

Fig. 2. Time-response curves for the production of cAMP (A) and cGMP (B) by the rat adrenal cortex of normal (○—○) and ACTH pre-treated rats (●—●), in response to 10 IU/kg of ACTH.

new specific membrane receptors cannot be disregarded. We are now examining this possibility by trying whether chronic ACTH treatment could shift the onset of the plateau in the dose-response curves to higher doses of ACTH.

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The effects of a juvenile hormone analogue on the male reproductive organs of the red cotton bug, *Dysdercus cingulatus* (Heteroptera)

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Summary. The male *Dysdercus cingulatus* F., when treated with the JHa, methyl-3,7,11-trimethyl-7,11-dichloro-2-dodecenoate, showed striking morphological deformities in the gonads, such as formation of additional apical growth on the testes, highly deformed, reduced vasa deferentia and accessory glands.

The juvenile hormone of insects, which is responsible for the maintenance of larval characters prior to imaginal differentiation, is also shown to have a gonadotropic action in the adult females³. The topical application of the juvenile hormone mimics to the adult females is also reported to have oviducal effects^{4,5} and block embryonic development⁶, besides causing several derangements in the developing oocytes^{7,8}. However, very little is reported regarding the action of the juvenile hormone on the adult males. Involvement of juvenile hormone in spermatogenesis analogous to oogenesis is doubted by a few authors⁹, while some argue against its involvement in spermatogenesis¹⁰. However, no conclusions can be drawn as yet, due to lack of sufficient data. The effect of a juvenile hormone analogue (JHa), methyl-3,7,11-trimethyl-7,11-dichloro-2-dode-

cenoate, on the male reproductive system of *Dysdercus cingulatus* is reported in the present communication.

Material and methods. The red cotton bugs, *Dysdercus cingulatus* were reared in our laboratory under controlled conditions ($28 \pm 1^\circ\text{C}$; r.h. = $70 \pm 5\%$; photoperiod = 12 h). $1 \mu\text{l}$ (= $1 \mu\text{g}$) of the JHa in acetone was topically applied to each of the male bugs between the wing bases immediately before and after moulting into adults, i.e., 12 h prior to imaginal ecdysis and just after imaginal ecdysis. On the 7th day after treatment, the male reproductive organs were dissected out in Ringer's solution and the morphological differences were examined under a stereoscopic microscope. Controls were similarly treated with acetone only and simultaneously they were also examined.

