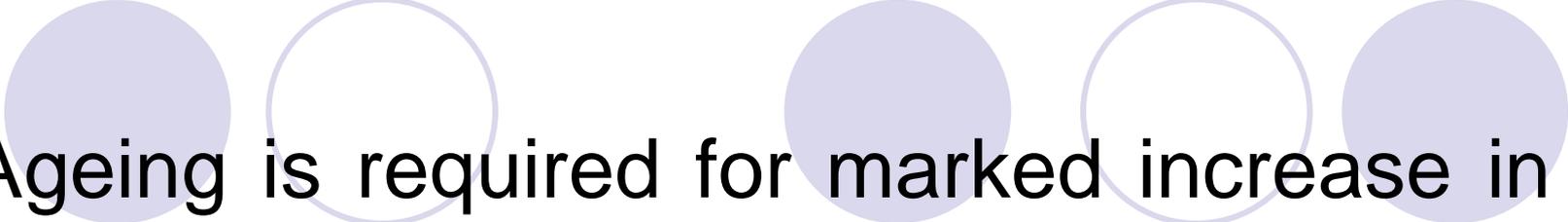


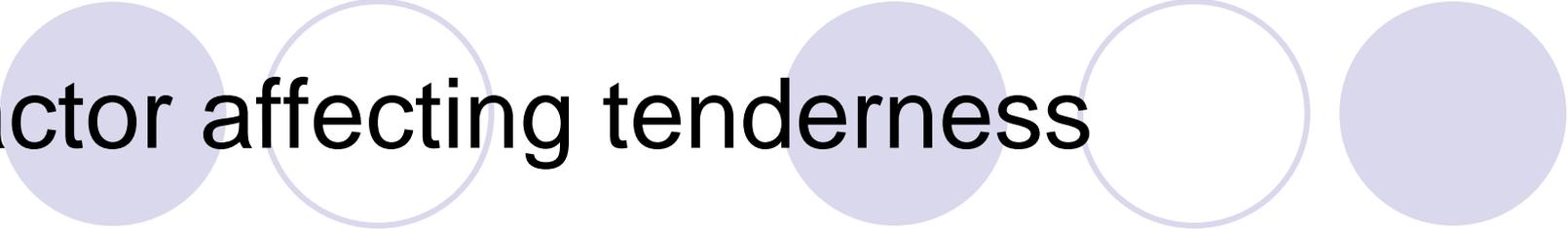
Ageing of meat

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- In the absence of microbial spoilage the holding of unprocessed meat above freezing point is known as ***Ageing***
- It is frequently referred as *conditioning*, *tenderizing*, *ripening* or *maturing* of meat
- By the process we can make muscle soft and pliable
- During the process of holding at 0-3 °C i.e. above freezing point several changes occur in meat at a suitable rate

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- The top of the slide features five decorative circles arranged horizontally. From left to right, the colors and styles are: a solid light purple circle, an outlined light purple circle, a solid light purple circle, an outlined light purple circle, and a solid light purple circle.
- Ageing is required for marked increase in flavor, juiciness and tenderness of meat
 - In the process action of enzyme in meat plays a key role while bacterial action is not of much importance.
 - Ageing is important for beef and buffalo meat while pork and lamb do not require ageing because they are slaughtered in the age while they are young and inheriting tenderness



Factor affecting tenderness

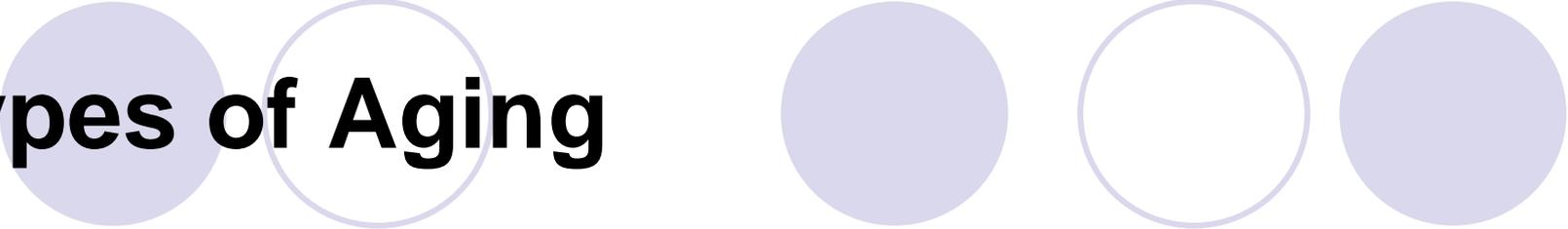
1. Pre-slaughter factor

Breed, age, exercise and nutritional status of meat animal prior to slaughter greatly affect ageing

