

ON THE DIURNAL RHYTHM OF MITOTIC ACTIVITY
IN THE BONE MARROW OF THE RAT

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It has been established that, in the majority of tissues in which the cells are capable of dividing, mitotic activity varies over a twenty-four h period [2]. The one exception is lymphoid tissue [3]. The situation with respect to bone marrow is still not clear. In 1962, Killman and colleagues [8] published an article dealing with a study of the diurnal variation in mitotic activity of human bone marrow cells.

The authors of the above mentioned work inclined to the conclusion that a diurnal rhythm of activity did exist in human bone marrow. However, the rather low number of observations and the somewhat large variation in the mitotic index at various times of the day, together with the failure of these authors to analyze their results statistically, renders this conclusion somewhat unreliable. Because of this, we have been led to undertake this particular research.

EXPERIMENTAL METHODS

The research was carried out on male "Wistar" rats weighing 200-220 g. The animals were decapitated at various times of the day (18-20 at each time). Smears of bone marrow derived from the femoral bones were stained by the technique of Kellner and Stekinger. In order to determine the mitotic index, we counted about 40,000 bone marrow cells containing nuclei. The mitotic index is expressed as a percentage.

EXPERIMENTAL RESULTS AND DISCUSSION

The mitotic index ($M \pm m$) varied from 8.0 ± 0.45 to $9.1 \pm 0.47\%$ according to the time of day. The difference between these values is not statistically significant. Thus, in 18 animals (at 10.5 h) it amounted to $8.0 \pm 0.45\%$, in 19 animals (at 13.5 h) to $8.4 \pm 0.47\%$, in 19 animals (at 16.5 h) to $9.1 \pm 0.47\%$, in 20 animals (at 21.5 h) to $8.6 \pm 0.27\%$, in 18 (at 3.5 h) to $8.6 \pm 0.35\%$, and in 18 (at 10.5 h) to $8.2 \pm 0.45\%$.

It would appear, therefore, that bone marrow cells of Wistar rats maintain a constant tempo of cell division over the whole 24 h and we can now speak of two tissues, in which no diurnal rhythm of mitotic activity occurs: bone marrow and, possibly, lymphoid tissue.

The diurnal periodicity of mitotic activity in various tissues is related to their unequal functional load at different times of the day (light rhythm for the cornea, feeding regime for mucous epithelium of the intestine, etc.). The relationship is one of antagonism between the functional and mitotic activities of the particular tissue [1,4-6,8]. The main function of the bone marrow is the production of blood cells. The functional and mitotic activities in this organ go hand in hand and there cannot be any antagonism between them. The same relationship applies in the lymph node. Hence, the absence of diurnal periodicity in the mitoses of bone marrow and lymph node cells may be described as a consequence of the specific functions of these tissues, which have to be undertaken equally over the 24 h of the day. It should be stated here, that the tissues of the thymus gland, which also has a homopoietic function in the rat, has not been found to exhibit any diurnal mitotic rhythm.

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All abbreviations of periodicals in the above bibliography are letter-by-letter transliterations of the abbreviations as given in the original Russian journal. *Some or all of this periodical literature may well be available in English translation.* A complete list of the cover-to-cover English translations appears at the back of this issue.
