



Fig. 4. Vertical acrylamide gel electrophoresis of prealbumin fraction of Walker 256 ascites tumour fluid in glycine buffer, pH 9.6. Origin was at top and anode compartment was proximal to base. Prealbumin applied was initially isolated from the tumour fluid by elution convection electrophoresis from acrylamide gels after electrophoresis in *tris*-EDTA-boric acid buffer, pH 8.3.

buffer, pH 5.2. In both buffers, this fraction migrated as a single band. This fraction was found to exhibit inhibitory activity at a concentration as low as 6 µg of protein/ml.

The hexose and hexosamine bound to protein were determined for the electrophoretically isolated prealbumin fraction from the tumour fluid according to the techniques of Winzler<sup>7</sup>. On the basis of Lowry protein determinations the prealbumin was calculated to contain 2.6 per cent hexose and 0.9 per cent hexosamine.

Work possibly relevant to the foregoing data includes reports of fibrin as a cancer-distinctive substance<sup>8</sup>; the finding that the intravenous injection of a polysaccharide fraction extracted from Ehrlich ascites tumour cells into rabbits results in impaired migration of peripheral blood leucocytes *in vitro*<sup>9</sup>; and a report that a mucoprotein fraction derived from human plasma and urine is inhibitory to cell migration<sup>10</sup>.

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## AGRICULTURE

### Influence of Diet on the Behaviour Pattern of Sheep

BALCH<sup>1</sup> noted that under normal management adult sheep and cattle sleep little if at all. He suggested that this behaviour pattern may be related to the need for maintaining the thorax in an upright position for proper functioning of the reticulo-rumen, and to the requirement of time and consciousness for rumination. He defined sleep as a marked relaxation of consciousness and especially of vision and hearing ability. The following observations on the behaviour of ewes would seem to support the suggestion that the typical sleepless behaviour pattern is connected with the requirements for rumination.

Six ewes were kept in 3 m × 3 m pens, where they had free access to water and to pellets of finely ground dried grass. They also received daily 2 kg of a conventional concentrated mixture for ewes which was given in two meals at the two daily milking times. While the ewes were on this diet no rumination was observed. This is in accordance with earlier reports of an absence of rumination when animals are fed on diets in which all the roughage is finely ground<sup>2</sup>. The pens were brightly illuminated throughout the period. After an initial period of 14 days, during which the animals remained healthy and milked normally, experimental treatments were applied. These consisted of an hourly injection of 9 units of oxytocin through a semi-permanent jugular cannula. Every hour the ewes were taken from their pens and walked 20 m through a passage into the milking parlour, injected and then returned to their pens. After the first few hours of treatment the ewes began to show obvious signs of fatigue and even of exhaustion. Their walk became slow and they had to be pushed through to the parlour. Three of the ewes had periods of panting. Most striking was their behaviour between injections. They lay down in a quite atypical position with the head straight out between the forelegs and the thorax fully inclined. The position was similar to that of a sleeping pig or dog. Their eyes were closed and the ewes did not respond to any noise or the approach of the experimenter. It was necessary to prod them repeatedly in order to awaken them from what, in the terms of the definition above, was a deep sleep. The milk yield dropped 15 per cent over the 4 days of the treatment.

On the advice of Dr. C. C. Balch, roughage was added to the diet; the ewes were offered hay *ad lib.* for 1.5 h every evening. This resulted in a dramatic recovery; rumination was observed within 2 h of the first hay meal and within 4 h all the obvious signs of distress and exhaustion had disappeared. No panting was observed. Between injections the ewes lay down in a typical position, with the thorax held upright and eyes open; their hearing was alert, and on many occasions rumination was observed. When the experimenter approached the pens for the hourly injection the ewes stood up and moved towards the gate of the pen in anticipation. The milk yield increased at the morning milking following the first meal of hay and had regained the earlier level by the next evening. Although the injections were continued in this group of ewes for a further 5 days, and subsequently on other groups of ewes for similar periods, no recurrence of the unusual behaviour was observed.

These observations suggest that ewes which were not ruminating, because of the finely ground diet, needed to sleep for considerable periods and were greatly upset when disturbed hourly. This need for sleep disappeared when the ewes were given hay and they began to ruminate.

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