and mesothoracic ganglia to form another common nerve that innervates the posterior part of the gland. However, the main trunks of all these nerves (except possibly of the N4) proceed past the prothoracic glands to innervate the body wall and musculature of the first 2 thoracic segments. Bilateral sectioning of the nerves had no effect on the development and metamorphosis of the insect except for a delay of a day or two in pupation which could be due to the shock of the operation. The results of the experiment are summarized in the table.

Discussion. Different authors have suggested different roles for the nerves innervating the prothoracic glands in insects. Possompes[3], for example, concluded that the nerves are involved in the regulation of the moulting process while Herman and Gilbert[2] believed that they stimulate degeneration of the glands during the pupal-adult moult. Srivastava and Singh[4] and later Hintze-Podufal[5], on the other hand, suggested that the nerves transport a neurosecretory type of granules to the gland cells. None of these suggestions, however, have experimental support. On the basis of the experimentally known facts, it can be assumed that the nerves innervating the prothoracic glands are either involved in feeding sensory/proprioceptive inputs to the central nervous system, or exert a nervous inhibition on the activity (synthesis or release of ecdysone) of the prothoracic glands. In regard to the first alternative, there is now an increasing evidence to suggest that proprioception plays an important role in the activation of the neurosecretory system (NSS) and/or release of the brain hormone[9–12].

Effect of sectioning the prothoracic gland nerves in the larva of Papilio demoleus

Nerves sectioned	No. operated	No. survived	Pupation after		
			6–7 days	12–14 days	none
N1 through N5	110	65	61	3	1
Controls	35	30	30	0	0

Edwards[9] has shown that this effect is more pronounced when the sensory input of a larger number of body segments is blocked by severing the ventral nerve cord anteriorly than when the input of only a few segments is blocked by severing the cord more posteriorly. Similar results were also obtained by Alexander[6]. From these findings it could follow that there exists an effective sensory/proprioceptive input produced by the peripheral nervous system of a larger number of body segments, to which alone the NSS responds. Since N1 through N5 in the present insect innervate only 2 of the body (thoracic) segments, their sectioning would not be adequate to dilute the effective sensory/proprioceptive input to the extent that it could inhibit the NSS. And therefore, despite the denervation of the prothoracic glands, the development of the insect would not be hampered, as observed in our studies. The evidence for the second alternative comes from the works of Alexander[6] and Hsiao and Hsiao[7]. While their evidence is largely indirect, the difficulty in confirming their findings lies in 2 facts: a) that the ecdysone is capable of activating its own prothoracic glands[13], and b) that tissues other than prothoracic glands may also produce ecdysone in some cases[14,15]. These possibilities are likely to neutralize any effect that the nerve section may produce. The whole issue of the significance of the prothoracic gland innervation is, therefore, a complex one and needs a more thorough investigation.

One of the side effects of the above experiment was the failure of the C2 (figure) to condense in the adults that developed from the nerve sectioned larvae. Preliminary observations implicate N5 for this effect. Further work is in progress to confirm and explain this possibility.

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Influence of corpora allata and brain extract on the lipid release from the fat body of termite queen Odontotermes assmuthi

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Summary. Short term in vitro experiments on the influence of the extracts of corpora allata and brain from the termite queen *Odontotermes assmuthi* on the lipid release from the fat body into the haemolymph indicated that the extract of corpora allata does not influence the lipid mobilization, whereas the brain extract increases the free fatty acid level in the haemolymph. It is believed that the brain extract stimulates triglyceride hydrolysis in the fat body.

It is well recognized now that the corpora allata control aspects of lipid metabolism in the various tissues of insects[1–3]. Allatectomy increases the total lipid content[4] and also stimulates turn-over of phospholipids and triglyceride fractions[5]. In the allatectomized *Schistocerca gregaria*, Walker and Bailey[6] have demonstrated considerable increase in triglyceride content of the fat body, but no appreciable effect on the haemolymph lipid level. The role of cerebral neurosecretary material on carbohydrate, as well as on the lipid metabolism in the fat body of some insects, has also been suggested[7–8]. While working with *Hyalophora cecropia* moth Gilbert and his associates[1] have shown that corpora allata stimulate incorporation of (1-C^{14}) palmitate into ovarian glycerides. It is well understood now that the glycerides provide some of the energy for embryogenesis. In vitro studies on the female *Leucophaea maderae*[1] have suggested that the corpora allata act on both the fat body and ovary by making more lipid available for storage in the maturing

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Influence of corpora allata and brain extract on the lipid release from the fat body of the termite queen *Odontotermes assmuthi*

Individual glyceride		Microgram glyceride (as glycerol equivalent)/ml haemolymph				
		Control	Corpora allata extract	Difference to control %	Brain extract	Difference to control %
Monoglyceride	(4)	48.0± 4.0	45.6± 6.0	−4.8	43.2± 7.30	−10.0
1,2-diglyceride	(4)	31.2± 3.6	33.2± 5.86	+6.04	35.2± 6.32	+12.82
1,3-diglyceride	(4)	29.6± 2.96	32.0± 3.80	+8.1	34.0± 7.82	+12.80
Triglyceride	(4)	45.6± 5.0	43.8± 4.84	−6.1	46.4± 7.16	− 1.7
Free fatty acid	(4)	46.0±11.0	50.0±13.2	+8.7	100.0±18.26	+117.4 ($p < 0.05$)
Total neutral lipid and free fatty acid content		200.4	204.6	+2.0	258.8	+27.2

The results presented in paranthesis indicate the number of experiments. + increase, − decrease.

oocytes. It seems evident from the afore-mentioned observations that the effect of corpora allata on lipid metabolism is an indispensable adjunct to oogenesis.

