

## THE EFFECT OF PNEUMOPERITONEUM ON ASEPTIC LEUKOCYTOSIS CAUSED BY PARENTERAL INJECTION OF MILK

K. A. Pimenova

From the Experimental Section (Head - G. S. Kan, Candidate for Medical Sciences),  
Leningrad Institute of Tuberculosis (Directors - Prof. A. D. Semenov, Research Consultant;  
V. N. Chernigovsky, Active Member of the Academy of Medical Sciences, USSR)

(Received October 30, 1956. Presented by V. N. Chernigovsky, Active Member of the  
Academy of Medical Sciences, USSR)

In earlier published works [6,7], we showed that the inducement of pneumoperitoneum in animals produced marked changes in the excitability of the basomotor center, thermoregulation and the respiratory center.

The purpose of this work was to study the effect of pneumoperitoneum on leukocytosis caused by the intramuscular injection of boiled skin milk.

### EXPERIMENTAL METHODS

When the mechanoreceptors and chemoreceptors were stimulated, changes appeared in the composition and quantity of the peripheral blood leukocytes [1,2,3,8]. The part of the reflex component in these leukocyte reactions has been proved [4,5,9,10,11].

In our experiments, the leukocyte reaction was caused by intramuscularly injecting cats with 3 ml of boiled skin milk, under aseptic conditions.

The studies were done on 8 male cats. 39 experiments and 248 hematological examinations were done in all. Each animal was examined every 15-30 days. The milk was injected into a different paw in each different experiment.

The observations were so conducted that the control studies with the milk injection (without the injection of air into the celiac cavity) alternated in each animal with the experiments, in which pneumoperitoneum had been preliminarily induced. Besides, the spontaneous fluctuations occurring in the peripheral blood leukocyte content under no influence other than that of the experimental set-up were examined in each animal over a period of 4 hours.

The number of leukocytes in the peripheral blood was determined before the milk injection and then, 30 minutes, 1, 2, 3, and 4 hours after the injection. Blood was taken from an incision made in the ear with sharp scissors.

In the experiments, small volumes of air were injected into the celiac cavity in 9 cases (100-150 ml), and large volumes in 3 cases (300-400 ml). Pneumoperitoneum was induced 1-1½ hours before the milk injection. During this period, no appreciable changes in the number of leukocytes in the peripheral blood appeared.

### EXPERIMENTAL RESULTS

Leukocytosis, in accordance with the data in the literature, developed in the control observations with the intramuscular milk injection. The temporary and slight decrease in the original number of peripheral blood leukocytes, which occurred right after the milk injection, usually became, within an hour or two, acute leukocytosis, which continued for the next two hours of observation.

In the experiments in which pneumoperitoneum had been induced, leukocytosis also developed before the milk injection, but the features of the leukocyte reaction effected by the pneumoperitoneum were different,

TABLE 1

The Effect of Pneumoperitoneum (small doses) on Leukocytosis Caused by the Parenteral Injection of Skim Milk (average of all experiments)

Time interval in hours after milk injection	Numerical increase of leukocytes in control experiments (in %)	Numerical increase of leukocytes in experiments with pneumoperitoneum (in %)	Difference in leukocyte numerical increase in experiments with and without pneumoperitoneum (in %)
2	108	91	-17
3	167	94	-73
4	181	128	-53
Average	152	104	-48

TABLE 2

Effect of Pneumoperitoneum (large doses) on Leukocytosis Caused by Parenteral Injection of Milk

Time interval after milk injection (in hours)	Numerical increase of leukocytes in control experiments (in %)	Numerical increase of leukocytes in the experiments with pneumoperitoneum (in %)	Difference in numerical increase in experiments with and without pneumoperitoneum (in %)
2	102	130	+28
3	158	160	+2
4	172	186	+14
Average	144	159	+15

In 8 out of 9 experiments in which a small dose of air (100-150 ml) had been preliminarily injected into the celiac cavity, the leukocyte reaction to the parenteral injection of milk was less marked than in the control (Fig. 1).

The change in the number of leukocytes in the experiments and in the control is shown in Table 1.

Table 1 shows that the average numerical increase of leukocytes 2, 3 and 4 hours after the milk injection (the results were not determined during the first hour due to the fact that the original number of leukocytes usually decreased considerably during that period) was 48% less in the experiments than in the control.

Therefore, the preliminary injection of small volumes of air into the celiac cavity causes the leukocyte reaction, developing due to the milk injection, to be moderated, and decreases the intensity of the developing leukocytosis.

