

Research Article

EFFECT OF MARBLE SLURRY ON REPRODUCTIVE SYSTEM OF *PERIPLANETA AMERICANA*

Sangeeta Dhanwar

Department of Zoology, Kishanlal Public College, Rewari, Haryana 123401 India

*Author for Correspondence

ABSTRACT

In the present study *Periplaneta americana* was exposed to marble slurry for 24, 48, 72 & 96 hours respectively and the effect was studied on its reproductive organ, studies revealed that marble slurry affects both the change in morphological picture of ovaries and changes in histological picture of ovaries. The nuclei of follicular epithelium are damaged completely and the interfollicular tissues disappeared.

Key Words: Marble Slurry, Ovaries, *Periplaneta americana*

INTRODUCTION

The female reproductive system consists of a paired ovaries, mesodermal oviducts, ectodermal medial oviduct and vagina. The ovaries are usually dorsolateral to the gut and when each structure are compared, it consisting of a variable number of tubular ovarioles in which oogenesis takes place. The medial oviduct usually carries one or more spermathecal sac in which sperm is stored after copulation. Bursae copulatrixes may be diverticulae of either the medial oviduct or of the vagina. The ovarioles is divided into following regions:

(i) Germarium containing the oogonia enveloped in a layer of mesodermal cells. In certain types of ovarioles, oogonia differentiated into primary oocytes and nutritive cells (trophocytes). Somatic mesodermal cells, located at the base of the germanium form the pre follicular tissues.

(ii) Vitellarium, a very flexible region the size of which strongly depends upon reproductive activity. In their region one or more oocytes are enveloped in an epithelial follicle in most cases and they are arranged in a single row and gradually develop into eggs and increases in size accordingly. At the anterior end of each follicle one or more trophocytes may be present.

(iii) Ovariole stalk in which the mature eggs pass to the oviduct after the epithelial plug separating them from the lumen has been ruptured.

The effect of chemosterilants was studied by many researchers. It was observed that corpora allata of *Periplaneta americana* shows clear signs of degeneration after the treatment with apholate (Bhargava and Tondon, 1975 a). In the egg of *Phyllopertha* which absorb water twice of their own weight in early stages of incubation, this is a process of controlled osmosis brought to end by water proofing of the shell by the embryo (Laughlin, 1957). In vivo and In vitro investigations have showed that vitellarium differentiation, cytoplasmic growth of the oocytes and previtellogenesis require the presence of ecdysone. In *Tenebrio molitor* cauterization of the pars inter cerebralis causes a decrease in the size of the germarium and inhibits previtellogenesis (Mordue, 1965 b). In vitro evidence of the role of a brain neurohormone in the initial growth of oocytes in *Tenebrio* has been presented (Laverdure, 1972). The Activation hormone is necessary for the development of ovaries in *Calliphora* studied by Thomsen (1952). Bhargava and Mathur (1977) studied the effect of hempa on ovarian tissue of *Periplaneta americana*. The experiments showed that hempa damages the nuclei more than cytoplasm. Morgan (1966) reported that *Musca domestica* maintained on food containing one or two percent of hempa were able to develop into eggs from the first egg chambers in some but not all of the ovarioles, but no eggs were fully developed from the second or third chambers. Morphological changes of ovaries were quite prominent in *Poeciloceris pictus* (Thomas and Sahai, 1993), *Odontotermes obesus* (Chimkod and Basalingappa, 1992).

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MATERIALS AND METHODS

The insects were reared in the laboratory by keeping them in a box with humid sand and maintaining a temperature of 22 to 26 degree centigrade. The adults were separated for experimental purpose. The experimental insects were exposed in a closed chamber in which marble slurry was pumped by an air pump. Such experimental insects were killed after 24 hours, 48 hours, 72 hours and 96 hours period. Last nymphal stage male and adult female were killed in soap solution and testes and ovaries were removed through dissection under Bausch and Lomb binocular microscope. These organs were stretched on a glass slide by dipping in Bouin's solution, after dehydration the tissue wax blocks were prepared for these tissues by using paraffin wax (60 degree centigrade) and section were cut at 8 micron and stained with haematoxyline and eosin for histological studies. The insect for above use were killed after 24 hours, 48 hours, 72 hours and 96 hours of exposure to marble slurry.

RESULTS AND DISCUSSION

The female reproductive organ of *Periplaneta americana* consist of a pair of ovaries, each having an oviduct, a pair of accessory glands, spermatheca, common oviduct and female genital opening. The ovaries are large in shape, white, flat masses, which lies below the alimentary canal on lateral side of the abdomen. When the eggs are matured in the ovaries it fill up the whole abdominal cavity, some times extending into the thorax also.

