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Histological Investigations on the Neurosecretory Cells in Thoracic and Abdominal Ganglia of *Melanogryllus desertus* (PALLAS, 1771) (Orthoptera; Gryllidae)

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Abstract: In this study, three kinds of neurosecretory cells, which are called A, B and C-types, have been described in the thoracic and abdominal ganglia of adult *Melanogryllus desertus* (PALLAS, 1771), (Orthoptera; Gryllidae) by using paraldehyde fuchsine and azan staining methods at the light microscope level.

Key Words: *Melanogryllus desertus,* Orthoptera, Gryllidae, thoracic ganglia, abdominal ganglia, neurosecretory cell.

Melanogryllus desertus (PALLAS, 1771) (Orthoptera; Gryllidae)'un Torasik ve Abdominal Ganglion Nörosekresyon Hücrelerinin Histolojik Araştırılması

Özet: Bu çalışmada ergin *Melanogryllus desertus* (PALLAS, 1771), (Orthoptera; Gryllidae)'un torasik ve abdominal ganglionlarında paraldehit fuksin ve azan boya metodları kullanılarak; ışık mikroskobu düzeyinde A, B ve C- tipleri olarak adlandırılan üç çeşit nörosekresyon hücresi tesbit edilmiştir.

Anahtar Sözcükler: *Melanogryllus desertus,* Orthoptera, Gryllidae, torasik ganglion, abdominal ganglion, nörosekresyon hücresi

Introduction

The neurosecretory cells of insects were first described in the pars intercerebralis of the honeybee *Apis mellifera* by Weyer in 1935 (1). However, the study of insect neurosecretion progressed slowly during the years 1930-1950, intensified only after the introduction of Gomori's methods in 1950, i.e., Gomori's chrome hematoxylin by Bargman (1949) and paraldehyde fuchsin by Gabe (1953, 1955). Neurosecretory cells have been described in many groups of insects, but most of the observations have been made on the brain, suboesophageal and frontal ganglia and corpora cardiaca. There is relatively little information concerning the neurosecretion in the thoracic and abdominal ganglia of insects.

Neurosecretory cells were described in the suboesophageal and abdominal ganglia of *Periplaneta americana* L. (2,3), abdominal ganglia of *Lucilia caesar* (4), ventral nerve cord of *Blaberus craniifer* and *Periplaneta americana L.* (5,6), *Schistocerca gregaria Forsk.* (7,8), *Locusta migrotoria* (9,10), *Leuchopaea maderae* (11), *Clitumnus extradentatus* (12,13), *Blaps mucronata* (14), *Anacridium aegyptium* (15), P*oekilocerus pictus* (16) and some Diptera (17,18,19).

Some probable roles of the neurosecretory cells in nerve cord ganglia in controlling some physiological activities are known. This article aims to demonstrate the neurosecretory cells in the thoracic and abdominal ganglia of *M. desertus* because, up to now, no case has been described in this insect group.

Materials and Methods

Adult *M. desertus* were collected in the vicinity of İzmir. They were kept in glass cages in laboratory conditions at a temperature of 28±2 °C, with a 45-50% relative humidity under a long-day photoperiod (9:15 hours). The animals were fed on ground chicken-food pellets as well as fresh lettuce and water. Thoracic and abdominal ganglia were dissected out from adult animals into physiological saline solution and fixed in Bouin's solution. With rutin preparations, 4-5µm paraffin sections were obtained and Gabe 1953, paraldehyde fuchsine (PAF) (20) as well as Koneff 1938, Mallory Heidenhain's azan (21) staining procedures were applied.

The sections were examined by Jena NF-binocular microscope and Jena MF photomicrography accessory.

Results and Discussion

A-type Neurosecretory cells

Secretory granules in the cytoplasm of the A-type neurosecretory cells stained deep purple with PAF and red with azan (Fig. 1). The granules were also observed along the axons. A-type neurosecretory cells were found in pairs in metathoracic and in all abdominal ganglia except in the last abdominal ganglion of *M. desertus*. The average cell and nuclear diameters of this type of cells were measured to be 24.6-20.8µm 11.1-8.7µm, respectively.

