AGE CHARACTERISTICS OF EXPERIMENTAL MYOGENIC THROMBOCYTOSIS

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The age characteristics of the blood platelet picture are of considerable interest to experimental biology and medicine, yet many aspects of this problem remain unexplained. Some authors [8] have reported an increase in the number of platelets in the blood in persons after physical exertion, others [9, 11] found a decrease, while a third group [1, 10] state that the platelet count is unchanged. This problem was studied in more detail by A. A. Markosyan [4, 5], who found a significant increase in the number and a change in the nature of the platelets after physical exertion; he called this phenomenon myogenic thrombocytosis. The same worker gave the first account of the phased character of this phenomenon. Similar findings were reported by Kh. D. Lomazova [3]. These workers studied the blood of adolescent and adult athletes. This, however, exhausts the information which is available on the blood platelet picture from the aspect of age.

EXPERIMENTAL METHOD

Experiments were conducted on 45 rabbits of a local breed, divided into 3 age groups: juvenile (1.5 months), adolescent (3 months), and adult (6 months). Each group consisted of 10 experimental and 5 control animals.

The experimental animals were subjected to graded physical exertion by means of a daily session on a treadmill lasting 2-3 min, by K. P. Ryabov's method [7]. The results of electrocardiographic tests and daily weighing and inspection of the animals showed that the exertion was physiological in nature. The duration of the training period was 7 weeks.

Blood for investigation was taken from the marginal vein of the rabbit's ear at intervals: before exertion, 5 and 20 min, and 1, 2, 3, 4, 6, 9, and 12 h thereafter every week in the case of the experimental animals, and at the same intervals at the beginning, middle, and end of the experiment in the controls.

Films were obtained and stained, and the platelets were counted, by Fonio's method. The size of the platelets was measured by means of an ocular micrometer (1 division = 0.1 μ; MBR-3 microscope; ocular 15, objective 90). The number of erythrocytes per mm^3 of blood was counted in a Foryaev's chamber. The numerical data were analyzed by statistical methods [6].

EXPERIMENTAL RESULTS

Before the experiment began, the platelet count in the blood of the rabbits of the different ages was almost identical, but the quality of the platelets showed certain differences. In the blood of the young animals, for example, the commonest platelets were 1-3 μ in diameter and possessed a bluish-pink hyalomere (82%), while 13% were larger (3-6μ) and had a distinctly basophilic hyalomere, and only 5% of the platelets had a saturated violet color with a pink border at the periphery of the hyalomere and a diameter of less than 1μ. In accordance with the accepted classification [2], these corresponded to adult, juvenile, and senile forms. In the adolescent rabbits and in the adults the proportion of senile forms was higher than in the young rabbits (12-20%) and the proportion of juvenile forms was lower (6-7%).

In the control animals no special features were observed in the platelet picture during the experiment. Only for a period of 1 day was a slight increase in the platelet count observed in the hours of daylight (see table). In the

Mean Number of Platelets (in Thousands) in Samples (per mm^3) of Blood from Control and Experimental Animals

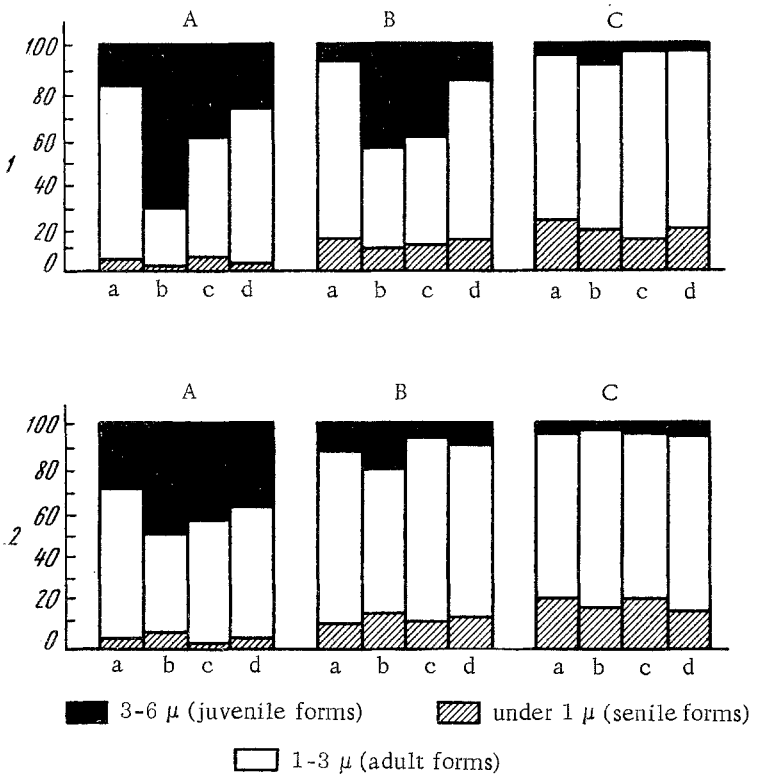
Group	No. of animals	Age	Day of taking blood	Before exert. 7 a.m. (M±m)	Time after exertion 5 min (M±m)	P_1	6 h (M±m)	P_2	12 h (M±m)	P_3
Control animals	5	Young	1-st	109±15	113±15	0,5	140±12	0,2	142±9	0,05
			50-th	107±11	107±10	=0	137±8	0,05	139±5	0,02
	5	Adolescent	1-st	117±15	122±13	0,5	142±8	0,2	168±14	0,05
			50-th	127±9	126±7	0,5	152±7	0,05	152±8	0,05
	5	Adult	1-st	101±2	102±1	0,5	118±13	0,2	125±6	0,001
			50-th	108±11	105±13	0,5	125±15	0,5	144±16	0,05
Experimental animals	10	Young	1-st	114±10	368±31	0,001	250±37	0,01	162±19	0,05
			50-th	109±12	279±41	0,001	236±31	0,01	155±14	0,02
	10	Adolescent	1-st	118±8	218±18	0,001	171±31	0,1	141±12	0,1
			50-th	132±11	166±18	0,1	150±11	0,2	147±10	0,2
	10	Adult	1-st	107±14	135±16	0,2	173±20	0,01	129±11	0,2
			50-th	121±15	134±18	0,5	129±15	0,5	128±15	0,5

