

RELATIVE NUMBERS OF VARIOUS TYPES OF CELL IN THE RAT ADENOHYPOPHYSIS

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It is well known that there are 3 kinds of cells in the adenohypophysis—the acidophil, basophil, and the chromophobe. They secrete various hormones, and according to many authors [9] the chromophobe cells are cambial in nature, and take little part in the secretion of hormones. The basophil cells secrete thyrotropic, follicle-stimulating, and luteinizing hormones, hormones which are glycoproteins and contain a substance known as hexosamine [4]. Purves and Grisbach [8] used the histochemical method of MacManus and Hotchkiss [5, 7] to demonstrate glycoproteins, and found many characteristic structural features of the basophil cells in rats, and on this basis they divided the cells into 3 types: thyrotrops, follicle-stimulating gonadotrops, and luteinizing gonadotrops. These authors also described how most of the thyrotrops were found in the center of the gland, while cells of the gonadotropic series were to be found in the zone lying adjacent to the posterior hypophyseal lobe, particularly in the periphery of the zone. Descriptions of the relationships of the different types of cells in the adenohypophysis are not of a strict quantitative nature: only the preponderance of one or another type of cell has been estimated.

Data are available concerning the reaction of the anterior hypophyseal lobe to various experimental influences; in particular in the works of E. B. Pavlova [1, 2] a detailed description is given of changes occurring in the cells of the anterior hypophyseal lobe after castration and various other measures. But this description also is mainly qualitative.

The object of the present investigation has been to determine the percentages of acidophils, basophils, and chromophobe cells in the different zones of the adenohypophysis, and the distribution of the basophil cells of the thyrotropic and gonadotropic series in the zones.

EXPERIMENTAL METHOD

The experiments were carried out on 6 normal sexually mature female rats weighing from 125-179 g. All the rats were in a condition of diestrus. The weight of the pituitary varied from 4-7 mg. The pituitaries were fixed in mercuric chloride and formol, and embedded in paraffin. Sections 4 μ thick were cut and stained by the methods of MacManus and Hotchkiss; we used a modification which enabled all 3 types of cell to be revealed. The cytoplasm of the basophil cells was stained crimson, while the acidophil cells were an orange yellow. The nuclei of all 3 types of cells stained well in Harris's hematoxylin, and were a dark blue. The cytoplasm of the chromophobe cells scarcely stained at all. A count of the cells was made in the following zones: 1) in the zone bordered by the posterior lobe, 2) in the center of the gland (central zone), and 3) in the peripheral zone. A count was made of 5000 cells in each zone, in each of the animals. Altogether 90,000 cells were counted.

EXPERIMENTAL RESULTS

As can be seen from the results given in Table 1 the acidophil, basophil, and chromophobe cells in the adenohypophysis of female rats are unevenly distributed. In all zones the chromophobe cells preponderate, and the percentage may be as high as 59.3 (in the peripheral zone). The acidophil cells vary from 30.7 to 35.9%, and the basophils from 6.6 to 9.9%.

TABLE 1. Percentage of the Different Types of Pituitary Cells in Female Rats

Zone	Basophil cells	Acidophil cells	Chromophobe cells
Bordering posterior lobe	6.67	35.91	57.41
Central	7.7	35.95	56.31
Peripheral	9.97	30.71	59.34

Statistical treatment by the method of Student-Fisher showed significant differences as follows.

1. Between the basophil cells in the zone adjacent to the posterior lobe and the number in the peripheral zone ($P < 0.001$).

2. Between the number of acidophil cells in the zone adjacent to the posterior lobe and the number of acidophil cells in the peripheral zone ($P = 0.013$); there was also a difference between the number of acidophil cells in the central and peripheral zone ($P = 0.009$). In all the remaining cases the differences were not statistically significant.

In the same 3 zones we determined the distribution of the thyrotrops and gonadotrops among the basophil cells. We used many features to distinguish these types (shape, size, position with respect to blood vessels, and nature of the granularity). We counted 3,000 basophil cells in each zone. The results of the experiment are given in Table 2.

TABLE 2. Percentage of Thyrotropic and Gonadotropic Cells in the Different Zones of the Adenohypophysis of Female Rats

Zone	Thyrotropic cells	Gonadotropic cells
Bordering posterior lobe	16.06	53.92
Central	78.93	21.05
Peripheral	6.35	93.63

The differences in the content of gonadotropic and thyrotropic cells in the peripheral zone and the zone adjacent to the posterior lobe was not statistically significant. In all other cases there was no doubt about the difference ($P < 0.0001$).

The results of the experiments agree with those obtained by many authors who observed that the peripheral zone of the adenohypophysis and the zone adjacent to the posterior lobe contained mostly gonadotropic cells, and that the thyrotropic cells are mostly found in the center of the anterior lobe. The quantitative results obtained in the present work confirm these observations. During the investigations we found that the mitotic activity in the adenohypophysis was very low (2 mitoses in 99,000 cells); very frequently binucleate acidophil cells were found [6]. Binucleate basophil cells were seen only rarely. Apparently polyploidy may occur, because there is considerable variation in the nuclear size.

SUMMARY

The percentages in female rats of acidophil, basophil, and chromophobe cells in the central and peripheral portions of the anterior pituitary lobe, as well as in the portion adjacent to the posterior lobe were determined. It was shown that the number of chromophobe cells in the various portions ranged from 56.3 to 59.3%. The number of acidophils varied between 30.7 and 35.9%, and basophils from 6.6 to 9.9%. The basophil count was higher in the peripheral portion than in the portion adjacent to the posterior lobe; there were fewer acidophil cells in the peripheral than in the central portion or in the portion adjacent to the posterior lobe.

Of the basophils there were 93.6% in the peripheral and only 21.0% in the central portion. On the other hand the thyrotrops numbered 78.9% in the central portion, 6.35% in the peripheral zone, and only 16.0 in the portion adjacent to the posterior lobe.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
