Impacts of a simulated heatwave on physiological responses, and retail meat quality of crossbred lambs

Minghao Zhang[1], Frank R. Dunshea[2], Robyn D. Warner[2], Kristy DiGiacomo[2], Aleena Joy[1], Archana Abhijith[1], Pragna Prathap[3], Ting Ma[2], Surinder S. Chauhan[3]

[1] Faculty of Veterinary and Agricultural Sciences, The University of Melbourne, Dookie College, Australia
[2] Faculty of Veterinary and Agricultural Sciences, The University of Melbourne, Melbourne, Australia
[3] Faculty of Veterinary and Agricultural Sciences, The University of Melbourne, Dookie college, Australia

Introduction: In the warmer parts of the world, high ambient temperature and relative humidity compromise the heat dissipation capacity of animals leading to heat stress. The long-term heat stress has been known to cause negative impacts on growth performance and meat quality of small ruminants (Zhang et al., 2020). However, there is still no study focused on the impact of short-term heat stress (12 h to 1 week) on small ruminants' meat. Especially the duration of most heatwaves is less than 1 week in Australia and other warm-temperate region countries (Cowan et al., 2014). Therefore, this study assessed the impacts of three different simulated heatwave (HW) durations (1, 3 or 5 days) on lamb meat quality and physiological parameters.

Materials and Methods: 72 lambs [9-12 months old; 40-60kg; Poll Dorset X (Merino X Border Leicester)] were exposed to thermo-neutral (TN; 18-21°C, 45-55% RH, n=36) or simulated HW (28°C-38°C temperature, 40-60% RH, n=36) in the climatic chambers for either 1, 3, or 5 days such that 12 lambs (6 TN and 6HW) were finished on the same day and were slaughtered (after 12 hrs fasting) at the same time. Physiological parameters were measured three times per day to monitor the response to HS. At the end of HW treatment, animals were slaughtered by a licensed mobile abattoir after 12 h fasting (water was available). Carcasses were chilled in mobile chiller (0°C-4°C) for 24 h post-slaughter and Longissimus thoracis et lumborum (LTL) and Semitendinosus (SM) muscle were dissected out and samples (140 g, n=4) were collected for meat quality measurements. Retail meat samples were vacuum packaged for 5 days ageing being kept at 4-6 °C with overwrap packaging in display cabinets for 0, 2.5, 5, 7.5, and 10 days retail display. Meat colour, cooking loss, purge loss, Warner-Bratzler shear force and texture profile analysis were measured at each display time point.

Results: A simulated HW increased heart and respiration rate and rectal and skin temperature irrespective of HW duration. However, as the duration of HW increased, lambs showed higher respiration rate in the morning indicating accumulation of heat load from 1 day to 5 days.

A simulated HW had no significant effect on retail meat quality (colour, water holding capacity and texture) for both LTL and SM muscle. 3 days HW showed some differences compared with other HW durations which included higher L*, a* and b* of LTL muscle during display, but only a* was significant compared with TN at day 5 and there was no difference in SM muscle.

Conclusions: It is concluded that while HW lasting longer than 3 days affects animal physiology and compromises welfare, it does not affect major parameters of retail meat quality of lamb meat.

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Literature:

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