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**Evaluation of Kahne rumen sensors in
fistulated sheep and cattle under
contrasting feeding conditions**

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Abstract

The Kahne rumen sensor (bolus) is a device developed to measure temperature, pressure and pH in non-fistulated animals. This bolus allows real-time monitoring of the rumen environment, which could help preventing health problems such as rumen acidosis in cows. It is less invasive to use boluses compared to other technologies that measure the ruminal pH (e.g. rumenocentesis). Kahne boluses and transceivers are commercially available in the market.

Several studies on the relationships between data recorded by the bolus and actual data recorded by independent devices were conducted. The bolus temperature and pressure were compared with actual temperature and pressure under controlled conditions. The pH drift was studied by comparing the difference between bolus and direct measurement over time. The capture of the data was calculated for each bolus in various experiments to examine the factors affecting the data capture rate of the boluses. Animal to animal variation was studied using boluses in a group of cows fed and managed under uniform conditions. An animal experiment involving fistulated cows eating two different diets was performed using boluses to monitor the changes of ruminal pH.

There was no apparent interruption to normal animal behaviour as a result of using boluses. Regression relationships between bolus measurements and actual data for both temperature and pressure were developed and used for calibration of bolus data. The pH drift was a problem, as the regression relation between the pH difference and the time for one bolus from one experiment could not represent this bolus on other experiment. The data capture rate on the hourly basis ranged from 0 to 100%, but was usually between 30 to 70%. The data capture rate was affected by many factors and further studies to identify these factors are needed. A study of animal to animal variation suggests that in a comparison of 2 treatments, a minimum 3 cows per group would be required to detect the standard deviation of 0.11 for a pH difference of

5% of the mean (approximately 0.35 pH units). Seventeen cows per group would be required to detect the standard deviation of 0.33 for the same difference. The boluses effectively monitored the ruminal pH change in cows eating two different diets and the profile of change of pH was successfully analysed. Feeding 7.6 kg baleage twice a day cause pH to decrease at 0.009 pH units per minute during feeding, while offering a similar quantity of grass and hay once a day resulted in a decrease of 0.0009 pH units per minute during feeding. The beginning of pH increase was about 1 hour following feeding and continuous during resting and rumination. The level of pH increase did not differ significantly for two diets..

The Kahne devices appear to have advantages compared to other technologies for the measurement of parameters of the rumen environment on a real-time basis. Boluses are especially good at intensively monitoring the temperature, pressure, and pH in the rumen. The major limitations of this technology to be used are the data capture rate and the pH drift. By improving the limitations found in the experiment, the Kahne rumen sensor could become very useful for both scientific research and under commercial conditions for monitoring animal health.

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