

Managing heat load and heat stress in sheep and cattle at saleyards



This factsheet assists a person responsible for animals in meeting their animal welfare obligations when managing heat load and heat stress in sheep and cattle at saleyards.

Heat loss mechanisms in sheep and cattle

Sheep and cattle are able to regulate their body temperature within a narrow range of air temperatures, the thermo-neutral zone. However, as air temperature rises above the thermo-neutral zone (above 25°C for beef cattle and sheep), the animal will begin dissipating heat, by panting and sweating to increase evaporative cooling.

Cattle and sheep dissipate heat via radiation, evaporation, conduction, convection and by their behaviour (e.g. seeking shade). Evaporation from the skin via sweating provides the greater heat loss for cattle. Panting for sheep provides the main means of evaporative heat loss. When high temperatures combine with humidity, heat loss by evaporation becomes more difficult, and animals struggle to maintain body temperature. Once the environmental air temperature equals or exceeds an animal's body temperature then evaporative heat loss is the only available heat loss mechanism to regulate body temperature.

Heat loss also occurs by conduction when cool drinking water is consumed and brought up to body temperature.

Convection heat loss occurs either passively when hot air rises, and is replaced by cooler air, or by forced air movement, i.e. wind or mechanical means.

Sheep and cattle also respond to higher temperatures by reducing activity, seeking shade and standing or spreading out to increase their surface area for heat loss and to allow air movement around their bodies.

Dehydration can limit the transfer of heat via the blood to the surface of the animal and severely reduce the ability to respond adequately to hot conditions. **Visibly dehydrated animals cannot be transported or offered for sale.**

Factors likely to predispose sheep and cattle to heat stress

Any sheep or cow may be affected by heat stress. There are a range of environmental and animal factors that influence susceptibility to heat stress.

Table 1 Factors likely to predispose sheep and cattle to heat stress

Environmental factors	Air temperature and humidity	Increasing air temperature and humidity reduces the ability for animals to lose heat.
	Access to shade	Shade protects animals from radiant heat from the sun.
	Wind speed	Wind aids heat loss by convection.
Animal and management factors	Hydration status and access to water	Dehydration can limit the transfer of heat via the blood to the surface of the animal and substantially reduce the ability to respond adequately to hot conditions.
	Physical activity	Animal movement generates metabolic heat.
	Penning density	Penning density impacts on access to drinking water and the ability to lose heat via the skin. This is particularly important for cattle. During hot weather cattle may bunch together, possibly to obtain shade from each other, to escape flies or as a natural herding response when under stress. Bunching reduces the ability of animals to lose body heat. Penning density must take this factor into account.
	Breed	<i>Bos indicus</i> cattle have a higher natural heat tolerance than <i>Bos taurus</i> breeds. Middle eastern breeds of sheep have a higher natural heat tolerance than Merino breeds.
	Coat colour and length	Darker coloured animals, and animals with long hair/wool are at increased risk of heat stress.
	Age and pregnancy status	Juvenile, pregnant and lactating animals have a higher metabolic rate than adult animals and tend to be more susceptible to heat stress.
	Body condition score	Fatter animals tend to produce more metabolic heat and have reduced capacity to lose heat.

Obligations for saleyard operators and those responsible for animals in the saleyard

The Animal Welfare (Transport, Saleyards and Depots) Cattle and Sheep Regulations 2020 (Transport Regulations) place specific obligations on operators of saleyards and those responsible for animals in the saleyard.

The operator of the saleyard must ensure the saleyard provides suitable conditions for the livestock. Suitable conditions include.

Table 2 Suitable conditions for livestock in saleyards	
a) Airflow	Effective airflow that is appropriate for the species and class of livestock using the saleyard; and
b) Watering facilities	Suitable watering facilities for the species and class of livestock using the saleyard. This would include: <ul style="list-style-type: none"> • temperature and flow rate of the water • size and accessibility of the water points; and
c) Facilities that minimise impact of weather conditions	Suitable facilities to minimise the impact of weather conditions that are likely to predispose livestock to heat stress; and
d) Otherwise suitable	The facilities are otherwise suitable for the species and class of livestock using the saleyard.

Other specific requirements include managing penning density and minimising the impact of weather conditions.

Table 3 Other requirements	
a) Penning density	A person responsible for sheep or cattle at a saleyard, including the saleyard operator, must ensure the penning density is reduced to a level sufficient to minimise the potential for the welfare of livestock to be affected in a way that causes pain, injury or distress to the livestock. This may require reducing penning density to facilitate heat loss and airflow and to facilitate each animal's access to water.
b) Minimising the impact of weather conditions	A person responsible for sheep or cattle at a saleyard, including the saleyard operator, must take reasonable steps to minimise the impact of weather conditions that are likely to predispose sheep and cattle to heat stress.

In meeting the requirements of the Transport Regulations, consider:

- the different mechanisms of evaporative heat loss for sheep and cattle (i.e. respiratory vs sweating)
- the environmental, management and animal factors likely to predispose sheep and cattle to heat stress
- proactive measures to prevent heat stress, and reactive measures to detect and manage heat stress if it is identified
- the physical facilities of the saleyards, as well as management factors.

