to the evolutionary mechanisms involved. A detailed report on these continuing studies will be presented elsewhere[14].

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The Pathogenicity of Nodamura Virus for Insects

NODAMURA virus, which was originally isolated from mosquitoes from Nodamura, near Tokyo, multiplies in several insect and tick species, apparently without causing symptoms. It is transmissible to suckling mice by infected *Aedes aegypti*, and is fatal[1]. In Japan young pigs have been found with antibodies to the Nodamura virus, which has been classified as an unusual kind of arbovirus because it is resistant to ether[2]. This property, together with other features of the virus particles[3] are reminiscent of acute bee-paralysis virus[4] and we therefore examined its effect on the honey-bee, *Apis mellifera*. We also tested its pathogenicity for the wax moth, *Galleria mellonella*.

A 2% suspension in 0.01 M phosphate buffer, *p*H 7.0, of homogenized brain tissue from mice killed by Nodamura virus was emulsified with carbon tetrachloride and the supernatant fluid cleared by low speed centrifugation. Adult bees, each injected with 1.0 μl. of the preparation, died after a minimum incubation period of 7 day at 30° or 35° C. Their anterior two pairs of legs became paralysed a few hours before death. The virus was serially passaged in bees, and an extract containing the equivalent of 10^{-7} of a bee killed by Nodamura virus was infective by injection into healthy bees. Isometric particles, about 30 nm in diameter, identical in shape and size to those seen in muscle tissue of mice killed by the virus[3] were purified by triturating infected bees in phosphate buffer with a quarter volume of ethyl ether, emulsifying the mixture with carbon tetrachloride and then subjecting the aqueous phase to cycles of high and low speed centrifugation[5]. Virus preparations reacted strongly in Ouchterlony gel-diffusion tests with antiserum prepared against Nodamura virus and formed single precipitin lines confluent with those formed by the original mouse brain inoculum. Antiserum from rabbits we injected with virus from bees also gave a single homologous precipitin line against virus from bees and mice. Nodamura virus did not react with antiserum to acute bee-paralysis virus. Wax moth larvae injected with an extract containing the equivalent of 10^{-3} of a bee killed by Nodamura virus died, mostly as pupae, after 7–14 day at 30° C. A crude extract of each of these pupae in 1.0 ml. water with 0.2 ml. ether gave an intense single precipitin line, confluent with Nodamura virus from bees, in gel-diffusion tests.

Our results indicate that Nodamura virus is a virulent insect virus of a kind which, contrary to widely held opinions about insect pathogens, can multiply in and kill mammals.

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Nature of the Lepidopteron Sensing Mechanism: Possible Photochemical Response

THE complex nature of the moth sensing problem has been demonstrated[1–4]. Here we suggest that the interaction of a moth with its radiation environment may be explained by a chemical change in metabolism induced by the radiation. We have tested this hypothesis by studying the temperature dependence of the behavioural response of several moth species to a black-light source and coherent submillimetre wave radiation.

Behavioural experiments were carried out with equipment previously described[3], in which moths were exposed to uniform radiation in a test chamber. Experimentally, the response of an individual moth was indicated by its attraction to the end of the test chamber at which the radiation source was located.

If the radiation source induced altered chemical metabolism mediated by change of photochemical behaviour, an individual moth would not respond to the radiation stimulus until the chemical reaction had been triggered. Assuming that the moth response follows a first order law, and if C_m is the concentration of moths in the test chamber which have not responded to the radiation, then

$$\frac{dC_m}{dt} = -k\,C_m \qquad (1)$$

where k is the rate constant. That is,

$$\ln(C_m) = -kt + k' \qquad (2)$$

where k' is a constant of integration.

In our experiment with black-light, the source was a 'General Electric F15T8-BL' lamp, having a fluorescent band with a peak in the ultraviolet (below 0.38 μm). The broad fluorescence ended at 0.45 μm and had mercury peaks in it spectrum. Some emission was observed around 8 μm, but this was no greater than a black body at 45° C. There were no significant bands beyond 0.45 μm.

It was found that the response of both the almond moth, *Carda cautella*, and the fall armyworm, *Spodoptera frugiperda*, to the BL source followed first order kinetics. The response of