

# Physiological and Behavioral Changes with Variations in Ambient Temperature and Exposure to Lipopolysaccharides in Cattle

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## Introduction

The objectives of this study were to determine the effects of ambient temperature and lipopolysaccharides (LPS) on biothermal distribution and behavioral activity of calves. Clinical disease diagnoses are often based on the interpretation of body temperatures which may vary with environmental conditions. Further, calf biothermal response following LPS exposure may vary under different ambient conditions.

## Materials and Methods

Three healthy eight-week-old calves were used for this pilot study. Environmental conditions were preselected at low ambient temperature 70°F (21°C; LAT) and high ambient temperature 90°F (32°C; HAT) to simulate mild and moderate thermal stress environments. Each calf was evaluated without LPS (control, CON) and after IV LPS administration (LPS) in each of the environmental conditions (LAT, HAT) to result in four treatment groups: LAT CON; LAT LPS; HAT CON; and HAT LPS. Temperature was measured over each 12 hour study period for all calves using submucosal nasal biothermal sensors (hourly), rectal temperature (hourly), HD thermography (six hours), and rumen telemetry boluses (15 minutes). Accelerometers were attached to the right metatarsus and used to continuously measure behavioral activity.

## Results

The only significant interaction was between ambient temperature and LPS for the nasal passage temperatures. At LAT, nasal passage temperature remained stable following LPS whereas at HAT nasal temperature decreased following LPS administration. Analysis of temperature data revealed significant increases in rectal and rumen temperatures and surface temperature of the cornea, nasal planum, and right nares during the periods of study at HAT compared to LAT. Administration of LPS caused marked, transient increases in rumen and rectal temperatures compared to CON. Accelerometer analysis determined that calves spent more time lying down and less time walking after exposure to LPS compared with CON.

## Significance

The results of this study demonstrate that body temperatures, temperature distribution, and behavior is effected by environmental conditions, and that the expected response to exposure to LPS may differ under these various conditions.

**Keywords:** ambient temperature, lipopolysaccharide, nasal temperature, rumen temperature