ANTIGENIC CHANGES IN THE MAMMARY GLAND TISSUES OF LINE-A MICE DURING POSTNATAL DEVELOPMENT

V. F. Shchekolodkin

UDC 612.664.017.1-019

Mice of lines with a high cancer incidence are known to be susceptible to Bittner virus, which is transmitted with the mother's milk, only in the first few days after birth, although the disease itself does not develop until many months later [4-6]. This fact served as the basis for the hypothesis that the entry of the virus into the mouse's body soon after birth leads to the development of a state of artificial immunologic tolerance to this virus [2].

The reproduction of this phenomenon depends on the timing of the adaptive period, which ends in mice, as experiments have shown, in the first days of life [9].

At the same time, the opinion is held that the action of the factors controlling the susceptibility of mice to mammary gland cancer is localized to the cells of these glands, and that the presence of young cells is essential for tumors to develop in cases when the virus enters the body for the first time [1, 8].

The author has postulated that the mammary gland tissues of mice in the adaptive period differ in their antigenic structure and their metabolic properties from the same tissues in later stages of development, and this may be responsible for the existence of certain favorable conditions for introduction of the virus into the cells of the mammary glands.

In the present investigation the antigenic structure of the mammary glands of mice of the high-cancer A line was studied in the course of postnatal development.

EXPERIMENTAL METHOD AND RESULTS

The experimental method is described in the previous paper, which dealt with the study of the antigenic structure of the spleen in the process of development of line-A mice [3].

In the experiments of series I, the reaction of an antiserum against mammary gland antigens of young day-old mice with antigens from the mammary gland tissues of line-A mice at different periods of life was investigated (Fig. 1A, B). As may be seen in Fig. 1A, the antiserum formed two precipitation bands with nearly all the antigens, and one band with antigens from the mammary gland tissues of line-C57BL mice aged 90 days. No reaction was given with antigens from the mammary gland tissues of 15-, 30-, and 90-day-old animals, the mammary gland tissues of pregnant line-A mice, and antigens from the tissues of a spontaneous mammary gland adenocarcinoma of mice of the same line the precipitation bands with antigens from the mammary gland tissues of day-old line-A mice and line-C57BL mice, and of 7-day-old line-A mice remained (Fig. 1b). It may be concluded that the mammary gland tissues of mice aged 1 and 7 days contain antigens absent from these tissues at subsequent periods of life of the mice.

The antisera against antigens from the mammary gland tissues of mice aged 30 and 90 days were investigated in the same way. Because of the uniformity of the results, the data obtained by the study of the antiserum against the mammary gland tissues of 90-day-old mice are given (Fig. 2).

It is clear from Fig. 2A that the antiserum formed a different number of precipitation bands with antigens from the mammary gland tissues of mice of different ages. After absorption of the antiserum with antigens from the mammary gland tissues from animals 1 and 7 days old, precipitation bands remained to antigens from older mice (Fig. 2B, C). After absorption of this antiserum with antigens from the mammary gland tissues of animals aged 30 and 90 days, it was completely exhausted.

Laboratory of Immunology of Growth and Development, Institute of Experimental Biology, Academy of Medical Sciences of the USSR, Moscow (Presented by Active Member of the Academy of Medical Sciences of the USSR, N. N. Zhukov-Verezhnikov). Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 64, No. 9, pp. 78-81, September, 1967. Original article submitted August 10, 1966.

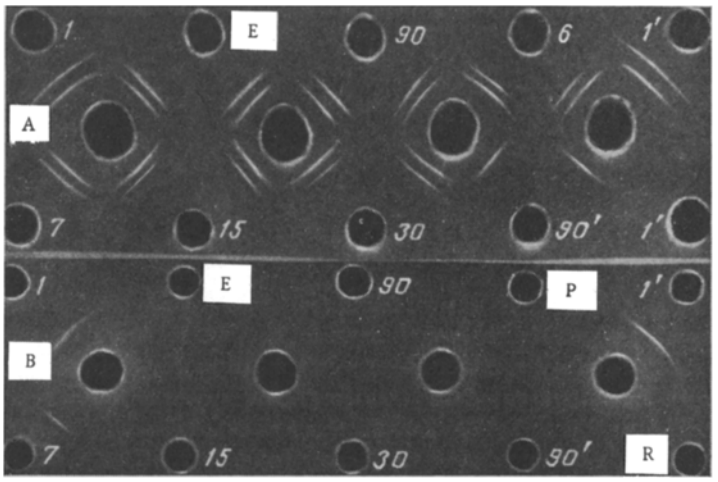

Fig. 1. Gel-precipitation reaction between antiserum against the mammary gland tissues of day-old animals and antigens from the mammary gland tissues of mice of different ages. A) Native antiserum; B) antiserum absorbed by antigens from the mammary gland tissues of mice aged 15, 30, and 90 days. 1, 7, 15, 30, 90) Antigens from the mammary gland tissues of line C57BL mice aged the corresponding number of days; P) antigens from the mammary gland tissues of pregnant line-A mice; E) antigens from the tissues of a spontaneous mammary gland adenocarcinoma of line-A mice; R) antigens from the mammary gland tissues of Wistar rats 90 days old.

