

## **Histopathology and Histochemistry of the Insects Treated With Chemosterilants VI: Brain Damage Including Reduced Neurosecretion Caused by Chemosterilants in *Periplaneta americana* (L)**

S. C. Saxena and Pradeep Bhatnagar

Toxicology Laboratory, Department of Zoology University of Rajasthan, Jaipur, India

No report is available on the brain of *Periplaneta americana* (L) treated with chemosterilants. In the present investigation an attempt is made to study the histological damages caused to the brain of male cockroaches on treating them with thiotepa and bis (dimethylamino) dithiazolium chloride.

### Materials and Methods:

Adult cockroaches caught from the local drainage were acclimatized for fifteen days in the laboratory before subjecting them to chemosterilants. The chemosterilants were dissolved in sterile glass distilled water and injected from the ventral side between the 3rd and 4th abdominal segments. The insects were autopsied after 24 hours of treatment. Sections of 6  $\mu$  were cut after fixation of relevant part in Bouin's fluid and were stained in Harris Haematoxyline eosin and in standard Paraldehyde fuchsin. The sterilizing doses of thiotepa and bis (dimethylamino) dithiazolium chloride, 5  $\mu$ g and 6  $\mu$ g per insect respectively determined earlier by cross experiments (Bhatnagar and Saxena communicated), were injected into the cockroaches.

### Observations and Discussion:

#### Normal Histology: (Fig. 1A and 1B):

Neurilemma, a thin cellular membrane surrounds the brain. The medullary region consists almost entirely of fibers forming a neuropile, within which are seen denser condensation of fibers, the glomeruli. In the dorsal periphery of interlobar region (pars intercerebralis) deeply stained neurosecretary cells are present. Mushroom-shaped corpora pedunculata, is present in each lobe. Its outer cavity contains large number of globuli cells.

#### Histopathological Observations After Treatment With Chemosterilants:

The effects of thiotepa and bis (dimethylamino) dithiazolium chloride on the brain are more or less similar. The histopathological damages to the brain and neurosecretary cells of treated cockroaches include:

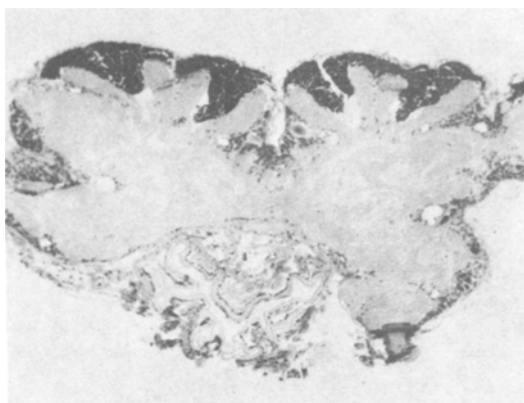


Figure 1 A.

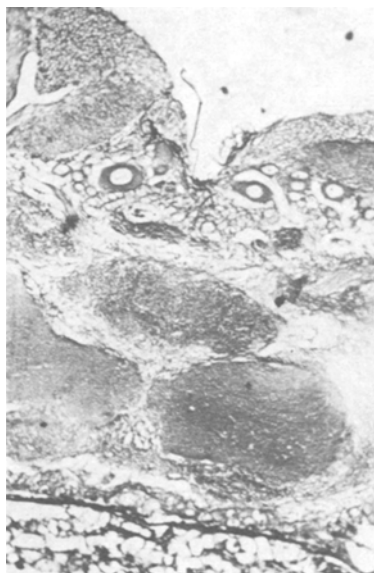


Figure 1 B

(a) Separation of neurolemma from the main brain tissue which is more prominent in the insects treated with thiotepa and the degeneration in the neurolemmal cells (Fig. 2).

(b) Vacuolisation and chromatolysis in the nuclei of the neuros; cytoplasmic inclusion taking dark stain (Fig. 2).

(c) Extensive damage to fibrous portion which gets separated from each other leaving spaces between the fibre tracts and corpora pedunculata probably due to either vacuolisation or liquefaction necrosis of nerve fibres (Fig. 3).

(d) Reduced neurosecretion of neurosecretory cells of pars-intercerebralis (median and lateral) evident by negative reaction with paraldehyde fuchsin (Fig. 4).

(e) Vacuolisation in the cytoplasm and karyolysis in the nucleus of neurosecretory cells are more prominent in the insects treated with thio-tepa (Fig. 4).

These damages to the brain and neurosecretory cells are of considerable importance in understanding the mode of action of these chemosterilants, which sterilize the cockroaches. It is suggested that due to the effect on neurosecretory cells, the functioning of the normal endocrine system is disturbed which in turn affects the reproductive physiology, therefore, the insect fails to reproduce normally, (Bhatnagar and Saxena, communicated).

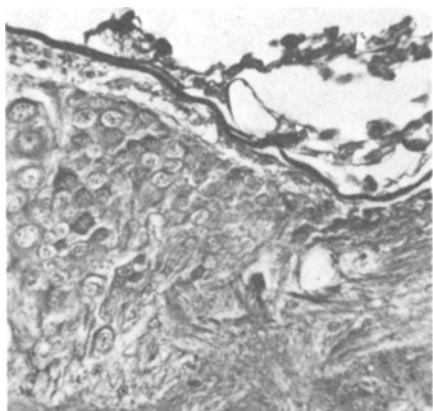


Figure 2

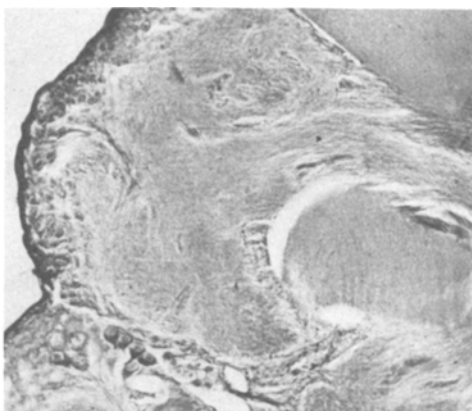


Figure 3

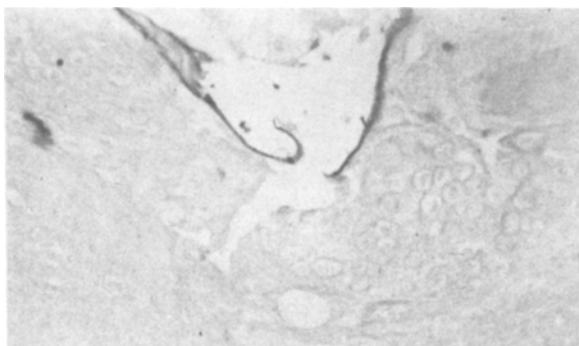


Figure 4

#### Summary:

The brain is damaged and neurosecretion is reduced in the *P. americana* treated with chemosterilants thio-tepa and bis (dimethylamino) dithiazolium chloride. The damage includes, separation of neurolemma, vacuolisation and chromatolysis in the nuclei of neurons and extensive damage to fibres. Reduced neurosecretion, vacuolisation in the cytoplasm and karyolysis in the nucleus of neurosecretory cells, are also observed. These changes in the brain are of considerable importance to understand the mode of action of the chemosterilants.

The authors express their deep gratitude to Dr. A.B. Borkovec, Chief, insect chemosterilant Laboratory, USDA, Beltsville, Maryland, U.S.A. for kindly providing us chemosterilants.

#### REFERENCE

1. Pradeep Bhatnagar and S. C. Saxena: Studies on the Effect of Chemosterilants. V. Effect of Chemosterilants on the Fertility of *Periplaneta americana* (L.) (Communicated).