atom of carbon assimilated, according to the results of experiments on the carbon dioxide outputs of soils[2]; this latter result of Porteous and Lees has been confirmed by as yet unpublished measurements of the oxygen uptakes of soils in the percolating respirometer[3].

It therefore seems likely that any attempt to isolate the nitrifiers by static liquid culture or by plating methods is foredoomed either to failure or to success tediously won. Under such conditions, where aeration is not very good, heterotrophic organisms with their low oxygen demand are almost certain to proliferate more rapidly than the nitrifiers with their high oxygen demand. Reference to Höber[4] suggests that if the nitrifiers are to grow at a reasonable rate in a static medium, say, at the rate of 1 mgm. dry-weight bacteria per 100 ml. medium per day, then the medium must be less than 1 mm. thick, otherwise the rate of oxygen diffusion into it will be insufficient. Moreover, since the production of 1 mgm. dry weight of the nitrifiers would consume all the oxygen in 250 ml. of air, only very limited growth of the nitrifiers can be expected in a Petri dish.

If, however, we ensure asepsis and adequate aeration of the medium by growing the nitrifiers in a soil percolator containing glass beads in place of soil and fed with sterilized air[5], conditions are made optimal for the nitrifiers, and consequently the statements[6] that "nitrifiers grow very slowly and any contaminants in enrichment cultures grow faster", and that "it is impossible to obtain pure cultures [of the nitrifiers] by simple serial transfers in liquid medium", which are true of static culture, are no longer necessarily valid.

I believe I have obtained the nitrifiers in pure culture by growing them in a soil percolator on a medium of the following composition:

$CaCO_3$	2 gm.
1 per cent NaH_2PO_4	1 ml.
Dialysed iron (B.P.)	5 drops
Molar $(NH_4)_2SO_4$	1 ml.
Distilled water to	100 ml.

The medium was initially inoculated with 1 gm. actively nitrifying soil. Subcultures were made by inoculating 1 ml. of the medium, in which nitrification had been established, into a fresh 100-ml. medium percolating over glass beads in a similar way. After five such subcultures, the nitrifiers were obtained in an apparently pure state. The criteria of purity were: (*a*) microscopical examination of the medium revealed only such colonies as were described by Meiklejohn[6]; (*b*) streaks on to nutrient agar showed no growth after three weeks; (*c*) the oxygen uptakes of the cultures, studied in the percolating respirometer[3], corresponded, within experimental error, to the amount of nitrogen oxidized by the cultures over a seven-day period.

It is hoped that this method of culture will provide nitrifying organisms in quantities sufficiently great to allow of a proper biochemical study of the organisms.

H. Lees

Department of Biological Chemistry,
University, Aberdeen.
Oct. 23.

[1] Stephenson, M., "Bacterial Metabolism" (Longmans, Green and Co., London, 1949).
[2] Lees, H., and Porteous, J. W., *Plant and Soil*, **2**, 231 (1950).
[3] Lees, H., *Nature*, **166**, 118 (1950).
[4] Höber, R. (edit.), "The Physical Chemistry of Cells and Tissues" (Churchill, London, 1945).
[5] Lees, H., *Plant and Soil*, **1**, 221 (1949).
[6] Meiklejohn, J., *J. Gen. Microbiol.*, **4**, 185 (1950).

Influence of the Thyroid on Body Temperature of Growing Animals

The thyroid hormone, which regulates about 40 per cent of the body metabolism, is likely to influence the body temperature; but very little systematic work has been done to study the effects of the thyroid on the body-temperatures of growing animals. This seems to have some practical value, because the body-temperature gives an indication of the physiological state of the animal. In the present investigation the effects of known levels of thyroidal stimulation and inhibition, for short or long periods, on the rectal temperatures of the growing male rabbit and the ram have been studied.

Thyroidal stimulation within the physiological range did not affect the rectal temperature, whereas higher levels resulted in an increase in the rectal temperatures of the treated rabbits. The increase above the normal body temperature of the thyroxine-treated rabbit given such larger doses was relatively higher during the summer months than that observed during the winter months. Administration of moderate doses of thyroprotein did not affect the rectal temperature of the young ram. Continuous thiouracil feeding, or thyroidectomy, resulted in a significant decrease in the body temperatures of the young rabbit and the ram when compared with their respective controls. Simultaneous administration of thyroxine in amounts about equal to the estimated rate of secretion of thyroxine to the young thiouracil-treated rabbit maintained the rectal temperature to that of the control value.

It appears that there exists a relationship between the rise in the internal body-temperature and the dosage of thyroprotein administered in the young male rabbit. Detailed results will be described elsewhere.

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M. Maqsood

School of Agriculture,
University of Cambridge.
Oct. 22.

Excretion of Œstrogens in the Urine of Non-Pregnant Ewes during the Breeding Season

Recent work[1,2] has demonstrated the presence of œstrogens in the urine of ewes during the last few weeks of pregnancy. It would appear that œstrogens have not been found in the excretions of non-pregnant ewes[3]. During the course of studies on reproduction in the ewe, attempts have been made at Ruakura to follow the œstrogen excretion of ewes over the œstrous, diœstrous and pregnancy periods.

With specially designed apparatus permitting the collection of twenty-four hour samples from grazing ewes at pasture[4], we have confirmed the findings of Whitten and Beck on the presence of œstrogens in the urine of pregnant ewes. In addition, we have been able to demonstrate œstrogen excretion in urine during the œstrous period. Using six mature Romney Marsh ewes and the bioassay technique of Evans *et al.*[5], mean uterine weights of as high as $18{\cdot}2 \pm 0{\cdot}92$ mgm. have been obtained from test mice, a result approximately equivalent to that obtained by the administration of 1·75 I.U. of œstrone. The mean

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