Histopathology and Histochemistry of Insects Treated with Chemosterilants: IX. Tumor Like Growth in the Ovary of *Periplaneta americana* (L) Treated with Apholate*

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The present investigation includes an histological study of the tumor formed in the ovary of Periplaneta americana (L) treated with apholate.

Materials and Methods

Two and one half to three months old nymphs of P. americana were treated with 0.25% apholate by oral feeding. The feeding was allowed ad libitum. For oral feeding the required concentration of apholate was made in tap water. The chemical was thoroughly mixed with finely powdered dogfood which was dried before it was fed to the insects.

The experimental and control insects were dissected 21 and 35 days after the treatment under physiological saline solution (0.7% saline solution to every 100 cc of which 2 cc of 10% $CaCl_2$ has been added, Baker 1944). For histological preparation the tissues were fixed and seven micron longitudinal sections of the ovaries were cut and stained in haematoxylin-eosin.

Observations

15 days after administration of apholate (Morphological Observations): The proximal region of the ovarioles show a swelling, a tumor like growth. (Fig 1a.)

21 days after administering apholate (Histological observations): Many oocytes appear normal but the basal region shows some swelling which is completely filled up with follicular cells. The remnants of degenerating oocytes in the form of lumps of eosinophilic material are seen scattered in the swollen portion. (Fig 1c.)

35 days after administering apholate (Histological observations) Except at the proximal end other ovarioles appear normal. At the proximal end the follicular cells seem to be migrating towards the periphery. The swelling(tumor-like growth) appears filled with follicular cells. (Fig 1b.)

Discussion

The formation of a swelling (a tumor-like growth) is exhibited at the proximal end of the ovariole 15 days after the treatment. A histological study, 21 and 35 days after administering the apholate reveals that a large number of normal and degenerating follicular

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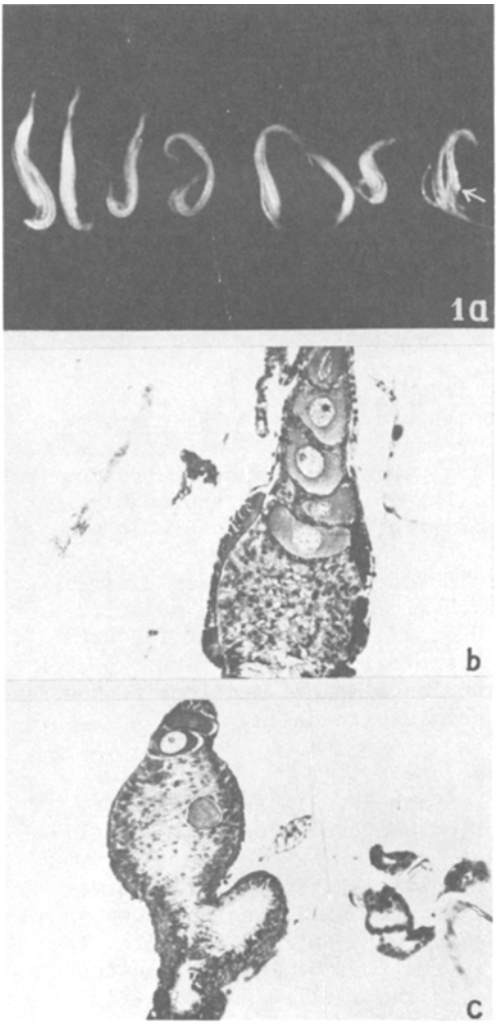

Fig 1a. Photomicrograph of ovary of P. americana nymph showing tumor like outgrowth (arrow) after administration of apholate
Fig 1b. Photomicrograph of ovariole of P. americana, 35 days after administering apholate. Note normal oocytes and tumor like growth at proximal end. Haematoxylin-Eosin X100
Fig 1c. Photomicrograph of ovary of P. americana, 21 days after administering apholate. Note the tumor like growth containing degenerating oocytes and follicular cells. Haematoxylin-Eosin X 100.

cells along with the remnants of the disintegrating oocytes are present in the growth. LANDA & REZABOVA (1965) reported a similar tumor-like growth suggesting the increase in the number of follicular cells to be a sign of tumor formation, which later degenerates. In a later report LANDA (1969) observed tumor in the ovary of chemosterilant treated Musca domestica and found that in the tumor the multiple growth of DNA content as well as increase in RNA content takes place. On the basis of the presence of the remnants of the disintegrating oocytes which have also been observed in the growth in the present investigation, it could be suggested that the growth may be simply due to the accumulation of degenerating oocytes at one place. This explanation appears to be more feasible as in the degenerating oocytes the interfollicular zone disappears, leaving various oocytes to be confluent with one another. The distintegration and disappearance of follicular cells and oocytes also result in the formation of empty spaces. At this stage if recovery occurs as observed in the present experiment, the developing oocytes will exert pressure forcing the degenrating oocytes to collect at one place before final resorption which thus gives the appearance of a tumor.

Whether this explanation could be applicable to the observations made by LANDA & REZABOVA (1965) cannot be said as they have made no mention of recovery in their report. But in view of that such type of proliferation of the follicular cells has also been recorded in the atretic follicles in the untreated ovary of Poecilocerus pictus and to some extent in Periplaneta americana (unpublished data) and the similar observations recorded in different insects by LUSIS (1963), WIGGLESWORTH (1936) and the findings in the present investigations, the authors suggest for further confirmation before accepting their interpretation that the chemosterilants act in a specific way by causing the formation of tumor cells. It may also be added that the growth of follicular cells may simply be to facilitate resorption of the oocyte as also observed by removing the corpus allatum by WIGGLESWORTH (1936).

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References

LANDA, V. & B. REZABOVA. Proc. 12th Intern. Cong. Entomol. London, Sec 8, 516 (1965).

LANDA, V. Colloques Internationaux Du Centre National De La Researche Scientifique, Paris, 189 (1969).

LUSIS, O. Quart. Jour. Micros. Sci., 104, 57 (1963).

WIGGLESWORTH, V.B. Quart. Jour. Micros. Sci., 79, 91 (1936).