



Conversion Of Muscle To Meat

Conditions immediately prior to slaughter may alter postmortem changes that affect meat quality like Transportation, handling, and holding . Extrinsic factors immediately following slaughter may influence postmortem changes that affect meat quality like Chill rate, electrical stimulation.

The degree of final contraction depend on :

- PH
- Water holding capacity (WHC)
- Proteolytic enzymes

After bleeding The circulatory system will be stopped.Oxygen , nutrients and wastes also will be stopped transportation. The aerobic pathway through the TCA cycle accompanied by reduction in creatine phosphatase.Less energy in the form of ATP is produced through the anaerobic pathway.

Lactic acid will remain in muscle tissue and increase in concentration as metabolism proceeds.

Postmortem pH decline

The lowering of pH in muscle due to the accumulation of lactic acid is one of the most significant postmortem changes.pH in living muscles 7.4 , After (6-8 hrs postmortem) pH about 5.6-5.7 and ultimate pH (24 hrs postmortem) about 5.3-5.7.

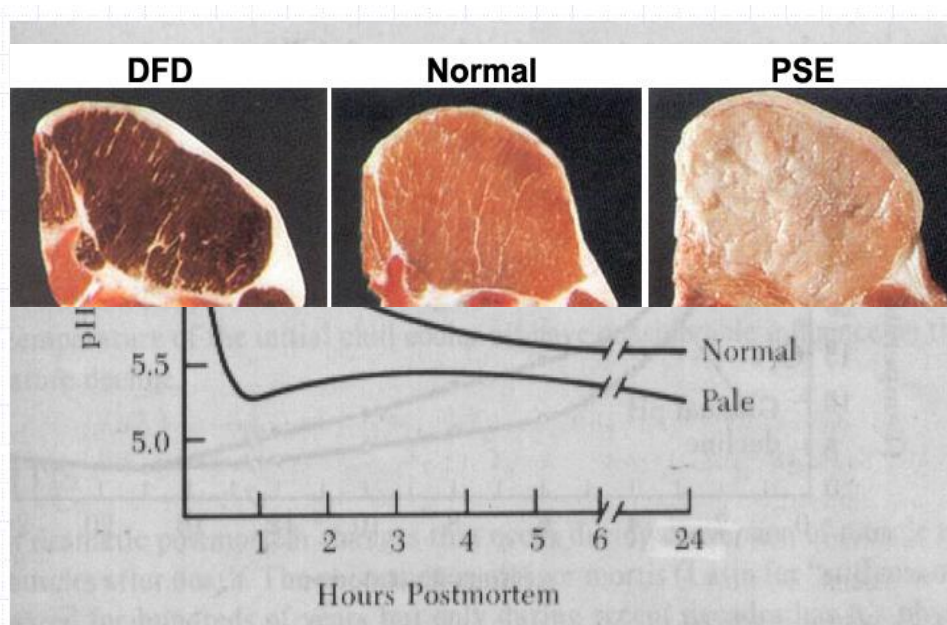
(PSE) pale soft exudate

Is abnormal condition,The pH will drop rapidly to around 5.4- 5.5 during the first hours after bleeding.Meat is characterized by it's pale color , lack of firmness and exudate dripping from its cut surfaces ,Low PH and high temperature causes denaturation of some muscle proteins leading to reduction in amount of water they bind, The large amount of exudate reflect the poorer water holding capacity.The shrinkage of myofilaments increase the amount of light reflected from the meat .The low PH tend to promote oxidation of the haem pigments from purple red myoglobin Mb and oxymyoglobin MbO₂ to the brown metmyoglobin.



(DFD) Dark Firm Dry

The pH drop very slowly during the first hour after slaughter and then remains stable



at a relatively high level. The ultimate pH in the range of 6.5-6.8

In DFD meat has very low shelf life because:

DFD meat is caused by glycogen depletion at antemortem, low levels of CHO in muscle restrict the growth of lactic acid producing bacteria and encourage the growth of bacteria that metabolize amino acids and proteins. The high PH of the meat promotes this bacterial growth. Meat with high PH is a problem in vacuum packed meat. A green coloration may develop due to formation of sulphmyoglobin which is caused by haem pigment reacting with hydrogen sulphide produced by bacteria under anaerobic conditions.

Both the rate and the extent of the post mortem decrease in pH determine the palatability of meat by affecting several meat quality properties including:

- drip loss,
- colour development
- shelf life
- water-holding capacity
- texture
- tenderness
- feeding quality in general



PSE	DFD
Acute stress	Chronic stress
Rapid initial acidification	Reduced glycogen
Low initial pH at high carcass temperature	High ultimate pH
Proteins denature	Proteins don't denature
Low water holding capacity	High water holding capacity
Bound water lost	Water held by proteins
Muscle fibers separate	Fibers tightly packed
Large extra cellular space	Small extra cellular space
Surface appear pale	Surface dark
Low pH promotes Mb oxidation	O ₂ diffusion inhibited
Meat looks less red	Mb O ₂ layer thin and underlying Mb purple

Biochemical Alterations

Muscle does not cease to function at the time after slaughter . The pyruvate that is generated as an end product of glycolysis is converted to lactic acid, and, since metabolic waste products cannot be removed, the lactic acid accumulates in the muscle.

Factors affect rate of postmortem metabolism and development of rigor mortis include:

- The size of the carcass,
- The amount of fat cover,
- The temperature of the chiller
- In addition the use of electrical stimulation to speed postmortem glycogen and high energy metabolite depletion will also have a profound effect on the time course of muscle metabolism.

Temperature and pH

Temperature plays a key role in denaturation.High temp can make a fast heat of continuous metabolism (glycolysis,lactic acid ,pH) and also make the pH of the carcass rapidly decline (5.4-5.6).

Denaturation

A loss of protein solubility, Loss of water, Loss of protein binding capacity and Loss in intensity of muscle pigment coloration.

Rigor mortis



The first and most considerable post-mortem change which occurs in muscle is rigor mortis. the phenomena is characterized by:

- a hardening and contraction of all the voluntary muscles
- a loss in transparency of the surface of muscle which becomes dull.
- It is accompanied by a slight rise in temperature of the carcass to 1.5°C or more above normal in the case of beef carcass, the temperature then gradually
- Dropping to that of the surrounding atmosphere.
- The heart is affected very early, usually within an hour of slaughter.

The onset of rigor mortis

loss of elasticity and extensibility as well as shortening and tension development, The time required for muscle of different animal species to enter the onset of rigor mortis will differ.

Resolution or softening of rigor mortis

Alteration in ultra-structure of myofilaments, Changes of neutral protease enzymes is related directly to tenderization in meat aging.

Cathepsin

Proteolytic enzymes and lysosomes, As the pH of the muscle drops (pH < 5.6), cathepsin enzymes are released and probably begin to degrade protein structure of the muscle.

