

STIMULATING EFFECT OF A COMBINATION OF LACTIN AND HYPHOTOCIN ON  
GALACTOPOIESIS IN RATS

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In the modern view a primary role in the regulation of the physiology of lactation is played by neurohormonal factors [1, 2, 4, 5]. Prolactin, a hormone of the adenohypophysis, is known to have a specific lactogenic action, directed toward the secretory activity of the mammary gland [9, 11]. However, for the lactogenic effect of prolactin to be fully manifested, the presence of other hormones also is necessary [3, 6]. A special role in this process is evidently played by oxytocin, a hormone regulating the processes of milk ejection. Recent investigations have shown that this neurohypophyseal hormone, besides its specific action on myoepithelial cells, also has an effect on formation of fat granules in the secretory cells of the mammary gland [7, 9].

The object of the present investigation was to study changes in the structure and function of the mammary gland of lactating rats after simultaneous administration of Soviet preparations of lactogenic hormone (lactin) and oxytocin (hyphotocin).

#### EXPERIMENTAL METHOD

Experiments were carried out on 100 sexually mature female albino rats and 600 newborn rats. In each litter six rats were left on the sixth day.

On the 17th day after parturition the mothers were given subcutaneous injections of the following preparations in a volume of 0.2 ml daily for 8 days: group 1, 5 units lactin; group 2, 0.125 unit hyphotocin; group 3, 5 units lactin + 0.125 unit hyphotocin; group 4, physiological saline. The young rats were taken from their mothers daily and deprived of food and water for 6 h. The quantity of milk sucked was judged from the difference in weight before and after feeding, which lasted 30 min.

The experimental mothers were killed on the 24th day after parturition. The right abdominal lobe of the mammary gland was dissected and fixed in neutral formalin, embedded in paraffin wax in the usual way, and histological sections were cut and stained with hematoxylin-eosin, with picrofuchsin, and by Brachet's histochemical reaction for RNA [8].

Sections through the mammary gland were cut on a freezing microtome and stained for fat with Sudan III and IV.

#### EXPERIMENTAL RESULTS

The results of the morphophysiological analysis showed that in all cases signs of depression of lactopoiesis were present in all rats of the control group receiving physiological saline. This was expressed as a decrease in the number of lactating females (Table 1). Signs of involution were observed morphologically. Partial lysis and expression of the degenerating cells into the lumen of the alveoli and a marked decrease in the RNA content in the cytoplasm of the epithelial cells can be clearly seen in Fig. 1a. Injection of lactin into the animals did not prolong the period of lactation, and the mean quantity of milk sucked from one female on the last day of the experiment was actually reduced. Nevertheless, in histological sections

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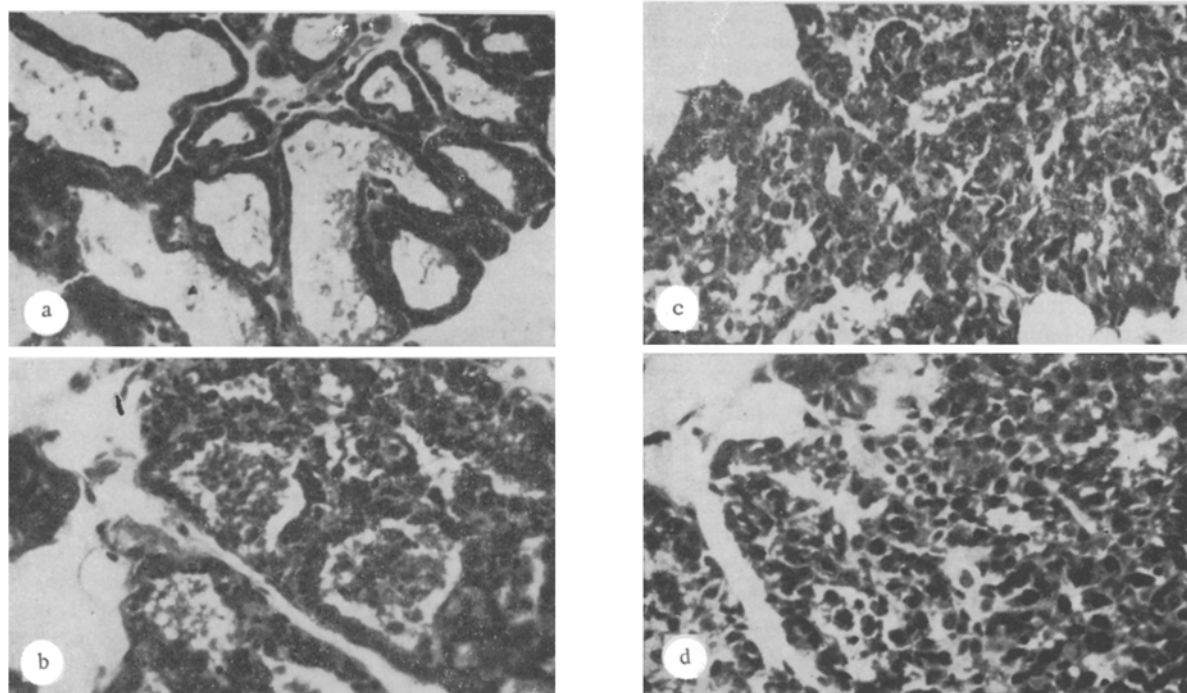


