Current and future prospects for the automatic recording and control of ruminant foraging on farms

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Precision technologies are used on many commercial dairy farms to aid cow management. This paper reviews the potential for the on-farm, automatic monitoring and control of feeding-related behaviour. As well as being useful for feed management, changes in feeding-related behaviour can also be used for oestrous and disease detection. On-farm rumination monitoring systems are already in use, based on either acoustic monitoring via neck-mounted sensors or using ear-mounted accelerometers. Research has shown that neck or halter mounted accelerometers can estimate when cows are eating, and this applies whether they are eating a total mixed ration (TMR) or grazing at pasture. Although head- and neck-mounted accelerometers can also estimate herbage intake in grazing cattle, the precision and range of foraging related data collected could be enhanced through the addition of bioacoustic monitoring. This latter approach involves the analysis of the sound generated during grazing and can be used to determine bites, chews and chew-bites. The energy density of the sound of chewing is also proportional to bite mass, and sound analysis also has the potential to estimate herbage quality and plant species consumed. Technology also has the potential to control access to feed, and could be used to optimise grazing management e.g. opening a remote-release gate once a paddock has been grazed to the optimal sward height. Technology could also facilitate diet selection in cattle that are normally fed a TMR. Research has shown that grazing sheep and cattle appear to select a diet that optimises their own efficiency of nutrient capture, albeit in a situation for which they have evolved an appropriate 'nutritional wisdom'. However, cattle given ad lib access to concentrate feed will often eat to excess resulting in acidosis. The current commercial solution to this problem is to ensure the fine mixing of the ration, but this removes the animal's ability to select its own diet, potentially reducing welfare through frustration. The automated control of gates giving access to different feed components could be linked to rumen pH monitoring and intake measurement to provide a technological solution to facilitate diet selection whilst protecting against nutritionally unwise choices.

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