

## **The live export of Merino sheep – a welfare and economical dilemma for Australia**

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*A discussion of recent welfare concerns for Merino sheep exported from Australia, their implications for the live export industry, and recommendations for future voyages*

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Australia is the world's largest exporter of live agricultural animals. This \$1.275 billion industry is a major contributor to the Australian economy and employment (MLA 2017). In 2017, 1.85 million sheep were exported from Australia, of which almost 90% were sent to the Middle East (MLA 2017). Live exporting is lucrative but it is often beset with animal welfare issues, with the industry frequently subject to regular scrutiny, government reviews and policy debates (Sinclair et al. 2018; Schipp 2013; Phillips 2005). Welfare advocates argue that it is better to slaughter the animals in Australia and transport their carcasses overseas. However, demand from Islamic nations in the Middle East and Asia for live animals, so that they can be slaughtered by traditional religious methods, makes it a complex issue. It is vital to ensure that adequate welfare standards are met while supporting a lucrative industry (Wright and Muzzatti 2007; Phillips 2005). Recent studies have examined four critical components of live export affecting welfare – the effects of ammonia, climatic factors, space allowance and ship transport motion on the wellbeing of Merino sheep during live export voyages.

Ammonia accumulation during live export is a concern due to its potential to cause mucosal inflammation and respiratory distress. It is also suspected of causing reduced feed intake in Merino sheep (Zhang et al. 2018). When transporting animals in a live export vessel, urine, faeces and pelleted food can potentially mix and form ammonia gas, especially in the high humidity and temperatures that are usually encountered when ships travel through equatorial and tropical areas (Pines and Phillips 2011).

To examine the effects of ammonia gas on nutritional behaviour and stress levels, Zhang et al. (2018) exposed twelve Merino sheep to 21mg/m<sup>3</sup> of ammonia for 14 or 28 days, which are typical ammonia concentrations and voyage durations aboard live export vessels with high stocking densities. Zhang et al. (2018) found that the exposure led to reduced feed intake and lower chewing rates, probably due to irritation of the buccal cavity. Faecal cortisol and corticosterone metabolites were also increased, indicating higher stress levels. This study was, however, conducted under highly controlled conditions, with a fixed level of ammonia exposure in climate-controlled rooms. In reality, variations in ammonia concentrations can be expected on an export vessel depending on factors such as ventilation and air flow, type of deck (open or closed sides), stocking densities and temperature (Pines and Phillips 2011). Notwithstanding that, ammonia accumulation is a major animal welfare concern, although this problem may be minimised through reduced stocking densities and improved hygiene and ventilation aboard vessels (Zhang et al. 2018).

Motion sickness is another concern that arises due to the movement of the vessel at sea (Navarro, Col and Phillips 2018). Navarro, Col and Phillips (2018) measured the behavioural and physiological responses of nine crated Merino sheep exposed to varying levels of motion resembling a ship at sea, at different space allowances including the current Australian shipping standard (0.26m<sup>2</sup>/head). The study revealed that floor movement coupled with space allowances of less than 0.30m<sup>2</sup>/head led to increased aggression and stress levels, decreased lying time and variations in heart rates (Navarro, Col and Phillips 2018). A limitation of this study is the highly controlled conditions and artificial ship-like motions, which may not be representative of conditions on an actual export vessel where variability is expected. Nevertheless, the study shows the importance of space allowance, as higher stocking densities are directly linked to increased aggression and stress levels of the sheep. (Navarro, Col and Phillips 2018).

Additionally, high stocking densities not only affect ammonia levels, and stress levels of the animals, but can also exacerbate heat stress and promote disease transmission (Foster and Overall 2014). Heat stress is one of the major concerns during live export and is a common cause of poor welfare and mortality in sheep during long distance voyages (Zhang and Phillips 2019; Caulfield et al. 2014; Phillips 2016). Zhang and Phillips (2019) statistically analysed whether climatic factors had any correlation with mortality rates of sheep during live export, using mortality data from 417 shipments of sheep over an 11-year timeframe. Zhang and Phillips (2019) found a seasonal mortality pattern in sheep exported from Australia to the Middle East with more deaths occurring when the sheep leave Australia during spring/winter and arrive during the Middle Eastern summer, a journey that lasts about 23 days. This is due to extreme changes in climatic conditions, especially after crossing the equator when the sheep suddenly experience hot and humid conditions. Sheep exported during this time may experience temperatures from as low as 0°C when departing during an Australian winter, and arrive in the Middle East during summer with temperatures higher than 40°C (Pal and Eltahir 2016). A limitation of the study is that it focussed mostly on atmospheric temperature and did not consider the humidity differences as well as other weather stressors. Nevertheless, the findings from Zhang and Phillips (2019) do suggest a potential to reduce mortality rates by avoiding live exporting during Australian winters and spring. However, this solution is problematic, as the annual Eidh al-Addha festival in Saudi Arabia (when demand for live Australian sheep rises) is held during the Middle Eastern mid-summer where temperatures usually reach peak levels (Zhang, Lisle and Phillips 2017).

To conclude, the live export of Merino sheep poses a critical ethical and economical problem. The live export industry is a large contributor to the Australian agricultural sector and supports the livelihood of many farmers and regional communities. However, animal welfare during live export must not be neglected. Issues such as ammonia accumulation, inadequate space allowances and unfavourable climatic conditions not only contribute to poor emotional states, but ultimately deteriorating health and mortality of the sheep. Decreasing the stocking densities for sheep on board export vessels, and improving hygiene and ventilation, can minimise welfare problems such as ammonia formation, overcrowding and heat stress. At the same time, Australia should re-examine

current Australian space allowance shipping standards, and consider shifting live animal export to the Middle East to take place during summer/autumn.

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