

Social Isolation in Sheep

Sheep (*Ovis aries*) are highly social animals. Their natural flocking behaviour encourages strong social bonds and desire to remain close (Nowak et al., 2008). Sheep communicate mainly through visual means and become stressed when losing visual access to their conspecifics (Hutson, 2007; Nowak et al., 2008). In response to being socially isolated, sheep exhibit severe stress responses including behavioural indicators of stress (Hutson, 2007). These behaviours include vocalizations (high-pitched bleats), and locomotion (rearing, jumping, escape attempts, and time spent standing erect (Nowak et al., 2008)). This review will investigate factors associated with stress behaviours, individual traits associated with stress, physiological responses to stress, and ways to improve welfare during social isolation.

Social isolation in most studies involves auditory, visual, and olfactory isolation from conspecifics. Typically, there will be observational measurements of behaviours before and after isolation, including count measurements of vocalizations and locomotion behaviours, and physiological measurements like blood hormones, heart rate, respiration, and temperature. Locomotion is often measured using an arena-test which involves drawing a grid in the test area and recording the number of squares each sheep enters (Barnard et al., 2015).

Social isolation stress results in both an increase in stress behaviours as well as a physiological stress response. De et al. (2004) investigated physiological changes in sheep after 24 hours of social isolation. They measured physiological characteristics and behaviours before and after isolation and found that there was a significant increase in heart rate, respiration, temperature and cortisol after isolation. Furthermore, they found a significant increase in stress behaviours

as well as a reduction in feeding, drinking, and weight. De et al. (2004) therefore suggested that social isolation negatively impacts the welfare of sheep.

Individual sheep vary in their response to social isolation, so it is important to understand contributing factors. Barnard et al. (2015) investigated how breed, parity, sex, and age affect stress behaviours through observing sheep before and after isolation, finding that female, primiparous (first birth), young, sheep as well as dairy breeds typically had an increase in vocalization and a greater frequency of locomotion in an arena test. Papadaki et al. (2021) assessed how breed, age, presence of siblings, and ewe and lamb bond changed vocal characteristics during social isolation in sheep. Breed, age, presence of siblings, and lamb bond resulted in changes in vocalization characteristics indicating a significant effect on vocal characteristics during social isolation. Poindron et al. (1997) investigated how parturition (giving birth) affects response to social isolation by observing pregnant ewes before, during, and after giving birth. They found a significant reduction in response to social isolation during and after birth resulting in reduction in vocalizations and locomotion.

Severity of behavioural response can be reduced by modifying isolation methods. da Costa et al. (2004) wanted to assess how seeing images of conspecifics during social isolation would affect stress. They found that isolated sheep shown images of sheep significantly reduced stress hormones and behaviours, and as such sheep may also prefer familiar environments when isolated. Price & Thos (1980) found that when comparing novel and familiar environments during social isolation, there was an increase in locomotion in novel environments indicating greater stress. Price & Thos (1980) and Vierin & Bouissou (2003) investigated the effect of human presence using behavioural observations and comparing results with and without the

presence of humans. Both studies found that the presence of a human during social isolation reduced vocalizations, indicating that humans may also be good alternative companions.

Guesdon et al. (2015) compared the behaviours of freely moving sheep to sheep contained in a single pen with visual access to conspecifics to socially isolated sheep. They found that sheep in a single pen were equally stressed as the freely moving sheep and significantly less stressed than socially isolated sheep, indicating that a single pen may be suitable when having to physically isolate sheep during handling.

The majority of the studies were on short term isolation periods and none directly about habituation of sheep to isolation, so given this review of these 10 articles future research should investigate an isolation period greater than 24 hours and the effect of repeated isolation.

Citations

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