

Sheep and their welfare: Live export

A discussion of recent advances in research into the impacts of transport, especially long-distance, on sheep welfare.

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Word count: 970

Introduction

The live export of sheep has been the subject of close media attention, particularly in recent years, due at least in part to welfare issues associated with animals being transported long distances before slaughter. During these voyages, sheep can be exposed to high stocking densities, elevated temperatures and ammonia concentrations, and changes to social groupings (Phillips & Santurtun, 2013). These can result in stress, defined as a reduction in fitness due to a disruption to homeostasis (Zhong *et al.*, 2011). There is a need for quantitative measurement of the influence of these factors on sheep welfare, as well as research into methods of either reducing or preventing their detrimental impacts.

Discussion

The microclimate on board live-export vessels can have a significant effect on Australian livestock during long voyages (Pines & Phillips, 2013). Of particular concern are high ammonia (NH₃) concentrations, which have been described as one of the biggest problems associated with high stocking rates, as they can cause reduced feed intake and loss of bodyweight (Phillips & Santurtun, 2013). To determine the true impact of these factors on sheep health and welfare Pines and Phillips (2013) monitored 20 sheep pens during a 10-day voyage from Australia to Oman, measuring atmospheric NH₃, air speed and temperature, and observing sheep behaviour and incidence of conjunctivitis. They found that several sheep pens had transient localised pockets with significantly higher NH₃ concentrations, and these tended to be present in pens with little or no airflow and an accumulation of excreta.

As 65% of pens had no recordable air movement, this has implications for microclimate monitoring on live-export vessels. Measurement sites must be carefully selected to achieve a true reading that can be compared with welfare standards. Sheep in pens with high NH₃ concentrations held their heads higher and had an increased incidence of conjunctivitis, possibly due to irritation of the mucosa by the accumulated NH₃ (Pines & Phillips, 2013). Those sheep subjected to higher NH₃ concentrations spent more time standing and less time feeding and ruminating (Pines & Phillips, 2013), a significant finding as reduction in rumination and feed intake is one of the primary causes of sheep mortality during live export (Phillips, 2008). Thorough comprehension of this microclimate variability within livestock pens seems to call for design changes, such as greater airflow, to decrease unnecessary sheep discomfort and thereby enhance their welfare.

Ship motion can be a major factor affecting sheep behaviour and stress levels on live-export vessels, but it can be difficult to measure its effect independently of other stressors (Santurtun *et al.*, 2014). These authors developed a method of measuring sheep responses to the ship motions “roll”, “heave” and “pitch”, as these are considered to be the three of highest importance and have been associated with motion sickness in humans. A programmable flight simulator platform was created to mimic these motions, and measurements of sheep behaviour, physiology, balance, body posture, heart rate variability, as well as rumination and feed intake (as with the previous study) were taken (Santurtun *et al.*, 2014). Four to six sheep were exposed to each ship motion independently, taking into account the features of a typical live-export vessel to determine appropriate amplitudes and frequencies of movement (Santurtun *et al.*, 2014). Animals were treated in pairs, with each sheep being exposed to treatment for 30-60 minutes a day for 8-12 days (Santurtun *et al.*, 2014).

These sheep were found to spend approximately two thirds of their time standing or lying, and one third of their time ruminating. As these behavioural proportions were similar to those of sheep on live-export vessels, it suggested that the simulator is an accurate way of emulating ship motion (Santurtun *et al.*, 2014). Heart rate variability increased over time, which suggested increased activity of the parasympathetic nervous system. The implication of this is that a long period of adaptation to ship motion before transport could positively affect sheep welfare by providing them with time to adjust to their new conditions (Santurtun *et al.*, 2014).

The studies by both Pines & Phillips (2013) and Santurtun *et al.* (2014) reached similar conclusions about the significant impact of long-distance ship transport on sheep welfare. Indeed, of the various steps involved in the pre-slaughter process, transport is one of the primary stressors). A study by Eriksen *et al.* (2013) aimed to determine differences in both stress parameters and meat quality between lambs slaughtered at conventional and mobile abattoirs (mobile abattoirs being complete systems that can be moved between locations). Conducted in Norway, the study recorded physiological parameters, behavioural observations and meat quality measurements of 36 lambs and sheep slaughtered at either a conventional slaughterhouse or at one of two mobile abattoirs (Eriksen *et al.*, 2013). Serum cortisol concentrations were found to be significantly lower in sheep at the mobile abattoir, indicating lower levels of stress, while lambs at the stationary slaughterhouse exhibited increased vocalisation and aggression. In terms of meat quality, mobile abattoir lamb meat was more tender and had a lower pH and slower cooling rate compared to conventional slaughterhouse meat (Eriksen *et al.*, 2013). Although not directly linked to animal welfare, the economics surrounding meat quality influence the industry's motivation to move toward the use of mobile abattoirs, and so are an important consideration.

Conclusions

It can be concluded that long-distance transport does indeed negatively influence the behaviour and welfare of sheep. The research discussed has drawn attention to the impact of microclimate and ship motion on these animals, as well as making definite progress toward developing more accurate methods of measuring their welfare. Further, in the longer term, the study by Eriksen *et al.* (2013) illustrates that, given certain improvements in terms of meat-storage facilities overseas, mobile abattoirs within Australia could be a viable alternative to the live export of sheep and the welfare concerns that accompany this practice.

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