Final Report **Summary**

Electrolyte supplementation to alleviate the adverse effects of severe heat stress in meat chickens

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Objectives

The research aimed to determine whether supplementing meat chickens with electrolytes in the final few days of the production period, during high temperatures, would:

- **improve carcass quality and performance, and**
- **reduce the effects of dehydration and physiological stress during transport and lairage.**

Meat chickens may be raised in regions with high temperatures

Meat chickens can suffer from heat stress during periods of high temperatures or humidity, which can reduce their feed intake and increase mortality. Heat-stressed meat chickens are also less productive and produce lower quality meat. Meat chickens can produce a considerable amount of heat themselves, but will experience heat stress due to a variety of other factors, particularly body weight, and the air temperature and relative humidity in the shed. Good shed insulation and evaporative cooling can reduce shed temperatures by 8-10 ºC. However, when outdoor summer temperatures exceed 28-32 ºC, it is difficult to keep the indoor temperature within the ideal thermal comfort zone (18-22 ºC).

Meat chickens can be particularly susceptible to heat stress in the days before pick-up for transport to the processing plant, when their weight is at its highest. To manage heat stress, meat chickens rely on panting to dissipate heat, but this raises the concentration of carbon dioxide in their blood, which increases blood pH. To mitigate these effects, meat chickens will excrete higher amounts of salts in their urine. However, this can reduce their ability to retain water and can cause dehydration, which may worsen potential stressors associated with pick-up and transport.

The efficacy of electrolytes to minimise heat stress was assessed

A common strategy for minimising heat stress in meat chickens is supplementation of their water supply with salts, called 'electrolytes', for a short time before pick-up. Previous research funded by AgriFutures Australia found that electrolyte supplementation two days before transport, and at air temperatures of 26-28 ºC, improved animal outcomes and meat quality. However, supplementation for five days before transport improved growth performance but had limited effects on meat quality. In those experiments, chickens started to show signs of severe heat stress at 28 ºC.

The aim of this research project was to determine whether electrolytes could minimise heat stress at air temperatures above 28 ºC, at one day and at three days before pick-up and processing. For both experiments, the birds were exposed to a temperature pattern that could be expected in a commercial shed during hot weather. Standard husbandry and nutrition were provided until the birds were 39 days old. At this point, the temperature was gradually increased to 32 ºC during the day, and then reduced to 20-22 ºC, to replicate the normal summer temperature cycle. Birds were given one of two electrolyte formulations, for either one or three days before processing. After the carcasses were collected at the processing plant, random samples were assessed for meat quality.

Electrolytes are most effective when supplied for 3 days before hot weather

When chickens were exposed to temperatures above 28 ºC before pick-up, unsurprisingly, there were increases in the mortality rate and number of birds needing to be humanely euthanised. While there were no differences in weight loss during transport or meat quality, between treatments, females responded less than males to the treatments. This could be related to differences in body weight, because males are usually heavier than females of the same age. Giving electrolyte supplements one day before expected high temperatures (and heat stress) did not significantly affect mortality or improve performance and meat quality. The combined results of this study and the previous study suggest that electrolytes are most effective under conditions of moderate heat stress when given for at least 2-3 days before the expected hot weather.

A key finding of this study was the difference in temperature between the air at the level of the birds' backs and the temperature under birds sitting on the floor. While it was not possible to determine how long the birds had been sitting before the temperatures were taken, the average temperature under the seated birds was 4.4 ºC higher than the temperature at the level of the birds' backs when standing. In one instance, the maximum temperature difference was 10.9 ºC. This suggests that heat stress could be more severe than previously thought because the heat under seated birds could have a greater effect than the ambient temperature in a shed alone. This finding has implications for older birds that are larger and much more likely to spend time sitting.

Several strategies are needed to minimise the impact of heat stress on bird welfare and productivity

Heat stress continues to be a concern for the welfare and productivity of meat chickens in regions of high summer ambient temperatures. When determining the potential for birds to experience heat stress, ambient temperature and humidity should be considered together. Electrolytes given immediately before hot weather appear to have some benefit in mitigating heat stress. However, several strategies are needed to minimise the potential for heat stress and to limit production losses, welfare issues and mortality. The most effective way to improve performance in hot weather is through good housing design. Farmers should have sound understanding of the temperature and humidity predictions for their region, and use strategies to reduce the risk of heat stress when high predicted outside temperatures (> 32 ºC) make it difficult to keep shed temperatures below 26-28 ºC.

Publications

- Previous related research: PRJ-009120 (agrifutures.com.au /18-013)
- Elshafaei, H.E., Rashed, R.R., Goma, A.A., El-Kazaz, S.E. Kerr, M.J., Hopkins, D. L. and Downing, J.A. (2020) The effect of electrolyte supplementation on behaviour and performance of broilers exposed to adverse high temperature one day prior to transport and processing. Australasian Poultry Science Symposium, 31: 152-155.
- Downing, J.A., Kerr, M. and Hopkins, D. (2017) The effects of pre-transport supplementation with electrolytes and betaine on performance, carcass yield and meat quality of broilers in summer and winter. Livestock Science, 205: 16-23.

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For the final report see agrifutures.com.au/product/electrolyte-supplementation-to-alleviate-the-adverse-effects-of-severe-heat-stress-in-meat-chickens

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