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HISTOLOGICAL CHANGES IN THE GONADS OF SPODOPTERA LITTORALIS (Boisd). FOLLOWING TREATMENTS WITH I131

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ABSTRACT

Histological changes in gonadal tissues of Spodoptera littoralis adults were studied after injection of larvae with I^{131}. The histological picture of gonads showed that I^{131} caused a drastic reduction in spermatogonia, spermatocytes, spermatids and sperms in the testes of male adults. All male gonads treated with I^{131} did not show recovery of germ cells after six days in emerging adults. The ovaries were also affected showing malformation of oocytes with evidence of vacuolation, destruction of trophocytes. Atrophy of the ovaries began in the 1st day with no evidence of recovery when the test was terminated two days after emergence.

INTRODUCTION

Many studies, using irradiation and radio-isotops to sterilize insects showed that the destruction of the spermatogonia and oogonia has a practical importance.

Riemann and Thorson (1969), showed that the primary spermatogonia were the stem cells of the testes and their complete destruction resulted in complete sterilization with ceasation of sperm production. On the other hand, Kvelland (1962) observed recovery of fertility in Drosophila melanogaster, while Wilson and Hays (1969) showed a recovery in male testes of house fly and no recovery in female ovaries.

This work have been conducted to elucidate the propable recovery of gonads in S. littoralis which have been treated with labelled iodine I^{131}.

MATERIAL AND METHODS

The strain of cotton leaf worm, Spodoptera littoralis, used for this investigation were brought from Faculty of Science, Menoufia University. They were reared in the laboratory under constant conditions of 25 ± 2°C and 70 ± 5% R.H.

Injection technique with labelled Iodine I^{131}:

The radioactive isotopes I^{131} in the form of potassium iodide was used. The I^{131} prepared for injection was put in physiological saline, this provides a suitable amount of chloride ions which serve as a carriar for the iodine traces. Full grown larvae (6th instar), were

used. Larvae were injected with 0.2 ml. Injection of the radioactive material was done by small needle of calibrated syringe in the hind part of the dorsal vessel. Larvae were kept in the rearing jars ready to pupate until adult emergence. Female adults were dissected after one, two and three days. Male adults were dissected after 1, 2, 3, 4 and 5 days.

Histological Study:

Moths for each treatment, were dissected in saline solution. The ovaries and testes were fixed in Bouin's solution for 12 hr and dehydrated throughout ascending series of ethanol, embedded in paraffin wax 55:57°C M.P. Longitudinal and transeverse sections were cut at 7 microns thickness. Sections were stained with Delafields haematoxylin and Eosin and then mounted in canada balsam.

RESULTS

Normals ovaries of S. littoralis:

After emergence the female of Spodoptera littoralis has a well developed ovaries (polytrophic type) in which each oocyte has nurse cells enclosed within its follicle. The wall of the overiole is formed of a single layer of syncytial epithelial sheath. Inside the ovariale, in the germarium, the follicular epithelial cells can not be easily differentiated from the oogenia. Trophocytes (nurse cell) has a very large nucleus with chromatin material that completely fills the nucleus. The ooplasm and the nurse

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cells surronded by the follicular epithelium represent the oocyte. The size of oocyte varies according to the phase of development. The oocyte nucleus (germinal vesicle) is located in the ooplasm. Ova (egg) has a follicular epithelial layer (egg shell) and acquire a yolk (Fig. 1).

