**Oral temperature as an indicator of fever in pre-weaned dairy calves**

K. R. K. Gottwald *[1], J. A. A. McArt[1], T. Bhattacharjee[2], T. E. von Konigslow [1]; Department of Population Medicine and Diagnostic Science, Cornell University College of Veterinary Medicine[1], Department of Computer Science, Cornell University [2]

Diarrheal and respiratory diseases pose significant threats to pre-weaned dairy calves. Early detection affords prompt intervention, thereby minimizing disease spread and severity and improving welfare and performance. Change in core body temperature can be an early indicator of illness. In calves, this is typically measured via rectal temperature (RT) which is time intensive, stressful to the calf, and invasive. Our study explored the potential of measuring oral temperature (OT) as an alternative indicator of fever in dairy calves with a goal of informing the design of novel health monitoring sensors. Our prospective cohort study was conducted at a single dairy farm in central New York where calves were housed in indoor group pens of 20 with free access to an automated milk feeder rationing up to 11 L/d of whole milk. Female Holstein calves (n = 150) were enrolled at birth and followed through 28 d of life. Ambient temperature and wind speed were recorded daily to account for environmental conditions (TC-3, ITC, Seneca Dairy Systems). Health scores, OT, and RT were measured at 1, 2, 4, 6, 8, 10, 12, 14, 18, 22, and 28 d. Daily milk intake records were available from the automated milk feeder starting at 5 d. Probe thermometers were used to measure OT (4” probe) and RT (2” probe) in Peak Hold temperature mode until stabilized. Statistics were generated in R. Preliminary findings (n = 121) showed an overall mean OT of 38.6°C ± 0.6 and RT of 39.0°C ± 0.5, with 15.2% of calves having a fever (RT ≥ 39.5°C). There was a strong positive correlation (r = 0.77) between OT and RT. Calves with fever had a mean OT of 39.5°C ± 0.4, and a mean RT of 40.0°C ± 0.4. A receiver operating characteristic curve aimed at identifying a fever via OT yielded an area under the curve of 0.96, with a sensitivity of 94% and a specificity of 92% at an OT threshold of ≥39.1°C. Our results demonstrate the capability to detect a RT fever via OT. These findings indicate that OT might be useful in monitoring health of pre-weaned dairy calves. Future work should assess the associations of OT with disease and inflammation.

**KEYWORDS**

Body temperature estimates
automated health monitoring systems
calf health