THE NUMBER OF BONE MARROW CELLS IN THE RAT SKELETON

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Details are given of the distribution of nucleated bone marrow cells in 17 parts of the skeleton of noninbred laboratory male rats weighing 200 g. The bone marrow accounted for 22.6, 14.7, 14.4, 13.9, 5.5, 5.0, and 1.8% of the total number present in the bones of the spine, lower limb, head, pelvis, upper limb, ribs, and sternum, respectively.

In order to study the characteristics of radiation damage, especially after nonuniform irradiation, it is essential to know the distribution of bone marrow in the skeleton [1, 3, 4, 8-10]. If the pattern of distribution of tissue doses is known, such information will enable the severity of the damage to the marrow tissue and the possibility of its repair to be assessed. Information on the distribution of bone marrow in the skeleton of the mouse [11, 16], rabbit [5, 7], guinea pig [5], dog [6, 12, 13, 16], monkey [16], and man [5, 15-

TABLE 1. Distribution of Bone Marrow in Skeleton Bones of Noninbred Male Laboratory Rat Weighing 200 g (mean data for 10 animals)

Bones and parts	Personal observ.		Data of Taketa et al., percent of whole bone marrow
	number of bone marrow cells (10^6)	percent of whole bone marrow	
Head	155	14,4	
skull	112,0±14,2	10,4	
lower jaw .	43,0±9,5	4,0	4,0
Upper limb .	59,6	5,5	5,5
humerus . .	43,3±9,1	4,0	
forearm . .	16,3±3,0	1,5	
Clavicle and scapula . .	9,3±2,3	0,9	
Sternum . . .	19,8±2,0	1,8	
Ribs	53,8	5,0	
I-VI (right and left) . .	26,8±3,1	2,5	
VII-XII (right and left) . .	27,0±5,8	2,5	

Bones and parts	Personal observ.		Data of Taketa et al., percent of whole bone marrow
	number of bone marrow cells (10^6)	percent of whole bone marrow	
Spine	243,4	22,6	24
cervical spine	29,8±6,6	2,8	
thoracic I-VI	33,4±6,8	3,1	
thoracic VII-XII	35,9±8,1	3,3	
lumbar	53,7±9,9	5,0	
sacral	55,0±10,2	5,1	
coccygeal	35,6±8,8	3,3	
Pelvic bones	149,0±16,2	13,9	
Lower limb	158,1	14,7	17,5
femur	105,1±13,2	9,8	9,5
leg	53,0±10,2	4,9	
Total. . .*	1075,0	100,0	

*To calculate the total number, the results for paired bones (upper and lower limb, clavicle, scapula) were doubled.

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17] is contained in the literature. Only one paper [16] describes the distribution of bone marrow in certain bones of the rat skeleton, but the details are incomplete.

Data on the distribution of bone marrow in the rat skeleton are given below. Altogether 10 noninbred male rats weighing 200 g were used.

EXPERIMENTAL METHOD

The animals were killed by division of the arteries of the neck. The bones were carefully freed from soft tissues and placed in liquid nitrogen. Bone marrow cells were washed out with a syringe from the chopped bones with 5% acetic acid solution. For work with the bones of the skull and pelvis 16 ml of acetic acid solution was used; otherwise the volume was 8 ml. The resulting cell suspension was drawn up into a white cell mixing chamber without further dilution. Karyocytes were counted by the method of Mantz and Gruzdev [14, 2]. To assess the effect of freezing the bone in liquid nitrogen on the integrity of the cells, the number of femoral marrow cells in the rat obtained by the method described above and by the methods of Mantz and Gruzdev [2, 14] was compared. Freezing the bones in liquid nitrogen led to death of not more than 10% of the cells.

EXPERIMENTAL RESULTS

The data of a statistical analysis of the results are given in Table 1. The results obtained by Taketa et al. [16] are given for comparison.

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