Session 5 – "Emerging technologies in meat processing"

Red meat biochemical and flavor changes through postmortem aging presented by **Dr. Jerrad Legako**, Texas Tech University, United States

Red meats consist of beef, pork, and lamb which commonly undergo postmortem aging prior to consumption. Palatability of red meats is greatly influenced by flavor. Furthermore, consumers frequently describe flavor to be the most important red meat palatability attribute. During the aging period biochemical mechanisms progress which may liberate or develop flavor contributing metabolites. Factors such as aging type (wet or dry), duration, and temperature are demonstrated to be of significant influence on development of flavor related metabolites. Likewise, microbial growth during aging may further influence flavor contributing metabolites and perceived flavor. Each of these factors may impact flavor differently among beef, pork, and lamb. After exsanguination, through the conversion of muscle to meat, and during postmortem aging several endogenous processes that yield flavor related compounds remain active. A major shift occurs in muscle metabolism predominantly towards the glycolytic pathway due to the loss of oxygen supply and a subsequent depletion of adenosine triphosphate (ATP) over time. Postmortem proteolysis may progress through activity of enzymes involved in protein turnover prior to harvest, yielding free amino acids and small peptides. Endogenous lipolytic enzymes may also free fatty acids from phospholipids and triglycerides paving the way for lipid oxidation. Free radicals accumulated during aging may initiate lipid oxidation or cross over to induce protein oxidation. The decline of antioxidant systems postmortem along with various prooxidant molecules may greatly dictate the rate of oxidative change during aging. Exogenous enzymes may also be released from microorganisms that induce further proteolysis and lipolysis. Microorganisms may also release organic acids that directly influence taste. Variation in skeletal muscle composition between red meat species influence biochemical changes and production of flavor compounds. Therefore, environmental factors, such as atmosphere and temperature, in combination with aging duration and form should be considered relative to each red meat species to maximize flavor. Fortunately, these parameters are controllable in most processing, storage, and distribution cold chains. Processors and retailers should be encouraged to monitor and maintain cold chain strategies in light of biochemical changes during aging. Likewise, researchers may evaluate biochemical processes to hypothesize new alternative aging strategies that may beneficially impact red meat flavor. (J. Legako, 2025. Red meat biochemical and flavor changes through postmortem aging, Meat Science 229, 109885)



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Jerrad Legako, Ph.D. is an associate professor in the Animal and Food Sciences Department at Texas Tech University. Dr. Legako's research program addresses pre- and post-harvest factors, which influence meat quality and safety. His research is supported through federal grants, foundations, and private industry. He is frequently invited to speak at national and international conferences, including the Reciprocal Meats Conference, American Society of Animal Science Annual Meeting, Institute of Food Technologists Annual Meeting, and the North American Meat Institute – Meat Industry Safety Conference. Dr. Legako has advised numerous graduate and undergraduate students who now work in various capacities within the meat and food industries, as well as academia. Dr. Legako has instructed courses, such as Food Analysis, Food Chemistry, Meat Technology and Processing, and Experimental Techniques in Meat Chemistry and Muscle Biology. Dr. Legako serves as a reviewer for multiple scientific journals and associate editor for Meat and Muscle Biology. Additionally, he is an active member within the American Meat Science Association, American Association of Animal Scientists, and Institute of Food Technologists.