

fection even when administered relatively late in its course. The mouse protection test is regarded as a more reasonable method than those at present employed for the standardization of therapeutic antimeningococcus sera.

8006 P

Experimental Freezing: Bleeding Volume, General and Local Temperature Changes.

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The bleeding volume in control dogs was found to be 58.6% of the calculated blood volume (one-thirteenth of the body weight) by Roome, Keith, and Phemister¹ and 53.4% by Harkins.² On the other hand, the former authors found that in shock due to trauma to an extremity, hemorrhage, plasmapheresis, and intestinal manipulation, the bleeding volume was greatly reduced, averaging 21.8% and in burns the latter author found it to average 20.3%. In another series of experimental burns it was found that in 6 burned animals in which the blood pressure was allowed to fall near a so-called shock level (50 to 82 mm. of Hg.) before the bleeding volume was determined, the bleeding volume averaged 26.3%. If, however, the bleeding was done before the blood pressure had fallen markedly (102 to 130 mm. of Hg.), the bleeding volume was already markedly reduced, averaging 31.4%.

The present work was undertaken to determine the bleeding volume in experimental freezing. Portions of the bodies of dogs were frozen by solid carbon dioxide under complete anesthesia (maintained till end of experiment) as described in previous papers³ and the results shown in Table I. It is seen that in all instances the bleeding volume was below the normal values but the decrease was not quite as marked as in burned animals. In the first 3 experiments where the bleeding volume was only slightly reduced, the

¹ Roome, N. W., Keith, W. S., and Phemister, D. B., *Surg. Gynec. and Obstet.*, 1933, **56**, 161.

² Harkins, H. N., *PROC. SOC. EXP. BIOL. AND MED.*, 1934, **32**, 3.

³ Harkins, H. N., *PROC. SOC. EXP. BIOL. AND MED.*, 1934, **32**, 432.

TABLE I.
Bleeding Volumes of Dogs with Experimental Freezing.

No.	Wt. Kg.	Interval from freezing to bleeding		Blood Pressure mm. Hg.		Hemoglobin, %		Hematocrit		Terminal bleeding vol. % cal. blood vol.
		Hr.	Min.	Start	End	Start	Max.	Start	Max.	
1	12.2	26	25	162	112	76	131	36	63	47.3
2	9.0	7	40	136	96	104	145	55	67	31.1
3	9.5	11	40	164	90	100	123	49	62	43.1
4	7.0	4	45	172	36	86	100	35	50	27.0
5	7.0	15	15	166	72	82	126	39	62	24.2
Aver.										34.5

bleeding was determined before the blood pressure had fallen to a so-called shock level.

In several of the frozen dogs very low general body temperatures were obtained. In one dog a rectal temperature of 25.7°C. (78°F.) was noted after 3 hours of constant application of solid carbon dioxide to practically the entire left side of the body. After removal of the ice, the temperature rose gradually to 33.7°C. (92°F.) at the time of death 16 hours later. This rectal temperature is not as low as that reported by Reincke⁴ in 3 drunken men who had been exposed to cold. In these cases rectal temperatures of 27°C., 23 hours before death; 26.4°C., 13 hours before death; and 24°C. (75.2°F.) with recovery were reported.

Experiments on the rapidity of penetration of the cold were performed. It was found that living tissue was a much better insulator than dead tissue. At a depth of 2 cm. in one instance it took 17 minutes and in another 7 minutes for the body temperature to drop 10°C. (a 10 cm. cube of solid carbon dioxide being pressed tightly against the shaved skin). If the measuring thermometer was placed subcutaneously about 2 minutes' application was necessary to produce a 10°C. drop in temperature.

Summary. Experiments are reported to show that the bleeding volume is reduced in experimental freezing. General temperature studies in partially frozen animals were made and the low temperature of 25.7°C. (78°F.) reported in one instance. Local temperature studies were made to demonstrate the insulating function of living tissues.

⁴ Reincke, J. J., *Deutsch. Arch. f. klin. Med.*, 1875, **16**, 12.