

EXTREME HEAT

Extreme heat is defined as temperatures 10° F (5.5° C) or more above the average temperature highs. These conditions can last for days or several weeks. Because of differences in the average temperature in different areas of the country and at different times of the year, the absolute temperature that defines extreme heat varies throughout the United States. When drought and extreme heat occur at the same time, the conditions can be very dangerous.

Extreme heat conditions usually occur in the summer months. However, warm temperatures at other times of the year can cause stress to animals that are not adapted to the temperature change. For example, heat stress occurs most commonly in the early summer when a sudden increase in ambient temperature affects cattle and other outdoor animals that have not had time to adjust to high ambient temperatures. Another condition arises when ambient temperatures are hot (greater than 105° F [41° C]), humidity is high (greater than 90%), and there is little or no air movement or cloud cover. Although this combination of conditions occurs less frequently than simple, above average high temperatures, it can be associated with massive mortality in animals (and humans) when it does occur

		Relative humidity, %																			
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Dry bulb temperature, °F	60	59	59	59	59	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60
	62	60	60	60	60	60	61	61	61	61	61	61	61	61	61	61	62	62	62	62	62
	64	61	61	61	61	62	62	62	62	62	62	63	63	63	63	63	63	64	64	64	64
	66	62	62	62	62	63	63	63	63	64	64	64	64	64	65	65	65	65	65	65	65
	68	63	63	63	64	64	64	64	65	65	65	66	66	66	66	67	67	67	67	68	68
	70	64	64	64	65	65	65	66	66	66	67	67	67	68	68	68	69	69	69	70	70
	72	65	65	65	66	66	67	67	68	68	69	69	69	70	70	70	71	71	71	72	72
	74	66	66	67	67	68	68	69	69	70	70	70	71	71	71	72	72	73	73	74	74
	76	67	67	68	68	69	69	70	70	71	71	72	72	73	73	74	74	75	75	76	76
	78	68	68	69	69	70	70	71	71	72	73	73	74	74	75	75	76	76	77	77	78
	80	69	69	70	70	71	72	72	73	73	74	75	75	76	76	77	78	78	79	79	80
	82	69	70	71	71	72	73	73	74	75	75	76	77	77	78	79	79	80	81	81	82
	84	70	71	72	73	73	74	75	75	76	77	78	78	79	80	80	81	82	83	83	84
	86	71	72	73	74	74	75	76	77	78	78	79	80	81	81	82	83	84	84	85	86
	88	72	73	74	75	76	76	77	78	79	80	81	81	82	83	84	85	86	86	87	88
	90	73	74	75	76	77	78	79	79	80	81	82	83	84	85	86	86	87	88	89	90
	92	74	75	76	77	78	79	80	81	82	83	84	85	85	86	87	88	89	90	91	92
	94	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
	96	76	77	78	79	80	81	82	83	85	86	87	88	89	90	91	92	93	94	95	96
	98	77	78	79	80	82	83	84	85	86	87	88	89	90	91	93	94	95	96	97	98
	100	78	79	80	82	83	84	85	86	87	88	90	91	92	93	94	95	97	98	99	100
102	79	80	81	83	84	85	86	87	89	90	91	92	94	95	96	97	98	100	101	102	
104	80	81	82	84	85	86	88	89	90	91	93	94	95	96	98	99	100	101	103	104	
106	81	82	84	85	86	88	89	90	91	93	94	95	97	98	99	101	102	103	105	106	
108	82	83	85	86	87	89	90	92	93	94	96	97	98	100	101	103	104	105	107	108	
110	83	84	86	87	89	90	91	93	94	96	97	99	100	101	103	104	106	107	109	110	
112	84	85	87	88	90	91	93	94	96	97	99	100	102	103	105	106	108	109	111	112	
114	85	86	88	89	91	92	94	96	97	99	100	102	103	105	106	108	109	111	112	114	

FIG. 9-4 Temperature-humidity index values. (From Thom EC: Temperature-humidity index values, *Weatherwise* 12:57-59, 1959.)

Heat Balance and How Adaptation Occurs

Heat comes from both internal (metabolic) and external sources. Metabolic heat is generated all the time. Approximately 50% of metabolic heat is generated directly from what is eaten. The higher quality the feed, the less the amount of metabolic heat generated. In ruminants examples of high-quality feed are dense rations with high energy and crude and rumen-no degradable protein.

Additional metabolic heat is generated when an animal exercises. Metabolic heat is dissipated

in most species through sweating. In dogs panting is the principal method of heat dissipation. In cattle on feed the amount of available energy in the diet can be reduced at the times of day when external temperatures are at a peak. For example, the main feeding can be early in the morning, or small feedings can be offered frequently throughout the day.

Severe heat stress is characterized by body temperatures of 107° F (42° C) and above. These body temperatures can occur only if an animal is heat stressed. No diseases will cause body temperatures this high without additional external sources of heat. As heat stress progresses, agitation and refusal to lie down will be seen, which may be followed by confusion, recumbency, and death.

Signs of heat stress in animals are mostly behavioral adaptations to reduce metabolic heat generation and to avoid exposure to external sources of heat. Behavioral adaptations include reduced feed intake, open mouth breathing (except in horses, which cannot normally breathe through their mouths), and seeking water and shade. Hot livestock also crowd around water troughs. Often animals stand in groups in an attempt to reduce the exposure of individual animals to sources of external heat and to stabilize the temperature close to normal body temperature for the animals in the center of the group. Cattle may salivate excessively and attempt to splash their bodies with water, food, or dirt.