Summer Heat Stress

As summer is in full swing heat stress is already influencing the performance observed with livestock. The decrease in livestock performance isn't restricted to ruminants but impacts all livestock operations. In an article published by the American Dairy Science Association in 2003, Dr. St-Pierre and coauthors reported that the average losses due to heat stress were $897 million for dairy, $369 million for beef, $299 million for swine and $128 million for poultry. Five years later with higher feed prices and higher valued end-products (milk/meat/pork/poultry), we can only imagine how inflated those values have become. This article will focus primarily on dairy and beef but many of these principles can carry over to other livestock operations.

The temperature humidity index (THI) needs to be monitored regularly to evaluate what strategies need to be implemented. The figure on the second page shows how temperature and relative humidity influences the THI. When the THI is 74 or below normal conditions occur and livestock aren't suffering from heat stress. From a THI of greater than 74 up to 79, mild heat stress is occurring. From a THI of 79 up to 84 intense stress is beginning to influence the performance of livestock. When the THI reaches 84 or above, severe stress is occurring and emergency measures may be necessary to reduce morbidity/mortality that will occur.

There are several areas that should be evaluated on every livestock operation to assure that proper steps are being taken to abate heat stress.

Water Supply

During the summer water intake can double for ruminants. Making sure they have adequate accessibility to a cool (70-86° F) water supply is critical. Just as critical is to make sure the water supply is clean. Several times a week waters should be checked to make sure they are clean from debris, such as manure or algae.

Shade

Providing sufficient shade reduces the amount of radiant heat livestock receive from the sun. Recommendations range around 6 to 10 feet of shade per animal. Any metal material used to supply overhead shade should either be insulated or high enough not to become a heat generator itself.

Ventilation and cooling

Cooling the animals will greatly reduce the effects of summer heat. Placement of fans and misters is critical to take full advantage of them. Sprinklers or misters should be placed over the feed bunks in combination with fans to create a comfortable environment where cattle eat to maximize feed intake. In dairy free stall barns, additional fans may be place over the free stalls

Working cattle and movement

On feedlot operations, cattle should be worked early in the morning to avoid activity adding to the heat load they are experiencing. This allows cattle to cool back down before the day's sun and heat begin to rise. On dairy operations, make sure the holding area has maximum ventilation with fans and misters/sprayers operating efficiently. As animals are crowded together their own body heat will generate out to other cows next to them creating an additional source of heat stress.

Diet

Ration changes during the summer are critical to maintain optimal performance. Adjusting the forage to concentrate ration has been shown to be

beneficial by increasing the energy density of the diet, although care should be taken not to create acidosis. The use of additional bicarbonate and supplemental fat has successfully been implemented to reduce the chance of acidosis and increase the diet's energy density. Questions have been raised by Dr. Baumgard and coworkers at the University of Arizona on the efficiency of fat metabolism during periods of heat stress. When they compared cows fed diets restricted to the feeding level of cows experiencing heat stress there were several metabolic differences that occurred. Heat stressed cows reduced fat metabolism in favor of glucose metabolism for energy. The hypothesis was that fat metabolism generated more heat of metabolism than glucose, thus the cow's body was regulating metabolism to reduce heat buildup. With the increase in glucose utilization for energy, this has the potential of reducing glucose use for essential nutrients such as vitamin C. Research by Padilla and coworkers at Kyoto University showed a decrease in plasma vitamin C for cow's undergoing heat stress. This deficiency of vitamin C could lead to some of the morbidity and mortality observed in cattle during bouts of heat stress. Supplementation with Bovi-C (rumen bypass vitamin C) will help in maintaining more normal plasma levels of vitamin C. This should help the cow's immune system stay more normal during heat stress conditions.

Additional ration adjustments that need to be reviewed are mineral levels. With increased sweating and panting, minerals are lost at a faster rate than normal. Also, with reduced dry matter intake replenishment of those minerals is reduced. Specific increases have been recommended for potassium (>1.4% of DM), sodium (0.35-0.45% of DM), magnesium (0.35-0.40% of DM) and chlorine (<0.40% of DM). These levels should be checked on a regular basis during heat stress conditions. The other trace minerals in the ration should be evaluated as well. With reduced DMI, supplying adequate levels of Zn, Cu and Mn becomes more critical, as well as anything in the diet that might reduce those minerals' bioavailability. During periods of heat stress the use of organic trace minerals like SQM is more important than ever to keep performance maximized.

Summer heat stress is upon us and now is a good time to review your summer programs. Even at this point in time, there are adjustments that can and should be made to minimize the overall effects of heat stress.

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Temperature Humidity Index (THI)

	Relative Humidity											
F°	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
90	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	96	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	75	76	76
76	69	70	70	71	71	72	72	73	73	74	72	75

Normal | Mild Stress | Intense Stress | Severe Stress

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