coefficient, and if there were a constant amount of it in the body, then the concentration in the aqueous phase would be higher the less fat was present, and vice versa. If the hypothalamus responded to the substance (as it appears to do to some steroids) by calling for increased food intake and possibly decreased energy expenditure, a feedback system would exist which would tend to stabilize body fat content; and in so doing to equalize energy intake and output. There is at present little evidence to show whether this is the mechanism used by the body; it is, however, suggested that some hitherto unconsidered mechanism must exist to account for the observed properties of energy balancing.

**Protein content of the diet and food intake in steers.** By M. KAY, N. A. MACLEOD and A. MACDEARMID, *Rowett Research Institute, Bucksburn, Aberdeen AB2 9SB*

In trials in which concentrate diets were given to appetite we found that diets containing 14% crude protein in the dry matter promoted greater food intakes and faster growth rates than those containing 11%. The two experiments described below were made to determine whether the difference in growth was entirely a consequence of that in food intake.

In the first, seven pairs of Friesian steers were used in a double reversal trial to compare the effects on growth rate of diets containing either 11% or 14% crude protein in dry matter but rationed so that equal amounts of calculated metabolizable energy (ME) were consumed daily. In the second, six trios of steers were used in a reversal trial to compare the effects on growth rate of a basal diet of barley containing 9·5% crude protein in the dry matter with or without the addition of urea or soya-bean meal added to give 13% crude protein in the dry matter. Steers given the supplemented diets were rationed so that calculated ME intakes were equal. In addition, four steers with rumen fistulas were fed to appetite on the same basal diet but were given soya-bean meal or urea by mouth or fistula in order to study the separate effects of palatability and rate of digestion.

In the first trial, the daily live-weight gain was 0·90 kg daily and 1·07 kg daily (SE ± 50 g) when the steers were given the low-protein diet and the high-protein diet respectively. In the second trial, steers given the basal diet grew at 0·92 kg daily whereas those given either urea or soya-bean meal grew at 1·14 kg daily (SE ± 140 g). The differences in gain in the second trial were not statistically significant. In the fistulated steers, the intake of the basal diet was increased by both of the nitrogen supplements; the effects of the two routes of administration will be discussed.

It thus appears that the faster growth rate promoted in steers by diets higher in protein is not simply a reflection of greater food intake.

**The influence of protein concentration in concentrate feeds on the apparent disappearance of dry matter, protein, starch, ether extract and ash in various segments of the digestive tract in sheep.** By E. R. ØRSKOV and C. FRASER, *Rowett Research Institute, Bucksburn, Aberdeen AB2 9SB*

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Ørskov & Andrews (1968 and unpublished results) gave young lambs concentrate rations in which the concentration of crude protein in the dry matter was varied between 10 and 20% by substituting soya-bean oil meal for barley. Growth rate and protein deposition in the carcass increased with protein intake. This effect is unlikely to be due to changes in the amount of microbial protein synthesized in the rumen, which depends on the amount of carbohydrate fermented (Hungate, 1966). It could be due to enhanced utilization of dietary protein which passed through the rumen undegraded.

Four sheep 9 months of age were used to investigate the influence of dietary protein concentration on the disappearance of feed constituents along the digestive tract. The sheep weighed about 35 kg and were fitted with cannulas in the abomasum and terminal ileum. The experimental design was a $4 \times 4$ latin square in which diets containing four protein concentrations (10·3, 13·3, 16·1 and 19·6% crude protein in dry matter) achieved by varying the ratio of soya-bean meal to barley were given in four successive 14-day periods. During the last 24 h of each period samples of abomasal and ileal content and of faeces were obtained every 2 h. The mean amount of feed given was 989 g/day, which was estimated to be near the voluntary intake. Chromic oxide was used as an indigestible reference substance to estimate the disappearance of digesta, anterior to the abomasum, in the small intestine and in the large intestine that is to say posterior to the ileum.

The apparent disappearance in g of non-ammonia crude protein in the small intestine, Y, could be predicted from the protein intake, X, from the equation $Y = 2{\cdot}12X - 0{\cdot}0057X^2 - 82{\cdot}5$ ($r = 0{\cdot}79$) which describes a curvilinear increase with increased amounts of protein in the feed. The maximum amount which was apparently absorbed (111 g) occurred when dietary protein concentration was approximately 18%.

There were no significant differences due to treatments in the apparent disappearance of starch, ether extract and of ash in the three segments of the digestive tract. Of the mean daily intake of 545 g of starch determined as $\alpha$-linked glucose polymers 93% disappeared in the rumen and 6% in the small intestine. The daily feed contained 21 g ether-extractable lipid. Analysis of gastro-intestinal contents and faeces showed that an additional 9 g/day was added anterior to the abomasum possibly in microbial lipids, that 24 g/day disappeared daily from the small intestine and that 6 g were excreted daily in the faeces; none disappeared in the large intestine. Similarly for mineral matter (ash), the daily feed contained 68 g to which was added 29 g/day (presumably from saliva) the amounts which disappeared from the small and large intestines were 38 and 9 g respectively and 50 g was present in the daily faecal output.

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