

CHOLINE INTAKE AND METABOLISM IN SHEEP

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The main source of choline for sheep nutrition is choline present as phosphatidylcholine in pastures. Pasture phosphatidylcholine may be utilized directly by ruminal protozoa, but virtually no free choline is present in the rumen (Broad and Dawson, 1976). Neill and Dawson (1977) showed that free choline in the rumen is rapidly converted to trimethylamine and methane. Preliminary work had suggested dried pastures contained considerable amounts of free choline and this raised the question of the adequacy of choline intake for sheep on such pastures.

Choline was determined by a specific radio-enzymic method using choline acetyltransferase (Snoswell and Mann, 1978) on lipid and aqueous layers of a Folch lipid extraction of dried pastures. Choline synthesis and breakdown was examined in isolated sheep hepatocytes using [methyl-³H]-methionine and [1,2-¹⁴C]-choline and measuring radio-activity in products after lipid extraction and thin-layer chromatography.

The results presented in Table 1 indicate that in dried wheaten hay 90% of the choline is present in the aqueous extract (as free choline). This is in direct contrast to fresh pastures where virtually all choline is present as phosphatidylcholine. The release of free choline is presumably due to the action of phospholipase D in the pastures.

TABLE 1. Choline in dried wheaten hay following Folch lipid extraction

	(μ mole/Kgm)
Aqueous layer (free choline)	517 \pm 9 (5)
Lipid layer (phosphatidylcholine)	63 \pm 4 (5)

Studies with isolated sheep hepatocytes showed the ratio of incorporation of label from [1,2-¹⁴C] choline into betain~~e~~phosphatidylcholine was 0.84, in contrast to a figure of 26 for rat hepatocytes. These results suggest that sheep liver degrades choline at a considerably lesser rate than rat liver. Further biosynthesis of choline by the methylation pathway was very much reduced in hepatocytes from diabetic sheep compared with those from normal animals.

Collectively these results suggest that sheep fed on dried pastures receive a marginal choline intake and in times of metabolic stress, with associated depressed food intake, may well become choline deficient.

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