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Paraventricular nucleus (*nucleus paraventricularis*) and supraoptic nucleus (*nucleus supraopticus*) in spiny mouse (*Acomys cahirinus* Desmarest, 1891)

Jądro przykomorowe (*nucleus paraventricularis*) i jądro nadwzrokowe (*nucleus supraopticus*) u myszy *Acomys cahirinus* Desmarest, 1981)

Paraventricular nucleus (*nucleus paraventricularis*) and supraoptic nucleus (*nucleus supraopticus*) make components of macrocellular neurosecretory system of the hypothalamus (16). They form so called hypothalamic – hypophysial system together with nervous lobe of the hypophysis, the system that regulates water balance and temperature of an organism. Some laboratory animals subjected to a thermal shock showed significant changes in the cells of the mentioned nuclei (6, 7, 8). The earlier examinations on the morphology of the neurosecretory nuclei have also demonstrated morphological changes in many species of mammals, both laboratory (1, 2, 4, 10, 15, 16, 18) and domestic (5, 19, 20) as well as free living ones (9, 11, 13, 14, 17). The clear differences in size and dismemberment of these nuclei was stated, particularly of the paraventricular nucleus, in gopher (*Spermophilus suslicus*) and dormouse (*Muscardinus avellanarius*) (11). There were also investigations on the development of ultrastructure of supraoptic nucleus cells in rat (2).

The observations presented below concern a species *Acomys cahirinus* (*Muridae*), a rodent living in the semidesert regions of the eastern part of the Mediterranean region. A climate of the region, especially very high differences between a night and day temperature, does affect the hypothalamic-hypophysial system. Monitoring the morphology and a degree of the paraventricular and supraoptic nucleus development in spiny mouse seems to be advisable, in particular in comparison to these species examined that live in the temperate climate conditions. Moreover, the authors of the present article hold this belief for recently numerous studies have been made on the usage of water contained in food as well as water balance of species living in the desert and semidesert regions (3, 12, 21).

MATERIAL AND METHODOLOGY

The examinations were conducted on the brains of sexually mature males and females (two brains of each sex) bred in Dept. of Comparative Anatomy and Anthropology UMCS. The material was fixed in formalin and then, having undergone the alcoholic series of increasing concentration, it was paraffin embedded. The serial transverse sections of 10 μm thickness were stained with cresyl violet for cell presence according to Klüver and Barrera's method.

RESULTS AND DISCUSSION

Paraventricular nucleus (*nucleus paraventricularis*)

Paraventricular nucleus (PVN) is a very short and not differentiated band of nervous cells in this species. It is found (like in other species) near the dorsal region of ventricle III, in some places a little over its lumen. The posterior pole PVN lies in the transverse plane found in half of the supraoptic nucleus length, the anterior one is very unclear, yet its forward range is smaller than that of the anterior pole of supraoptic nucleus (SON). The posterior segment PVN is a narrow, not differentiated tract of closely arranged cells. Its transverse cross-sections are rounded and, moving forward, they become vertical and oval. The anterior half of the nucleus is substantially thicker (about twice), vertical and oval. Alike the posterior part, the cells are spaced closely. A region taken by PVN is a bit protruded dorsally over the lumen of ventricle III (Phot. 1).

The cells forming PVN are mainly multipolar of 6 up to 10 μm (Phot. 4). The rounded and spindle-shaped cells (up to 40 μm long) are quite fewer. Cell nuclei are usually big with well stained nuclear membrane. The cells are filled with microgranular or shapeless tigroid.

Supraoptic nucleus (*nucleus supraopticus*)

This nucleus (SON) is well developed. The posterior segment, about 1/3 of nucleus length, is a vertical, rather narrow band found laterally of tractus opticus (Phot. 2). Moving forward, the transverse cross-sections of the nucleus enlarge and take shape of a not very thick band that surrounds tractus opticus in an arch-like way on the lateral side (Phot. 3). In this part, the SON forming cells are arranged very closely. From about half of the length, the transverse cross--sections of the nucleus grow smaller. The portion that lies laterally of tractus opticus is evidently narrower than this found over the tract. A short anterior segment makes a narrow unclear band of cells loosely spaced over the optic tract.

The cells forming the supraoptic nucleus reach the size of 10 to 20 μm (Phot. 5). These are spindle-shaped, multipolar and rounded cells that stain intensively. Quite typical are great cell nuclei with very distinct nuclear membrane. Some cells show clusters of nuclear chromatin near the nuclear membrane.

