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Reference uncertain

[Study on rats; 200 Oe magnetic field, at a freq. of 50 Hz]

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COMPLEX REACTION OF LYMPHOID TISSUE TO INTERMITTENT MAGNETIC FIELDS

Alternating

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It has been noted in the literature that some features of the immunomorphological complex can be reproduced against a background of nonantigenic stimuli [1]. I.B. Shternberg [2] showed that this applies to single brief exposure to an intermittent [noncontinuous, variable, alternating?] magnetic field (IMF), however, in his experiments only splenic tissue was examined. We investigated the cytological changes in the spleen, thymus, and lymph nodes against a background of prolonged exposure to IMF.

Method

We divided 120 rats into two equal groups. One group was exposed to IMF (intensity -- 200 oersted, frequency -- 50 hertz). The control group of rats was kept under the same conditions, but not exposed to IMF. The same number of animals was sacrificed after 6, 12, 24, 48, 72 hours, 5, 7, and 14 days, in both groups. Imprint smears of the spleen, thymus, and lymph nodes were fixed in methyl alcohol and stained with azure-eosin. Cytogram counts

were made per 1,000 cells. The data are submitted as means (M±m).

Results and Discussion

Substantial changes occurred with reference to lymphoblasts, medium lymphocytes, immature plasma cells, and neutrophils, under the influence of IMF. No significant changes occurred in other cell forms.

Within the first 12 hours, the number of lymphoblasts dropped in all organs examined, with the exception of the thymus. After 24 hours had elapsed, the decline referable to lymph nodes was followed by a rise of this index (0.16±0.03 in the experiment, versus 0.06±0.04 in the control; $P<0.001$). In the thymus, there was a decline after 1 day (0.1±0.01 in the experimental group, 0.2±0.03 in the control; $P<0.05$). The index dropped in the spleen after 12 hours.

The second wave of changes developed starting on the 5th day. In the thymus, the number of lymphoblasts increased (0.20±0.003 in the experimental group, 0.06±0.0007 in the control; $P<0.01$) on the 5th day, and decreased ($P<0.001$) on the 7th. Approximately the same occurred in lymph nodes, but there was a time shift: the rise was referable to the 7th, rather than 5th, day, and by the 14th day the number of lymphoblasts decreased.

Immediately after exposure to IMF, the number of immature plasma cells decreased (in the thymus and lymph nodes), and by the 3rd day it increased in all organs examined; with statisticaly reliability in the spleen (0.63±0.17 in the experimental group, 0.21±0.08 in the control, $P<0.05$) as well as the thymus ($P<0.05$). This reaction regressed by the 5th day.

The medium-sized lymphocytes reacted only in lymph nodes and the thymus. Unlike other cells, their number increased by the 12th hour. A second rise began on the 3rd day; the curve for the lymph nodes showed two peaks (maximums

on the 3rd and 7th days) with increase in number of medium lymphocytes in the thymus on the 5th, 7th, and 14th days.

Throughout the experiment the number of neutrophils in the spleen was high.

Thus, the reaction of lymphoid tissue to IMF takes place in two stages. The first lasts less than 24 hours. It is characterized by a decrease in number of lymphoblasts and proplasmocytes and increased quantity of medium lymphocytes. Perhaps, it is related to the "anxiety [or alarm] phase" of the Selye stressor reaction, provided IMF is a stressor. The second stage develops by the 3rd day and, in turn, consists of several waves. The earliest consists of an increase in number of proplasmocytes and medium lymphocytes in all organs examined and increased number of medium lymphocytes in the thymus and lymph nodes. Since the cytoplasm of these cells is rich in RNA, it could be believed that this cellular shift reflects intensification of nonspecific protein synthesis, related to discharge into blood of somatotropic hormone (adaptation phase). Later on, the number of proplasmocytes reverts to normal, while the number of medium lymphocytes remains high to the end of the experiment.

We were impressed by the similarity of proplasmocyte count dynamics to what happens with plasma cells at the early stages of immunogenesis (inductiv phase of antibody production). This warrants the assumption that nonspecific (perhaps, stressor) mechanisms play an important part in development of immunomorphological changes in general.

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