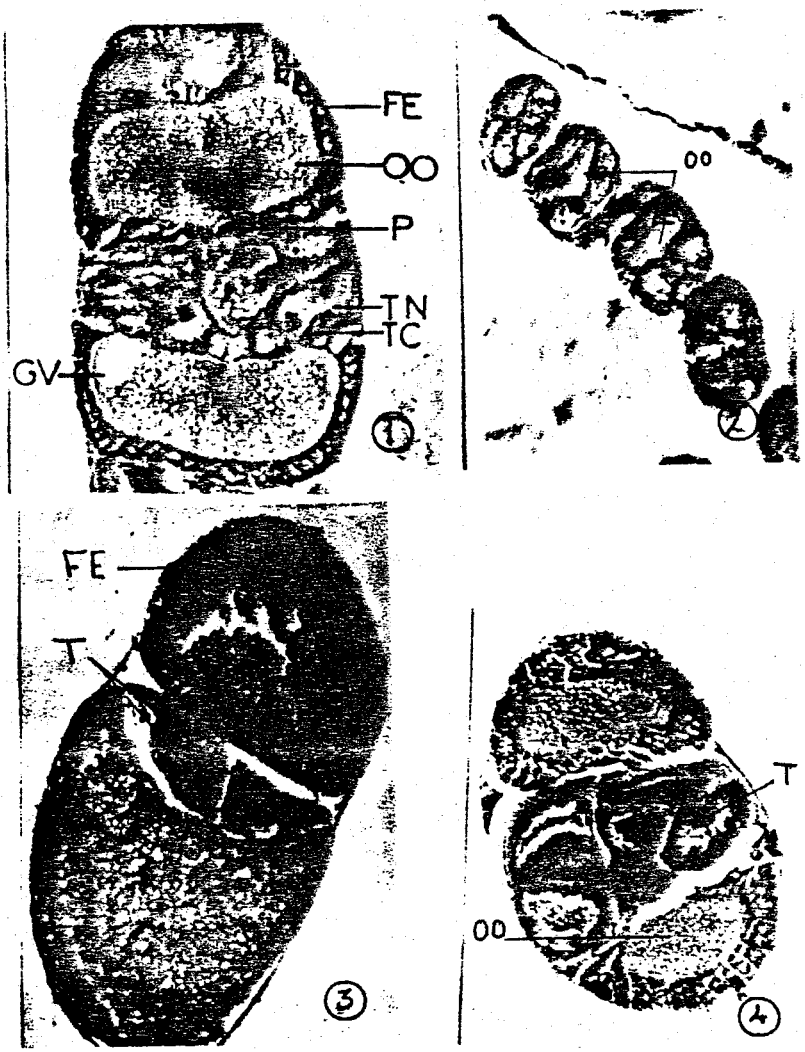
Ovaries of treated adults:

One day old female adults emerging from treated fully formed larva showed an atrophied ovaries. The oocytes as well as the fully developed eggs appeared scattered in the body cavity. The nurse cell appear abnormal in shape with pyknotic nuclei. The ooplasm is shrinked with vacuoles. The fully developed eggs were very small with too little yolk (Fig. 2).

Two days old female adults exhibited malformed oocytes as well as trophocytes indicating a pronounced effect. The effects ranged between abnormal follicular tissue, vacuolated ooplasm, abnormal nurse cell with absent nuclei and germinal vesicles (Fig. 3).