Comparing the morphology of supraoptic and paraventricular nucleus in *Acomys cahirinus* and some other rodents, it can be stated that there is a very significant difference in the structure of paraventricular nucleus. It is a poorly developed single tract of cells, while in dormouse and gopher to even greater extent, it is a big dismembered cluster of nervous cells with differentiated shapes. There occur rounded, multipolar and spindle-shaped cells, whereas in *Acomys cahirinus* multipolar cells predominate. Taking into consideration a position of paraventricular nucleus in a species studied, it corresponds to a paramedial part of the nucleus in a gopher, dormouse and rat Wistar. It is also of a shape resembling an elongated upturned drop and the contour of both paraventricular nuclei (the left and right side) looks like a letter "V". The appearance of the other parts PVN – lateral portion, dorsomedial cap as well as the posterior part cannot be stated.

The supraoptic nucleus in *Acomys cahirinus* has a structure approximating that of nucleus in gopher and dormouse. In case of rat the differences are also minimal and they refer mainly to the size, not a position. A caudal segment of the supraoptic nucleus that lies laterally of tractus opticus corresponds to pars tuberalis distinguished by Armstrong et al. (1) in Wistar rat, gopher and dormouse (11). A part placed dorsally of tractus opticus may be considered an equivalent of pars anterior in the species mentioned.

In gopher, dormouse and rat in particular, both portions of the supraoptic nucleus are clearly separated from each other. However, in *Acomys cahirinus* a portion that can be regarded as an equivalent of pars tuberalis is connected with pars anterior and makes a narrow band of nervous cells placed over the lateral portion of optic nerve chiasm. Pars tuberalis of the described species is more poorly developed in comparison with gopher and dormouse.

In this case the morphological examinations cannot be any foundations for drawing conclusions on the relation between the development degree of neurosecretory centres discussed and the conditions of animal life. The macrocellular neurosecretory nuclei developed best are recorded in rat (1, 16). A little poorer development of these centres is noted in gopher and dormouse (11), whereas the poorest development of neurosecretory nuclei – in *Acomys cahirinus*, the paraventricular nucleus in particular. This nucleus is made of homogenous, not differentiated band of cells. A degree of supraoptic nucleus development in all the mentioned species of rodents is congenial, still some differences occur. The most distinct division into two portions – pars anterior and pars tuberalis appears in rat, while the least clear one in *Acomys cahirinus*. The course of life of the rodents mentioned as well as their environment are absolutely unlike. Rat is active all the year long and adapted perfectly to living in any conditions i.e. in basement, ditches, farm buildings. Hence, an ambient temperature and moisture are different and changeable. Gopher and dormouse are hibernating animals whose body temperature goes down to a few grades over the dormancy time and the rate of their all metabolic processes decreases to minimum. The changes take place in a year cycle. The animals living in the semidesert regions of the eastern part of Mediterranean are exposed to quite considerable temperture fluctuations in a 24 hrs cycle. That is why, the water balance of these species, in that spiny mouse, has to be very economical, regarding this climate dryness, too. Kam and Degen (12) hold a belief that the water contained in plant and animal feed (snails mainly) is sufficient for an animal.

The morphology of supraoptic nucleus and paraventricular one in *Acomys cahirinus* is evidently simpler than in rat, gopher and dormouse. A question arises if this state of things is a matter of specialization, adaptation to the changes of thermal conditions occurring in a very wide but permanent range and reoccurring at some regular, relatively short time intervals. The domestic species under investigation meet with frequent irregular changes in temperature and moisture which make an organism adapt permanently to some exogenous changes appearing in their environment.

