

HEMATOCRIT AND BLOOD VOLUME IN THE COMMON AFRICAN TOAD (*BUFO REGULARIS*)

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ABSTRACT

The volume of blood in the common African toad (*Bufo regularis*) was determined by the use of radioactively labelled red blood cells (RBC-Cr⁵¹). Blood volume obtained = 6.24 ± 0.17 . Values are expressed as per cent of body weight. Females have higher hematocrit than males ($P < 0.02$).

INTRODUCTION

A variety of methods have been utilised to quantitate the blood volume in amphibians. The plasma-hematocrit method by the dilution techniques was employed by Conklin (1930) using Evansblue dye (T-1824). Aortic puncture was used by Rouf (1969). Radioactive Chromium (Cr⁵¹) has been used by Suero, Siret, Callejas and Carmena (1980). Results reported deal mainly with frogs (see Table 2).

The present study was undertaken to measure the hematocrit and the blood volume in the common African toad (*Bufo regularis*) through the use of the radioactively labelled red blood cells (RBC-Cr⁵¹).

MATERIAL AND METHODS

Donor animals were bled by heart puncture with heparinized syringe under chloroform anesthesia. Blood volumes were essentially determined according to the method prescribed by Suero *et al* (1980). Blood was mixed in a proportion of 0.1 ml of blood to 0.3 μ Ci of Cr⁵¹. Each toad was injected with 0.1 ml of isotopic blood by heart puncture. One sample was taken from the heart at 20 minutes from the injection. Standards were prepared in isotonic saline and injected with an aliquot of the isotopic blood. DADE nuclear Scintillation counter was used to count radioactive sample. Total blood volume was obtained from the following formula:

$$TBV = \frac{SV \times WSC}{SRC}$$

Where:

TBV = Total blood volume; SV = Volume of the sample; WSC = Whole standard counts per min per ml; SRC = Radioactive counts per min per ml of the sample.

After the count was made, blood was centrifuged for 20 min at 1500 rpm and plasma and red cells volumes were measured.

Hematocrit values were determined on heart blood in capillary heparinized hematocrit tubes. The hematocrit tubes were centrifuged with BHG, Heka centrifuge (Nr. 24843) at room temperature for 5 min. at 11000 rpm, and the percentage of the packed cell volume were read on a Hawksley hematocrit reader.

In the text a significant difference is taken to mean the indicated level of probability by the t-test.

RESULTS AND DISCUSSION

Body weight, hematocrit and blood volume are shown in Table 1.

The present data show that the difference in the hematocrit value between males and females of *B. regularis* was statistically significant ($P < 0.02$) with the females having higher hematocrit than males. In this regard our results agreed with Kaplan (1954) who found statistically significant sex differences in the hematocrit of *Rana pipiens*. Although Rouf (1969) stressed the impossibility of determining any sexual influences of the highly variable blood parameters of *R. pipiens*, Harris (1972), in the same frog, reported that males always have higher hematocrit than females. This discrepancy may be attributed largely to the changes in the hematocrit of amphibians during the bleeding process due to the entry of lymph into the blood stream (Schermer, 1954).

In *B. regularis* the mean blood volume was 6.24 per cent of body weight with extremes of 5.6 per cent and 6.74 per cent. The plasma volume was found to be significantly higher than the red cell volume ($P < 0.001$). Although actual results may differ, expressed in various forms, a wide range of values from one species to another and in the same species using different techniques is found, with high differences on the plasma volume (Conklin, 1930; Prosser and Weinstein, 1950; Klarris, 1972 and Suero *et al*, 1980). In works done in various vertebrates by Thorson (1959, 1961), Conte, Wagner and Harris (1963) and Suero *et al* (1980), it was shown that large plasma volume might be regarded as a primitive characteristic.

Sex	Body weight g	No. of speci- mens	Hematocrit %	Blood volume. ml per 100 g body weight		
				TBV	PV	RCV
Male	28.88±1.62	10	25.70±4.37	6.45±0.29	5.10±0.34	1.35±0.27
Female	31.45±7.56	9	27.40±2.83	6.04±0.41	4.66±0.18	1.38±0.24

TABLE 1: *Mean body weight, hematocrit and blood volume of *Bufo regularis*

* Values are the mean ± SE.

Sp.	No. individuals		Volume (ml/100g body weight			Method	Reference
			TBV	PV	RCV		
<i>Rana pipiens</i>	14	—	8.74	6.03	2.21	Vital red	Conklin (1930)
<i>Rana pipiens</i>	10	139	8.70	7.00	1.20	Evans blue dye (T. 1824)	Prosser and Weinstein (1950)
<i>Rana pipiens</i>	14	24.65	7.46	5.62	1.84	Atomic puncture	Rouf (1969)
<i>Rana catesbeiana</i>	2	15.5	9.45	8.00	1.45	Evans blue dye (T. 1824)	Prosser and Weinstein (1950)
<i>Rana catesbeiana</i>	15	40.4	3.35	2.00	1.35	Cr ⁵¹	Sureo <i>et al</i> (1980)
<i>Hyla septentrionalis</i>	17	22.4	7.50	5.80	1.70	Cr ⁵¹	Sureo <i>et al</i> (1980)
<i>Bufo regularis</i>	19	26.55	6.24	4.88	1.36	Cr ⁵¹	Present work

TABLE 2: Hematocrit, total blood volume, plasma volume and red cell volume in different amphibians from the literature

Based on the data obtained and from published results (Table 2) and the phylogeny of amphibia we might conclude that the common African toad (*B. regularis*) possesses a more efficient circulatory

system than Hylaidae and Ranaidae in that it requires a smaller volume of transport fluid per unit mass of animal in order to carry out its essential metabolic functions.

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