into the electrophoresis apparatus[3]. A typical second stage run was for 24 h in *tris* EDTA borate buffer, *p*H 9·2 (ref. 8), at 6° C and 70 V, the current falling from initial 25 to final 10 mA. The gels were stained with 0·3 per cent amido black for 8–16 h and de-stained by continuous washing in 7 per cent acetic acid with or without the aid of current[3].

Fig. 1 shows the two-dimensional pattern of human plasma. It is clear from the position of the proteins identified so far that from right to left the pattern is determined by electrophoretic mobility, and from top to bottom by the molecular size.

Two-dimensional gradient electrophoresis may be particularly useful in visualizing the immunoglobulins and the crowded post-albumin region.

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Effect of Dietary Chlortetracycline on the Rate of Growth of Wool in Sheep

A reduction in ruminal deamination should increase the availability of amino-acids in the host, and should lead to an increase in the rate of synthesis of wool fibre. This report is of a pilot study designed to measure the gross effects of dietary supplements of chlortetracycline on the rate of growth of the wool of sheep given rations which differed appreciably in protein concentration.

Sixteen mature Merino ewes of similar live weight were randomized into four treatment groups as follows: (*a*) high protein ration plus chlortetracycline ; (*b*) unsupplemented high protein ration; (*c*) low protein ration plus chlortetracycline; (*d*) unsupplemented low protein ration.

The initial mean live weight of the experimental animals was 80·5 pounds. The high protein diet consisted of a 3 : 1 mixture of lucerne chaff and linseed meal and contained 17·4 per cent crude protein on a dry matter basis. The low protein was a 1 : 1 lucerne chaff–wheaten chaff mixture which contained 7·2 per cent crude protein on a dry matter basis. Each of the four groups of sheep was fed at the rate of 1,125 g/sheep/day. The individual groups were maintained in four separate rooms of the John Hammond Climate Laboratory, so as to minimize antibiotic transfer. Chlortetracycline mixed with calcium carbonate was incorporated with the feed in the feeding troughs, and was administered at a level providing 10 mg of chlortetracycline/450 g ration. Animals were fed daily. Each animal had a 9 × 9 cm square tattooed on its right mid-side before the experiment was begun, and wool was collected from within this area at intervals of 3 weeks throughout the course of the study. 'Oster' animal clippers fitted with a size 40 cutter were used for this purpose. Animals were weighed weekly. The study was conducted during the period April–June 1968, and continued for a total of 12 weeks. Results are summarized in Table 1.

Table 1. Effect of dietary chlortetracycline on growth of wool

Treatment group	Clean wool production (g/patch) Time (weeks) 0–3	3–6	6–9	9–12	Total	Relative wool production
(*a*)	1·70	1·95	2·06	2·40	8·11*	138
(*b*)	1·10	1·53	1·69	1·57	5·89	100
(*c*)	1·23	1·18	0·98	1·34	4·73†	110
(*d*)	1·09	1·06	0·94	1·20	4·29	100

* Significant difference from control ($P < 0·01$).
† Significant difference from control ($P < 0·05$).

Dietary supplementation of chlortetracycline significantly increased the rate of growth of wool and it was evident that the effect was most pronounced in sheep fed the high protein ration. The suggestion of enhanced deaminative bacteriostatic action of the antibiotic in sheep receiving the high protein ration agrees with the reports of Warner[1] and Oxford[2].

The total live weight gain during the course of the study was 9·7, 9·0, 5·2 and 2·2 pounds/head in groups (*a*), (*b*), (*c*) and (*d*) respectively. The antibiotic thus induced small but non-significant improvements in live weight gain. The high and low protein rations induced notably different rates of gain, as was expected.

There are two ways in which the rate of growth of wool could be promoted without significantly affecting energy balance and live weight gain. If chlortetracycline primarily retarded the proliferation of deaminase-producing bacteria, the resultant increase in the availability of amino-acids could be large enough to increase the rate of synthesis of wool without materially adding to the net energy value of the ration. Alternatively, an increase in the availability of amino-acids capable of significantly increasing the net energy value of a ration could be offset by a decrease in the utilization of other dietary components. The level of chlortetracycline supplementation used in the present study was unlikely to affect the digestibility of the ration components[3], making the first alternative the more probable. Wool growth responses occurring in the absence of significant increases in live weight have been reported[4] and may be explained on the basis of the small increases in nitrogen storage involved. The failure of chlortetracycline to influence the nitrogen balance of lambs in the studies of Tillman and MacVicar[3] could be attributed to the errors involved in this measurement and a small but biologically important increase in nitrogen storage.

The known susceptibility of tetracyclines to the development of resistance of organism[5] was not evident in the bacteriological assays we performed at the conclusion of our study, but this may be because of the rather unique dynamics of rumen microbial populations. The interpretation of our results is based largely on reports which demonstrate the sensitivity of the growth of wool to alterations in the supply of amino-acids. Whatever the mechanisms involved, however, a more critical evaluation is warranted of the role of chlortetracycline and related compounds in wool growth regulation.

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