in the Arneth index (granulocytosis, with a shift to the left, and a fall in the reticulocyte count).

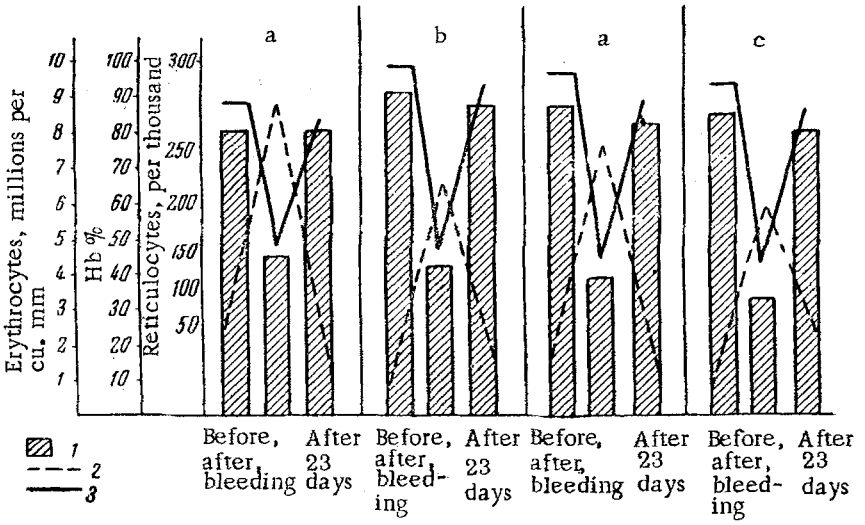

Fig. 3. Effects on the blood of prolonged administration of Noctal and Sonbutal to mice suffering from experimental anemia. a) controls; b) Noctal; c) Sonbutal; 1) hemoglobin; 2) erythrocytes; 3) reticulocytes.

In experimental anemia, produced by repeated bleeding, administration of Noctal and Sonbutal was, similarly to Medinal and Nembutal, without effect on the rate of recovery (the normal blood picture was restored equally soon in the experimental and control groups). Administration of Barbamyl, on the other hand, prolonged the time needed for recovery; the signs of anemia persisted over the 23 days of administration, at about the same level as immediately after bleeding.

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UDDER RECEPTION IN COWS AND GOATS, AND THE COMPOSITION OF THE BLOOD

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(Received April 21, 1956. Presented by V. N. Chernigovsky, Member Acad. Med. Sci. USSR)

Alterations affecting the whole of the organism take place during lactation. Lactation, like any other process taking place in the organism, is under the control of the central nervous system. Our knowledge of how this nervous control of secretion and ejection of milk is achieved, and by which pathways, is, however, far from being complete.

A number of authors [2, 3, 4, 6] have indicated a reflex connection between the receptor apparatuses of the udders and the alimentary tract.

A study of the processes of secretion and excretion of milk, conducted in our laboratory on ruminants, revealed a rise in the dry content of the blood after milking the animals. A study of the blood morphology showed pronounced changes in the composition of blood after massage of the udders and milking.

V. N. Chernigovsky and A. Ya. Yaroshevsky [7] have given a number of examples of the effects of stimulation of the receptors of individual organs on the morphological composition of the blood. Thus, stimulation of gastric interoceptors causes alterations in red corpuscle and differential white cell counts. The findings of E. L. Kan [5], who stimulated cows' gastric interoceptors, are evidence of well-defined alterations in blood composition following such stimulation. A.Ya. Yaroshevsky's work [7] showed that alterations in the composition of the blood occur similarly after stimulation of dogs' gastric interoceptors.

The present paper presents preliminary results of experiments on the effects of stimulation of udder receptors on the blood picture of cows and goats.

EXPERIMENTAL METHODS

Blood examinations were performed on: a) lactating goats; b) not lactating animals, which had never lactated; c) lactating cows; d) heifers. The hemoglobin content, erythrocyte and leucocyte counts, and differential cell counts of the blood were determined.