The full grown termite queen *Odontotermes assmuthi* lays as many as 30,000 eggs per 24 h. The size of the corpora allata compared to corpora cardiaca is considerably large. Moreover the major portion of the abdominal cavity of the queen is filled with ovarioles. It may be expected that the glycerides from the fat body are being released into the haemolymph, which are then transported to the developing oocytes. The present investigation is therefore aimed at ascertaining the influence of corpora allata and brain extract on the lipid release from the fat body of the queen of *O. assmuthi*.

Material and methods. The fresh queens of *O. assmuthi* were collected locally from their termatoria and were used for the experiments immediately. The fresh wet weight of the queens used in the present observations lay between 5.0 and 5.6 g. The haemolymph of a queen was collected in a graduated centrifuge tube by puncturing the tip of the abdomen. After draining the haemolymph, the queen was dissected; fat body was carefully removed and stored at 0 °C until use. The corpora allata and the brain (whole head) were removed carefully from 6 to 7 queens and homogenized at 3–4 °C in a known vol. of glass-distilled water. The homogenates were used as such to test their influence on lipid release. The fat body as well as the haemolymph collected from the same queen were used for each set of experiment.

The incubation mixture in the Erlenmayer flask (10 ml capacity) consisted of the fat body (100 mg), 1.5 ml freshly collected haemolymph and 0.2 ml corpora allata extract (CAE) or brain extract (BE). The incubation was carried at room temperature (26 °C) for 90 min with constant shaking. The incubation mixture without CAE or BE in the incubation mixture served as control. At the end of the incubation period, the mixture was filtered through Whatman filter paper (No. 1) under reduced pressure. The residue was thoroughly washed with distilled water. The lipid from the total filtrate was extracted following the method of BLIGH and DYER[9]. The extracted lipid was concentrated and redissolved in a known vol. of chloroform. Further separation of total lipid into individual glycerides and free fatty acids was effected on thin layer chromatography (tlc). Known aliquot (100 µl) of total lipid was applied on the activated silica gel tlc plate (250 µ thick). The plate was developed in the solvent system of *n*-hexane: diethyl ether: acetic acid (90:18:1.5 v/v/v)[10]. After the development, the plate was dried and individual spots were visualized by exposing the plate to iodine vapour. Monoglyceride (MGL), 1,2-diglyceride (1,2-DGL), 1,3-diglyceride (1,3-DGL), free fatty acids (FFA) and triglyceride (TGL) were identified with reference to their standards (supplied by Dr F. H. Mattson). The individual glycerides were scraped along with the silica gel from the tlc plate and then eluted through columns with peroxide free diethyl ether[10]. The individual glycerides were estimated according to the method described by RAGHAVAN and GANGULY[11], whereas the FFA were determined following the method of LAUWERYS[12].

Results and discussion. The results on the influence of CAE and BE on the various glycerides and FFA contents of the haemolymph are summarized in the table. The haemolymph lipid analysis revealed a slight increase in the 1,2- and 1,3-DGL and FFA levels. However, these changes seem to be insignificant. On the other hand, the effect of BE on the production of FFA in the haemolymph compared to CAE was highly significant ($p < 0.05$). Neither CAE nor BE produced any remarkable alteration in the MGL concentration of the haemolymph.

The medial neurosecretary cells of the brain of three species of mosquitos have been implicated in the regulation of aspects of lipid synthesis[7]. In the desert locust neither extirpation nor implantation of corpora allata produced changes in the concentrations of DGL content of the haemolymph[13]. In the male desert locust, allatectomy had no appreciable effect on the fat body lipid metabolism[6]. Isolated fat body of the *Cecropia* moth, when assayed after the addition of corpora allata, indicated decrease in the rate of lipid biosynthesis[1]. On the other hand, it has been shown that an aqueous extract of corpora cardiaca produced a significant increase in the DGL content of the haemolymph[14] and augmented the lipid mobilization from the fat body during flight[8]. It is believed now that the active agent in lipid metabolism is brain neurosecretary material which is stored and released by the corpora cardiaca[14]. It appears from these observations that the corpora allata control the TGL synthesis in the fat body, whereas the neurosecretory material through the corpus cardiacum influences the lipid mobilization from the fat body into the haemolymph. Our results on the termite queen *O. assmuthi* support the conjecture that the corpora allata in this insect do not influence lipid mobilization from the fat body into the haemolymph. The significant increase in the FFA level of the haemolymph with BE suggests that the neurosecretary material of the brain stimulates TGL (which constitutes 90% of the total neutral lipid) hydrolysis in the fat body, resulting in the release of FFA and DGL into the haemolymph.

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