EFFECT OF OROTIC ACID ON PHAGOCYTIC ACTIVITY OF THE LEUKOCYTES

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UDC 612.112.3.015.641.8

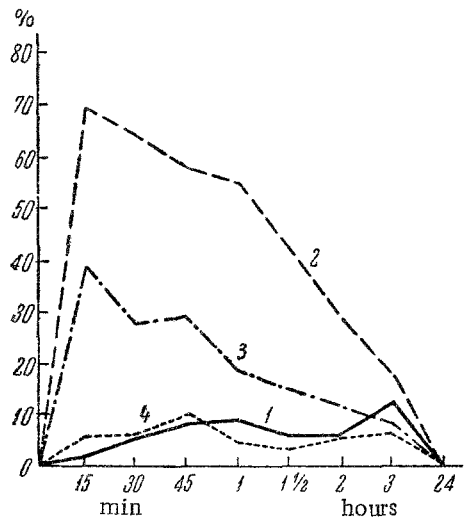
Investigations have shown [1, 3] that certain derivatives of pyrimidine (1, 3, 4-trimethyluracil, pentoxyl,* cytosine, metacil,† guametacil, and dihydrometacil) stimulate the phagocytic activity of the leukocytes in vitro. Pyrimidines with a nitro group in position 5 do not possess these properties.

Orotic acid is a natural metabolite in the synthesis of the pyrimidine bases [2, 4]. However, its influence on the phagocytic activity of the leukocytes has not been studied in vivo.

The object of the present investigation was to study the effect of orotic acid on the phagocytic activity of the leukocytes in guinea pigs.

EXPERIMENTAL METHOD

Four series of experiments were carried out. The guinea pigs (44 males weighing 350-400 g) received orotic acid daily by mouth for 15 days in doses of 100 mg/kg (series I), 50 mg/kg (series II), and 5 mg/kg (series III). In series IV (control) the guinea pigs were not given orotic acid. The experimental and control animals were kept on the ordinary vivarium diet. The phagocytic activity of the leukocytes toward foreign (hens') erythrocytes was studied in the guinea pigs of all the series against the background of aseptic information caused by intraperitoneal injection of meat-peptone broth into the animals. The exudate was extracted from the peritoneal cavity 15, 30, and 45 min and 1, 1.5, 2, 3, and 24 h after injection of a 1% suspension of hens' erythrocytes. Films of the exudate were dried, fixed with methyl alcohol, and stained by the Giesma – Romanovsky method. Two hundred leukocytes (neutrophils and monocytes) were counted in the film and the percentage of cells taking part in phagocytosis (Hamburger's index) and the mean number of hens' erythrocytes injested by the phagocytes (Wright's index) were determined.



Phagocytic activity of leukocytes in guinea pigs after receiving various doses of orotic acid. Along the axis of ordinates – phagocytic activity; along the axis of abscissas – time of investigation. 1) Control; 2) series I (100 mg/kg); 3) series II (50 mg/kg); 4) series III (5 mg/kg).

EXPERIMENTAL RESULTS

The results obtained are shown in the figure. The highest phagocytic activity was observed in the animals of series I. The differences from the control values were significant at all times of the investigation except the first day.

In the animals of series II, the phagocytic activity was less marked than in those of series I, although it was much higher than this index in the control animals 15-60 min after injection of hens' erythrocytes. Subsequently, it corresponded to the phagocytic activity of the control animals.

*5-Hydroxymethyl-4-methyluracil – Publisher's note.

†Methylthiouracil — Publisher's note.

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Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 63, No. 4, pp. 76-78, April, 1967. Original article submitted October 1, 1965.

In the experiments of series III the phagocytic activity of the leukocytes was the same as in the control animals.

Wright's phagocytic index in the experimental animals of series I was 1.8 compared with 1.0 in the controls.

A fact deserving attention was the more rapid increase of phagocytic activity of the leukocytes in the experimental animals of series I and II: the maximal phagocytic activity in the experimental guinea pigs was found 15 min after injection of the hens' erythrocytes, compared with 1 h after injection in the control animals.

Administration of orotic acid for 15 days had no significant effect on the number of leukocytes in the peripheral blood. The inflammatory leukocytosis (12 h after injection of meat-peptone broth) was more marked in the control guinea pigs of series IV (number of leukocytes increased by 61.2%) and the experimental animals of series III (number of leukocytes increased by 54.2%). In the experimental animals of series I and II the number of leukocytes in the peripheral blood increased after injection of meat-peptone broth by only 37.3% and 38.5% respectively.

These results show that orotic acid stimulates the phagocytic activity of the leukocytes in the body. However, this activity depends on the dose of orotic acid; highest activity is possessed by a dose of 100 mg/kg body weight, a dose of 50 mg/kg is less active, and a small dose – 5 mg/kg – does not stimulate phagocytic activity of the leukocytes.

LITERATURE CITED

1. E. I. Zhitova et al., in the book: Proceedings of a Conference on the Use of Pyramidine Derivatives in Oncology and Other Fields of Medicine [in Russian], Leningrad (1963), p. 36.
2. B. A. Lavrov, Vopr. Pitaniya, No. 6, 68 (1962).
3. Yu. N. Tokarev, Farmakol. i Toksikol., No. 2, 168 (1959).
4. F. B. Straub, Biochemistry [in Russian], Budapest (1963), p. 318.