EFFECTS OF SICKNESS ON WEIGHT GAIN AND RADIANT ENERGY LOSS IN RECENTLY RECEIVED FEEDER CATTLE[1]

M. F. Spire[2], J. S. Drouillard, and J. M. Sargeant[2]

Summary

Sickness from undifferentiated respiratory disease in recently received feeder cattle reduced weight gain and altered radiant energy loss. Over a 35-day receiving period, weight gains were reduced 26.3% if an animal was diagnosed as sick once and 48.1% if diagnosed sick more than once. Thermal profiles obtained 10 or more days following clinical illness were cooler than profiles of animals never diagnosed as being sick. Our data suggest that respiratory disease alters metabolic activity as evidenced by reduced weight gain and a detectable decrease in radiant energy loss from the body surface.

(Key Words: Infrared Thermography, Sickness, Feedlot Performance.)

Introduction

Respiratory disease is the most costly disease of feeder cattle and remains a major, ongoing concern for health care providers and feedlot operators. Death loss from respiratory disease was estimated to have cost the cattle industry nearly $500 million in 1996. Respiratory disease creates additional economic losses because of drug and vaccine costs, increased labor costs, poor feed efficiency, delayed animal marketing, poor weight gain, and decreased carcass grade. Marked physiological events associated with disease, adaptation to rations, and acute and chronic stresses occur during the early feedlot phase. These events can modify heat loss from the body surface. Scanning the animals with an infrared camera can monitor those changes in body surface temperature. This project was undertaken to evaluate the effects of acute respiratory disease shortly after arrival on animal performance and radiant energy loss after 33-35 days in a feedlot.

Experimental Procedures

A total of 224 British crossbred heifers (average weight 525 lb) was evaluated over a 35-day period for evidence of undifferentiated bovine-respiratory disease. Within 24 hours after arrival, each animal was treated for internal and external parasites; vaccinated against common viral and clostridial diseases; and received a subcutaneous injection of tilmicosin (Micotil®, Elanco Animal Health) at a dosage of 1.5 ml/100 lb body weight. During processing, the animals were sorted into groups of six head each. Cattle were fed a 60% concentrate diet during a 35-day receiving period. Seven days following arrival, the cattle were reweighed and re-vaccinated with a modified live viral product.

Once daily, on days 33-35 following arrival, cattle were thermally imaged using a short-wavelength, infrared radiometer. Based on thermal images, each animal were assigned a thermal score of 1 (coldest) to 4 (hottest). The 3-day average of assigned thermal scores was used as the thermal profile for each animal.

[1]The authors express their sincere appreciation to Steven Hogge, Food Animal Health and Management Center, for all his efforts in support of this project.

[2]Food Animal Health and Management Center, College of Veterinary Medicine.

Cattle were evaluated daily for clinical illness. Animals were assigned a clinical score ranging from 0 to 4 (0=no clinical signs of respiratory disease, 1=mild respiratory illness, 4=moribund), based on clinical signs, including depression, lethargy, anorexia, coughing, rapid breathing, and nasal and/or ocular discharge. Cattle were treated for respiratory disease if they had a clinical score $1 and a rectal temperature of $103.5°F. Animals not meeting those criteria remained untreated and were returned to their home pen. Animals requiring therapeutic treatment received a subcutaneous injection of tilmicosin (Micotil) at 1.5 ml/ 100 lb. Cattle were returned to their original pen following treatment. Retreatment was based upon a continuing clinical score of $1 and rectal temperature $103.5°F and commenced no sooner than 48 hours following initial treatment. It consisted of intramuscular injections of long-acting oxytetracycline (Liquamycin LA-200®, Pfizer Animal Health) at 6 ml/100 lb body weight and tylosin (Tylan 200®, Elanco Animal Health) at 5 ml/100 lb body weight.

Average daily gain and thermal profiles were analyzed as separate outcomes. For each outcome, differences between treatment groups (0, 1, and $2 treatments) were assessed using ANOVA with pen controlled as a random effect.

Results and Discussion

Forty-four percent of the cattle were treated for clinical respiratory disease within the first 35 days after arrival in the feedyard. Eight animals died prior to thermal profiling on days 33-35 and were not included in the analyses. Animals never identified as sick gained 3.16±0.10 SEM lb/day over the 35-day period, whereas animals requiring one or more treatments had a lower average daily gain (P<0.001, adjusted for pen effect). Cattle identified as sick once gained 2.33 ± 0.11 SEM lb/day, whereas those identified as sick more than one time gained 1.67 ± 0.16 SEM lb/day. Individual animal feed efficiency could not be evaluated, because the cattle were fed on a pen basis.

Ambient temperatures during the 3 days of thermal evaluation ranged from 46 to 61°F. Wind speed was calm except on day 2, when it ranged from 10 to 12 miles per hour. No animals were treated in the 10 days before thermal profiling. Animals treated one or more times had reduced average thermal profiles over days 33-35 (P<0.01). Thermal profiles of cattle not identified as sick averaged 2.06±0.07 SEM. Profiles for cattle identified as being sick once averaged 1.78 ± 0.09 SEM vs. 1.71 ± 0.11 for those sick more than once (P>0.05).

Thermal imaging measures the amount of infrared radiation from the surface of an animal, which is an exponential function of surface temperature. The body surface will come to equilibrium with skin temperature in an environment with static ambient temperatures. Heat flows to the body surface and dissipates by conduction, convection, radiation, and evaporation. Skin derives its heat from local circulation and tissue metabolism. Changes in an animal's skin temperature generally result from changes in perfusion of blood vessels, biorhythm, core body temperature, rate of metabolism, and environmental factors.

As evidenced by average daily gain, animal performance was altered significantly following clinical respiratory illness. This alteration in growth may reduce the amount of radiant energy released from the body surface as measured remotely by a thermal imaging unit. Animals having higher overall thermal profiles (warmer body surface) tend to be healthier and gain better. Radiant energy release from an animal, can be used to screen for conditions such as the effects of respiratory disease that may alter metabolism and, therefore, performance.