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Aerobic Fat Metabolism of *Ascaris lumbricoides.*

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In previous experiments[1] it was shown that *Ascaris,* during a starvation period of 24 hours, consumes a large amount of carbohydrate and a small amount of protein, but no fat. Mueller,[2] however, found that all the morphologically demonstrable fat disappears from explanted pieces of *Ascaris* tissue in 8 days, and Hirsch and Bretschneider[3] observed that during starvation much stainable fat disappears from the intestinal cells of this parasite. It seemed of interest to investigate the fat changes in *Ascaris* during a longer starvation period with a chemical method, since so far no convincing evidence is available as to whether any parasitic nematode is able to consume fat.

Consequently a series of experiments was performed in which, on the one hand, the fat content of freshly collected females of *Ascaris lumbricoides* from the pig was determined according to the method of Kumagava and Suto,[4] while the corresponding experimental worms, on the other hand, were kept for 5 days in 1% saline at 37°C under aerobic conditions. These latter worms were weighed individually at the beginning of the experiments and kept in separate containers, since out of a given lot of worms some always will die under these conditions. Moreover, it seemed essential to know the exact weight of the worms at the start of the starvation period. The saline was changed every 24 hours and the eggs discharged into it were collected individually for every worm by centrifugation. At the end of the starvation periods the surviving worms were used for a determination of the ether extract, and, in a separate analysis, the fat content of the discharged eggs was determined. A total of 12 experiments was performed with 230 worms, about equally distributed between worms analyzed at the beginning and after starvation.

The figures given below for the fat percentage of starved worms

[1] v. Brand, Th., *Z. vergl. Physiol.,* 1934, **21**, 220.

[2] Mueller, J. F., *Z. Zellfschg.,* 1928, 361.

[3] Hirsch, G. Ch., and Bretschneider, L. H., *Cytologia* (Tokyo), 1937, Fujii Jub. Vol., 424.

[4] Kumagava, M., and Suto, K., *Bioch. Z.,* 1908, **8**, 128.

are calculated on the basis of the weight of the worms at the beginning of the starvation period. This is the only way of assuring an accurate comparison between the fat content of worms analyzed at the beginning of the experiments and animals kept for some time *in vitro,* since the weight of ascarids kept for some days in saline shows a tendency to increase somewhat due to water intake, a factor which of course had to be eliminated in order to allow comparisons on a percentage basis.

The freshly collected worms contained $1.75 \pm 0.07\%$ ether extract; the body of the starved worms contained $1.67 \pm 0.05\%$, while the ether extract of the discharged eggs corresponded to $0.05 \pm 0.013\%$ of the weight of the worms. The sum of the ether extracts derived from the body and the discharged eggs of the experimental worms was therefore practically identical with that found at the beginning, indicating that no noticeable amount of fat had been used for production of energy. The amount of fat due to discharged eggs was relatively high and would probably have been higher under natural conditions. Fauré-Fremiet[5] has shown that *Ascaris* eggs contain a fatty compound (ascaryl alcohol) that certainly does not occur in the food of the worms and which, therefore, must be synthesized from other compounds. These observations seem to justify the assumption that *Ascaris* has a fat metabolism of some intensity which, however, is not connected with energy production, at least not during a starvation period of 5 days. The cited observations of Hirsch and Bretschneider may show a step in these synthetic processes. Mueller's findings, if corroborated by chemical analysis, would indicate, however, that the metabolism of explanted tissues of *Ascaris* must be different from that found in intact worms.

Summary. Females of *Ascaris lumbricoides* excrete in their eggs during a 5 days' starvation period at 37°C under aerobic conditions, a noticeable amount of ether soluble material, indicating the presence of a fat metabolism of some intensity. The sum of the ether extracts derived from the body and the eggs of the starved worms corresponds closely to that found in unstarved worms, showing that during the starvation period no fat had been used for the production of energy.

[5] Fauré-Fremiet, E., *Arch. d'Anat. microsc.*, 1913, **15**, 435.