paying adequate attention to the influence of environmental factors on the processes concerned.

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## Absence of Natural Volatile Solvents in Cockroach Grease

THE wax layer generally present in the epicuticle of insects is important because it reduces loss of water by evaporation[1–3]. Except possibly for the cricket[4], there has not been sufficient knowledge of the chemical composition of the cuticular wax of any insect to formulate with certainty a physico-chemical basis for the physiological action of the wax[5]. A detailed chemical analysis will be published (with Miss M. E. Cox) of the soft grease extracted from the cast skins of cockroaches. Since the preparation of the grease involves recovery from organic solvents, any natural volatile solvents still present in cast skins would not be detected by our techniques. Accordingly, attempts reported here were made to distil volatile compounds from the surface of freshly killed cockroaches.

Tests for the presence of volatile substances were made directly on specimens of *Periplaneta americana* (L.). The glass apparatus was similar to that described[6] for the transfer of gas chromatographic fractions boiling over 60°. A specimen container and a capillary for collection of samples were connected by a tube which could contain solid desiccants. Since desiccants such as magnesium perchlorate and calcium sulphate also trap alcohols, duplicate runs without desiccant were made and, if an aqueous distillate was obtained, this was extracted with hexane. In use, the specimen container was held for at least 1 hr. in liquid air before the whole apparatus was evacuated to a pressure of less than 0·01 torr. The source of vacuum was removed and the liquid air bath transferred to the capillary collector. Distillation under vacuum was allowed to proceed for 2–3 hr. after the specimen container had reached room temperature. Any distillate or its hexane extract was examined by gas chromatography at a number of temperatures to 200° with a 4-ft. column of 5 per cent 'Apiezon *L*' on 'Celite' and by infra-red spectroscopy.

When cockroaches, usually 4 in each experiment, were subjected to distillation without desiccant, water and other unidentified volatile constituents were collected. If the mouthparts and anal regions of the insects were sealed with paraffin wax, no volatile materials other than water were condensed. Even warming of the insects with an infra-red lamp failed to drive off volatile organic compounds. Negative results were obtained also with freshly moulted cockroaches tested while still white.

The absence of volatile solvents in the surface grease of the cockroach has possible implications in the mechanism of wax secretion[7] and was unexpected since Beament[5] has suggested that volatile paraffins and alcohols of chain-length $C_8$–$C_{12}$ are present in the soft grease. Such solvents provide a plausible explanation of changes observed such as the hardening with time of extracted grease. In the present experiments, when 5-μl. samples of solvents such as the primary *n*-alcohols, butanol, octanol and decanol, octan-2-ol, and the *n*-hydrocarbons, hexane, octane, decane, dodecane, tridecane and hexadecane were spread on the cuticles of cockroaches, quantitative recoveries and identifications were made. Further evidence that particular solvents are absent is the observation that 1 μl. of octanol run on to cockroach cuticles caused an immediate loss by the insects of the power of co-ordinated movement followed by death in a few hours. Similarly, amounts of 20 μl. of dodecane killed one-third of cockroaches tested, while 40 μl. killed two-thirds of test samples. With the collection techniques used, it was possible to detect volatile solvents, if present, in amounts less than 0·1 per cent by weight of the 0·5 mgm. of cuticular grease present per cockroach.

The current chemical analysis mentioned earlier has already shown that, besides saturated hydrocarbons and fatty acids, the grease from cockroach cast skins contains unsaturated hydrocarbons in large amount, unsaturated fatty acids and a number of aldehydes. The presence of these more reactive types of compound suggests the possibility that changes in the properties of cockroach grease during ageing[5] may have a chemical basis.

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## Steroid Hormone in an Insect, *Bombyx mori*

IT is well known that the metamorphosis of insects is brought about by two hormones, one secreted by the brain and the other by the prothoracic gland. The brain hormone activates the prothoracic gland and directly induces metamorphosis with ecdysone[1].

The extraction of the hormone from brains of insects was first reported by Kobayashi and Kirimura[2]. Until recently, only a few workers[3,4] had carried out extraction of active principle from brain or central nerve system in insects. At present we have succeeded in crystallization of the brain hormone in the silkworm, *Bombyx mori*[5].

This communication deals with the further progress conducted on the chemical character of the brain hormone and with the results obtained on bioassay of the hormone and of its related compounds.

The melting point of the crystal (142°–143° C) which was reported previously[5] remained unchanged by recrystallization and no ultra-violet spectrum of the crystal was found. The infra-red spectrum of the crystal in potassium bromide showed that it has a $RR'C = CR''H$ type band which was characteristic in the region 750–850 $cm^{-1}$, and a hydroxyl band which was shown at 3,480 $cm^{-1}$. Furthermore, the characteristic absorption spectrum of crystal was very similar to that of pure cholesterol in all regions. The crystal was also analysed by means of gas chromato-