experimental animals, on the other hand, changes were found in the platelet picture at all times of the experiment. It is clear from the table that during the first day of the experiment, 5 min after the period on the treadmill, the platelet count of the animals underwent changes which varied from 1 group of rabbits to another. For example, in the young rabbits the platelet count rose on the average by 254,000 per mm^3 of blood (223%), while in the adolescent animals it rose by 100,000 per mm^3 of blood (85%). In the adult animals this increase, as a rule, was small, but was perceptible considering the scale of the individual variations, amounting to 28,000 (26% of the initial value). In the animals of this age a larger increase in the platelet count was observed only 6 h after exertion. In the adolescent and adult rabbits a marked tendency towards restoration of the initial mean level of the platelet count was found 12 h after exertion, whereas in the young animals this index remained significantly elevated.

On the last day of the experiment, as on the first, immediately after exertion the young animals revealed a well defined myogenic thrombocytosis; the picture remained unchanged even after 12 h. At the same time, no increase in the platelet count could be detected in the adolescent and adult animals. Stabilization of this type took place in most of the rabbits of both age groups in the 5th week of the experiment.

The qualitative nature of the platelets also changed in different ways after exertion in the animals of the different age groups (see figure). The figure shows that in the young rabbits, at all periods of the experiment after exertion, a 2nd phase of myogenic thrombocytosis developed, characterized by rejuvenation of the platelet picture (an increase in the number of juvenile forms). The shift of the "thrombocytogram" to the left was still present after 12 h. At the end of the experiment, the number of juvenile forms in the blood of the young animals before exertion increased (24%). The rejuvenation of the "thrombocytogram" in the adolescent rabbits was less marked in degree, and it was completely absent from the blood picture of the adult animals, in which the course of the myogenic thrombocytosis was consequently in its first phase.

It may be concluded from these results that physiological levels of physical exertion produce a myogenic thrombocytosis in animals of different ages. The age differences in the process amount to a more marked myogenic thrombocytosis and a longer recovery period in animals in the period of puberty and, in particular, in younger animals, by comparison with adult animals.



Qualitative changes in the platelet picture of the blood in young, adolescent, and adult experimental rabbits. 1) On 1st day of experiment; 2) on last day of experiment. Along the axis of abscissas—times of taking blood; a) before physical exertion; b) 5 min after exertion; c) 6 h after; d) 12 h after exertion. Along the axis of ordinates—relative percentages of forms of platelets: A) juvenile; B) adolescent; C) adult rabbits.

In the young rabbits and, to a lesser degree, in the adolescent animals, the platelet picture at all periods of the experiment showed a shift to the left. This evidently indicates the revival of the thrombopoietic function of the red bone marrow in these animals.

Adaptation to physical exertion, as shown by the changes in the blood indices examined above, takes place more rapidly in adult and adolescent rabbits than in younger animals.

SUMMARY

A study on 45 rabbits of different ages (1.5-3-6 months) was carried out to assess the quantitative and qualitative thrombocyte changes in blood in response to a 7-week-long physical, physiological load.

The data received showed that the physical load caused myogenic thrombocytosis in the blood of animals with age-specific peculiarities. The time and degree of adaptation to physical load in animals differed also.

When analyzing the thrombocytograms in laboratories it is necessary to take into consideration the age and training of animals and also the dependence of quantity and quality of thrombocytes upon the myogenic factors.

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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.