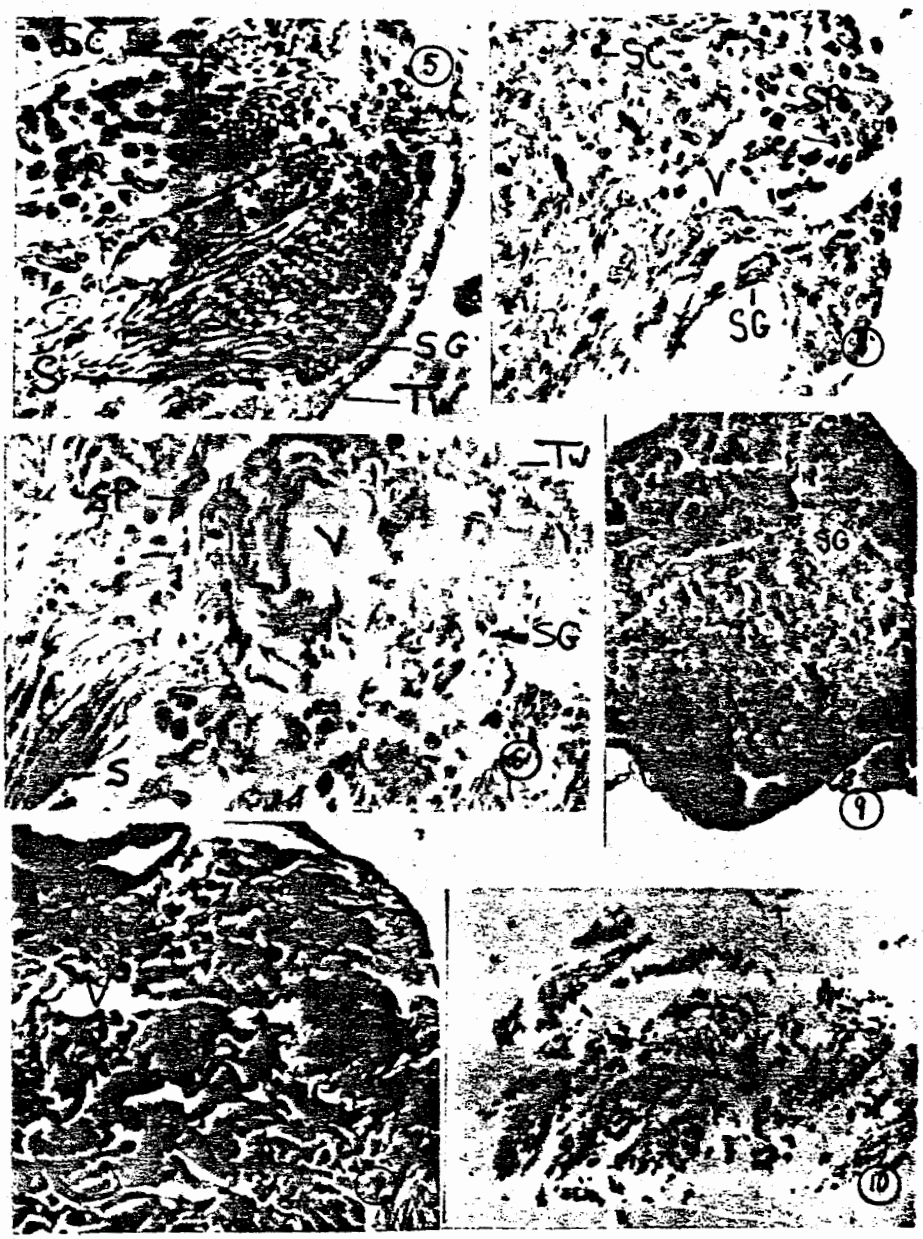
In case of three days old female adults showed occasional yolk disappearance, deformed oocytes, shrinked vacuolated ooplasm which occupy half of the volume of oocytes (Fig. 4). The septum between the trophocytes and oocytes became somewhat disorganised and thickened with destruction of nurse cells.

Four and five days old female adults were unhealthy



Sections in ovary of S. littoralis:
1) Normal ovary of adult S.littoralis.
2) Ovary of 1-day-old female emerged from injected full grown larvae with I^{131}.
3) Ovary of 2-day-old female.
4) Ovary of 3-day-old female.

T(trophocyte),TN(trophocyte nucleus),TC(trophocyte cytoplasm),OO(ooplasm),GV(ooplasm nucleus or germinal vesicle),P(Pore),FE(follicular epithelium) andV (vacuole).



Sections in testis of S. littoralis:

5) Normal testis of adult S. littoralis.
6) Testis of 1-day-old male emerged from injected full grown larvae with I^{131}.
7) Testis of 2-day-old male.
8) Testis of 3-day-old male.
9) Testis of 4-day-old male.
10) Testis of 5-day-old male.

TW (testicular wall), SG (spermatogonia), SC (spermatocyte), SP (spermatid), S (sperm)

and rapidly died.