Fig. 1. State of glandular epithelium of mammary gland of rats after injection of physiological saline (a), lactin (b), hyphotocin (c), and lactin + hyphotocin (d). Hematoxylin-eosin, 52  $\times$ .

TABLE 1. Changes in Lactation under the Influence of Hormones

Preparation injected	No. of mothers in groups	Percentage of lactating mothers on 24th day	Quantity of milk sucked from one rat on 24th day
Physiological saline	30	53	$1,80 \pm 0,49$
Lactin	20	50	$0,8 \pm 0,29$
Hyphotocin	22	82	$4,0 \pm 0,66$
Lactin + hyphotocin	25	92	$3,7 \pm 0,81$

through the mammary gland a sharp increase in the size of the alveoli with flattened epithelium was observed, and many of them were packed with fatty contents (Fig. 1b).

The connective tissue of the mammary gland in this group of experimental mothers consisted of thin bands. In the stretched alveoli the epithelial cells were flattened in shape but the RNA content in these cells was nevertheless higher than in the control.

In the group of animals receiving hyphotocin the number of lactating females was sharply increased (Table 1). Morphological analysis showed that despite the large number of empty alveoli with cubical epithelium, intensive development of connective tissue containing large fat cells was observed in the mammary gland of the mothers of this group (Fig. 1c).

Simultaneous injection of lactin and hyphotocin caused a significant increase in the number of lactating females (Table 1); the mean quantity of milk sucked from one female was doubled. In histological sections of the mammary gland of this group of animals, lobules in different stages of development and function could be seen (Fig. 1d). Some of the lobules had dilated alveoli filled with secretion. The epithelium of the alveoli was flattened. Meanwhile there were some lobules which consisted of tubular alveoli, in the lumen of some of which desquamated epithelial cells could be seen. The development of interlobular connective tissue was observed. The epithelial cells were cylindrical. The RNA content was much higher than in the control, possibly indicating an increase in the intensity of secretory processes in the cell.

The results of these experiments indicate a well-marked effect of pituitary hormones on the structure of the mammary gland. Lactogenic hormone is known to cause activation of milk secretion [10, 12]. The results of the present experiments show that lactin alone, if given to lactating females in the stage of declining lactation, causes stimulation of lactopoiesis, which is not accompanied by active ejection of milk, as is confirmed by a decrease in the quantity of milk sucked by the young rats on the 24th day after birth (0.8 g). This phenomenon may perhaps be associated with the fact that an excess of lactogenic hormone in the blood, as a result of injection of prolactin leads by a feedback mechanism to inhibition of secretion of endogenous oxytocin. Meanwhile, a high oxytocin concentration accompanied by a deficiency of lactogenic hormone, which is observed in the stage of declining lactation, does not inhibit the process of fatty involution of the mammary gland, as the results of the present experiments showed.

Simultaneous administration of the two hormones leads to more distinct stimulation of lactopoiesis, when signs of involution were least marked.

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