These cells are similar to the A-type cells in the ventral nerve cord of *Clitumnus extradentatus* and *Carausius morosus* (12,22), Poekilocerus pictus (16), in the thoracic and abdominal ganglia of *Locusta migratoria migratorioides* (10), and in the suboesophageal and prothoracic ganglia of *Eristalis taphicus* (18,19). The type-I cells of the thoracic and abdominal ganglia of *Blaberus craniifer* (5), the ventral nerve cord of *Periplaneta americana* (6), and the first abdominal ganglia of *Anacridium aegyptium* (15) have been described to show similar location and staining reactions to A-type neurosecretory cells in thoracic and abdominal ganglia of *M. desertus*. However, these cells differ significantly from type-I cells in their small cell sizes and nuclear diameters. These are histologically identical with the lateral cells of the first five abdominal ganglia of larvae of *Lucilia caesar* during diapause (4). Similar cells have also been described as A2- type in the metathoracic and mesothoracic ganglia of *Schistocerca gregaria* (7,8), and as type-XI cells in the abdominal ganglia of adult *Blaps mucronata* (14).

B-Type Neurosecretory Cells

B-type neurosecretory cells in the ganglia of *M. desertus* were PAF negative and stained light pink granules (Fig. 2). They also were stained light blueish-pink with azan (Fig. 3). These cells were present in peripheral regions in the all thoracic and abdominal ganglia of *M. desertus*. The cell diameters of these cells were measured to be 29.7-24.7µm and the nuclear diameters were 14.6-11.9µm.

Similar phloxinophilic cells have also been described as B-type cells in thoracic and abdominal ganglia of *Locusta migrotoria* (10), *Poekilocerus pictus* (16), the type-II cells of the thoracic and abdominal ganglia of *Blaberus craniifer* (5), *Anacridium aegyptium* (15) and the ventral nerve cord of *Periplaneta americana* (6). The homologies of these cell types were described with the lateral cells which lack any secretory product and the cytoplasm of which is uniformly phloxinophilic in the abdominal ganglia of Lucilia caesar during diapause (4). The type-IV cells in thoracic and abdominal ganglia of *Blaps mucronata* (14) and the B_2-type cells of the ventral nerve cord of *Clitumnus extradentatus* (12,13) seem to be similar to the B-type cells depicted in the present work.

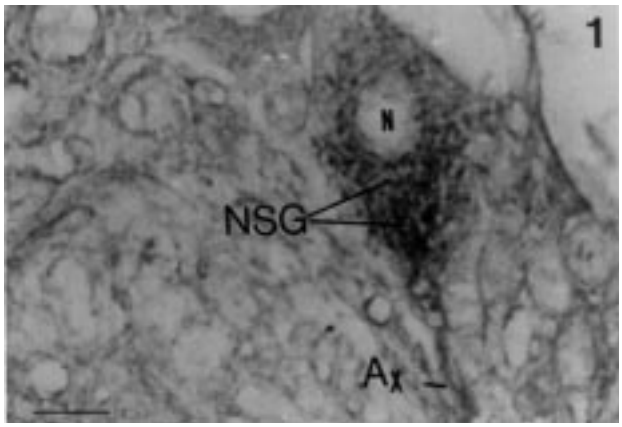

Fig. 1. Section of the third abdominal ganglion, showing A-type neurosecretory cell, stained with PAF. Nucleus (N), Neurosecretory granules (NSG), Axon (Ax). Bar: 10µm.

