THE ROLE OF THE NERVOUS SYSTEM IN LACTATION

A. V. Ogorodnyaya

From the Physiology and Anatomy of Agricultural Animals Department of the
Kherson Agricultural Institute

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The presence of nerve trunks servicing the mammary gland has been established by many researches; these nerves have been shown to originate from the lumbar-sacral section of the spinal cord, and their branches in the gland have been traced [3, 4, 6, 11]. Similar studies by P. Dmitrievsky [5], later confirmed by other works, proved that a mass of effector type nerve endings are present in the glandular cells of the mammary gland. Research conducted by M. Mironova (1895) and L. N. Voskresensky (1896) in I.P. Pavlov's laboratory showed first that lactation depends on the integrity of the nerve trunks and secondly that lactation is changed by stimulation of these nerve trunks. The latest studies of I. I. Grachev [3] showed the importance of the interoceptive reflexes to mammary gland activity.

However, there are certain known experimental data from which scientists have concluded that humoral factors, particularly the hypophyseal hormones, play the only regulating role in lactation. The supporters of the humoral theory of lactation are W. Petersen, F. Goltz, O. Riddle and others. They discount the role of the nervous system in the lactation process.

EXPERIMENTAL METHODS

In this work, we investigated the effect on lactation of stimulating and inhibiting the autonomic nervous system by means of pharmacological substances.

The pharmacological method makes it possible to avoid the negative influence of operative intervention, which may damage nerves and vessels, and provides conditions for observation which are maximally proximate to normal conditions. Changes in the tonicity of the autonomic system may be estimated according to the operation of glands known to be regulated by the central nervous system, for example, the salivary glands, and by then comparing these data with the effect on the mammary gland. The substances we used for this purpose were:

1. Pilocarpine and carbocholine (Merck's "Lentin"), as substances stimulating the parasympathetic part of the autonomic nervous system, especially its secretory fibers. We used the following doses: 1.5-2 ml of 1% pilocarpine and 0.4-1.5 ml of a 0.1% solution of carbocholine.

2. Atropine, as an agent inhibiting the nervous elements, in a dose of 1-1.5 ml of a 1% solution.

3. Adrenalin, as a stimulator of the sympathetic part of the autonomic nervous system. It was injected in doses of 1.5-2 ml of a 0.1% solution.

4. Thyroidin, which was fed with bread in a daily dose of 2 grams. The sympathicotrophic action of thyroidin was the principal effect we had in mind, and we therefore used thyroidin in several experiments in combination with adrenalin in order to intensify thyroidin's effect on the sympathetic division.

The experiments were conducted on 7 animals - 5 female goats and 2 cows. After a control period, the substance was injected daily for 4-7 days; a week elapsed between each series of experiments. The injections of the experimental substance were done in the morning. The udder was completely stripped to eliminate all
accumulated milk before the injection. The subsequent batches of milk were obtained by careful milking 1 and 2 hours after the injection. The changes in the composition of the milk were also studied, which made it possible to estimate the effect of the experimental preparation on the corresponding portion of the nervous system and also to ascertain the character of the secretion. For this purpose, we studied the changes in the dry matter content and in certain of its components – fat, lactose and ash.

To observe the effects of the substances and the change in the tonicity of the autonomic nervous system, fistulas of the parotid gland ducts were induced in 3 goats. This enabled us to calculate the intensity of saliva secretion.

**EXPERIMENTAL RESULTS**

1. The effect of the substances stimulating the parasympathetic part of the autonomic nervous system – pilocarpine and carbocholine – on the lactation process was expressed by an increase in the volume secreted the first hour after the injection. With pilocarpine, this increase was an average of 15% in relation to the control experiments for the first hour after the injection, and reached 56% in individual cases. With the carbocholine injection, there was a greater increase in the milk yield, which consisted of an average of 145% in relation to the control experiments the first hour after the injection, and in individual cases was more than 200%.

![Graph showing the effect of carbocholine on milk composition and synthesis work of the gland](image)

The effect of carbocholine on change in milk composition and on the intensity of the synthesizing work of the gland (average from 5 goats).

1) dry matter; 2) percentage of fat in milk; 3) lactose; 4) yield of dry matter in g per hour; 1) carbocholine; 2) control; shaded column – carbocholine; white column – control.