## Free Amino-Acids of the Tsetse Fly (*Glossina*)

It was discovered some years ago that there is a substantial decrease in the residual (non-fatty) dry weight of the head and thorax of tsetse flies in the course of starvation[1]. Subsequent analysis of flies (*Glossina swynnertoni* Aust.) collected in the field at different stages of the hunger cycle showed that the thoracic residual dry weight decreases by as much as 0·25 mgm. towards the end of the hunger cycle (unpublished work). The findings suggest the existence of a non-fatty food reserve, and since neither glycogen nor reducing sugars could be demonstrated in amounts sufficient to account for these changes in weight, a study of the free amino-acids was undertaken in an attempt to identify the substances responsible.

Amino-acids were extracted in water after precipitation of proteins with ethanol; to avoid contamination with products of digestion in the gut only the head and thorax were used. The extract was evaporated to dryness and taken up in 10 per cent propanol. Amounts corresponding to 1/20 of a tsetse thorax were spotted on Whatman No. 4 filter paper for two-dimensional development with water-saturated phenol and with 77 per cent ethanol at 23° C.

Fig 1*A* shows the free amino-acids of a well-fed *G. morsitans* Westw. captured in the field; those of a similar fly starved to death at high relative humidity are shown in Fig. 1*B*. The chromatogram of the well-fed fly is dominated by an intense alanine spot; glutamic acid also occurs in substantial concentration, with arginine, taurine and serine present in smaller amounts, and glutamine and aspartic acid just detectable. The chromatogram of the starved fly shows a striking decrease in general ninhydrin positivity; a small amount of ornithine has appeared during starvation, the concentration of taurine and serine is about the same, but the alanine, glutamic acid, glutamine and aspartic acid spots have all but disappeared, and the intensity of the arginine spot is reduced.

Preliminary estimates of the amino-acid contents, using Naftalin's colorimetric technique[2], have shown that the disappearance of the alanine spot alone represents a loss of between 0·1 and 0·2 mgm. In other words, the decrease in ninhydrin positivity is quantitatively commensurate with the recorded decrease in residual dry weight, and there can be little doubt that some of the free amino-acids of the thorax of the tsetse do indeed constitute an expendable reserve of food. Viewed in this light it may not be without significance that the de-amination products of the substances concerned (alanine, glutamic acid, glutamine and aspartic acid) are all members of the citric acid cycle.

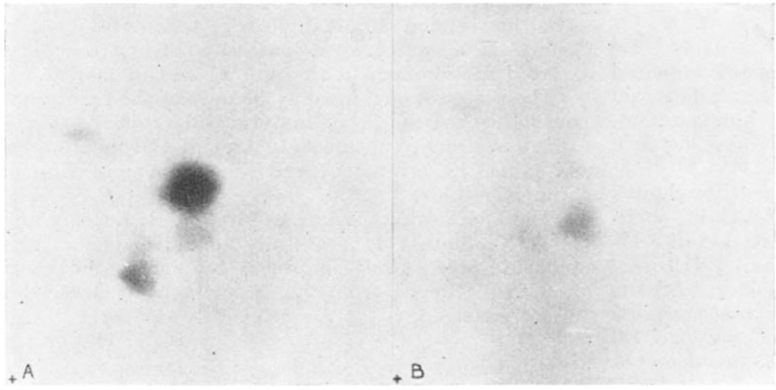
A comparison has been made between the amino-acid patterns of fed and starved individuals of a few other insects (*Musca* sp., *Lucilia* sp. and *Apis mellifera*). In all of them there is some change in the relative concentration of different amino-acids during starvation, but none shows the striking decrease in ninhydrin positivity which characterizes the tsetse fly. Other blood-sucking insects are at present under investigation, and details of quantitative and comparative results will be published elsewhere.

I am indebted to the Wellcome Trust for a grant towards equipment used in the present investigation.

E. Bursell

Department of Zoology,
University College of Rhodesia and Nyasaland,
Salisbury.

[1] Bursell, E., in Ann. Rep. East Afr., Trypanosomiasis Res. Org., Nairobi (1957).
[2] Naftalin, L., *Nature*, **161**, 763 (1948).



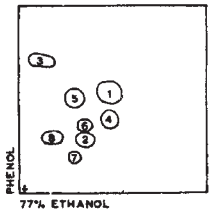




Fig. 1. The free amino-acids of the thorax of fed (*A*) and starved (*B*) *Glossina morsitans*. The extract was applied in the lower left hand corner (+); after development in water-saturated phenol and in 77 per cent ethanol the chromatograms were sprayed with 0·25 per cent ninhydrin in acetone and heated to 85° C. for 5 min. 1, alanine, 2, glutamic acid, 3, arginine, 4, taurine, 5, glutamine, 6, serine, 7, aspartic acid, 8, ornithine

## Sialoadenectomy and the Distribution of Thyrotrophin labelled with Iodium-131

Previous reports from these laboratories[1,2] have indicated the thyroid response to thyrotrophic hormone, as measured by uptake of phosphorus-32 (ref. 3), to be increased in sialoadenectomized animals when compared with intact controls. Hypophysectomy and hypophysectomy plus sialoadenectomy gave identical results as regards iodine trapping by rat thyroid, but the ratio of thyroid organic iodine-131 to inorganic iodine-131 indicated that sialoadenectomy reduced the synthesis of organically bound iodine-131 (ref. 4). To date, our observations have indicated some change in the modus operandi of thyrotrophic hormone in animals whose salivary glands have been removed. To obtain further information regarding the role of thyrotrophic hormone in sialex animals, it was decided to investigate the distribution of labelled hormone therein.

Animal care, feeding, size and preparation were the same as previously described[2]. The thyrotrophic hormone, given by Dr. S. Steelman of the Armour Laboratories, was labelled with iodine-131 by conventional methods[5] with only minor changes. Carrier iodine-127 was kept minimal so that the final iodine to thyrotrophic hormone molecular ratio did not exceed 1 : 100. Under the conditions employed, the radiochemical yield was low (23 per cent) but a high specific activity was obtained. After dialysis, to