EXPERIMENTAL RESULTS

Our first experiments, performed under laboratory conditions on goats, showed that massage of the udders and milking caused a considerable rise in the erythrocyte count, without affecting the hemoglobin content. In one of the experiments, a goat was milked once by its regular milker, and on another occasion by a different person, all other conditions being the same. As appears from Figures 1 and 2, massage and milking caused a

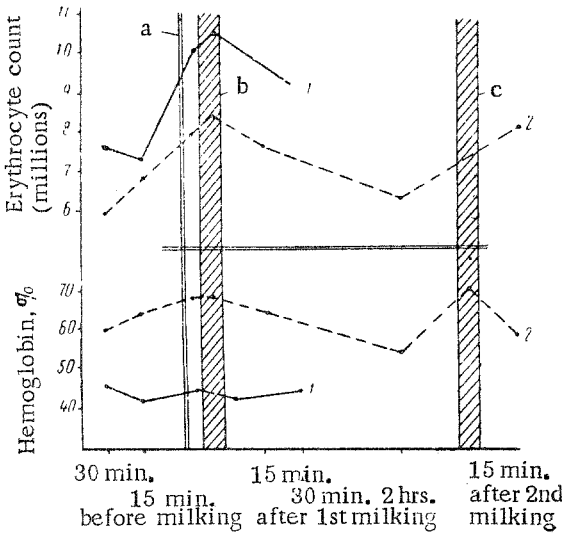

Fig. 1. Alterations in erythrocyte count and hemoglobin content of blood associated with milking. 1) Goat; 2) cow; a) entry of milkmaid; b) and c) massage and milking (first and second).

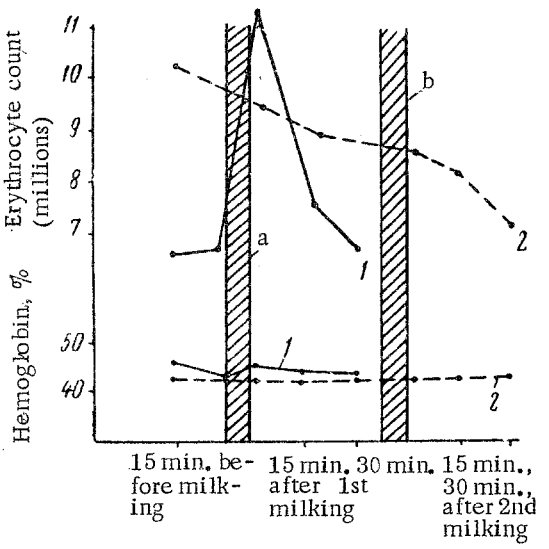

Fig. 2. Effect of condition of udder receptors on alterations in erythrocyte count and hemoglobin content. 1) Control cow; 2) cow with anesthetized udder; a) and b) massage and milking.

considerable rise in the erythrocyte count (from 7,280,000 to 10,950,000 in one case, and from 6,800,000 to 11,230,000 in the other), without any change in the hemoglobin content. It should be noted that the blood changes took place not only after massage and milking, but also after the action of other factors connected with these processes: the entry of the milkmaid caused as large changes in the blood picture as did the milking itself, which is evidence of the inception of a conditioned reflex arc (see Figure 1). The speed with which the

blood reaction appeared after milking is evidence of the part played by the central nervous system in producing the effect.

Experiments were performed on goats after previous anesthetization of the udders, by Magda's method. No blood changes were seen after massage and milking (see Figure 2). The high erythrocyte count found at the beginning of the experiment can be ascribed to the lumbar procaine block. It is known that lumbar procaine block causes a pronounced rise in the erythrocyte count [1]. The return to normal of the erythrocyte count coincided in our experiment with restoration of sensibility to the udders.

It may be concluded that the blood changes depend on stimulation of udder receptors; when these are excluded we could find no change in blood morphology.

The experiments on nonlactating goats gave a somewhat different result. Experiments were performed on Goat No. 16 before and after calving. This animal had never previously been milked. At the same time we examined the blood of a nonlactating goat, No. 8, which had been in milk the previous year. It was found that the goat which had never lactated did not show any blood changes after massage of the udders, but that these appeared after birth of the kid, and that they were identical with those found in all lactating animals after massage of the udders. The blood changes resulting from udder massage of Goat No. 8 were similar to those found in lactating animals, with the sole difference that they were of short duration.

Massage and milking are followed not only by changes in the erythrocyte count, but also in the differential white cell count: the lymphocyte count rises, and there is a slight fall in the neutrophil count. This reaction is of a short duration.

