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*Reference 4 omitted in Russian original; extensive literature search suggests this article is the one intended — Translator.

IMMUNITY TO TUBERCULOSIS IN THYMECTOMIZED ADULT MICE

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Thymectomy performed on adult animals 6 months or more before infection with *Mycobacterium tuberculosis* considerably reduces resistance to tuberculous infection; the longer the time after the operation, the greater the decrease in resistance. Disturbances of immunity connected mainly with damage to thymus-dependent cells (depopulation of the thymus-dependent zones, a decrease in the tuberculin sensitivity of the skin and the cytotoxic action of lymphocytes on antigen-containing target cells).

KEY WORDS: thymectomy; tuberculosis; immune response.

The work of Miller [8] and Metcalf [7], and subsequently many other authors has shown that the thymus in the neonatal period is the central organ of immunity. Investigations carried out mainly in the last decade [3-6, 9, 10] have demonstrated that the thymus plays an important role in immunogenesis in the adult state also. These investigations are based primarily on the study of the action of thymectomy or irradiation followed by protection of the bone marrow on the individual phenomena of immunity. The effect of thymectomy in adult animals on infectious immunity, including immunity to tuberculosis, has received much less study.

In the investigation described below the state of immunity to tuberculosis was studied after thymectomy in adult mice.

EXPERIMENTAL METHOD

Thymectomy was performed on CBA mice at the age of 14 weeks (the technique of the operation was fully described earlier [2]). The mice were divided into groups, with 30 in each group, 2, 6, and 12 months after the operation and they were infected intravenously, simultaneously with mice of the same age undergoing mock operations, with a virulent strain $H_{37}Rv$ in a dose of 0.05 mg.

Five mice from each group were killed after infection purely for histological study of the immunocompetent organs, and 10 mice from each group were killed 3 weeks after infection. In this latter group a morphological investigation was made of the immunocompetent organs and lungs and hypersensitivity of delayed type was studied (the cytotoxic effect by the method of Averbakh et al. [1], tuberculin skin tests). The tuberculin skin tests were read after injection of Koch's old tuberculin (0.05 ml) into the footpad of the mouse's hind limb; thickening

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TABLE 1. State of Immunity to Tuberculosis in Mice at Different Times after Thymectomy

Index studied	Infected intact mice (control)	Mice infected at undermentioned times after thymectomy		
		2	6	12
Tuberculin sensitivity (number of positive reactions)	9 of 10	7 of 10	3 of 10	1 of 10
Cytotoxic action of lymphocytes, % of action of intact lymphocytes	61,7± 1,94	56,3± 2,05 $P>0,05$	16,3± 2,16 $P<0,001$	2,4± 1,83 $P<0,002$
Length of survival of infected mice, days	41,2± 0,62	39,8± 0,54 $P>0,05$	32,1± 0,38 $P<0,002$	29,3± 0,46 $P<0,001$

of the footpad by at least 0.15 mm after 24 h was taken to be a positive reaction. Fifteen mice from each group were left for determination of the survival period after infection.

EXPERIMENTAL RESULTS

The results showed that in mice thymectomized 6 and 12 months before infection depopulation of the thymus-dependent zones — periarteriolar in the spleen and paracortical in the lymph nodes — was observed. In regions of proliferation of antibody-producing cells the changes were less marked.

Tuberculin skin tests were positive in the infected control mice and mice thymectomized 2 months before the experiment, but negative in mice thymectomized 6 and 12 months before infection (Table 1). The cytotoxic action of the lymphocytes of animals thymectomized 6 and 12 months before infection was sharply reduced (Table 1).

Three weeks after infection the tuberculous process was much more widespread in the mice thymectomized 6 and 12 months before infection. The length of survival of mice thymectomized 6 and 12 months before infection was 8-13 days less than that of animals thymectomized 2 months before infection and of the control group (Table 1).

The results of these experiments thus show that thymectomy performed on adult mice has an adverse effect on the course of tuberculosis and on the phenomena of immunity to tuberculosis, especially on phenomena dependent upon the thymus. They also show that whereas during the first few months after thymectomy, cells "trained" in the thymus and located in the peripheral organs can participate in the formation of immunity to tuberculosis, in the later stages their pool is exhausted and, in the absence of the thymus, no new stem cells are "trained," with a consequent effect on the ability of the mice to give an immune response and on their resistance to mycobacterial infection.

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