Normal structure of S.littoralis testes:

Each testis is formed of 8 follicles. Each follicle contains a succesive zones in which germ cells are located. At the distal and each follicular chamber, there is a large nucleated mass of protoplasm known as apical cells. Within each follicle there is a distinct germinal area consisting of spermatogonia. These cells are rounded in shape containing large nuclei. Spermatogonia are grouped in the form of cyst in which they are transformed to spermatocytes. All cells, within the cyst, mature to spermatid (Immature sperm). These cells are in stage of synchronous transformation into spermatozoa (mature sperm). Sperms are nearly spherical (Fig. 5).

Testes of treated adults:

One day old male adults emerged from fully formed treated larvae presented a greatly destructed testes. The germ cells appear scattered in the body cavity, the apical cell is completely disappeared. Vacuolation, degeneration, liquification and clumping of germ cells are also obvious (Fig. 6).

Two days old male adults showed abnormally thickened follicular tissue, a little number of dislocated germ cells with evidence of clumping and vacuolation. Spermatocytes, spermatids and sperms appeared sometimes normal. Follicular

septum was apparently clear with the disappearance of apical cells (Fig. 7).

In three days old male adults the testes were irregular in shape with evidence of vacuoles under testicular follicular tissue. Also the germ cell exhibited pronounce cytological abnormalities except sperms (Fig. 8).

Four days old male adults presented a destruction of outer follicular cells covering the testis, decreased number of germ cells, absent follicular septum and apical cells. Some spermatogonia and spermatocytes were dislocated, destructed showing evidence of vacuolation were identified (Fig. 9).

Five days old male adults exhibited more severe effect than those present in three and four days old adults. All the germ cells were destructed to the degree that it was difficult to detect their different cell types. Apparently they showed vacuolation, liquifaction and progressed degenerative processes. The apical cells, follicular cells, follicular septum, all were completely absent (Fig. 10).

Six days old male adults were unhealthy and fail to survive.

DISCUSSION

The present work illustrated the adverse effect of

radioactive material I^{131} on the ovary. All kinds of cytological abnormalities such as pyknosis of nuclei, vacuolization, liquification of cellular mass and cavities just beneath the germinal epithelium in males were observed up to the 5 -day- old adult emerging from injected fully grown larvae treated with iodine I^{131}.

The same cytological abnormalities which were observed in adult females one, two and three days old, ranged between the destruction of different developmental stages of ova with consequent suppression of oogenesis. It appears that, due to this cytological abnormalities, the reproductive power of the testes and ovaries was suppressed.

Very little is known about the histological effects of radioactive material I^{131} in insects. El-Halfawy (1983) studied the effect of radioactive I^{131} on the gonads in newly emerged adults.

In the present work the recovery of fertility after treatment was not evidenced. This means that, these results are in agreement with those of Offori (1970). He showed the same results for testes fertility after 15 days of irradiating Stomoxys calcitrans. Wilson and Hays (1969) reported that no recovery was noticed in male house fly treated with phosphinothioic amide, and in adult females treated with chemosterilants.

On the other hand, the recovery of fertility is a

common phenomenon observed after treatment of isotopes. It has been demonstrated that the males of treated insects recovered their fertility and became as fertile as control (Riemann 1967 and Riemann and Thorson 1969).

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التغيرات النسيجية لمناسل فراشة دودة ورق القطن بعد تعريضها لليود ١٣١ المشع

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درست التغيرات النسيجية للخلايا الجنسية للفراشات الناتجة من حقن يرقات دودة ورق القطن باليود المشع • وقد أظهرت هذه الدراسة أن اليود المشع يسبب نقصا شديدا فى عدد الخلايا الجنسية فى الذكور • وهذه الخلايا لا تعود الى طبيعتها خلال ستة أيام من عمر الحشرة البالغة •

أما تأثر الاناث باليود المشع فقد ظهر فى أن المبيض ينتج الخلايا مولدة البيض مشوهة وبهـا فراغات ولا تستطيع العودة الى طبيعتها •