

FLAVOUR ASSOCIATIONS BY SHEEP PROVE DIFFICULT TO EXTINGUISH

J. HILLS^A, G.N. HINCH^A, J.V. NOLAN^A, I. KYRIAZAKIS^B and J. DE MEULDER^A

^A Department of Animal Science, University of New England, Armidale NSW 2351, Australia

^B Genetics and Behavioural Sciences Department, Scottish Agricultural College, Edinburgh, EH9 3JG, UK

Animals form associations between attributes of food and their positive or negative post-ingestive consequences, which help animals select foods that meet nutritional needs and avoid toxicosis. The most important food attribute is flavour (taste plus odour). Although animals learn to eat for nutritional consequences rather than flavour (Burritt and Provenza 1992; Forbes and Kyriazakis 1995), under some circumstances flavours appear to condition preferences and aversions independently of the nutritional value of the food. Association of a particular flavour with recovery from illness (Zahorik and Bean 1975) or the supply of energy (Villalba and Provenza 1997) will lead to a strong preference for that flavour which is difficult to extinguish. Similarly, a flavour that has been associated with a strong negative post-ingestive effect will lead to a strong conditioned aversion that could also be difficult to extinguish. Hence if that flavour is then used in a second experiment, the results could be confounded by the results of the previous experiment.

We have examined this hypothesis in sheep using aniseed and orange flavours in two consecutive experiments. Initially, two diets of oats chaff differing only in the added flavour were both offered to 32 crossbred ewes for 10 minutes to determine flavour preference. The ewes were then made averse to either aniseed or orange flavoured food in three conditioning periods during which one of the flavoured foods became associated with toxic levels of a sulphur (S) dose and the other became associated with water (Expt 1). Flavour preferences were recorded in 20-minute, two-choice preference tests at the end of each conditioning period. Four weeks later another 10-minute flavour preference test was performed using aniseed and orange flavours added to barley chaff. In Expt 2, the ewes were re-randomised and one or other of the flavours was again associated with high levels of sulphur during three conditioning periods. Preference was evaluated from the amount of aniseed flavoured chaff ingested as a proportion of total aniseed plus orange chaff intake (A/A+O) during the 10 and 20 minute preference tests and was analysed using Spearman rank correlations.

There was no rank correlation (r_s) between the first 10-minute flavour preference test and any later test in either experiment. That the animals' rankings changed would indicate that flavour preferences, conditioned by S, changed after the first conditioning period of Expt 1. There were significant rank correlations between the three conditioning periods of Expt 1 (1 and 2 = 0.73 and 2 and 3 = 0.89, $P < 0.001$). This was expected because the conditioning periods only reinforced the S-flavour association. When flavour preference was tested in a neutral feed one month after the completion of Expt 1, there was little change in the S-flavour association that was present at the end of the third conditioning period of Expt 1 ($r_s = 0.57$, $P < 0.01$). A significant rank correlation between the second 10-minute preference test and the first conditioning period of Expt 2 ($r_s = 0.61$, $P < 0.001$) indicated that the new S-flavour associations did not completely extinguish S-flavour associations from Expt 1. This conclusion is reinforced by the significant rank correlation between the results of the last preference test in Expt 1 and the last in Expt 2 ($r_s = 0.65$, $P < 0.001$).

These results indicate that associations between a flavour and post-ingestive consequences can occur. They can also be retained for extended periods and influence the formation of new associations. This may explain why some animals could fail to select appropriate combinations of foods in two-choice selection tests in which the same flavours are used in consecutive experiments.

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