2. Post-slaughter factor

Changes of meat during first 24 hours of slaughter is utmost importance

Types of Aging



Two types of postmortem aging processes are practiced commercially: "dry" and 'wet' aging

1. Dry aging

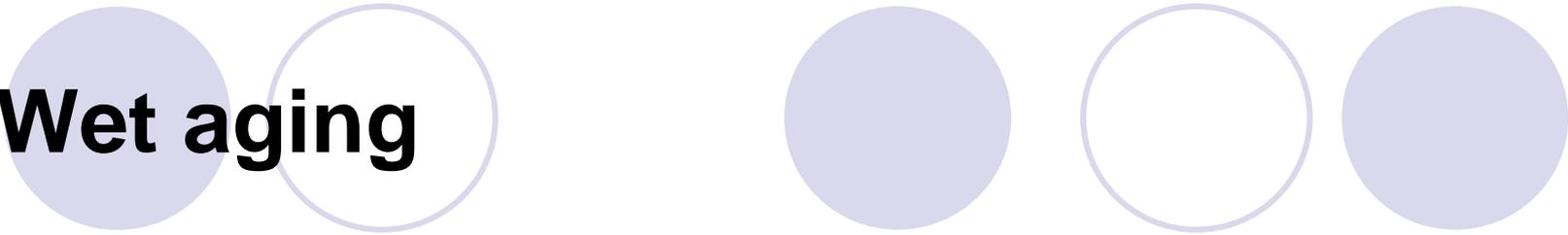
- Dry aging is the traditional process of placing an entire carcass or wholesale cut (without covering or packaging) in a refrigerated room for 21 to 28 days
- Temperature required is at 32-34 °F and 100-85% relative humidity, with an air velocity of 0.5 to 2.5 m/sec.
- Too much humidity will allow excessive microbial growth, whereas too little will cause excessive shrinkage

- Eighty-five percent relative humidity is a happy medium in slowing microbial growth and moisture loss.
- Tenderness development can be accelerated by aging at a higher temperature
- However, increased microbial growth becomes a serious problem at higher temperatures.
- Air velocity is essential because it acts as a medium for moisture removal from the refrigerated area

- Insufficient air velocity will allow excessive moisture to condense on the product, and as a result, off-flavors and aromas, as well as spoilage, will occur
- Too high an air velocity, on the other hand, will result in excessive surface drying, with resulting weight and trim losses.
- The main disadvantage of dry aging is the cost associated with these weight and trim losses



2. Wet aging



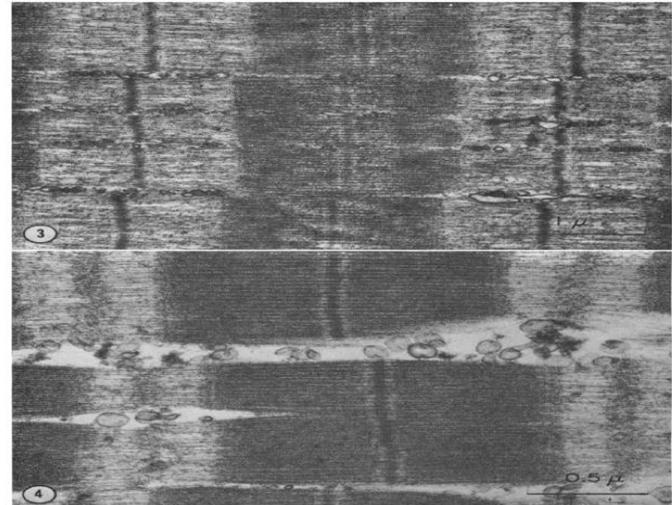
- Wet aging is the aging of meat in vacuum bags (usually the middle meats) under refrigerated conditions of 32-34° F.
- Obviously, humidity and air velocity are not necessary requirements for proper wet aging
- Because most beef is vacuum packaged at the site of carcass fabrication (cutting), wet aging is the predominant method of postmortem aging today.

