

Meat Science and Muscle Biology Symposium: Impact of Pre- and Post-Slaughter Handling on Meat Quality

966 Handling of pigs and the effect on muscle metabolism prior to harvest. M. J. Ritter* and S. N. Carr, *Elanco Animal Health, Greenfield, IN.*

Market weight pigs are subjected to numerous stressors during the marketing process from loading at the farm to stunning at the packing plant. These stressors have important implications for animal well-being and fresh pork quality traits. The objectives of this presentation are to review: 1) pre-harvest stressors in pigs; 2) common measures of stress during handling and transportation; and 3) effects of pre-harvest stressors on metabolic changes and fresh pork quality traits. Pre-harvest stressors can be encountered during loading, transportation, unloading, lairage, and movement to the stunning area. Although the majority of the work in this area has focused on animal handling procedures, other areas of interest include the mixing of unfamiliar pigs, transport floor space, transport time, lairage time, and environmental conditions. Genetics, previous experiences, and the physical condition of the animal will impact how pigs respond to these stressors. Measures of stress during handling and transportation include: body temperature, heart rate, respiration rate, blood acid-base balance (pH, lactate, bicarbonate, and base-excess), stress hormones (cortisol, epinephrine, and norepinephrine), enzyme activity (creatine kinase and lactate dehydrogenase), and muscle glycolytic potential. The magnitude of the change in these parameters is dependent upon stressor intensity, duration, and frequency. For example, recent work by Hambrecht et al. (2005) and Ritter et al. (2009) reported that multiple concurrent pre-harvest stressors have additive effects on body / carcass temperature, blood lactate, and muscle lactate values in market weight pigs. It is well documented that aggressive handling immediately before harvest increases early postmortem temperature and the rate of pH decline in muscle, resulting in pork with high drip loss (Hambrecht et al., 2004a; 2004b; 2005). However pre-harvest stressors that reduce muscle glycogen during loading at the farm may have beneficial effects on ultimate pH and water-holding capacity (Edwards, 2009). Therefore, improvements in pre-harvest handling do not always translate to improvements in fresh pork quality traits.

Key Words: pig, pre-harvest stress, pork quality

967 Pre-slaughter stress in ruminants and its relationship to meat quality. D. M. Ferguson^{*1} and R. D. Warner², ¹*CSIRO Livestock Industries, Armidale, NSW, Australia*, ²*Victorian Department of Primary Industries, Werribee, VIC, Australia*.

The production of meat that consistently meets consumer expectations requires vigilance and control at all points in the supply chain. In particular, control is required during the critical period from farm or pen to slaughter as the inevitable stress that all livestock experience can result in losses to meat quality. Livestock are exposed to multiple and often novel stressors, some repeated (e.g., handling), during the pre-slaughter phase. Animals can vary enormously in their response to these stressors, depending on their prior experience and genetic predisposition to stress. The variable nature of pre-slaughter stressors and the animals' response presents major challenges to the design of studies quantifying the impacts of these on animal welfare and meat quality. Furthermore, it creates difficulties in the development of control strategies to mitigate these impacts. The stress-mediated depletion of muscle glycogen and the subsequent dark-cutting condition in meat has been well documented and is perhaps indicative of significant pre-slaughter stress. Despite improved pre-slaughter management, there is still evidence of acute

increases in the incidence of dark cutting in consignments of cattle. These spikes cannot be explained by changes in pre-slaughter practices or other known stress mediating factors. Recent research in ruminants has revealed that pre-slaughter stressors can also negatively affect meat quality traits such as sensory panel scores and water holding properties independent of any change to ultimate pH or rate of pH fall. In this paper, we review the impacts of pre-slaughter stress on beef and sheepmeat quality traits and discuss recent developments in strategies to minimize the occurrence and effects of pre-slaughter stress.

Key Words: ruminant, pre-slaughter stress, meat quality

968 Impact of early pre- and post-mortem processing on poultry meat quality. S. Barbut*, *University of Guelph, Guelph, Ontario, Canada.*

Over the past decade there have been some major changes in the way poultry is handled. Three of the main ones have been the introduction of mechanical catching on a large commercial scale, controlled atmosphere stunning (CAS), and electrical stimulation (ES). Although the changes have been introduced to reduce manual labor, increase efficiency, address animal welfare issues, and in the case of ES also to shorten time to deboning, one of the major drivers is still meat quality. Efforts have also been directed to improve transportation conditions, restrict feed withdrawal and rest period after transportation; all can contribute to reduce stress and improve to meat quality. These factors are very important in general and also because some birds are known to be more susceptible to stress and show the pale, soft and exudative (PSE) syndrome which up to now is not dealt with by genetics. The new generation of mechanical catchers can handle a large number of birds and reduce wing and other damages if done correctly. CAS is becoming more popular in Europe but it should be remembered that meat quality issues are strongly depended on the method used (single vs multiple phase, gas mix) and way birds are handled. Electrical stunning is still the most common method but variations between high and low voltages / frequencies as well as the use a two phase stunning can be seen around the world. Most new plants are using ES (i.e., not common a decade ago), and together with an appropriate chilling regimen can allow broiler meat deboning with 3-4 hrs. The review will focus on how such developments have been made based on better understanding of meat science, animal physiology, and animal welfare.

Key Words: poultry, meat, stress

969 Processing practices and perceived pork quality. T. Ngapo*, *Agriculture and Agri-Food Canada, St Hyacinthe, Quebec, Canada.*

It is well known that potentially good sensory quality of pork brought to slaughter can readily be destroyed by post-mortem processing, but can the quality be further improved? Control of post-slaughter processes, such as, chilling regimens and aging, are vital to both realizing a good eating experience and to achieving a product of consistently good sensory quality. Pork is a relatively tender meat and achieves about 80% of its maximal tenderness in 5 d, twice as fast as that of beef. Consequently many of the post-mortem processes currently used were developed on the basis that an aging period is not required longer than the time to get the meat from slaughter to plate, estimated at about 6 d in North America. These processes have little changed in the last few decades,

but consumer perceptions have, with complaints of blandness leveled against modern lean meat. Accordingly, studies with the specific objective of improving the sensory quality of pork have come to the forefront of meat research in the last few years as avenues for improvement, rather than maintenance, of sensory quality are now being sought. Hence, this

bibliographic review of the impact of early post-mortem processing on perceived quality aims to provide insight into potential sources of amelioration of the eating quality of fresh pork. These processes include suspension, chilling, boning, electrical stimulation and aging.

Key Words: pork, post-mortem processing, quality