gently on adequate detail and documentation in publications in which experimental diets are used.

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The effect of restricted intake of a barley diet on rumen fermentation in cattle. By J. MARGARET EADIE, J. HYLDGAARD-JENSEN, S. O. MANN, R. S. REID and F. G. WHITELAW, *Rowett Research Institute, Bucksburn, Aberdeen, AB2 9SB*

All-concentrate diets based on barley are frequently given *ad lib.* to cattle and are known to result in high concentrations of volatile fatty acids (VFA) and high molar proportions of propionic acid in rumen contents. The low pH encountered under these conditions prohibits the establishment of rumen ciliate protozoa (Eadie, Hobson & Mann, 1967). The same diet given in amounts below appetite has now been shown to alter conditions within the rumen and to favour the establishment of ciliates.

Three 8-month-old heifers were changed gradually from a diet of equal parts of hay and barley cubes to one consisting entirely of barley cubes and protein supplement and were maintained on this latter diet for up to 52 weeks. Food intake was restricted and given in three equal feeds. Rumen samples were obtained *per fistulam*. The animals were then given the same diet *ad lib.*

On changing to the restricted barley diet the rumen ciliates initially present in all three heifers after some fluctuation reached very high and fairly stable population levels (up to $3{\cdot}3 \times 10^6$ organisms/ml) which were associated with a higher proportion of butyrate relative to propionate in the rumen VFA than is normally found on all-grain diets. Typical values for ciliate numbers, rumen pH and VFA at the restricted and *ad lib.* levels of intake are shown in Table 1, together with values obtained from one animal at a point on restricted intake when the ciliate population was unusually low.

Table 1. *Rumen ciliate numbers, pH and VFA in three heifers given restricted and* ad lib. *intakes of a barley diet*

Animal no.	Total ciliates ($\times 10^{-3}$/ml)	pH	Volatile fatty acids (molar %)			
			Acetic	Propionic	Butyric	'Higher'
Restricted feed intake (5·1 kg/day)						
794	1773	6·1	64	12	24	—
795	1767	6·4	59	18	23	—
832	2550	5·9	62	15	23	—
	18	5·5	52	41	7	—
Ad lib. feed intake (9·1–9·9 kg/day)						
794	None	5·2	34	46	14	6
795	None	5·0	35	58	6	1
832	None	5·4	34	44	15	7

Anaerobic cultures showed that species of *Bacteroides* were the predominant bacteria present during both restricted and *ad lib.* feeding. These appeared in Gram-films as two pleomorphic forms—mainly coccal in the presence of ciliates and rod-like during *ad lib.* intake.

Similar observations were made when two steers were changed from *ad lib.* to restricted intake and given an inoculum of rumen ciliates.

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Preliminary communication on studies of the digestive processes in pigs with intestinal cannulas. By R. BRAUDE, H. L. BUTTLE, F. HORSZCZARUK* and A. W. MYRES, *National Institute for Research in Dairying, Shinfield, Reading*

The use of intestinal cannulas has been found to facilitate the study of digestive processes in the living pig and to allow repeated observations on the same animal. One or two single cannulas, and one or two re-entrant cannulas were fitted into the small intestines of pigs weighing 60–100 kg. Preliminary observations were reported on the passage of the digesta, and particularly of nitrogen and polyethylene glycol (PEG) which was used as a marker. Movement of the digesta during the interval between two feeds showed two marked peaks, but very considerable variation between replicates from the same animal was observed. PEG was found unsatisfactory for tracing the passage of nitrogen, as it appears to leave the stomach faster than the solid material.

The influence of meat meal and other high-protein feeding-stuffs on the survival of chicks inoculated with *Salmonella gallinarum*. By R. HILL, *Royal Veterinary College, University of London*

The influence of level of dietary protein on infectious disease has been studied by a number of workers, often with conflicting results. Hill, Colburn & Schneider (1962) showed that certain substances other than protein, present in the diet, could modify the protein effect, and recently it became evident that the source of protein also influenced the result (Hill & Smith, 1969).

In the experiments described here the total protein contents of the diets were similar, about 20%, and near to the level recommended for chicks (National Research Council, 1966). For each diet one high-protein feeding-stuff was mixed with wheat-meal and an appropriate supplement of minerals, vitamins and amino acids to permit reasonably good growth in control chicks. From day-old to 12 days all chicks were

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