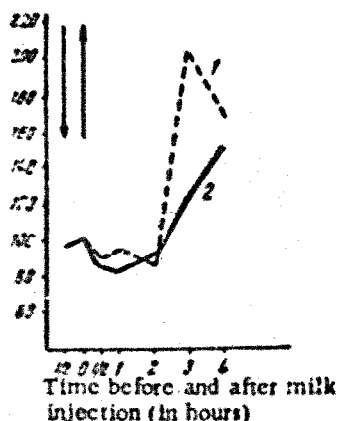


Fig. 1. Effect of pneumoperitoneum caused by the injection of a small volume of air (125 ml) on leukocytosis caused by the intramuscular injection of milk.

1) control; 2) experiment; ↓ - air injection; ↑ - milk injection.

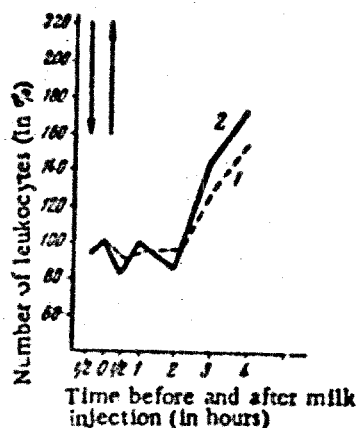


Fig. 2. Effect of pneumoperitoneum caused by injection of large volume of air (375 ml) on leukocytosis caused by intramuscular injection of milk. The symbols are the same as in Fig. 1.

The preliminary injection of large volumes of air (300-400 ml) into the cellic cavity caused the leukocyte reaction to the parenteral milk injection to be greater, not smaller, in the experiment than in the control (Fig. 2, Table 2).

Table 2 shows that the average numerical increase of leukocytes 2, 3 and 4 hours after the milk injection was 15% higher in the experiments than in the control.

Therefore, under identical experimental conditions, pneumoperitoneum in some cases (when small volumes of air are injected into the cellic cavity) decreases leukocytosis, but in other cases (when large volumes of air are injected) has a completely opposite effect and even somewhat intensifies leukocytosis.

### SUMMARY

The effect of air injection into the abdominal cavity in aseptic leukocytosis caused by intramuscular injection of boiled skim milk was studied.

One group was injected with 100-150 ml of air, the second with 300-400 ml.

The leukocytic reaction depends on the volume of air injected: a small volume lowers and a large volume raises the leukocytic reaction in comparison with the control group.

Thus, a relatively small volume of air injected into the abdominal cavity inhibits reflex mechanisms effecting the leukocytic reaction following parenteral injection of milk.

### LITERATURE CITED

- [1] R. I. Volynskaya, in the book: *The Mechanisms of Pathological Reactions*,\* Leningrad, 1941, 3, p. 25.
- [2] R. I. Volynskaya, in the book: *The Mechanisms of Pathological Reactions*,\* Leningrad, 1943, 6, pp. 21-26.
- [3] E. L. Kan, *Data Studying the Effect of the Nervous System on Blood Composition*,\* Dissertation, Leningrad, 1953.
- [4] K. G. Malysheva, in the book: *The Mechanism of Pathological Reactions*,\* Leningrad, 1950, 16-20, pp. 128-150.

\* In Russian.

[5] K. G. Malysheva, On the Mechanism of the Leukocyte Reaction, Conditioned Reflex Leukocytosis, Leukocyte Reaction in Narcosis Caused by Barbiturates,\* (Experimental study), Author's Abstract of Dissertation, Leningrad, 1951.

[6] K. A. Minenova, In the book: Concerning the Role of the Nervous System in the Pathogenesis and Treatment of Tuberculosis,\* Moscow, 1954, 1, pp. 309-319.

[7] K. A. Minenova, Arkh. Patol., 1955, Vol. 17, No. 3, pp. 3-8.

[8] V. N. Chernigovsky and A. Ya. Yaroshevsky, Problems Concerning the Neural Regulation of the Blood Systems,\* Moscow, 1953.

[9] M. D. Shkolnikova, Byull. Eksp. Biol. i Med., 1952, Vol. 34, No. 6 (12), pp. 24-26.

[10] M. D. Shkolnikova, Byull. Eksp. Biol. i Med., 1953, Vol. 35, No. 6, pp. 22-24.

[11] A. Ya. Yaroshevsky, Arkh. Patol., 1951, No. 3, pp. 16-20.

---

\* In Russian.