Each ovary consists of 7 tubules known as ovarioles, each about 4 mm long which are invested in a layer of epithelial cells. Each ovary appears more or less a flattened structure. All the ovariole tubules of each side open into an oviduct, which is about 2 mm long, the two oviduct unites above the junction of 5th & 6th abdominal segments, to form a common oviduct, which opens to the ventral side of the 9th abdominal segment.

The spermatheca is small, ball shaped structure which opens by duct on the dorsal wall of the common oviduct. A small narrow tubular gland also opens on the surface of common oviduct. Ovariole is an elongated tube in which the developing eggs are disposed, the oldest oocytes being situated nearest with the oviduct. The wall of an ovariole is a delicate membrane, transparent in nature, the inner layer of the ovariole is the coat of epithelium. Whole cells rest on a basement membrane, each ovariole comprises of a terminal filament, germarium, vitellarium

and pedicle. The terminal filament of the ovary is a thread like apical prolongation of the peritoneal layer. It keeps the ovary in position and is attached with body wall. The germarium forms the apex of an ovariole below the terminal filament and consists of a mass of cells, which are differentiated into the primordial germ cell and the nutritive cells. The germarium contains prefollicular tissue which comes to vitellarium in the form of follicular epithelium. The vitellarium constitute the major portion of an ovariole and contain Each oocyte lies in a definite egg chamber or follicle, the cells of follicle secrete chorion of the egg and it nourishes the oocytes. Each developing oocyte is surrounded by a follicular epithelium. The vitellarium is an active ovariole, is comprised of oocyte that are under going to deposit the nutrients, this process is known as vitellogenesis. The composition of yolk is of proteins, carbohydrates, neutral lipids and RNA. The oocyte in the vitallrium have the d progressively more yolk in an apical to basal sequence, the most mature basal oocyte being separated from the lumen of the pedicle by an epithelial plug, which ruptures when the oocytes is mature and ready to move from the ovariole and lastly it enters into the lateral oviducts, this process of exiting from the ovariole is called ovulation.

Effect on Ovarion Follicle

The normal oocyte of the insect cytoplasm is full of yolk granules (**Fig.1**) The follicular epithelium is made up of tall epithelial cells and inter follicular tissue of the cell is thick, nucleus is clear and full of nucleoplasm.

In treated insects the details of the damages caused by the exposure of slurry powder after 24 hours, 48 hours, 72 hours & 96 hours are as follows :-

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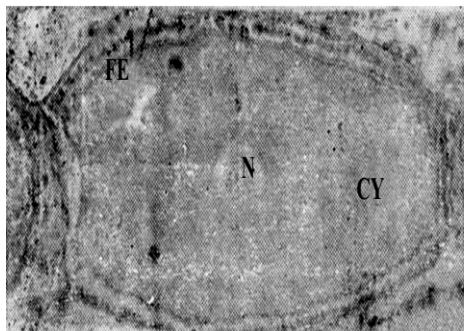


Fig.1 (Control)

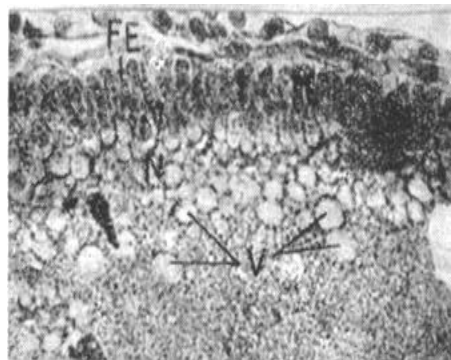


Fig.2 (after 24 hours)

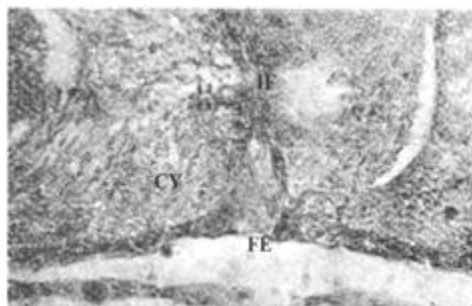


Fig.3 (after 48 hours)

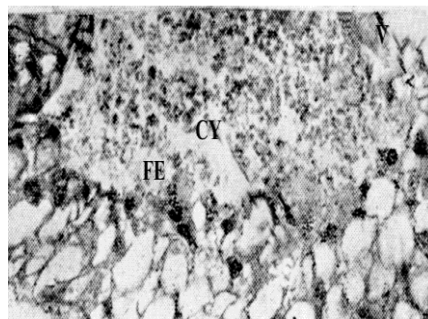


Fig.4 (after 72hours)

