Conditioned feeding responses in sheep to flavoured foods associated with sulphur doses

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The development by ruminants of strong conditioned flavour aversions (CFAs) to foods associated with the administration of LiCl has demonstrated their potential to avoid feeds that cause negative postingestive consequences (Launchbaugh and Provenza, 1994). Weaker CFAs are formed when they ingest foods with the detrimental secondary plant compound, oxalic acid (Kyriazakis *et al.* 1997). Moreover, animals may exhibit conditioned preferences (CFPs) for foods supplying appropriate amounts of nutrients such as nitrogen (Provenza, personal communication). In this study we tested whether sheep were able to form CFAs or CFPs to foods that were associated with increasing availability of sulphur (S).

Sheep were conditioned to associate orange-flavoured or aniseed-flavoured food (oaten chaff, flavour inclusion rate 0.75%: wt) with a particular dose level of S (3, 6, 9 or 12 g S in 250 ml water administered intra-ruminally 1 h after commencement of feeding) or with 250 ml of water without S. Each conditioning period lasted for 8 days and was repeated three times. At the end of each conditioning period preference for the two flavoured foods was measured by a two-choice, 20-minute preference test. Lucerne pellets were fed as the basal food prior to and between test days. Sheep were randomly allocated to one of the four S-dose treatments (n=12) and within treatments to one of four groups (n=3) as outlined in Table 1.

Aversion ratios (intake of flavoured chaff associated with the S dose / total intake of flavoured chaff during the preference test) were calculated to test treatment effects. Sheep formed a CFA to the flavoured feeds associated with the sulphur doses ($p<0.01$). Reinforcement through repeated exposures lead to stronger CFAs ($p < 0.0 1$) (Table 2.).

There was no evidence of a preference for any of the S associated diets as all apparently resulted in an oversupply of S, due possibly to high levels in the lucerne pellets (5.3g/kg DM). These results extend the concept of the development of CFAs to foods associated with LiCl (an artificial toxin), to the development of CFAs to potentially toxic levels of normal feed nutrients.

References

Kyriazakis, I., Papachristou, T.G., Duncan, A.J. and Gordon, I.J. (1997). Mild conditioned food aversions developed by sheep towards flavours associated with plant secondary compounds. *Journal of Chemical Ecology* **23**, **727-746.**

Launchbaugh, K.L. and Provenza, ED. (1994). The effect of flavour concentration and toxin dose on the formation and generalisation of flavour aversions in lambs. *Journal of Animal Science 79,1* O-13.

Table 1 Schedule for one conditioning period offering a unique combination of flavoured feed and sulphur dose to four groups of sheep (n=3) within a treatment (S+ = sulphur dose, S- = water dose).

Day	Group 1	2	3	4
1	Aniseed/S+	Orange/S-	Aniseed/S-	Orange/S+
2	Aniseed/S+	Orange/S-	Aniseed/S-	Orange/S+
5	Orange/S-	Aniseed/S+	Orange/S+	Aniseed/S-
6	Orange/S-	Aniseed/S+	Orange/S+	Aniseed/S-
8	20-min preference test			

Table 2 Mean aversion ratios for sulphur-associated flavoured feed, during short-term preference tests at the end of each conditioning period (SED = standard error of difference)

	Sulphur dose (g S)					
Conditioning	**3**	**6**	**9**	**12**	**Mean**	**SED**
1st	0.341	0.327	0.306	0.393	0.341	0.077
2nd	0.267	0.319	0.188	0.222	0.249	0.069
3rd	0.281	0.334	0.175	0.152	0.235	0.067