

sclerosis, in which case amines like serotonin and histamine may cause intimal lesions when their concentrations increase beyond physiological limits. The beginning of the actual mechanism of lesions remains obscure, but it looks as though the sub-endothelial deposits of mucopolysaccharides might be the answer.

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### The 'Brain' Hormone in the Silkworm, *Bombyx mori* L.

THE imaginal differentiation of lepidopterous insects in which diapause occurs in the pupal stage is not accomplished in one step, but the hormone secreted from the 'brain' acts upon the prothoracic gland, and the latter organ in turn secretes a hormone which induces imaginal differentiation<sup>1,2</sup>. On the contrary, such a system of hormonal action is not yet known in the lepidopterous insects in which diapause does not occur in the pupal stage. One of us<sup>3,4</sup> carried out experiments to elucidate this latter problem with the result that an imaginal differentiation in *Bombyx* silkworm in which diapause occurs in the egg-stage is induced by two hormones, the brain hormone and the prothoracic gland hormone. The former causes the latter to be secreted to induce imaginal differentiation. Further, it was made clear that the brain hormone is secreted from the neuro-secretory cells in the brain<sup>4</sup>.

Pupæ of  $F_1$  hybrid between two varieties, *J.122* and *C.115*, were used and were kept at 25° C. throughout the present experiments. In ordinary pupæ of silkworm, they became imagines on the 11th–14th day after pupation, in contrast to the pupæ which are deprived of their brains immediately after pupation, in which no imaginal differentiation was observed for more than 40 days after pupation, although the operated pupæ survived for 220 days. Such a pupa was called 'Dauer-pupa' by Kobayashi<sup>4</sup> following Wigglesworth's<sup>5</sup> 'Dauer-larva'. If a fresh brain is implanted into the head of 'Dauer-pupa', it becomes an imago in 16–20 days after implantation.

From the experiment mentioned above, it is concluded that the hormone-like substance is released from the brain affecting a prothoracic gland to secrete its own hormone to induce an imaginal differentiation. This role of prothoracic gland was proved by Fukuda<sup>6</sup>. We have tried to obtain an effective preparation of the brain hormone as described below.

Brains of 8,500 pupæ collected within 24 hr. after pupation and stored in 60 ml. of methanol were used as the starting material. These brains were homogenized in methanol and centrifuged, and this procedure was repeated three times. 200 ml. of supernatant methanol solution was concentrated to 38 ml. and extracted with 145 ml. of ethyl ether.

Ether was evaporated from the ether layer and about 2 mgm. of oily substance, yellowish brown in colour, was obtained as residue. Throughout the treatments the temperature was never allowed to rise above 38° C.

About 0.1 mgm. of the oily substance was injected into the head of each 'Dauer-pupa' about 1.1 gm. in fresh weight on the 30th day after pupation. Of five 'Dauer-pupæ' operated, one died, and the others survived, among which one on the 25th day, the remaining three on the 40th–47th day, became imagines from the injection, while not one of twenty 'Dauer-pupæ' without injection became imagines for 87 days, though they had the normal appearance of pupa during the same period.

In the second experiment 0.1 mgm. of oily substance which dissolved in 0.01 ml. of sesame oil is injected into each of four 'Dauer-pupæ' 64 days old. Among these, two pupæ died, the other two survived and became imagines in the 26th and the 43rd day after injection respectively.

In the third experiment each of four 'Dauer-pupæ', 51 days old, was injected with 0.06 mgm. of the oily substance which was dissolved in 0.0075 ml. of sesame oil. In 22 days, two died and the other two showed no sign of further development, when each of the latter two was again given 0.1 mgm. of the oily substance which was dissolved in 0.015 ml. of sesame oil. After 22–25 days from the second injection, they became moths.

Among nineteen 'Dauer-pupæ' which were used as control for the foregoing two experiments, and were not injected with oily substance, eighteen survived, remaining in a diapause state for 120 days, though one pupa became an imago on the 71st day. It is supposed that in the latter by the time when it was deprived of its brain a brain hormone already existed above threshold value for imagination.

Concerning the problem of whether the prothoracic gland hormone was contained in the oily substance or not, we think that this oily substance does not contain the hormone, because only brains were used as the source of this preparation.

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### Nasal Salt Secretion in the Humboldt Penguin

THE much-discussed problem of whether marine birds drink sea-water has recently led to the unexpected discovery that the kidney is not always the major organ of salt excretion. It was found that in cormorants (*Phalacrocorax auritus*) much salt may be excreted extra-renally in the form of a highly concentrated solution of sodium chloride, discharged from the nasal (salt) glands<sup>1</sup>.

It has long been known that the bilateral nasal glands are particularly well developed in marine birds, in contrast to terrestrial birds<sup>2</sup>. The usual, and commonly accepted, interpretation has been