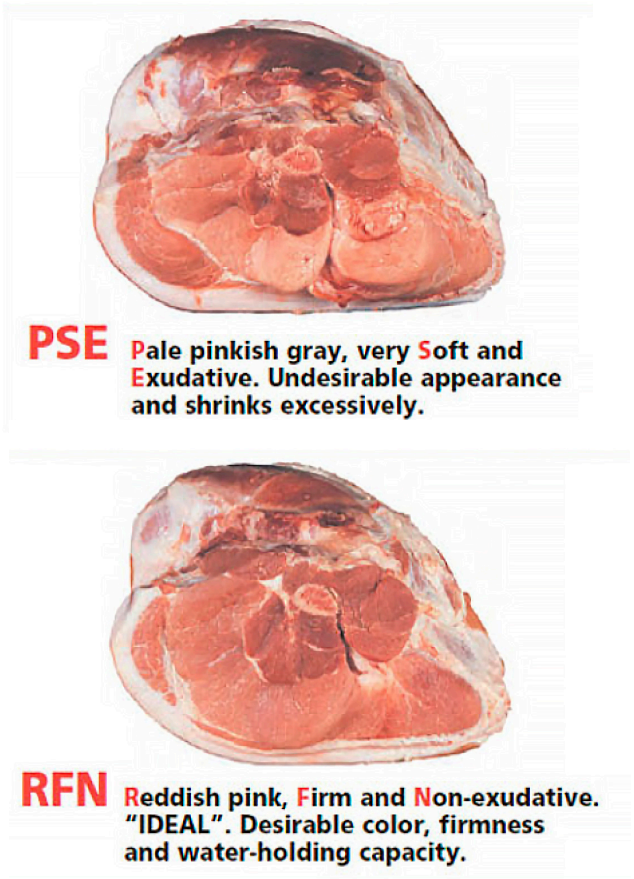
Pale, soft, and exudative meat, or commonly referred to as PSE, refers to meat that has abnormal characteristics in terms of its appearance, texture, and moisture retention properties.

Moisture Retention

PSE meat has high levels of exudate, or excessive release of moisture. This results in a wet surface on the meat, often with a watery appearance, as water leaks out due to the denaturation of myofibrillar proteins. This condition is linked to excessive loss of water-holding capacity in the meat. Poor water-holding capacity make PSE meat a difficult raw material to work with during further processing, particularly for water-added ground products or injected products.



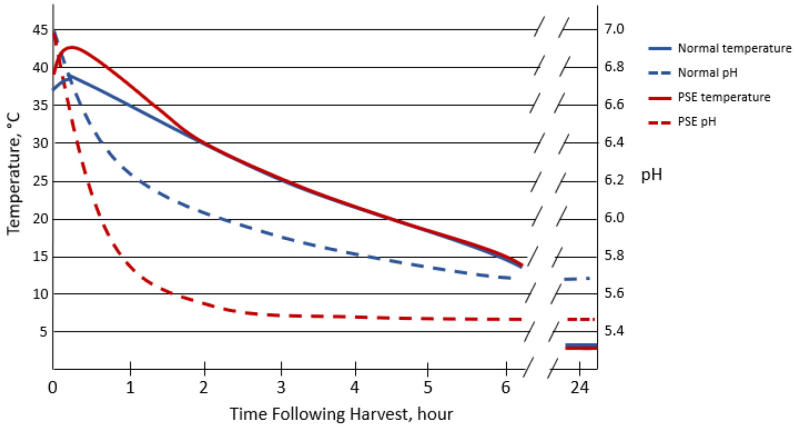
Representation of PSE pork compared with normal pork (described here as RFN - reddish pink, firm, and non-exudative). Source: America's Pork Chckoff Program, Des Moines, Iowa.

Appearance

PSE meat appears lighter in color than normal meat, which is typically a pale, pinkish-white color. Abnormal conditions during the early post-mortem period which affect muscle proteins create this appearance. Denaturation of myofibrillar proteins lead to smaller myofibrillar volume within muscle fibers which results in increased light scattering and a paler appearance.

Texture

The texture of PSE meat is unusually soft and mushy. This softness is due to the denaturation of myofibrillar proteins during the early post-mortem period which weakens the structure of muscle fibers.



Theoretical postmortem temperature and pH decline of PSE pork longissimus muscle (red lines) compared with normal pork longissimus muscle (blue lines).

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THE MEAT LOCKER
BY AMERICAN MEAT SCIENCE ASSOCIATION

 Doc # T4

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Historical Perspectives from the Pork Industry

The 1992 Pork Chain Quality Audit, funded by the National Pork Producers Council (NPPC), was the U.S. pork industry's first attempt to gauge the extent of pork quality problems along the supply chain, from consumers to producers. The objective was to provide information to guide industry research programs designed to limit pork quality problems. Large pork packers were audited to provide the industry with initial benchmarks of the quality status of U.S. pork. Packers, accounting for 68% of barrows and gilts slaughtered, completed questionnaires on items affecting pork quality and its value. Results from the packer survey found PSE pork in over 9 million hogs, accounting for 10.2% of U.S. commercial slaughter of barrows and gilts.

Subsequent studies, along with several more pork quality and safety summits sponsored by the NPPC, reaffirmed the prevalence and importance of pork muscle quality problems.

An updated version of the 1992 Pork Quality Audit (Benchmarking Value in the Pork Supply Chain), commissioned by the American Meat Science Association, showed that the incidence of PSE pork had increased to 15.5% of slaughter hogs in 2002.

Improvements in swine genetics related to stress and pre-slaughter handling techniques helped reduce PSE in pork. A 2006 survey presented at American Society of Animal Science Midwest Section Meeting reported 3.3% of loins exhibited PSE.

While no recent industry-wide survey has been conducted, the incidence rate of PSE in the commercial swine industry is thought to be less than 0.5% at the present time (year 2024). Improvements in genetics, pre-slaughter handling techniques, and post-mortem chilling have all likely contributed to industry-wide improvements.