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HEMATOLOGICAL VALUES FROM HEART AND TAIL VEIN OF THE GOLDEN HAMSTER

WILLIAM L. MENGEBIER AND BEVERLY PLEASANTS
Department of Biology, Madison College
Harrisonburg, Virginia

Investigation on the effects of partial hepatectomy on the hematology of the golden hamster was begun with the establishment of control values. These results included total erythrocyte and leucocyte counts, differential count, hemoglobin determination, clotting time and platelet count.

Since the withdrawal of marked amounts of blood results in anemia in some rodents, (Farris and Griffith, 1949), all of our hematological data, both pre and post-operative was secured in this laboratory from small tail-vein samples. Comparison with the data of Fulton et al. (1954) revealed significant differences in clotting time and platelet count, Column 2, Table I. The values reported by these authors, however, and the clotting time of 4'52" obtained by Svihla, Bowman and Pearson (1952), were calculated from samples taken by cardiac puncture.

TABLE I
Hematological Control Values

Type Determination				
Red Blood Cells (mm^3)		$7.56x10^6 \pm 1.35$	$6.96x10^6 \pm 1.51$	*
White Blood Cells (mm^3)		$5.96x10^3 \pm 1.50$	$4.64x10^3 \pm 1.90$	*
Hemoglobin (gms./100 ml.)		15.8 ± 1.1	16.0 ± 7.0	*
Clotting time (mins.)		0.87 ± 0.6	2.4 ± 0.6	*
Platelets (mm^3)		$4.95x10^5 \pm 0.40$	$3.28x10^5 \pm 0.89$	*
Neutrophils	(%)	20.3 ± 6.1	26.0 ± 8.0	*
Eosinophils	(%)	$1.5 \pm .91$	1.3 ± 1.4	*
Basophils	(%)	$1.1 \pm .91$	0	*
Lymphocytes	(%)	76.3 ± 6.7	70.0 ± 13.0	*
Monocytes	(%)	1.2 ± 7.4	2.5 ± 0.7	*

* Fulton, Joftes, Kagan and Lutz; *Blood, The Journal of Hematology*, 9:622-629. 1954

In order to ascertain whether the marked differences in clotting times and platelet count in our work was due to the site of sampling, a comparative study was made of blood taken from the heart and tail vein of twenty animals. Values given in Table I are based on data from forty-five animals.

Materials and Methods

Mature hamsters of both sexes weighing between 100 and 147 grams were placed under light ether anesthesia. Cell counts,

hemoglobin concentration and differential counts were made from tail vein samples using standard methods.

Clotting times were determined from tail vein samples by the capillary tube method and from the heart by a modification of the Lee-White method as described by Fulton, Akers, and Lutz (1953). Platelet counts from both samples were made directly using Rees and Eckers fluid as a dilutent.

Results

Table II illustrates comparative clotting times and platelet counts as obtained from the two sampling sites. In all instances the clotting times of heart blood exceeded that of the tail vein sample. The platelet count in the heart, in all cases, was less than that of the venous sample.

Tests for significance showed a $P<0.01$ between the mean values of each experimental group.

It should also be noted that our mean results for platelet counts and clotting times determined from heart samples are within the limits reported by Fulton et al. (1954) as shown in Table I and commented upon previously.

TABLE II
Comparison of Clotting Time and Platelet Counts

Animal	Clotting Times		Platelet Counts	
	Heart	Tail	Heart	Tail
1.	102 secs.	78 secs.	200,000 mm^3	424,000 mm^3
2.	195 secs.	100 secs.	280,000 mm^3	396,000 mm^3
3.	186 secs.	65 secs.	200,000 mm^3	604,000 mm^3
4	115 secs.	81 secs.	264,000 mm^3	552,000 mm^3
5.	104 secs.	86 secs.	224,000 mm^3	608,000 mm^3
6.	126 secs.	125 secs.	512,000 mm^3	732,000 mm^3
7.	235 secs.	78 secs.	352.000 mm^3	484,000 mm^3
8.	120 secs.	63 secs.	360,000 mm^3	656,000 mm^3
9.	227 secs.	83 secs.	324,000 mm^3	424,000 mm^3
10.	225 secs.	154 secs.	308,000 mm^3	412,000 mm^3
11.	197 secs.	98 secs.	224,000 mm^3	476,000 mm^3
12.	145 secs.	82 secs.	296,000 mm^3	420,000 mm^3
13.	300 secs.	152 secs.	556,000 mm^3	872,000 mm^3
14.	111 secs.	106 secs.	364,000 mm^3	620,000 mm^3
15.	240 secs.	55 secs.	324,000 mm^3	528,000 mm^3
16.	206 secs.	59 secs.	252,000 mm^3	400,000 mm^3
17.	140 secs.	50 secs.	228,000 mm^3	380,000 mm^3
18.	164 secs.	77 secs.	164,000 mm^3	424,000 mm^3
19.	278 secs.	71 secs.	368,000 mm^3	440,000 mm^3
20.	102 secs.	95 secs.	336,000 mm^3	428,000 mm^3
Mean	176 ± 61*	88 ± 28*	$3.06x105\pm1.01$*	$5.13x105\pm1.04$*

*S. D. : $S\,\bar{X} = \frac{S}{\text{square root of } n}$

Discussion

A complete interpretation of our results is difficult at this time. Although the relationships between clotting times and platelet counts from each sampling site are evident, it is not

possible to say that the decreased platelet count in a given heart sample is the sole reason for the increased clotting time in that sample as compared to a tail vein sample from the same animal. The role attributed to the platelets in the scheme of clotting is well known, but it should also be noted that some authors contend that the presence of platelets is not essential for coagulation – Maximow and Bloom (1952).

The difference in total platelet count between the two sampling sites may be explained by the passage of these particles from the marrow into the circulation via venous sinusoids draining the area of platelet formation. This concept has been introduced by Cowdry (1934), but is in disagreement with Fulton (1946) who maintains that arterial blood entering an organ displays a higher platelet count than does the venous blood leaving it.

There does, however, seem to be one further factor that should be taken into consideration; the relationship between the velocity of the blood and the peripheral location of platelets in the circulatory stream. Since the velocity of circulating blood is at its minimum in the capillaries and veins, the peripheral concentration of platelets which is evident throughout the vascular network, should be increased. In direct contrast, platelet concentration within the heart, especially within the ventricles, would be kept at a minimum level.

Summary

Blood samples from the heart of the golden hamster showed a significant increase in clotting time and a significant decrease in platelet count when compared with tail vein samples taken from the same animal at the same time. No specific conclusion can be drawn from the clotting time – platelet relationships. The source and peripheral position of the platelets in the circulatory stream may explain the difference in platelet counts.

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