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# PROBLEMS OF SHEEP TRANSPORT IN COLD CLIMATES, CONTEXTUALIZING THIS WITH IMPACTS IN HUMAN WELLBEING

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In Northern China, the cold winter season of 7 months and associated cold stress can have a direct impact on the quality of animal performance, reproductive capacity and autoimmunity. The average temperature in January is-17.9℃. To acclimatize to low temperatures, the sheep increasing the production of metabolic heat [1]. For adult sheep, the lower critical temperature is –3 °C [2]. Low temperatures can provide a risk to the welfare of sheep during transport because of increased ventilation chilling the sheep. This paper [3] reports on an investigation into the importance of three factors during the road transport of sheep in cold temperatures: covering the vehicle, duration of the transport, and feeding prior to transport on the welfare of sixty transported 4-month-old Dorper × Mongolian female sheep in a cold climate. The transport journeys took place on 15 and 16 January 2020. Mean maximum and mean minimum temperatures on these two days were −13 °C/−21 °C and −11 °C/−18 °C; the humidity was 69% and 77%, respectively. Three experiments were conducted with two treatments in each and 10 sheep in each treatment. The factors investigated in the three experiments were: enclosing the vehicle (truck with or without a plastic cover and 1 h trip); transport duration (1 or 2 h); and pre-feeding (feeding the sheep before loading or not, on a 2 h trip). Temperatures were low before the transport, -17 and -13 °C.

The results from the covered vehicle study included that the sheep in the covered vehicle had greater increases in head and ear temperatures compared to those in the open vehicle. And that Heat shock proteins (HSP), which expression can occur after excessive temperature change, including cold temperature change, were higher in the sheep transported in the open vehicle. Sheep transported for 2 h increased their leg temperatures, whereas those transported for 1 h had reduced leg temperatures. Increases in non-esterified fatty acids (NEFA) and lactate dehydrogenase (LDH) in the blood samples during the longer transport suggested that sheep had more muscular and metabolic activity, compromising their well-being. For two-hour transportation compared with one-hour transportation cortisol increased significantly more. Creatine kinase and Lactate dehydrogenase (LDH)

increased significantly in the longer duration transport, which could indicate a muscle damage effect of movement during driving. Alanine aminotransferase (ALT) was also higher and this can indicate a change in liver function. High concentrations of ALT could be an index of activity in the blood for the metabolic processes involved in carbohydrate, protein, and fat conversion [4]. The rates of metabolism increase during stressful conditions [5] and also when skeletal muscle is regularly contracting [6]. Feeding prior to transport did not affect body temperatures, but those not fed prior to transport had reduced alanine transferase, HSP and cortisol in their blood, whereas those that were fed had reduced NEFAs, LDH and creatine kinase. Prior feeding had no effect on the sheep temperature indices over a two-hour transport period.

Thus, the sheep most at risk of the adverse effects of cold temperatures were those transported in open vehicles, those transported for a longer time, and those not fed before transport.

These problems identified in sheep in transport in cold climates, can have impacts on human wellbeing, including loss of profit to the farmer, food security (reducing live animal transport will reduce losses of food from animals in the current system), Ethic concerns of the general public; customers have concerns about the well being of the animals that provide them with food, and the affect on the ; human-animal relationship on the :stock people involved in the care of these animals.

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