- The aging process continues when a primal or sub primal cut has been placed in a vacuum package
- Dry and wet aging both result in a similar degree of palatability of rib and loin steaks
- Meat from vacuum-aged cuts has a more bloody/serummy and metallic flavor, whereas, meat from dry-aging has a more brown-roasted beefy flavor



Significant changes in meat during ageing

- In the conversion of muscle to meat, natural enzymes (proteases) found in muscles, breaks down specific proteins in muscle fibers .This breaking of these protein strands, called myofibrils, by natural enzymes results in improved tenderness
 1. Protein denaturation
 2. Proteolysis
 3. Flavor enhancement



Protein denaturation

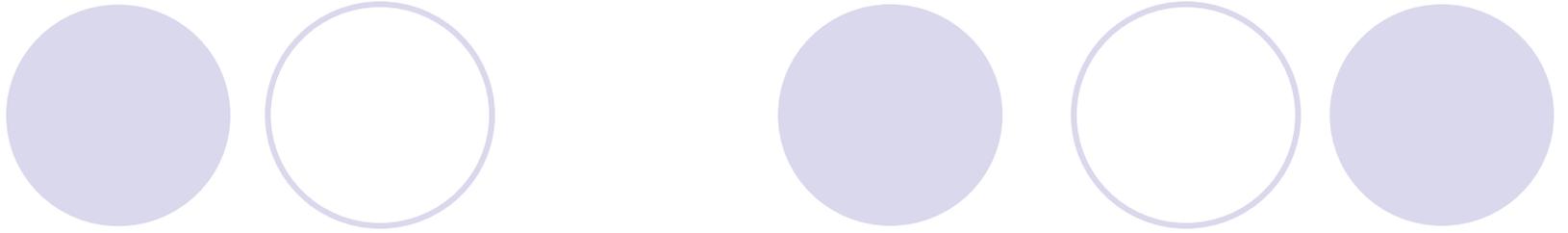


- Denaturation refers to physical rearrangement of chemical bonds in amino-acids of protein polypeptide chain without involving any hydrolysis.
- During post-mortem ageing myofibrillar and sarcoplasmic protein denature to a varying degree.
- There is detachment of actin filament at Z-line resulting in fragmentation of myofibrils.
- It enhances tenderness, although muscle protein manifest some loss of water holding capacity
- Elastin do not undergo denaturation

Proteolysis

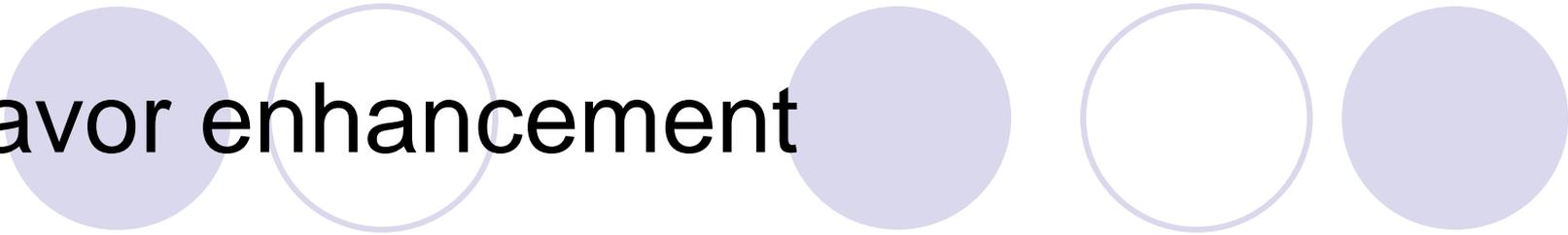


- During ageing sarcoplasmic reticulum loses the capacity to retain calcium ions and their release initiates a water soluble enzyme called 'calcium activated sarcoplasmic factor'
- This factor degrades desmin, connectin, troponin T, tropomyosin and M-line protein causing tenderization of meat
- Cathepsins become active at low ultimate pH or comparatively high temperature and bring about degradation of myosin and actin to fragments