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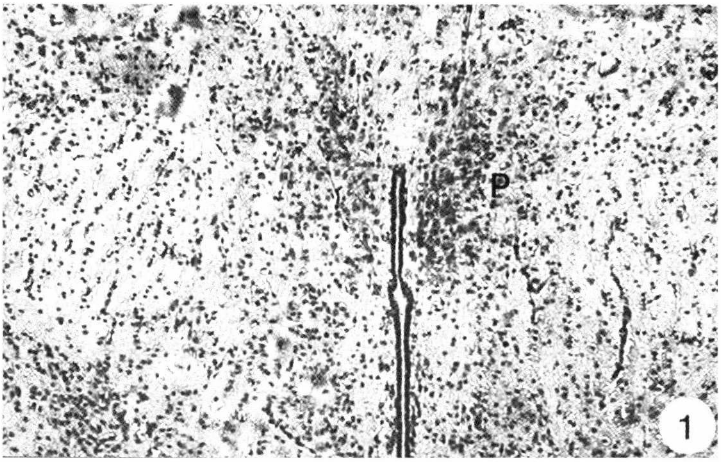
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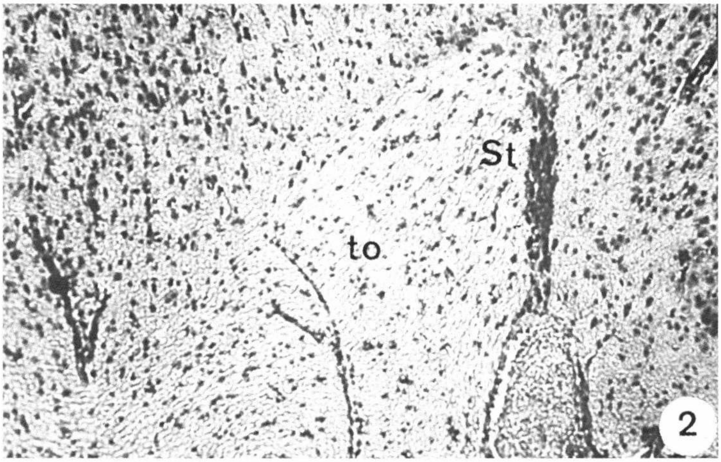
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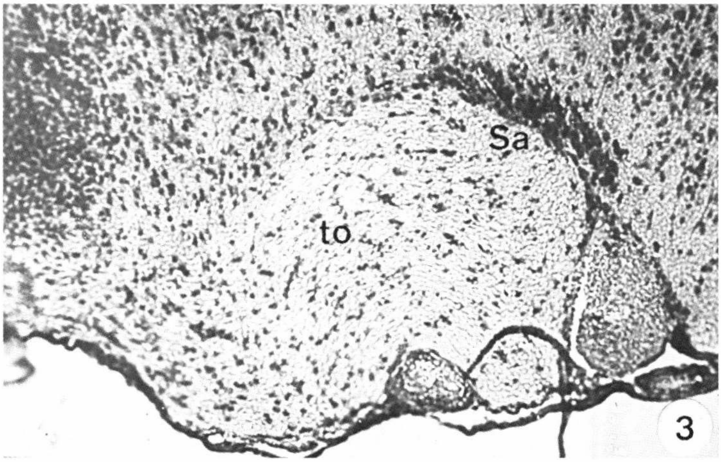
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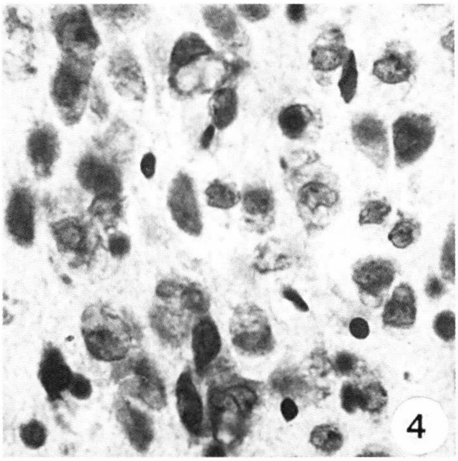

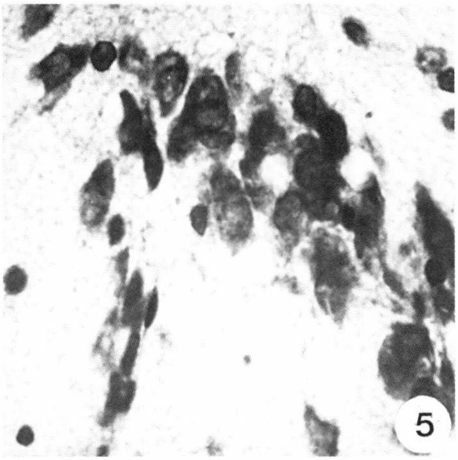

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PHOTOGRAMS

Phot. 1. Paraventricular nucleus – transverse cross-section in half of the length. Mag. 60 × .
Phot. 2. Supraoptic nucleus – pars tuberalis. Mag. 60 × .
Phot. 3. Supraoptic nucleus – pars anterior. Mag. 60 × .
Phot. 4. Cells of paraventricular nucleus. Mag. 500 × .
Phot. 5. Cells of supraoptic nucleus. Mag. 500 × .

ABBREVIATIONS USED

P – paraventicular nucleus, Sa – supraoptic *nucleus pars anterior*, St – *supraoptic nucleus pars tuberalis*, to – *tractus opticus*.

STRESZCZENIE

Opisano morfologię jądra przykomorowego (*nucleus paraventricularis*) i jądra nadwzrokowego (*nucleus supraopticus*) u myszy kolczystej (*Acomys cahirinus* Desmarest 1891) na podstawie obserwacji seryjnych skrawków parafinowych barwionych fioletem krezylowym wg metody Klüvera i Barrery. Do badań użyto po dwa mózgowia – samca i samicy. Jądro nadwzrokowe jest wydłużonym, pojedynczym pasmem komórek nerwowych. W porównaniu z innymi gatunkami gryzoni odpowiada ono części przyśrodkowej tego jądra (wg Armstronga). Jądro przykomorowe u myszy kolczystej wykazuje też mniej zróżnicowaną budowę komórkową: występują tu głównie komórki wielobiegunowe. Jądro nadwzrokowe ma budowę podobną jak u susła perełkowanego i orzesznicy, a także zbliżoną do budowy tego jądra u szczura Wistar, chociaż podział na *pars anterior* i *pars tuberalis*, które wyróżniane są u szczura, nie jest tak wyraźny.