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Popular Article

Defects During Conversion of Muscles to Meat

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Introduction

- Meat is a post rigor aspect of muscle and the conversion of muscle to meat is the result of series of biochemical, biophysical changes initiated in muscle at the death of the animal due to stoppage of the blood circulation (2).
- The most immediate change caused due to bleeding is the cessation of the oxygen supply to the muscle resulting in inhibition of the cytochrome system & therefore, oxidative phosphorylation (1).

Defects during conversion of muscles to meat-

- Pale, soft and exudative
- Dark, firm and dry

Pale soft exudative- Pale, soft, and exudative (PSE) meat is the result of a rapid postmortem pH decline while the muscle temperature is too high.

- This combination of low pH and high temperature adversely affects muscle proteins, reducing their ability to hold water and causing them to reflect light from the surface of the meat (the meat appears pale) (8).
- PSE meat is especially problematic in the pork industry (3,4,7).
- It is known to be stress-related and inheritable.
- A genetic condition known as porcine stress syndrome (PSS) may increase the likelihood that a pig will yield PSE meat.

Preventive measures to reduce the incidence of PSE in meats -

- First, there is need to develop breeds that are resistance to stress (5).

- Provide adequate pen space in holding pens at the plant.
- During summers wet animals down with sprinklers.
- Allow 2 to 4 hours of rest prior to stunning.
- Pigs must always have access to water (5,7).

Dark, firm, and dry (DFD) Dark, firm, and dry (DFD) meat is the result of an ultimate pH that is higher than normal (8).

- The resulting postmortem pH of DFD meat is 6.2 to 6.5, compared with an ultimate pH value of 5.5 for normal meat (8, 9).
- The dry appearance of this meat is thought to be a result of an unusually high water- holding capacity, causing the muscle fibers to swell with tightly held water.
- Because of its water content, this meat is juicier when cooked and eaten.
- its dark colour and dry appearance result in a lack of consumer appeal, so that this meat is severely discounted at the marketplace.

Factors that cause dark, firm and dry condition

- DFD meat is often the result of animals experiencing extreme stress or exercise of the muscles before slaughter.
- Stress and exercise use up the animal's glycogen reserves, and therefore, postmortem lactic acid production through anaerobic glycolysis is diminished.
- Rapidly fluctuating temperature.
- Genetic factors
- Rough handling.

Preventing DFD in meat

- Do not mix strange cattle together prior to slaughter at the plant. Fighting increases dark cutting (5).
- Handle animals quietly
- Unload trucks carefully
- Sugar or molasses feeding has been shown to replenish muscle glycogen levels thus helping to prevent DFD (5)
- Provide animals with food and water if they will spend more time in the lairage although this must be avoided
- Lairage time should also be kept short
- Abattoirs must be well designed to ensure that the animals are exposed to the least stress prior to slaughter

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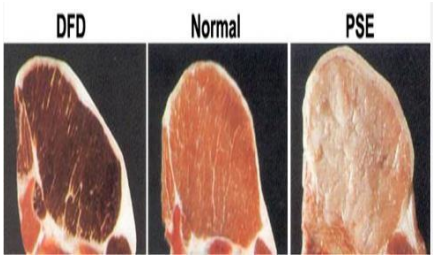

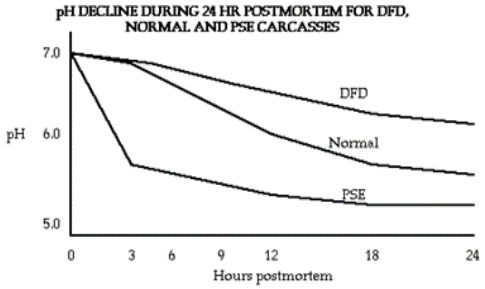

Differences in quality characteristics of PSE and DFD (10)

PSE	DFD
Due to acute stress prior slaughter Rapid initial acidification Low initial pH at high carcass temperature Protein denatures Low water holding capacity Muscle fibers separate Large extra cellular space Surface appears pale Low pH promotes oxidation of myoglobin Meat looks less red Pale, lean and soft texture	Due to Chronic stress prior to slaughter Reduced glycogen High ultimate pH Proteins do not denature High water holding capacity Fibers tightly packed Small extra cellular space Surface appears dark Oxygen diffusion is inhibited by closed structure high variation in tenderness Dark in colour

Antemortem factors affecting meat quality

- Various stress factors such as extremes of environmental temperature, overcrowding, preslaughter transportation, struggle during immobilization and bleeding (6).
- Exposure to temperature cause shivering which results in a reduction in muscle glycogen level (6).
- During environmental stress, susceptible pigs, show porcine stress syndrome (7,6)

Conclusion

- PSE and DFD meats are discriminated against by consumers.
- They have poor processing qualities and cause huge financial loss to the meat industry.
- Stress is a major contributing factor to PSE and DFD in meats.
- In addition, slaughtering procedures and processing techniques should be closely monitored to help reduce the incidence of PSE and DFD in meats.

References

1. Matarneh, S. K., Scheffler, T. L., & Gerrard, D. E. (2023). The conversion of muscle to meat. In *Lawrie's meat science* (pp. 159-194). Woodhead Publishing.
2. Paredi, G., Raboni, S., Bendixen, E., de Almeida, A. M., & Mozzarelli, A. (2012). "Muscle to meat" molecular events and technological transformations: The proteomics insight. *Journal of proteomics*, *75*(14), 4275-4289.
3. Greaser, M. L. (1986). Conversion of muscle to meat. *Muscle as food*, *23*(2), 37-102.

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4. Barbut, S., Sosnicki, A. A., Lonergan, S. M., Knapp, T., Ciobanu, D. C., Gatcliffe, L. J., ... & Wilson, E. W. (2008). Progress in reducing the pale, soft and exudative (PSE) problem in pork and poultry meat. *Meat science*, *79*(1), 46-63.
5. Adzitey, F., & Nurul, H. (2011). Pale soft exudative (PSE) and dark firm dry (DFD) meats: causes and measures to reduce these incidences-a mini review.
6. Fletcher, D. (1991). Ante mortem factors related to meat quality. In *Proceedings of the 10th European Symposium of Poultry Meat. TG Uijttenboogaart, and CH Veerkamp, ed. Spelderholt Centre for Poultry Research and Information Services, Beekbergen, The Netherlands* (pp. 11-19).
7. Sionek, B., & Przybylski, W. (2016). 3. The Impact of Ante-and Post-Mortem Factors on the Incidence of Pork Defective Meat–A Review. *Annals of animal science*, *16*(2), 333-345.
8. Enfält, A. C., Lundström, K., & Engstrand, U. (1993). Early post mortem pH decrease in porcine M. Longissimus dorsi of PSE, normal and DFD quality. *Meat Science*, *34*(2), 131-143.
9. Alarcón Rojo, A. D., Duarte Atondo, J. O., Rodríguez Almeida, F. A., & Janacua Vidales, H. (2005). Incidence of PSE and DFD muscle in pigs slaughtered in Mexico's Bajio region.
10. Van der Wal, PG, Bolink, AH, & Merkus, GSM (1988). Differences in quality characteristics of normal, PSE and DFD pork. *Meat Science*, *24* (1), 79-84.

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