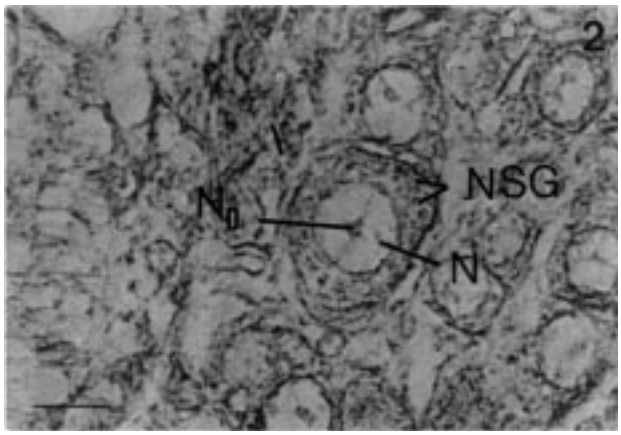

Fig. 2. Section of the mesothoracic ganglion, showing B-type neurosecretory cell, stained with PAF. Nucleus (N), Nucleolus (N_0), Neurosecretory granules (NSG). Bar:10µm.

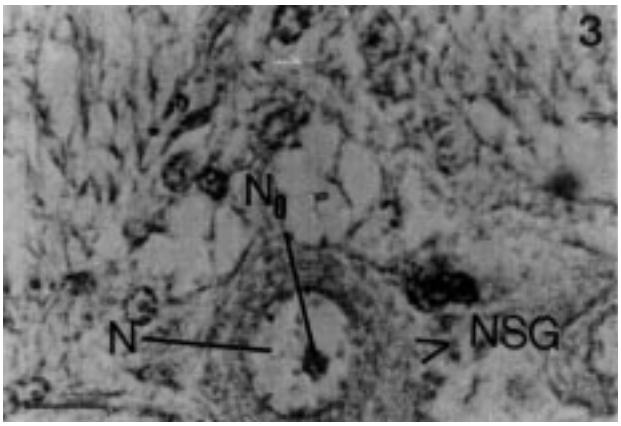

Fig. 3. Section of the fourth abdominal ganglion, showing B-type neurosecretory cell, stained with Azan. Nucleus (N), Nucleolus (N_o), Neurosecretory granules (NSG). Bar: 10µm.

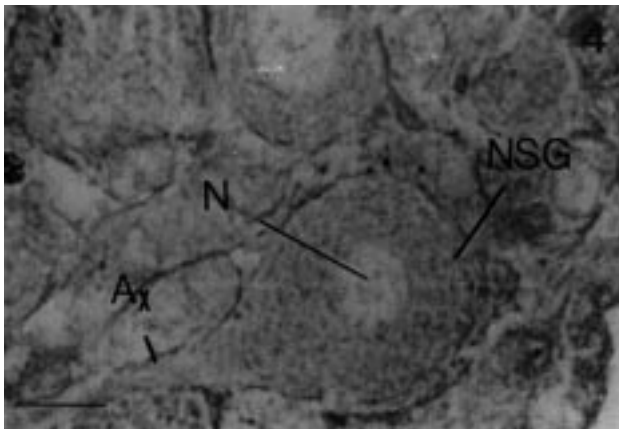

Fig. 4. Section of the last abdominal ganglion, showing C-type neurosecretory cell, stained with PAF. Nucleus (N), Neurosecretory granules (NSG), Axon (Ax). Bar: 10µm.

C-Type Neurosecretory Cells

These neurosecretory cells have very small granules distributed uniformly within the cell body which stained deep purple with PAF and reddish blue with azan (Fig. 4). The cell bodies of this type of neurosecretory cells were measured to be 39.1-28.7µm in their average diameters and have ellipsoid nuclei measuring 14.6µm in the longest and 11.5µm in their shortest diameters. These were the most common large neurosecretory cells observed in the all thoracic and abdominal ganglia and were distributed generally throughout the periphery of each ganglia. These cells in their staining reactions are similar to the previously described type-IV cells of the thoracic and abdominal ganglia of *Blaberus craniifer* and *Periplaneta americana* (5,6), the D-type cells of *Schistocerca gregaria* (8), and also the type-III cells of the *Anacridium aegyptium* (15).

This is the first report to date that describes three types of neurosecretory cells in the thoracic and abdominal ganglia of *M. desertus*. These light microscopical observations are expected to be invaluable for further detailed studies.

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