

CELL COMPOSITION OF THE ANTERIOR LOBE OF THE PITUITARY WITH RAISED AND LOWERED LEVELS OF ESTROGENS IN THE BODY

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After castration, hypertrophy of the basophilic cells producing gonadotropic hormones takes place in the anterior lobe of the pituitary, and their number is increased [1, 2, 3, 4, 11]. It has also been reported that increased doses of estrogens depress the activity of the gonadotropic cells [8, 9]. However, the quantitative changes in the various groups of cells of the adenohypophysis have been inadequately studied.

The object of this investigation was to determine the quantitative changes in the cell composition of the anterior lobe of the pituitary in rats after castration and administration of synestrol (dihydrostilbestrol).

EXPERIMENTAL METHOD

Experiments were carried out on 18 female rats weighing 150 g. The ovaries were removed from 9 animals (series I), and the other 9 rats (series II) received an injection of an oily solution of synestrol in a dose of 0.4 mg per animal daily for 7 days. The investigation of vaginal smears showed that a permanent diestrus was produced in the castrated animals on the second day after the beginning of the experiment, and a permanent estrus in the animals receiving synestrol. The rats were sacrificed 7 days after the beginning of the experiment. The pituitaries were fixed in mercuric chloride-formol fixing solution. Sections were stained by the methods of McManus and Hotchkiss [7, 10]. All three types of cells of the adenohypophysis were counted in three zones: peripheral, central, and bordering on the pars intermedia of the pituitary. Altogether about 100,000 cells were counted. Results obtained previously on normal rats, not subjected to any form of procedure, and in a state of diestrus, were used for comparison. The numerical results were analyzed by statistical methods.

EXPERIMENTAL RESULTS

Analysis of the experimental results (see Table) shows that statistically significant changes took place in the number of basophilic cells of the peripheral zone and the zone bordering on the pars intermedia (i.e., the cells of the gonadotropic series) in the castrated animals by comparison with the controls. In the castrated rats the number of basophils in the peripheral zone increased to 12.76%, and in the zone bordering on the pars intermedia to 11.92%. The intensity of staining of the basophils in these zones was rather greater than in the control animals, and they stained appreciably brighter than the same cells in the animals receiving synestrol.

The anterior lobe of the pituitary of the castrated and control rats in a state of diestrus was in a similar functional state, because in both cases a deficiency of estrogens was present in the body, leading to an increase in the size and number of cells producing gonadotropic hormone. However, absence of the ovaries caused a more marked increase in the relative proportion of cells of the gonadotropic series.

In the rats stimulated with synestrol, compared with the normal rats and, in particular, with the castrated animals the basophilic cells of the gonadotropic zones of the adenohypophysis appeared paler, and sometimes they were difficult to distinguish from the chromophobes. In the peripheral zone their number fell to 5.89%. Meanwhile the percentage of acidophils increased appreciably and the percentage of chromophobes decreased in all the zones. All these differences were statistically significant. In the animals receiving synestrol the percentage of basophils fell only in the peripheral zone, while in the zone bordering the pars intermedia it remained unchanged compared with the normal animals. It may be supposed that in the zone bordering on the pars intermedia of the pituitary, the basophilic cells do not produce

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Relative Proportions of Type of Cells in the Adenohypophysis (in %) of Female Rats with a Lowered and a Raised Estrogen Level

Experimental conditions	Zone	Acidophilic cells	Basophilic cells	Chromophobe cells
Castration (7 days)	Peripheral	30.29±1.96	12.76±0.30	56.93±1.93
	Central	37.67±1.36	7.83±0.32	54.47±1.60
	Bordering on pars intermedia	34.39±1.40	11.92±0.60	53.66±1.76
Control (diestrus)	Peripheral	30.70±1.04	9.97±0.50	59.31±1.33
	Central	35.95±1.33	7.70±0.70	56.31±1.58
	Bordering on pars intermedia	35.91±1.33	6.67±0.40	57.41±1.45
Synestrol (7 days)	Peripheral	41.00±0.53	5.89±0.43	53.07±0.30
	Central	41.24±0.40	7.24±0.27	51.48±0.48
	Bordering on pars intermedia	42.36±0.76	6.48±0.33	51.14±0.60

follicle-stimulating hormone. They may possibly produce luteinizing hormone, as a result of which the increased doses of synestrol had no inhibitory effect on these cells. The increase in the level of basophilic cells in this zone after castration may be explained by removal of the inhibitory action of progesterone after removal of the ovaries. This assumption, however, requires experimental verification.

It is difficult at present to explain the increase in the percentage of acidophils in the animals receiving synestrol. It has been claimed that the action of estrogen on the anterior lobe of the pituitary increases the production of prolactin, whereas castration sharply depresses the lactogenic activity of the pituitary [5, 6]. Prolactin is known to be produced by the acidophilic cells. Most probably during the action of estrogens the acidophilic cells producing prolactin become more numerous.

The theory of the conversion of chromophobe cells into basophils and acidophils depending on the functional state of the adenohypophysis is probably confirmed by these findings. For instance, in castrated animals, in which the percentage of basophils is increased and in animals stimulated with synestrol, in which the percentage of acidophils is increased, the percentage of chromophobes is reduced. In the first case this decrease is not statistically significant, but evidently only because the absolute number of newly formed basophils is too small to cause any significant change in the proportion of chromophobes.

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