The changes observed in cows' blood after milking are presented in Figure 1 and in the Table. These changes are of the same sort as for goats, in that the erythrocyte count rises. But whereas in goats the hemoglobin content is unchanged, in cows massage and milking produce changes which vary parallel with the erythrocyte count. The lymphocyte count rises, and the neutrophil count falls slightly (Figure 3). The duration of this reaction is much less than that of the erythrocytosis.

As for goats which had never lactated, massage of the udders of heifers caused no changes in the blood. Massage of the udders of cows, not followed by milking, evoked the same blood reaction as milking itself.

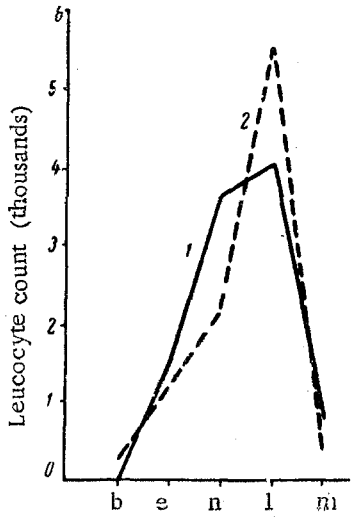

Fig. 3. Leucocyte count of cow's blood before and after milking 1) efore milking; 2) after milking; b) basophils; e) eosinophils; n) neutrophils; l) lymphocytes; m) monocytes.

Our experiments demonstrated the existence of nervous connections between udder receptors and the hemopoietic organs. It may be presumed that the bone marrow participates in this reaction, releasing erythrocytes of low hemoglobin content into the blood in response to stimulation of the udders. Further support is given to this presumption by the rise in reticulocyte count of the blood of goats after milking. The blood index (ratio of percentage hemoglobin content to the erythrocyte content in millions) falls steeply in goats after milking. It is evident that the mechanism of the nervous connections in cows is somewhat different to that in goats, since the index does not vary in cows after milking.

The changes in blood composition following the appearance of the milkmaid are evidence of the existence of a conditioned reflex mechanism. That these changes are not seen in animals which have never lactated, in response to massage of the udders, suggests that this reflex is established during the first lactation. Further research may reveal the pathways whereby the reaction is effected. The process of milking, and subsequently the preliminaries to milking alone, evoke a definite reaction in the composition of the blood. It may be concluded that the process of milking is of considerable significance to the organism as a whole.

TABLE

Effect of Milking on the Erythrocyte Count and Hemoglobin Content of Cows

When experiment performed	Name of cow							
	Mol		Gazel		Zenitka		Volzhanka	
	erythrocytes, millions	Hb, %	erythrocytes, millions	Hb %	erythrocytes, millions	Hb %	erythrocytes, millions	Hb %
Before milking	7.50	50	5.91	56	6.09	50	5.92	60
During Milking	8.59	60	7.20	60	7.89	60	8.67	69
30 minutes after milking	—	—	—	—	7.08	51	7.91	66
40 minutes after milking	7.86	51	6.72	52	—	—	—	—
1 hour 30 minutes after milking	6.77	—	6.24	51	6.01	53	6.18	54
During 2nd milking	8.62	60	7.19	61	7.08	59	7.36	68
25 minutes after milking	8.04	62	7.75	61	—	—	—	—
40 minutes after milking	—	—	—	—	—	—	8.50	59
1 hour after milking	—	—	—	—	6.28	50	—	—

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BLOOD CHANGES DURING PHYSIOLOGICAL SLEEP

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(Received September 16, 1955. Presented by V. N. Chernigovsky, Member Acad. Med. Sci. USSR)

Nocturnal sleep causes alterations in a number of the vegetative functions of the body. Variations in the cytomorphology of peripheral blood during sleep have been little investigated, although the study of hematological and other functional shifts taking place in the organism during sleep is necessary in the application of sleep therapy. The results of a study of the cytomorphology of peripheral blood during nocturnal physiological sleep will be reported in the present paper.

EXPERIMENTAL METHODS

The observations were carried out on 32 healthy men, aged from 21 to 23 years. In 22 of them two blood samples were taken: one before sleep, at about midnight, and one during sleep, at about 6 a.m. Four blood samples were taken from the remaining subjects: one before sleep, and three during the night, at 2-hourly

* In Russian.