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Combining an active transponder system with sprayed *n*-alkanes to quantify investigative and ingestive grazing behaviour of dairy cattle in pastures treated with slurry

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Abstract

This paper explores the interaction of grazing pregnant dairy cattle (lactating and non-lactating) with contaminated pasture. Behavioural responses were divided into investigative and ingestive grazing events. Patches of sward were artificially contaminated with slurry (containing faeces and urine) and were used to test the behavioural interactions; faecal collection bags ensured no further contamination occurred throughout the two 1-week periods of the experiment. Investigative behaviour was quantified using an active transponder system with aerials buried around the contaminated patches. Ingestive behaviour was quantified using *n*-alkane markers sprayed on the contaminated patches. The cattle preferentially grazed the uncontaminated sward and this created a trade-off between the non-contaminated and contaminated areas. There was a large variation between cows in both investigative and ingestive behaviour, consequently the effect of physiological state was not significant ($P > 0.05$). As the proportion of faecally contaminated to uncontaminated pasture increased, there was a significant ($P < 0.05$) increase in investigative activity as quantified by both the total number and total duration of contacts in contaminated patches. The changes in proportion of contaminated to uncontaminated sward resulted in a greater proportion of contaminated sward selected in the diet on day 4 than day 1. The results from this study demonstrate investigative and ingestive

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behaviour can be reliably quantified by combining an active transponder system with sprayed *n*-alkanes, thus providing a useful tool for future studies.

Keywords: Cows; Foraging behaviour; Grazing selection; *n*-Alkanes; Patch selection; Selection behaviour; Transponder; Visual cues

1. Introduction

Selection of individual sward components by grazing herbivores can influence animal performance through variation in both the quality and quantity of ingested forage material (Wilmshurst et al., 1999; Distel et al., 1995; Fryxell, 1991). An example where this process has important economic implications is the development of rejected areas associated with faecal contamination of dairy pastures (Marsh and Campling, 1970). Faecal contamination initiates grazing avoidance due to smell (Aoyama et al., 1994; Dohi et al., 1991; Entsu et al., 1992), the grass in the ungrazed patches become taller relative to the grass in the rest of the paddock. The taller patches provide grazing animals with an opportunity to achieve a higher intake rate through increased bite mass (Penning et al., 1991). Therefore faecally contaminated patches offer potential grazing benefits and are visually more obvious for the grazing animal. However, the patch has unattractive olfactory properties and detrimental health effects as a potential source of gastrointestinal parasites (Hutchings et al., 2000). Although faecal avoidance and subsequent development of rejected areas has been documented (Black and Kenney, 1984; Arnold, 1987; Hutchings et al., 1998; Hutchings et al., 1999; Marsh and Campling, 1970), the mechanisms that initiate and determine the degree of avoidance are not well understood. In this paper we explore whether investigative and ingestive behaviour can be quantified using active transponders to quantify the frequency and duration of a contact and a sprayed marker to quantify intake.

An active transponder system has successfully been tested for grazing behaviour work (Swain et al., 2003) and used to study grazing animal activity at badger and rabbit latrine sites in relation to disease transmission (Daniels et al., 2001; Hutchings and Harris, 1996; Hutchings and Harris, 1997). *n*-Alkanes have been successfully used to measure the intake and diet selection of grazing herbivores (Dove and Mayes, 1996). While such an approach provides a powerful tool for dietary selection studies involving different species (and selection of various plant parts) its use is limited when the herbage is homogeneous in terms of alkane profile. Duncan et al. (1999) demonstrated that reliable estimates of dietary proportions could be obtained when herbage sprayed with even-chain alkanes was offered to sheep indoors, while Ciavarella et al. (2000) successfully utilised the technique under field conditions to estimate diet choice.

The objective of this study was to quantify individual dairy cow grazing decisions using a combination of active transponders and sprayed *n*-alkanes. More specifically it aimed to differentiate between investigative and ingestive behaviour associated with faecally contaminated swards. The experiment tested the hypothesis that there were no statistically significant differences in either investigative or ingestive behaviour between a group of late lactation and non-lactating dairy cows. Transponder data provided information relating to the searching strategies and alkane data provided information relating to grazing events. An evaluation of the relationship between the *n*-alkane and active transponder data provided a method for exploring behavioural selection by individual grazing dairy cows.