

NATURE AND DISTRIBUTION OF PHOSPHORUS IN RUMEN DIGESTA OF SHEEP

J.C. WADSWORTH*

Although the phosphorus in phytic acid, a major P compound in plants, is readily available to ruminants, it is not known if the P in other organic compounds (PO) is well digested (Playne, 1976). Since availability of dietary P presumably depends on conversion to inorganic form (PI) before reaching the absorption sites in the small intestine, I determined the nature of P in liquid and solid phases of rumen digesta from sheep in preparation for studies of the kinetics of P digestion and absorption.

Three mature, crossbred wethers, each fitted with a rumen fistula, were fed pelleted lucerne hay at 3 hr intervals (712 g DM/24 hr; 0.17% P). Digesta samples were filtered through nylon gauze and the solid residue washed with 0.9% saline. A particulate fraction was separated from the filtrate by centrifugation at 21000g for 15 min. The washed solids were extracted with 0.2N HCl for 2-4 hr at room temperature before being dried and ignited. The separated fractions were treated with trichloroacetic acid (final concentration 5%, w/v) and filtered. Coloured samples were treated with acid-washed charcoal before determination of PI by the molybdenum blue reaction. Total P, Ca and Mg was determined after digestion with nitric-perchloric acid (Ca and Mg by atomic absorption spectrophotometry).

Distribution of P between soluble and particulate phases of rumen digesta is shown in Table 1. The P in clear rumen fluid was largely PI (PO, 3-23%). Composition of the particulate fraction was variable (PI, 9-64%; acid soluble PO, 5-13%; acid insoluble PO, 31-78%). Acid extracted 85% of P from washed rumen solids. The (Ca + Mg)/P and Ca/Mg ratios (molar basis) in the latter extract were 1.45 and 8.3, respectively.

TABLE 1. Distribution of phosphorus in rumen digesta from sheep (mg P/kg digesta).

Sheep No.	1	2	3	Mean
Clear fluid	456	366	560	461
Particulate fraction	145	123	463	244
Washed solids	154	571	923	549
Acid insoluble P (all fractions)	205	Not Done	294	-

After intravenous injection of ^{32}P in one sheep, radioactivity appeared rapidly in all fractions of rumen digesta. Comparison of specific activities suggested that at least two thirds of the PI in both rumen liquor and washed rumen solids was of endogenous origin. The results suggest that two thirds of the soluble P in the rumen came from saliva and that most of the P associated with solids in the rumen was precipitated $\text{Ca}_3(\text{PO}_4)_2$.

PLAYNE, M.J. (1976). Reviews in Rural Science No. 3. Ed. G. Blair (University of New England Publishing Unit: Armidale). In press.
*C.S.I.R.O., Division of Animal Production, Prospect, N.S.W., 2148.