EFFECT OF DEVELOPMENT OF A BROWN-PEARCE TUMOR ON PHAGOCYTIC ACTIVITY OF CIRCULATING LEUKOCYTES IN RABBITS

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UDC 616-006.6-092.9-07 : 616.155.3-008.13

In the early periods of development of a Brown-Pearce tumor the phagocytic activity of the circulating leukocytes of rabbits increases, but later it decreases. Regression of the tumor or its surgical removal, without the subsequent development of metastases, is accompanied by a lasting increase in phagocytic activity of the leukocytes.

The study of phagocytosis, a nonspecific index of the resistance of the body, is of practical as well as theoretical interest not only in inflammatory diseases, but also in other pathological processes, notably in malignant disease. Data in the literature on this subject are inconsistent or contradictory [1-3, et al.].

The object of the present investigation was to study the dynamics of phagocytic activity of the leukocytes in rabbits developing a Brown-Pearce tumor.

EXPERIMENTAL METHOD

Three similar groups of male rabbits weighing 2.5-3 kg (10 animals in each group) were selected. The animals of groups 1 and 2 were inoculated intratesticularly with a 20% suspension of Brown-Pearce tumor in a dose of 0.5 ml. In the animals of group 2, on the 5th day after inoculation of the tumor the testis with the tumor transplanted into it was removed. The animals of group 3, apparently healthy rabbits, acted as controls.

The phagocytic activity of the circulating leukocytes was determined against a strain of Staphylococcus aureus.* Blood from the rabbit was taken from the marginal vein of the ear, and in accordance with the method, films were made from each experimental animal. In each film 100 neutrophil leukocytes were counted, and the phagocytic number (percentage of neutrophils engaged in phagocytosis) and the phagocytic index (ratio between the number of ingested cocci and the number of neutrophils examined) were calculated. The phagocytic activity of the leukocytes was determined throughout the experiment: before inoculation of the tumor, and every 5-7 days thereafter until death of the animals. The results were analyzed statistically by the Fisher–Student method. Differences were regarded as significant when $P < 0.02$.

EXPERIMENTAL RESULTS

The original (before inoculation of the tumor) indices of leukocytic activity in all three groups of animals varied within narrow limits (Table 1). The difference between the phagocytic numbers and phagocytic indices of the rabbits of groups 1 and 2 and the control group (group 3) are not statistically significant.

*The strain was obtained from the L. A. Tarasevich Central Institute of Vaccines and Sera.

Laboratory of Immunology of Tissue Growth and Development, Institute of Experimental Biology, Academy of Medical Sciences of the USSR, Moscow. (Presented by Academician of the Academy of Medical Sciences of the USSR N. N. Zhukov-Verezhnikov.) Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 70, No. 8, pp. 83-85, August, 1970. Original article submitted December 28, 1969.

TABLE 1. Phagocytic Number and Phagocytic Index for Rabbits at Various Times after Inoculation of Brown-Pearce Tumor (M ± m)

Group of rabbits	Phagocytic number				Phagocytic index			
	before inoculation of tumor	on 8th day	on 15th day	on 22nd day	before inoculation of tumor	on 8th day	on 15th day	on 22nd day
1	49,2±2,1	62,6±3,8	36,6±2,2	31,1±1,5	1,69±0,2	3,25±0,31	0,9±0,08	0, 81±0,06
2	49,2±2,1	70,2±4,4	38,4±1,6	35,0±2,1	1,69±0,2	3,76±0,13	1,05±0,32	0, 87±0,07
3	57,1±3,1	53,7±2,8	51,0±3,6	54,5±3,1	1,26±0,1	1,18±0,3	1,38±0,15	1, 19±0,09
4	49,2	80,0	83,1	79,1	1,69	4,7	2,7	2,7

No substantial variations were observed in the indices of the control group (group 3) of animals throughout the period of investigation by comparison with the original level.

Subsequently, on the 5th-8th day after inoculation of the tumor, a statistically significant increase in phagocytic activity was observed in the experimental animals of group 1, when compared both with the corresponding figures in the control group and with those in the same rabbits before inoculation of the tumor (for the phagocytic number, $P = 0.002$; for the phagocytic indices the absence of transgression indicates significance of the differences). Later, during development of the tumor (15th-22nd day after inoculation) the phagocytic number and phagocytic index virtually decreased, although still remaining within the limits of significance (Table 1).

Both the increase and the subsequent decrease in phagocytic activity of the experimental animals of this group were thus statistically significant, when compared with the original criteria of phagocytic activity and also when compared with those criteria in the animals of the control group at the corresponding times of the investigation.

In the animals of group 2, from which the malignant tumor, together with the testis, was removed on the 5th day after its inoculation, the indices of phagocytic activity were approximately the same at all times of investigation as in group 1. This is evidently because after the surgical operation on the experimental animals of this group, as was discovered at autopsy, intensive metastasization was observed (just as in group 1), and this was responsible for the absence of clear differences between the intensity of phagocytic activity in the animals of these two groups (differences between indices for groups 1 and 2 are not significant).

In the course of the experiment, and also after its end, at autopsy on the animals, the tumors in two rabbits of group 1 were discovered to have regressed, while in one rabbit from group 2 no metastasization was observed after removal of the primary tumor. It was therefore decided to exclude these rabbits from the groups indicated above for analysis of the data and to isolate them as a separate group (4), for although they were few in number, their levels of phagocytic activity and their general state differed sharply from those of the animals in groups 1 and 2 with progressively developing tumors.

The rabbits of group 4 were sacrificed when their condition was satisfactory on the 22nd day, i.e., at the same times as animals of groups 1 and 2 died or were sacrificed (in a serious condition).

The results in Table 1 show that indices of phagocytic activity in the rabbits of group 4 during the period of absorption of the tumor (starting from the 8th day after inoculation) were significantly higher than the original indices before inoculation of the tumor (no transgression is present when the indices for the various groups are compared).

It can be concluded from a comparison of the data for all four groups that the phagocytic activity of the circulating leukocytes in rabbits during growth of a Brown-Pearce tumor and of its metastases is inconstant and fluctuates considerably. In the early periods of development of the tumor (3rd-8th day) a clearly defined increase in phagocytic activity of the leukocytes is observed, and this is subsequently followed by a decrease and subsequent depression of phagocytic activity.

This decrease in phagocytic activity of the leukocytes corresponds to the times of appearance of macroscopically visible metastases of tumors of this particular strain, as the writers have shown previously. Subsequent development of the tumor is accompanied by still greater depression of phagocytosis.

Following removal of the primary focus of the Brown-Pearce tumor, which did not prevent the development of metastases of that tumor in the rabbit, the phagocytic activity of the leukocytes was not appreciably

changed by comparison with that in the group of rabbits from which the primary focus was not removed (these differences are not statistically significant).

Regression of the inoculated Brown-Pearce tumor in the rabbits or its surgical removal without subsequent development of metastases (group 4) is accompanied by an increase in the phagocytic activity of the leukocytes.

These results suggest that the phagocytic activity of the leukocytes is an indicator of the course of tumor development. It can be used in conjunction with other data (immunologic, clinical, etc.) as evidence on which to assess the course and, to some extent, the prognosis of the malignant process in rabbits inoculated with a Brown-Pearce tumor, for in the case of its complete regression, not followed by the development of metastases, the phagocytic activity of the leukocytes in these animals is increased and remains for a long time at a higher level than originally (before inoculation of the tumor), and also by comparison with the control group. At the same time, during progressive development of the tumor and its metastases, although the phagocytic activity of the leukocytes is increased in the early periods of development of the tumor, it subsequently falls sharply.

LITERATURE CITED

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