

Measurement of rumen motility using a tri-axial gyroscopic bolus

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Rumination monitoring in dairy cattle is becoming increasingly important as a means to identify welfare events such as the onset of calving or the early onset of illness such that appropriate interventions can be made. Several approaches have been adopted including the use of accelerometer based collars where the neck motions experienced by the accelerometer are interpreted to identify eating and rumination events. This study reports initial trials of a rumen motility bolus containing a tri-axial accelerometer and a tri-axial gyroscope to determine the feasibility of measuring the frequency and amplitude of rumen contractions in ruminants. The bolus recording were made over a 5 day period. Motility sensor boluses were placed in the cranial ventral sac of the rumen in 4 Jersey cows with ruminal canulae. The cattle were house housed indoors in a straw yard and fed hay ad libitum, with 300 g lightly roller-milled barley grain fed to each cow at 08:00 h and 15:00 h each day.

Data from the rumination boluses were processed to identify the duration and time between rumen contractions. During rumination periods the time interval between contractions was generally longer, around 60 seconds with typical contraction durations of 10-11 seconds. The contraction events were observed to clearly align with points in the collar measured signatures where the mastication process stops and a fresh bolus is regurgitated (see Figure 1 below). The rumen motion frequency increased during eating periods with a typical contraction rate being 1 every 40 seconds.

The study has identified that the rumen motility bolus is clearly measurable using accelerometer and/or gyroscopic sensors. The information derived from the sensor correlates well with collar based measurements and provides an additional sensor modality that can provide an insight into animal welfare.

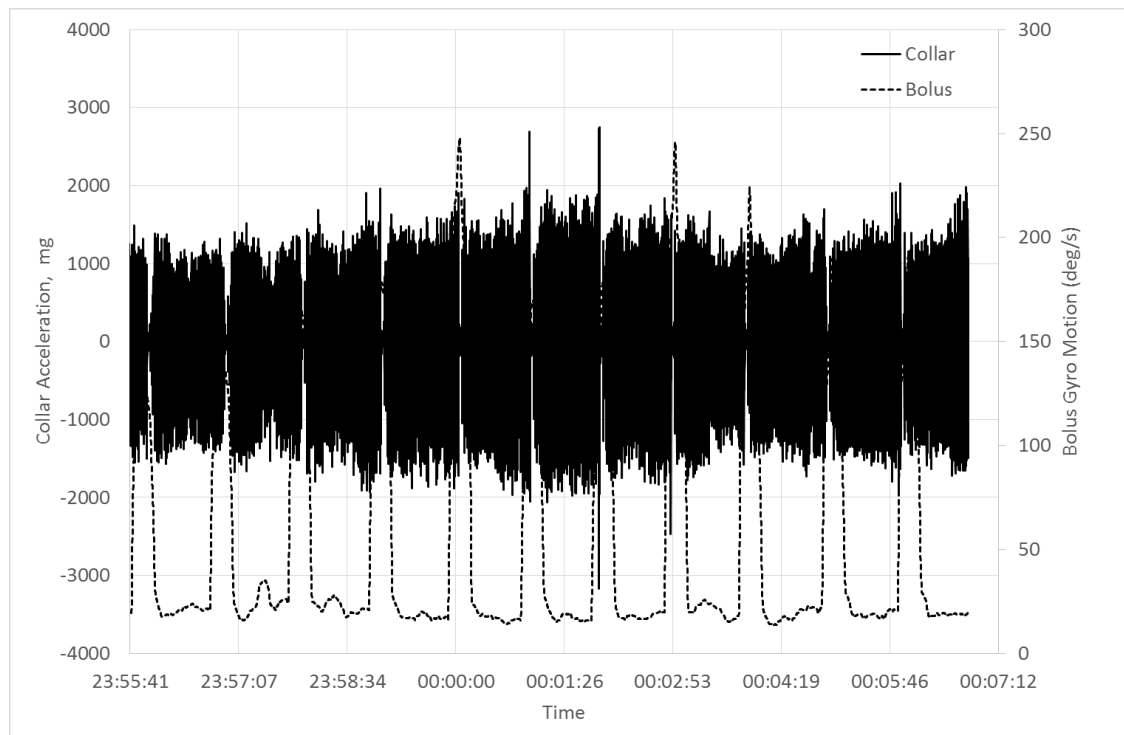


Figure 1: Collar Acceleration Measurement and Bolus Contraction over 10 minute period.

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