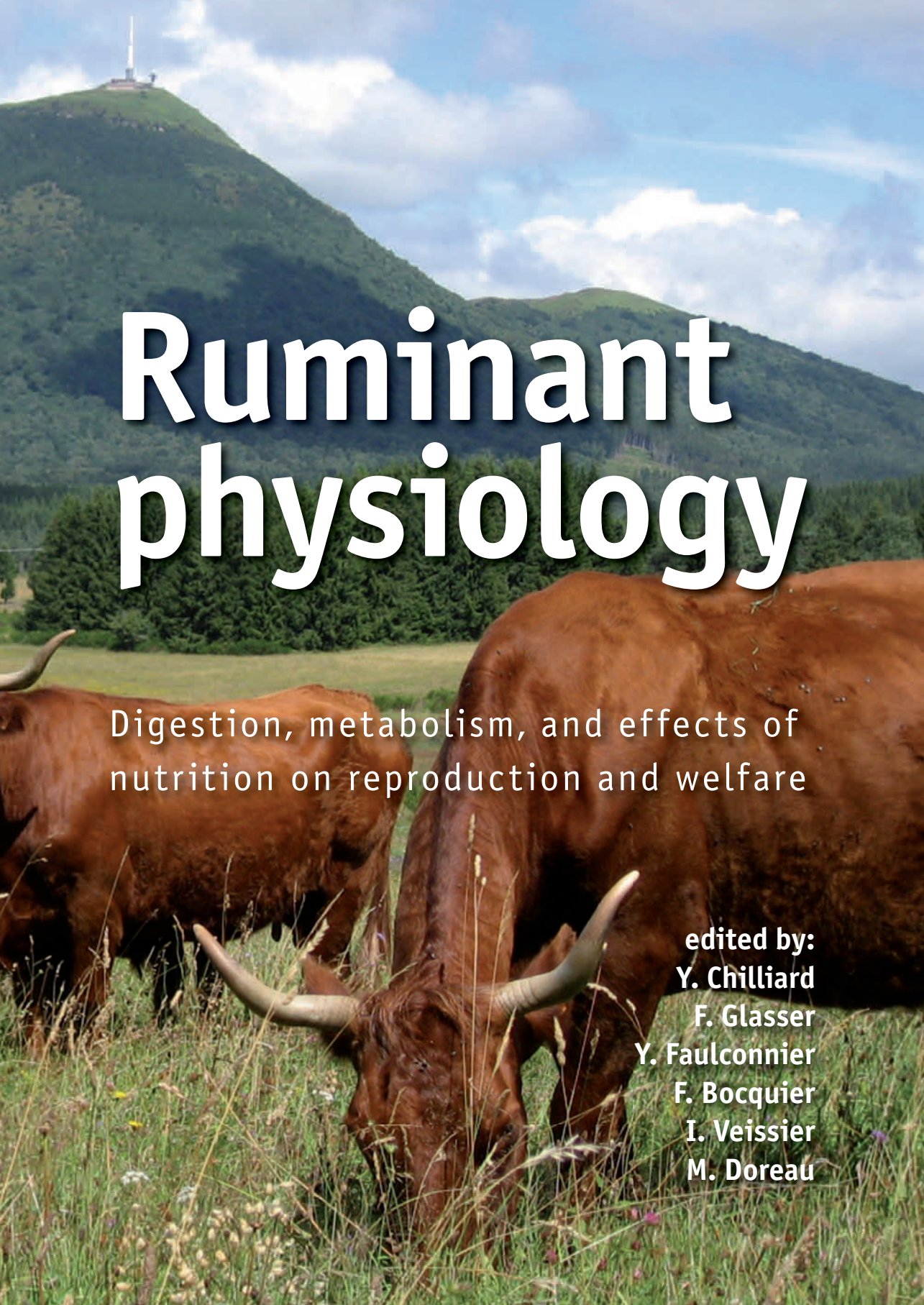

Ruminant physiology

Digestion, metabolism, and effects of nutrition on reproduction and welfare

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Novel technique for tracing ingestive and ruminative behaviours