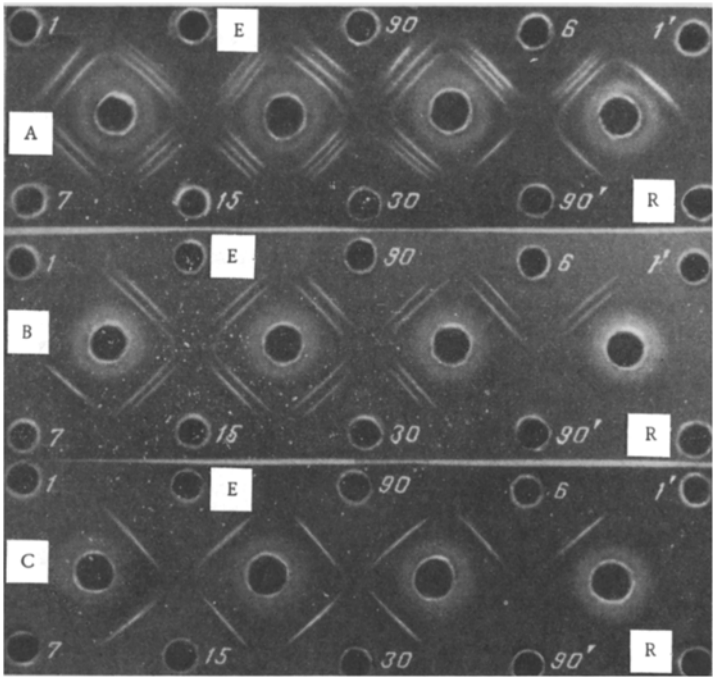

Fig. 2. Gel-precipitation reaction between antiserum against the mammary gland tissues of animals aged 90 days and antigens from the mammary gland tissues of mice of different ages. A) Native antiserum; B) antiserum absorbed by antigens from the mammary gland tissues of day-old mice; C) antiserum absorbed by antigens from the tissues of the mammary glands of 7-day-old mice.

The differences observed in the antigenic structure of the mammary gland tissues of the newborn and adult mice could not be attributed to the presence of serum proteins and skin antigens of the newborn animals in the tissue extracts, for in the crossed gel-precipitation reaction with antiserum against the mammary gland tissues of day-old mice nonidentity was established between the precipitation bands to plasma antigens of the newborn and adult mice, and also to the skin antigens of the newborn mice, and the bands formed to antigens from the mammary gland tissues of mice aged 1 and 90 days. In addition, absorption of this antiserum by plasma and skin antigens of newborn mice did not exhaust it, for precipitation bands continued to be formed to mammary gland antigens of mice aged 1 and 90 days. Similar results were obtained during the investigation of the antiserum against the mammary gland tissues of 90-day-old animals after its absorption by plasma antigens of newborn and adult mice.

The results obtained demonstrate that in the process of development of line-A mice the mammary gland tissues differ antigenically at different stages of postnatal development. The definite antigenic differences between these tissues in the first days of life compared with in subsequent periods of development of the animals suggest that the metabolic processes in the developing mammary glands in the early postnatal period, which evidently corresponds to the adaptive period of the animals so far as the phenomenon of tolerance is concerned, possesses certain specific differences. These specific metabolic differences are possibly associated with the favorable conditions for the introduction of Bittner virus into the mammary gland cells of mice in the first days of their postnatal development.

LITERATURE CITED

1. L. A. Zil'ber, The Virus Theory of Origin of Malignant Tumors, Moscow (1946).
2. L. A. Zil'ber and G. I. Abelev, The Virology and Immunology of Cancer, Moscow (1962), p. 90.
3. I. N. Maiskii and V. F. Shchekolodkin, Byull. éksp. Biol., No. 8, 75 (1967).
4. E. E. Pogosyants, Cancer of the Mammary Glands of Mice and the So-Called Milk Factor, Author's abstract of doctoral dissertation, Moscow (1952).
5. J. J. Bittner, Science, 84, 162 (1936).
6. Idem, Cancer Res., 12, 510 (1952).
7. B. Björklund and V. Björklund, Proc. Soc. Exp. Biol. (New York), 79, 319 (1952).
8. L. Dmochowski, Brit. J. Cancer, 2, 94 (1948).
9. M. Woodruff, Ann. N. Y. Acad. Sci., 64, Art. 5, 792 (1957).