Active Relaxation of Unstriated Muscle

Ramsey and Street[1], working on single muscle fibres, concluded that relaxation in skeletal muscle was active. Prof. A. V. Hill[2] has conclusively shown that relaxation in skeletal muscle is passive. We stimulated the frog's rectus abdominis with potassium salts and acetylcholine and did not find any active relaxation. In unstriated muscle relaxation is active under some conditions and passive under others[3-5]. In unstriated muscle there would appear to be two cycles: in one, the energy for contraction is derived from chemical stores; in the other, the energy for contraction is derived from energy previously stored in the structure. Striated muscle appears to possess the former cycle only. This, we think, is the fundamental difference between the two kinds of muscle.

The nature of one kind of tonus in unstriated muscle follows as a corollary to the above. It is due to interference with active relaxation[3,4]. This is supported by oxygen-consumption experiments, there being less oxygen consumed during contraction and more during relaxation[6]. Estimations of lactic acid also support this[7]. Oxygen or glucose causes the muscle to relax, or increases relaxation during inhibition[8,9], asphyxia, cyanide or iodoacetic acid increasing the tonus. It is interesting to note that acetylcholine and adrenaline cause contraction and relaxation also by direct action on the contractile mechanism[10]; sodium and calcium ions cause contraction, whereas potassium ion causes relaxation by similar action. Histamine causes contraction. These findings may be of importance in connexion with the contraction and relaxation of the actomyosin system. For twitch contraction and inhibition, substances which are readily destroyed would be required; these may well be acetylcholine and adrenaline. For tonic contraction and inhibition, a permanent substance is required; this is presumably an ion[10]. It is interesting to note that acetylcholine is necessary for the contraction of the heart muscle[11].

SUNITA INDERJIT SINGH
INDERJIT SINGH

Physiological Laboratory,
S.N. Medical College,
Agra.
Aug. 22.

[1] Ramsey, R. W., and Street, S. F., *J. Cell. Comp. Physiol.*, **15**, 11 (1940).
[2] Hill, A. V., *Proc. Roy. Soc.*, B, **136**, 420 (1949).
[3] Singh, S. I., and Singh, I., *Curr. Sci.*, **17**, 306 (1948).
[4] Singh, S. I., and Singh, I., *Proc. Ind. Acad. Sci.*, B, **30**, 343 (1948).
[5] Singh, S. I., and Singh, I., *Curr. Sci.*, **19**, 60 (1950).
[6] Rao, M. S., and Singh, I., *J. Physiol.*, **98**, 12 (1940).
[7] Bharadwaj, U. R., and Singh, I. (unpublished observations).
[8] Singh, S. I., and Singh, I., *Proc. Ind. Acad. Sci.*, B, **27**, 127 (1948).
[9] Singh, I., *Proc. Ind. Acad. Sci.*, B, **29**, 190 (1949).
[10] Singh, S. I., and Singh, I., *Proc. Ind. Acad. Sci.*, B, **32**, 12 (1950).
[11] Burn, J. H., and Vane, J. R., *J. Physiol.*, **108**, 104 (1949).

Effects of Hypo- and Mild Hyper-thyroidism on Fleece-Growth in Sheep

A REVIEW of the available literature on the subject of wool biology shows that practically no systematic work has been done so far on the role of various hormones on wool growth. Since the thyroid hormone regulates about 40 per cent of the energy metabolism in sheep and the growth of wool is influenced by the plane of nutrition[1], as well as by other factors, an investigation was undertaken of the effects of varying levels of thyroidal stimulation or inhibition on wool growth in the growing sheep.

Eight Suffolk male lambs about 4–4½ months old were used in the present experiments, and they were divided with regard to age and body-weight into three groups. The lambs in group No. 1 were given daily 'Protamone' (thyro-active iodinated casein) in the ration, within the physiological range, and the lambs in group No. 2 were either given daily sufficient doses of a goitrogen (for example, thiouracil) or thyroidectomized, while group No. 3 was kept as control. All the animals were kept under the same environmental and feeding conditions. After 5½ months of treatment, wool samples were taken from each ram every month for four consecutive months, the animals being kept on the same treatments throughout the experimental period. All the animals were weighed and their rectal temperatures recorded weekly during the first half, and fortnightly during the second half, of the experimental period. The animals in a mild hyperthyroid condition showed greater gain in body-weight than the controls; but their rectal temperatures did not differ significantly from those of the controls[2].

Examination of the wool samples showed that mild hyperthyroidism resulted in an increase, while hypothyroidism resulted in a decrease, in the fibre-length when compared with the control group. In both the hypo- and hyperthyroid sheep the fibre diameter was not affected. The fleece in one of the hypothyroid sheep was comparatively easily pluckable and the crimps were less distinct when compared with the control.

Thyroidectomy performed in the young merino sheep does not show any effect on the wool fibre diameter[3].

How thyroidal stimulation influences wool growth in the growing sheep needs further investigation; but it may be that the thyroid hormone, by increasing the body metabolism with anabolic effects, stimulates wool growth. In the hypothyroid sheep, the marked decrease in the basal metabolic rate might have interfered with the normal fleece growth. These results will be described in detail elsewhere.

I am indebted to Dr. J. Hammond and Dr. Arthur Walton for providing facilities in their laboratories, to Dr. Sven Skărman, Wool Laboratory, Waid, Sweden, for sectioning the wool samples, and to Dr. A. B. Wildman, Wool Industries Research Association, Leeds, for valuable suggestions.

M. MAQSOOD

School of Agriculture,
University of Cambridge.
April 25.

[1] Marston, H. R., *Aust. J. Sci. Res.*, **1**, 362 (1948).
[2] Maqsood, M., *Vet. Med.*, **45**, 339 (1950).
[3] Marston, H. R., and Peirce, A. W., *Aust. J. Exp. Biol. and Med.*, **10**, 203 (1932).

Uptake of Phenothiazine Labelled with Sulphur-35 by the Tissues of Nematode Parasites and their Hosts

PHENOTHIAZINE has a very low solubility, a low toxicity for host animals, and a high dose-rate when used as an anthelmintic. Its anthelmintic action varies among even closely related species of nematodes; *in vitro* it has little activity. Explanations for these characteristics have been sought by following the uptake and retention of phenothiazine labelled with sulphur-35 by host and parasite tissues. This