RESPONSES OF HOLSTEIN COWS TO HEAT STRESS IN EARLY LACTATION

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TAKE HOME MESSAGES

♦ Heat stress caused a sudden and dramatic drop in the feed consumption of cows whose intakes would otherwise have been steadily increasing.

♦ After three days of heat stress dry matter intake began to recover, which suggested cows were adjusting to environmental conditions.

♦ Changes in milk production lagged, but were not as large as, those in feed consumption.

INTRODUCTION

The feed intake and milk production of dairy cows is reduced during times of heat stress. Heat stress itself is a function of time, temperature, and humidity, because cows rely on water evaporation via sweating and panting to dissipate an excess of heat they have generated metabolically or absorbed from the environment. It is less clear how increased milk production, a result of genetic selection and improved management over the years, has affected the response of cows to heat stress. Even less is known about heat stress in early lactation. Our objective was to study, for a few cows in early lactation, as many of the relevant variables as possible during heat stress in a farm setting.

MATERIALS AND METHODS

Physiological data for Holstein cows that were on or entered another experiment at calving and environmental data were gathered over a 29-day period, from mid-June through mid-July 1998, for Holstein cows that were on or entered another experiment at calving. At least three weeks of data were obtained for nine cows; however, those discussed here are for four cows which averaged 9.5 days in milk when the experiment began.

Body temperature, heart rate, respiratory rate, rumen contraction rate, milk production, and water intake were determined at approximately 6 A.M. and 4:30 P.M. each day. Barn temperature, relative humidity, and local weather station air pressure were also recorded at these times. Dry matter intake and weather station maximum, minimum and mean temperature data were collected daily. Body weight was measured weekly. Barn temperature, relative humidity, and air pressure were used to calculate a heat index for cattle which combines the effects of heat and humidity and was analogous to that reported in the news for humans.
RESULTS AND DISCUSSION

Body temperature closely followed heat index, especially during times of heat stress (Figure 1). This confirmed that the heat index employed was appropriate. Body temperature of a cow normally rises once environmental temperatures above 77 to 79 °F are attained. This was especially true on days when the heat index remained mostly above this range (days 175 to 181).

Dry matter intake decreased rapidly at the onset of heat stress and was only 74 % of its average for the first three days on day 177 (Figure 2). Feed consumption then began to increase again, despite high heat indices over the next four days. It is not clear how cows were able to begin to adjust to the high heat indices; however, the drive to consume additional feed at this point of the lactation cycle would undoubtedly be high.

The decline of milk production during heat stress lagged that of dry matter intake by about one day and its relative depression was less, about 9 % (Figure 3). Like dry matter intake, milk production also began to increase before heat indices declined. The cows were only in their third week of lactation when they were subjected to heat stress; otherwise, their milk production would have been still increasing.

![Graph showing environmental heat index and average body temperature](image)

**Figure 1.** Twice daily environmental heat index and average body temperature.
Figure 2. Twice daily environmental heat index and average daily dry matter intake as a percentage of the first three days, which was 38.6 lb dry matter.

Figure 3. Twice daily environmental heat index and average daily milk production.