Results and discussion. In the normal bugs, the male repro-

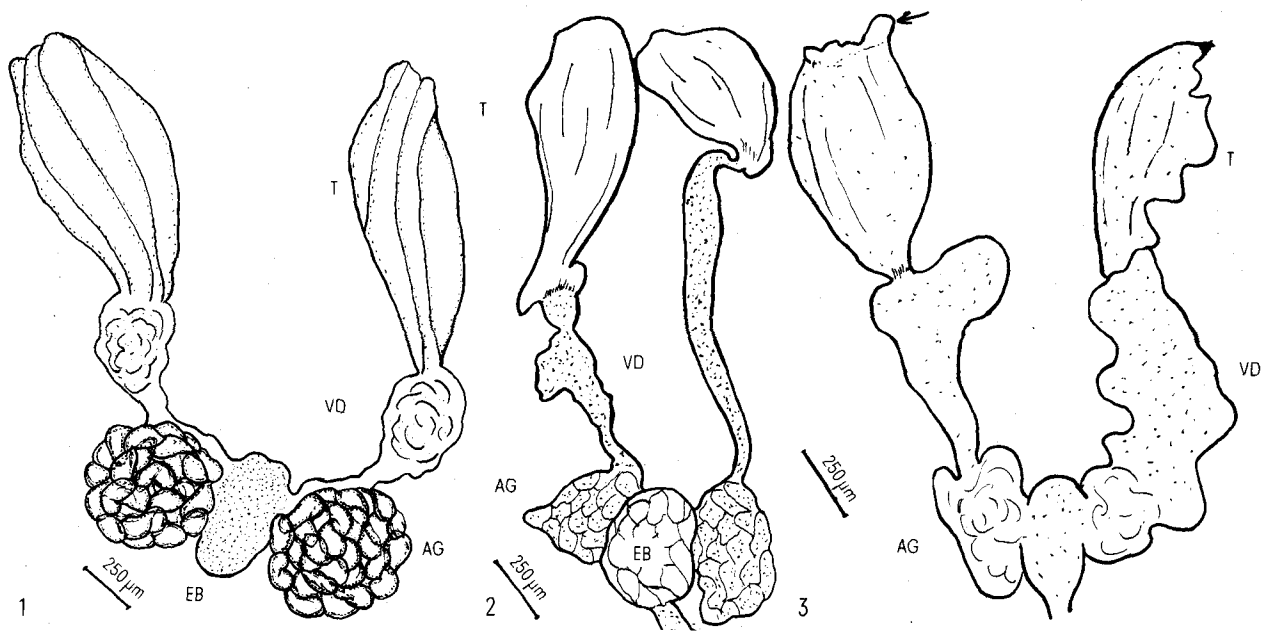


Fig. 1-3. Camera lucida drawings of the male reproductive organs of the bug, *Dysdercus cingulatus*. Fig. 1. Normal mature adult without treatment as a control. Fig. 2. Abnormal shape of the testes lobes and vasa deferentia. Fig. 3. The extra follicular growth (marked with an arrow), abnormal outline of the testes lobes, vasa deferentia and accessory glands.

T, testis; V D, vas deferens; A G, accessory gland; E B, bulbus ejaculatorius.

(Figure 2 treated with JHa just before imaginal ecdysis, figure 3 treated with JHa just after imaginal ecdysis. They were dissected 7 days after adult ecdysis.)

ductive organs consist of a paired fasciculate testes of orange or brick red colour. The testes lobes are elongated and more or less ovoid structures with longitudinal grooves on them. Vas deferens is a sac-like, continuous duct, bulged anteriorly and narrow posteriorly. Each vas deferens is associated with an accessory gland. Each gland is a compact mass of convoluted tubule forming a globular structure terminating at the distal end of each vas deferens (figure 1). After application of the JHa, the following abnormalities were observed in the morphology of the male reproductive organs. 1. Testes: These were usually slender and pale when compared with the normal ones. In several cases, an outgrowth or bulging was found at the apical region of the testes. In some, they were found to be deformed and irregular in shape (figures 2, 3). 2. Vas deferens: Vas deferens appeared to be the most seriously affected part of the male reproductive system by the JHa. In most of the treated insects they were found to be elongated, either tubular or folded (figures 2, 3). 3. Accessory glands: These were found to be either elongated or compressed. However, in some the growth is highly retarded and is hardly visible. The treated male did not mate with the female and

ultimately died after a week or so. The untreated females kept with the treated males did not oviposit and finally died.

It has been reported that the exogenous treatment of the males with juvenile hormone analogues does not interfere with the spermatogenesis¹⁰, or the mating behaviour^{11,12}. However, the active substance was known to be transferred to the females during copulation and block embryonic development^{8,12}. The above results show that the JHa, methyl-3, 7, 11-trimethyl-7, 11-dichloro-2-dodecenoate, can damage all the 3 important parts of the male reproductive system in a similar way as the analogues cause derangements in the ovarioles^{4,7}. Besides damaging the different parts of the male reproductive system, it is interesting to note that JHa also seriously affected the mating behaviour of the treated insect, in contrast to the earlier reports^{11,12}. The degenerated condition of the vasa deferentia and accessory glands which were observed on applying JHa were more or less the same as the result obtained by applying chemosterilants like tepa and metepa to the same bug, *D. cingulatus* while the testes remained unaffected¹³.

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