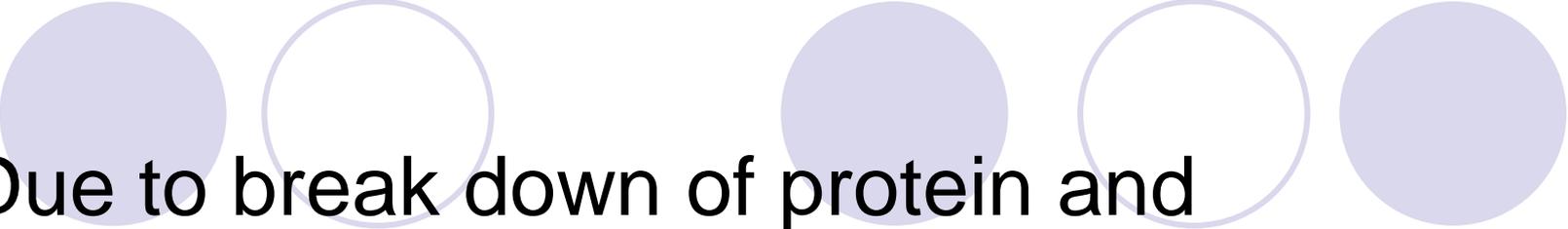


- Besides, they also degrade cross-links of non-helical telopeptides of collagen and mucopolysaccharides of ground substance.
- Proteolysis, thus, brings about some improvement in water holding capacity.

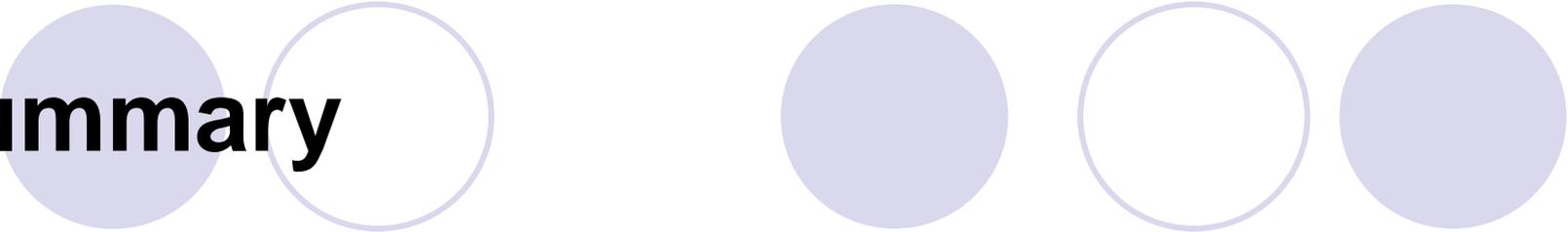
Flavor enhancement



- During post-mortem ageing, ATP is broken down to mononucleotides-AMP and IMP which produce inosinic acid and hypoxanthine, enhancing flavor of meat
- Besides, there are production of some flavor compounds such as hydrogen sulfide, ammonia, acetaldehyde, acetone and diacetyl by microbes most particularly by yeast and in long term ageing by molds.

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- Due to break down of protein and accumulation of free amino acids and presence of traces of soluble carbohydrates contributing carbonyl groups, ***Millard reaction*** can also take place during later part of ageing. This non-enzymatic reaction can form brown compounds, which may cause some discoloration and may impart some bitter taste to meat

Summary



- Postmortem aging of carcasses and cuts is a natural process that usually improves tenderness under refrigerated conditions
- Natural enzymes act to break specific muscle protein strands into smaller pieces to result in improved beef steak tenderness of rib and loin cuts.
- Most tenderization Occurs early in the postmortem aging process, and by 10 days postmortem, most tenderization has occurred in rib and loin cuts