Proactive management of heat load

Proactive measures to minimise the impact of weather conditions likely to predispose sheep and cattle to heat stress include the following.

Access to water

As animals entering a saleyard suffer some level of water deprivation and their time off water is generally unknown, ensuring all animals have unlimited access to clean, cool water is essential. Penning density must be sufficiently low to allow each animal to drink and allowances made for ensuring that non-dominant or submissive animals have sufficient access. When air temperature rises above 25°C, water consumption by the animals needs to increase due to sweating, panting and evaporative cooling. Increased water intake becomes crucial to prevent dehydration. Animals drink primarily to replace lost fluid, rather than in anticipation of future needs.

Note: A person responsible for sheep or cattle that are visibly dehydrated must not supply them for transport, load on a transport vehicle or offer for sale at saleyard.

Reducing penning density

Reducing penning density facilitates heat loss and airflow and allows each animal to have access to water. Reducing penning density influences the cooling mechanisms employed by sheep and cattle by allowing animals to stand apart to increase evaporation via the skin and enabling free access to cool drinking water. This is particularly important for cattle. During hot weather cattle may bunch together, reducing the ability of animals to lose heat. Penning density must take this factor into account.

Move livestock to shaded areas where possible

Provide sheep and cattle with shaded areas to reduce heat load from solar radiation.

Reducing humidity

Reducing humidity by increasing airflow from low humidity areas allows the animals to use their cooling mechanism to manage heat load.

Not conducting sales on hot days

Do not conduct a sale at a saleyard on hot days unless you are confident you can manage heat load and heat stress and have a documented action plan that specifies measures to minimise the impact of weather conditions likely to predispose sheep and cattle to heat stress (such as increasing airflow, reducing penning densities, water

access to animals in all pens and provision of shade) and action to be taken in the event of heat stress.

Heat stress

The Transport Regulations define heat stress as occurring when the response by a livestock animal to hot conditions above its thermoneutral zone exceeds the ability of its behavioural, physiological or psychological coping mechanisms.

The thermo-neutral zone of a livestock animal is the range of environmental temperatures over which the heat produced by the animal remains fairly constant and the animal does not have to expend energy on cooling mechanisms (such as panting and sweating).

Management of heat stress should be proactive through the effective management of heat load as outlined above, rather than reactive.

There are a number of observable or measurable conditions that can be used to determine if an animal is suffering from heat stress and a variety of indices have been developed to represent heat stress potential. The indices generally involve some combination of different forms of temperature measurement (dry bulb, wet bulb, black globe), humidity, and wind speed. Two of the simplest measures are outlined below.

Panting scores

A practical indicator of the onset of heat stress in livestock in saleyards is:

- **For sheep:** breathing rate above 70 breaths a minute
- **For cattle:** breathing rate above 70 breaths a minute and occasional open-mouth breathing.

Wet bulb temperature

When heat load conditions are operating, evaporative heat loss is the most important form of heat loss and this is influenced far more by wet bulb temperature than by dry bulb temperature. The simplest approach is to use wet bulb temperature alone as a practical measure of heat stress **in hydrated animals**.

Table 4 Wet bulb temperature risk criteria for heat stress in hydrated sheep and cattle (adapted from LIVE.0211, *Veterinary Handbook for Cattle, Sheep and Goats*, 2002; ALEC, *The Veterinary Handbook for the Livestock Export Industry*, 2021)

	Wet bulb temperature (taken in the immediate proximity of the animal midway up the side of the animal)		
	Safe No action required	Caution Reasonable steps required to minimise impact of weather conditions likely to predispose sheep and cattle to heat stress	Danger Immediate steps must be taken to manage the welfare of animal
Bos indicus cattle	Less than 28°C	28°C–31°C	Above 31°C
Bos taurus cattle	Less than 26°C	26°C–30°C	Above 31°C
Sheep	Less than 26°C	26°C–29°C	Above 29°C

Heat stress will cause harm (e.g. pain, injury or distress) to an animal. Failure to take reasonable steps to prevent unnecessary harm of an animal may result in a charge of cruelty.

Additional actions to take when an animal is showing signs of heat stress

When an animal is showing signs of heat stress, additional actions to those taken for animals under heat load (e.g. ensuring access to cool, clean water, reducing penning density and moving animals to shaded areas) are required to manage heat stress.

These include:

- Wet the animal. However, only do so if wetting will reduce the animal's body temperature or increase evaporative cooling rather than adding humidity. If sprays are used, ensure they produce large droplets with a droplets size that can reach the skin surface (at least 150 micron). Avoid misting or fogging as only the hair on the animal is wetted which substantially increases humidity. When using sprinklers monitor the cattle respiratory rate.
- Minimise movement. Minimise handling and disturbance of animals.
- Move affected animals to cooler pens with reduced stocking density, shade and better air flow.
- Maximise windflow by removing barriers to wind.
- Provide fan-forced airflow.

More information

- [Animal Welfare \(Transport, Saleyards and Depots\) \(Cattle and Sheep\) Regulations 2020](#)
- [Australian Animal Welfare Standards and Guidelines: Land Transport of Livestock; Livestock at Saleyards and Depots; Sheep; Cattle](#)
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