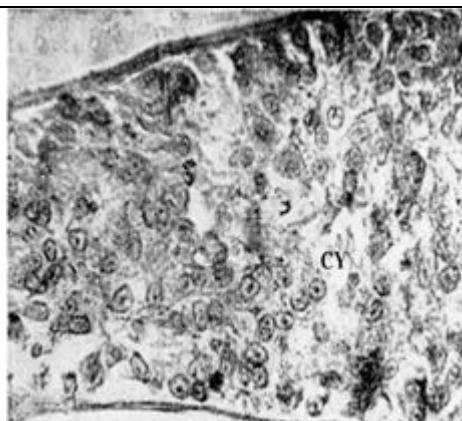


Fig.5 (after 96 hours)

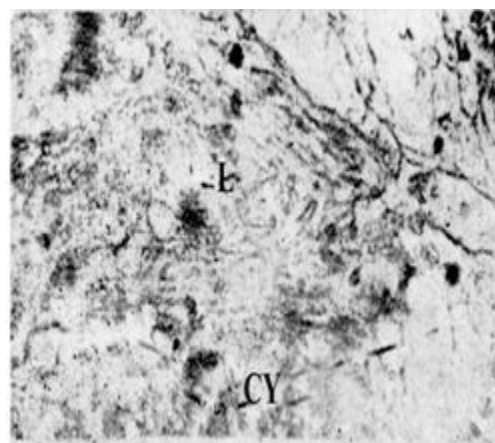


Fig.6 (after 96 hours)

Abbreviations used : CY- cytoplasm, N-nucleus, FE-follicular epithelium, V-vacuoles

Figure(1-6): Photomicrograph of normal and slurry treated Longitudinal Section of Ovary of *Periplaneta Americana*

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After 24 hours exposure (Fig. 2): The histological picture of the mature oocyte shows that there is no much damage is seen, however the inner and outer cell boundaries of follicular epithelium become thick and heavy, while the lateral boundaries of the cells are more or less indistinct. The cytoplasm of the cell starts reducing and nuclei become prominent. Vacuoles starts appearing at this stage.

After 48 hours (Fig. 3): The ovariole sheath breaks at many places and the cytoplasm of the cell starts shrinking and there are some vacuoles appears in the cytoplasm of oocyte. This is the indication of onset of damage of ovarian tissue.

After 72 hours (Fig. 4): The vacuoles in the cells of variable size can be seen in the cytoplasm of the ovum. As the vacuolization is increased in cytoplasm, the nuclei of follicular epithelium tissues starts disappearing and nuclei show karyorhexis.

After 96 hours (Fig. 5 & 6): The ovarioles show a complete picture of degeneration that can be seen in the mature ovum with yolk granules being reduced with the width of the ovariole. The nuclei of follicular epithelium is damaged completely and the inter follicular tissue disappears. The cytoplasm disappears almost and vacuolization of increased nature is seen.

There are many workers who reported the different effects on insects physiology and histology and some other parts of the organ. Tikku et al. (1978) has observed that in *Acorus calamus* vapours causes some damages in the ovaries of *Trogoderma granarium*. Ghanshani et al. (1981) studied that ovaries show a gradual decrease in weight after treatment with apholate, hempa and thiotepa.

Tondon and Bhargava (1977) reported the formation of fibrous tissue in ovaries of cockroaches after treatment with apholate tepa and metepa.

Hormonal control plays an important role in successful mating. Engelmann (1960 a, b) have a clear cut evidence that hormone liberated by corpora allata is involved in control of female receptiveness in *Leucophaea* females.

Tondon and Bhargava (1977) experimented with hemosterilants and studied in the ovary for the formation of fibrous tissue after treatment with apholate, metepa and thiotepa and reported that the damage in the ovary is permanent. The damage in the ovaries were caused by all the three chemicals.

Morgan and LaBrecque (1962) studied that apholate affects the length and width while thiotepa does not affect the size of the ovariole at all. Apholate has been known to affect egg laying and oviposition in many insects

Bhargava and Mathur (1977) reported the effect of hempa on ovarion tissue of *Periplaneta americana*, this experiment hempa damages the nuclei more than cytoplasm, and mature oocytes are damaged to a longer extent. Ghanshani et al. (1981) reported that the ovaries show a gradual decrease in weight after treatment with apholate, hempa and thiotepa.

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