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HEAT STRESS

Definition | Consequences | Prevention

Definition

Heat Stress is a pathological condition in which the animal's body cannot get rid of excess heat resulting in a rise in core body temperature.

Environmental Heat

Heat in the environment is determined by both humidity and ambient temperature. It is significantly more difficult to mitigate extreme heat than it is cold, particularly if nighttime temperatures remain elevated.

Consequences

Heat Stress can be rapidly fatal. In animals that are suffer from heat stress but recover, noted decreases in production, reproduction and off spring performance are usually noted. Changes in off spring performance can be seen for 3 generations in cattle.

Beef Cattle Temperature Humidity Chart

Temperature (°F) \ Relative Humidity (%)	30	35	40	45	50	55	60	65	70	75	80	85
100	84	85	86	87	88	90	91	92	93	94	95	97
98	83	84	85	86	87	88	89	90	91	93	94	95
96	81	82	83	85	86	87	88	89	90	91	92	93
94	80	81	82	83	84	85	86	87	88	89	90	91
92	79	80	81	82	83	84	85	85	86	87	88	89
90	78	79	79	80	81	82	83	84	85	86	86	87
88	76	77	78	79	80	81	81	82	83	84	85	86
86	75	76	77	78	78	79	80	81	81	82	83	84
84	74	75	75	76	77	78	78	79	80	80	81	82
82	73	73	74	75	75	76	77	77	78	79	79	80
80	72	72	73	73	74	75	75	76	76	77	78	78
78	70	71	71	72	73	73	74	74	75	78	76	76
76	69	70	70	71	71	72	72	73	73	74	72	75

Temperature Humidity Index (THI)

Normal <75 | Alert 75-78 | Danger 79-83 | Emergency >84

Figure 1: Cattle Temperature Humidity Index Chart

Heat Stress in Camelids

Alpacas and llamas evolved in an environment that is relatively cool and dry. Average high temperatures during the day rarely exceed 68F and night time lows rarely fall below 20F. Camelids are therefore more sensitive to heat than other domestic species. Heat stress is commonly diagnosed in camelids in geographical regions with high heat or humidity or both.

Hyperthermia in camelids is considered dangerous when the core body temperature exceeds 106F. Animals initially show a decrease in appetite and interaction with other animals. More

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	9 °C (48.3) °F	9.1 °C (48.3) °F	8.9 °C (48.1) °F	8.1 °C (46.6) °F	7.1 °C (44.8) °F	6.7 °C (44) °F	6.4 °C (43.5) °F	7.4 °C (45.2) °F	8.4 °C (47.2) °F	9.2 °C (48.6) °F	10.3 °C (50.5) °F	9.7 °C (49.4) °F
Min. Temperature °C (°F)	5.3 °C (41.5) °F	5.5 °C (41.8) °F	5 °C (41) °F	3.1 °C (37.6) °F	0 °C (32) °F	-1.2 °C (29.8) °F	-1.4 °C (29.4) °F	-0.4 °C (31.3) °F	1.5 °C (34.8) °F	3.3 °C (38) °F	4.4 °C (39.9) °F	5.2 °C (41.4) °F
Max. Temperature °C (°F)	13.3 °C (56) °F	13.3 °C (56) °F	13.4 °C (56) °F	13.3 °C (55.9) °F	13.8 °C (56.9) °F	14 °C (57.2) °F	13.9 °C (56.9) °F	14.6 °C (58.3) °F	15.1 °C (59.2) °F	15.2 °C (59.3) °F	16.1 °C (61) °F	14.6 °C (58.2) °F
Precipitation / Rainfall mm (in)	236 (9)	211 (8)	180 (7)	91 (3)	24 (0)	11 (0)	11 (0)	23 (0)	54 (2)	90 (3)	97 (3)	162 (6)
Humidity(%)	74%	75%	75%	71%	54%	42%	42%	43%	47%	53%	50%	65%
Rainy days (d)	20	18	19	13	5	2	2	4	9	12	12	17
avg. Sun hours (hours)	7.7	7.3	7.4	7.8	9.2	9.6	9.6	9.8	9.7	9.9	10.1	9.1

Data: 1991 - 2021 Min. Temperature °C (°F), Max. Temperature °C (°F), Precipitation / Rainfall mm (in), Humidity, Rainy days. Data: 1999 - 2019: avg. Sun hours

Treatment and Prevention

Treatment of Heat Stress in camelids should begin with prompt recognition of the condition.

- Move animals to cool area/ shade
- Actively cool animal (ice/water)
- Monitor temperature closely
- Administer cool fluids
- Consider antioxidants and anti-inflammatories

Prevention is key

- Acclimate animals
- Shear
- Provide effective shade (canopy and ventilation)
- Modify nutrition
- Provide access to clean fresh water
- Minimize stress during hottest periods of the day
- Actively cool animals (pools, sprays)

severe signs include recumbency, ventral edema (including the scrotum), salivation, increased respirations, open mouth breathing, weakness and inanity to stand.

Recovery

Recovery from a heat stress event can take days to weeks. Longer recovery periods should be expected with more severe events. Periods of intermittent hyperthermia can occur even after "full recovery". Reproductive performance, especially sperm production, can take weeks to return to normal.

Prevention

Prevention of heat stress may be impossible in some environments but as many steps as possible should be taken to reduce the occurrence and severity of an event. Animals should be acclimated gradually to hotter environments. Shade that provides a dense canopy and generous ventilation should be provided, as should elements such as pools for cooling. Shear animals as soon as possible prior to the start of warm weather.

Clean fresh water and high quality, easy to digest food that minimizes the heat increment should be provided. Keep fiber digestion to a minimum. Try to avoid inducing acidosis with grains. Feed and graze animals in the evening or when the environment is coolest. Consider building a reserved of metabolic antioxidants by supplementing vitamins and minerals such as Vita min E, selenium and zinc during periods of heat.

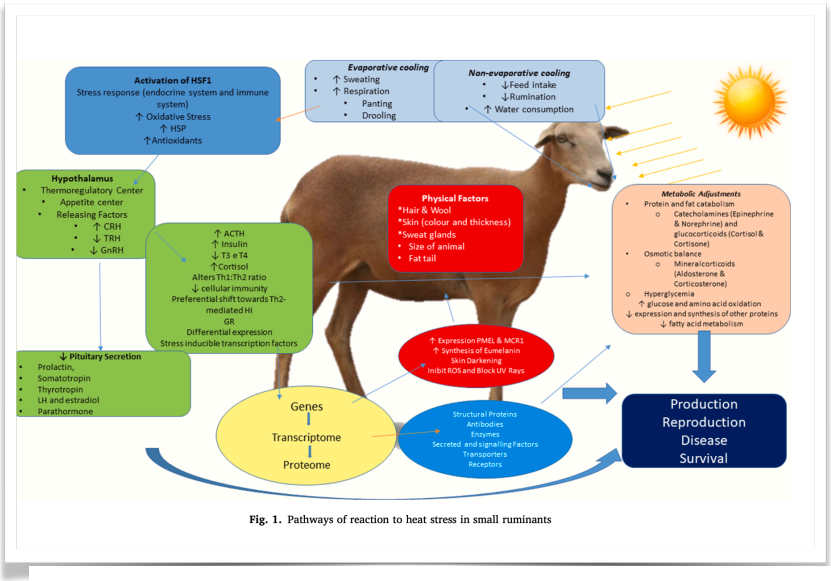

Fig. 1. Pathways of reaction to heat stress in small ruminants

Response to heat stress for small ruminants: Physiological and genetic aspects. Livestock Science 263 (2022) 105028