Rich information in the acoustic signals from feeding and grazing in ruminants

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Introduction Because of their impact on productivity and the environment, feeding behaviour, ingestion and rumination are critical to understand intake in grazing ruminants. Many systems, mainly mechanical, have been developed to measure ingestive behaviour. However, these systems have problems, including mechanical failure and the inability to distinguish between the complex jaw movements of prehension and ingestion (Laca *et al*., 1994). The sounds generated by these behaviours are rich in information that holds potential not only to distinguish and count behaviours, but also identify aspects of the nature of the foods ingested.

Materials and methods Steers and sheep were fed dry or fresh leaves or stems of lucerne or 'grasses'. All sounds were recorded using wireless microphones (Nady 155 VR, Nady Systems, Inc., Oakland, California) protected by rubber foam, placed on the animal's forehead and fastened to a halter where the transmitter was attached. Sound was recorded on the sound track of a VHS video recorder. Comparison of sound with recorded visual observations allowed objective matching of behaviours and sounds.

Results Prehensile manipulative movements, bites and bite chews were distinguished easily in both cattle and sheep and were similar in waveform between animal species. Sound intensity, silence/chew and time/chew differed between hay and fresh lucerne. Regardless of plant part consumed, chewing sounds were louder, shorter and more frequent for fresh than dried lucerne. The amount of energy flux density in the chewing sound/unit of NDF consumed had a significant interaction between food type and plant part ($P \leq 0.036$). The value for hay leaf was significantly lower than for fresh stem, or for leaf and dried stem, confirming the conclusion of Galli *et al*. (2003) that fresh tissues produce sounds that are related to free water present in cells.

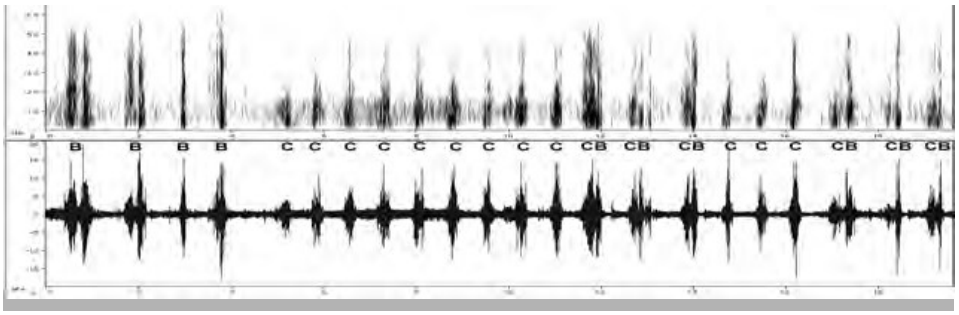

Figure 1 Spectrograph and waveform of grazing behaviour by an animal exhibiting bites (B), chews (C), and compound jaw movements (CB)

Conclusions Sounds produced in the ingestive process can be recorded accurately and simply to distinguish between ingestive bites and other types of jaw actions that other systems cannot distinguish. These sounds be used as the basis for a more accurate way to monitor feeding behaviour, particularly in free-ranging animals. The sounds generated in feeding, ingestion and rumination have rich patterns that may have potential for telemetric monitoring of dietary aspects of intake in grazing animals.

References

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