

# ONCOLOGY

## CHANGES IN THE ANTIGENIC PROPERTIES OF TUMOR CELLS UNDER THE EFFECT OF X-RAYS IN VITRO

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The question of the effect of ionizing radiation on the animal organism has been studied by many investigators.

L. F. Larionov [5] has presented data on the biochemical changes of desoxyribonucleoproteins under the effect of penetrating radiation; S. N. Aleksandrov [1] and N. V. Eltsina [2] observed changes in the rate of protein synthesis and energy exchanges of tumor cells under the effect of x-rays; R. Abrams [7] B. Holmes and L. Mee [8] studied changes in protein metabolism of the animal organism exposed to ionizing radiation.

N. N. Zhukov-Verezhnikov, I. N. Maisky and V. S. Gostev [3] put forward a suggestion concerning the possibility of the appearance of new antigenic properties on subjection of tumor cells to penetrating radiation. R. V. Petrov and L. I. Ilyina [6] observed changes in the antigenic properties of hepatic tissue elements and intestinal mucosa of white rats exposed to total roentgen irradiation. L. A. Zilber, V. A. Artamonova, G. M. Frank and A. D. Snezhko [4] report changes in the antigen composition of liver and spleen cells in rabbits following ionizing irradiation.

The present work is concerned with the problem of whether ionizing radiation exerts any effect on the antigen properties of tumor cells.

### EXPERIMENTAL METHODS

Experiments were carried out on Ehrlich's ascitic tumor cells (adenocarcinoma) irradiated in vitro with x-rays (dose 5000 r).

The freshly obtained ascitic cells were washed free of ascitic fluid with physiologic solution (three washings), being each time spun in a centrifuge at 2000 rpm. The washed cells were placed in small agglutination test tubes of equal diameter which had been previously weighed. The weight of the ascitic cells in the test tubes was so adjusted that on addition of 2 ml physiologic solution, 0.4 ml of the obtained suspension contained, according to experimental conditions, 2, 6, 10, 20 mg etc. of ascitic cells. The test tubes with the tumor cells were stoppered tightly with rubber bungs and shaken. Half the prepared test tubes was subjected to x-ray irradiation for 10 minutes (current 10 mA, voltage 180kV, no filter, dose 500 r per minute).<sup>\*</sup> The remaining test tubes served as controls. The viability of the irradiated cells was tested by subcutaneous inoculation of white mice.

Changes in the antigenic properties of the cells under the effect of x-rays were studied by means of the anaphylactic reaction with desensitization, sensitization being effected subcutaneously and desensitization and the resolving administration – intracardially.

The interval between sensitization and desensitization was 22-25 days; the intervals between repeated intracardiac injections were 2 hours. Guinea pigs sensitized with irradiated Ehrlich's ascitic cells were

<sup>\*</sup> The irradiations were performed at the Radiobiologic Laboratory of the Institute of Normal and Pathologic Physiology, AMN SSSR, with consultant help of the Director, N. N. Lebedev.

desensitized with non-irradiated ascitic cells. After checking for complete desensitization, irradiated Ehrlich's ascitic cells were administered as the resolving element.

Guinea-pigs sensitized and desensitized with non-irradiated ascitic cells served as controls, as did guinea-pigs which were used for testing the toxicity of the doses of preparations to be used for resolving.

### EXPERIMENTAL RESULTS

As can be seen from the Table, guinea pigs sensitized with irradiated Ehrlich's ascitic cells did not show complete desensitization on administration of non-irradiated ascitic cells.

TABLE 1

Results of Active Anaphylaxis Reaction with Desensitization with Irradiated and Non-Irradiated Ehrlich's Ascitic Cells

| Sensitiza-<br>tion.<br>Antigen-<br>irradiated<br>ascitic cells | Desensitization. Antigen - native ascitic cells |          |                         |          |                         |               |                         |       | Resolving admini-<br>stration. Antigen<br>irradiated ascitic<br>cells |          |
|--|---|----------|-------------------------|----------|-------------------------|---------------|-------------------------|-------|---|----------|
|  | 1st administra-<br>tion                         |          | 2nd administra-<br>tion |          | 3rd admini-<br>stration |               | 4th admini-<br>stration |       |   |          |
| dose<br>(In mg)  | dose<br>(In mg)                                 | reaction | dose<br>(In mg)         | reaction | dose<br>(In mg)         | reac-<br>tion | dose<br>(In mg)         | reac- | dose<br>(In mg)   | reaction |
| 10   | 2   | ±        | 6                       | ++       | 10                      | —             |                         |       | 10  | +        |
| 10   | 2   | +        | 6                       | +++      | 10                      | —             |                         |       | 10  | +        |
| 10   | 2   | ++       | 6                       | ±        | 10                      | —             |                         |       | 10  | ++       |
| 10   | 2   | +        | 6                       | ++       | 10                      | —             |                         |       | 10  | ++++     |
| 20   | 6   | +++      | 10                      | +        | 20                      | —             |                         |       | 20  | +++      |
| 20   | 6   | ++       | 10                      | ±        | 20                      | —             |                         |       | 20  | ++       |
| 20   | 6   | ++       | 10                      | —        | 20                      | —             |                         |       | 20  | +        |
| 20   | 6   | +++      | 10                      | ++       | 20                      | —             |                         |       | 20  | ++       |
| 50   | 2.5   | ±        | 7.5                     | ±        | 25                      | —             | 50                      | —     | 50  | +        |
| 50   | 2.5   | ++       | 7.5                     | +        | 25                      | ±             | 50                      | —     | 50  | ++       |
| 50   | 2.5   | +        | 7.5                     | ++       | 25                      | —             | 50                      | —     | 50  | +++      |

Note: The guinea pigs which were used for testing the toxicity of the preparations used were not included in the Table since administration of irradiated and untreated tumor cells in doses equal or even exceeding those used in resolving administrations did not elicit any discernible reaction in the animals.

Signs: — absence of reaction; ± occasional scratching of face and sneezing; + repeated scratching of face and sneezing; ++ the same plus coughing, unsteadiness; +++ the same plus convulsions, urinary and fecal incontinence.

This suggests the conclusion that changes occur in the antigenic structure of Ehrlich's tumor cells under the effect of ionizing radiation (in this case roentgen rays). New antigenic properties, absent in non-irradiated ascitic cells, would appear to arise under these conditions.

### SUMMARY

Complete desensitization of guinea pigs did not occur, if Ehrlich's ascitic cells, not irradiated by x-rays, were introduced following sensitization of these animals by the ascitic cells, previously irradiated by x-rays (the dose being 5000 r). Evidently, there is a change in the antigenic structure of Ehrlich's tumor cells, which takes place under the effect of x-rays.

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\* In Russian.

\*\* Original Russian pagination. See C. B. Translation.