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Poultry Management & Welfare

The Effects of Simulated Transportation Conditions on the Welfare of White-Feathered Layer Pullets

Purpose of the study

Transportation is a fundamental component to the poultry industry. Pullets are transported from a rearing facility to a laying facility at about 17 weeks of age, and this can either be over a short or a long distance. Poultry transportation consists of various steps including catching, loading, transport, and unloading. Many stressors can be present during transportation; however, the most significant stressor may be the microclimate within the trailer. To maintain homeostasis during transportation, birds may implement various behavioural and physiological mechanisms. Additionally, exposure to thermal stress can result in changes in muscle tissue physiology post-mortem.

Few studies have examined the stress responses of pullets during transportation. Therefore, the purpose of this research was to evaluate these responses when exposed to hot and neutral temperatures, with a low and high humidity, as well as a cold temperature, for a 4 or 8-hour duration.

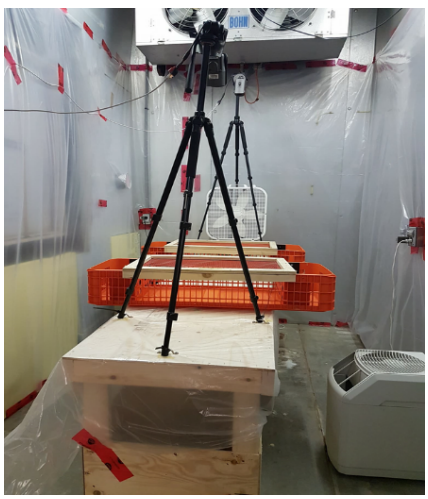

Image of environmental simulation chamber

What we did

A total of 240 pullets were obtained from 3 commercial farms. Pullets were randomly assigned to 1 of 5 exposure conditions including, 30°C with 80% relative humidity (RH) (30/80), 30°C with 30% RH (30/30), 21°C with 80% RH (21/80), 21°C with 30% RH (21/30), and -15°C with uncontrolled humidity (-15). Birds were exposed to the test conditions within transport crates for either 4 or 8 hours, with 8 pullets per crate.

Pre-treatment, all pullets were orally administered a miniature data logger to record core body temperature (CBT), which was retrieved post-treatment. Pre- and post-exposure, individual weights and foot temperatures were taken from all birds. A blood sample was taken from the same 5 pullets both pre- and post-exposure for analyses of blood physiology parameters.

During exposure, behavioural activity was recorded using two infrared cameras. Post-treatment, the same 5 pullets that had blood samples taken were slaughtered using a small-scale facility and muscle tissue physiology was analyzed. This included muscle tissue pH, water-holding capacity (drip, thaw, and cook loss), and colour.

We gratefully thank NSERC, Egg Farmers of Canada, Olymel S.E.C., and Maple Lodge Farms for their financial support of this project

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What we found

Core Body Temperature: Pullets experienced an initial increase in CBT when exposed to the 30/80 treatment, however, this plateaued over time. Birds exposed to the -15 treatment had an initial decrease in CBT, but by the end of the 8-hour duration, the CBT stabilized. During the last hour of exposure, pullets exposed for the 4-hour duration had a minor decrease in CBT, while those exposed for the 8-hour duration had a minor increase in CBT.

Extremity Temperature: Exposure to the 30/80 treatment resulted in higher foot temperatures, suggesting vasodilation. Exposure to the -15 treatment resulted in colder foot temperatures, suggesting vasoconstriction.

Behaviour: Pullets exposed to the high temperature treatments spent more time performing behaviours aimed to dissipate heat (surveying, increased activity, panting). Birds exposed to the -15 treatment spent more time motionless, aiming to conserve heat and energy. An increased duration resulted in birds spending less time active.

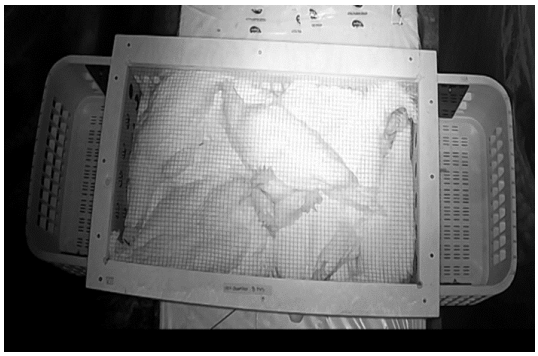
Blood Physiology: Exposure to the 30/80 treatment resulted in pullets having a higher final concentration of blood glucose, indicating mobilization of energy stores. Additionally, exposure for the 8-hour duration resulted in a lower blood pCO_2, tCO_2, and bicarbonate concentration, indicating a shift towards respiratory alkalosis.

Live Shrink: Exposure to both 30°C treatments resulted in pullets having a higher weight loss (shrink), suggesting that birds were required to mobilize energy to thermoregulate.

Muscle Tissue Physiology: Significant impacts on muscle tissue physiology did not follow any trend based on either the exposure treatment conditions or durations.

Conclusions

Overall, these findings indicate that exposure to thermal stress results in pullets implementing both behavioural and physiological mechanisms in order to maintain homeostasis. Exposure to thermal stress had minimal and non-specific impacts on pullet muscle tissue physiology. Transport duration of up to 8 hours may have little impact on pullet well-being.



Pullets during simulated transport

Pullet housing pen at the U of S

Who we are

Samantha Lalonde completed her MSc degree in April 2020 studying under Dr. Schwean-Lardner.

Dr. Karen Schwean-Lardner is an Associate Professor in the Department of Animal and Poultry Science at the University of Saskatchewan

Dr. Trever Crowe has a PhD in Biological and Agricultural Engineering. Much of his research focuses on transportation of farm animals