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Introduction

Eating and/or rumination are sequential processes. Eating is initiated by prehending feed, followed by mastication to form a bolus, and swallowing to cease the activity. Rumination begins with aspiration or regurgitation of the ingested bolus, re-swallowing the liquid and fine materials, re-mastication of the rough materials, and finally re-swallowing of the finely ground regurgitated bolus. Clearly identifying ingestive and ruminative behaviors would help to determine and predict how feed quality, palatability, diet selection, and feed intake of ruminant livestock are interrelated (Beauchemin and Iwaasa, 1993; Suhubdy, 2002). Past research to measure ingestive and/or ruminative behaviours relay on tracing only the pattern of movements of the jaw during eating and/or ruminating (Beauchemin *et al.*, 1989; Gordon, 1995). However, the limitation of tracing only the pattern of jaw movement cannot capture and distinguish when swallowing occurs. A limited effort has been done to distinguish the behaviour of swallowing (Suhubdy *et al.*, 1999; Suhubdy, 2002). This paper depicts the traces of jaw and laryngeal movements during eating and rumination and describes the importance of traces for identifying eating and ruminating behaviours of ruminants.

Material and methods

Four 2-3 year old Merino whether sheep were used in this trial. The sheep were kept indoor and fed a basal diet consisting of 700 g alkali-treated bagasse pellets (91% DM, 1.68% CP, and 70% NDF) and 300 g of cottonseed meal (90% DM, 38.59% CP, and 32% NDF). Drinking water and mineral lick were available at all times. A sensitive and robust *Suhubdy-collar* sensor was used (Suhubdy *et al.*, 1999; Suhubdy, 2002). For capturing the jaw and laryngeal movement patterns during eating and rumination, two similar sensors were attached to each sheep. Each sensor was connected to the Neotrace chart recorder (Neomedix System Pty Ltd., Sydney, Australia) and analogical signals were recorded on chart paper.

Results

Figure 1 shows the traces of jaw and laryngeal movement patterns during eating (A) and ruminating (B). It was observed that the laryngeal movement patterns were consistent when eating and ruminating. Patterns were consistent except when swallowing, which shows amplitudes. Jaw movement patterns were different during eating and ruminating activities. During eating, there were two types of patterns expressing the event of nibbling and mastication ingested feed. Sheep use their lip when prehending and nibbling patterns were short in amplitude and faster in rates. When masticating, sheep used their molars to grind the feed and patterns were higher in amplitude and consistent in rates. In addition to rumination, the jaw movement patterns were consistent in amplitude. Since swallowing is the end process of eating and ruminating activities, the inclusion of the measurement of laryngeal movement patterns could give more meaning to the jaw movement patterns since they were not shown in the measurement of eating and ruminating behaviour using only a jaw movement indicator.

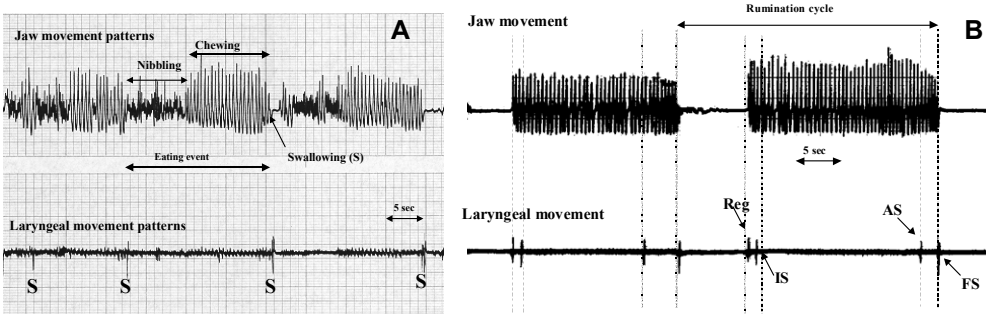

Figure 1. A combined jaw and laryngeal movement patterns during eating (A) and ruminating (B). The letters S, AS, FS, IS, and Reg denote swallowing, additional swallowing, final swallowing, immediate swallowing, and regurgitation.

Conclusion

Simultaneously capturing the pattern of jaw and laryngeal movements using two sensors allowed us to clearly identify the eating and ruminating behaviours of sheep and/or other ruminants. For long research observation, we need to develop a data logger that can record data for 24 h measurements.

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