

From the data shown in Fig. 1 we have plotted the minimum values of σ against $\log c$ and the curve obtained is a straight line with the slope of $d\sigma/d\log c = -1.59^\circ$. It follows from this that

$$u = \frac{1.59}{8.31 \times 10^7 \times 291} = 6.56 \times 10^{-11} \text{ mols. per sq. cm.}$$

$$a = \frac{1}{6.56 \times 10^{-11} \times 6.1 \times 10^{23}} = 2.5 \times 10^{-14} \text{ sq. cm.}$$

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Blood Volume in Hyperthyroidism.

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It is a well recognized fact that many patients with hyperthyroidism have disturbances of their cardiovascular system. With the increased demand for oxygen some compensatory mechanism must be at work in order to supply the needs of the tissues. The cardiac output and the velocity of blood flow have been repeatedly shown to be increased, and as a rule, this increase is in direct proportion to the basal metabolic rate.^{1, 2} In the opposite condition, myxedema, Thompson³ described a reduction in the blood volume and demonstrated its return to normal after the institution of thyroid treatment. Blotner, Fitz and Murphy⁴ also observed a correlation between the basal metabolic rate and the total blood count expressed in corpuscles per square meter of surface area. The present report deals with the blood volume findings in individuals suffering from hyperthyroidism, before and after subtotal thyroidectomy.

The series studied consisted of 17 cases of exophthalmic goiter and one of toxic adenoma.* The total blood volume was measured by the carbon monoxide method.⁵ All the determinations were made

¹ Fullerton, C. W., and Harrop, G. A., *Bull. Johns Hopkins Hosp.*, 1930, xlvii, 203.

² Blumgart, H. L., and Gargle, S. L., *J. Clin. Invest.*, 1928-29, vi, 18, (Proceedings).

³ Thompson, W. O., *J. Clin. Invest.*, 1925-26, ii, 477.

⁴ Blotner, H., Fitz, R., and Murphy, W. P., *J. Clin. Invest.*, 1928, vi, 4, (Proceedings).

* The first seven cases were studied in the Johns Hopkins Hospital and are reported by courtesy of Dr. G. A. Harrop.

⁵ Chang, H. C., and Harrop, G. A., *J. Clin. Invest.*, 1928, v, 393.

TABLE I.
Blood Volume in Hyperthyroidism Before and After Subtotal Thyroidectomy in Successive Cases.

Before Thyroidectomy				After Thyroidectomy				Absolute Decrease				Percentage Decrease			
B.M.R. percent normal	Blood Volume			B.M.R. percent normal	Blood Volume			B.M.R. percent normal	Blood Volume			B.M.R.	Blood Volume		
	Total cc.	Per kilo cc.	Per sq. meter cc.		Total cc.	Per kilo cc.	Per sq. meter cc.		Total cc.	Per kilo cc.	Per sq. meter cc.		Total	Per kilo	Per sq. meter
155	3730	81.0	2590	90	3290	59.5	2125	65	440	21.5	405	41.9	11.8	26.5	21.9
131	3315	73.0	2240	85	2875	61.8	1920	46	440	11.2	310	35.1	13.3	15.3	13.8
151	3610	58.0	2090	102	3190	50.0	1823	49	420	8.0	267	32.5	11.6	13.8	12.8
134	5120	76.4	2910	94	4320	63.4	2440	40	800	13.0	370	29.9	15.6	17.0	16.2
173	4041	74.1	2580	107	3590	64.1	2272	66	451	10.0	308	38.2	11.2	13.5	11.9
133	3780	74.0	2860	86	3595	65.0	2300	47	1185	9.0	560	35.3	24.8	12.2	19.6
130	4880	69.0	2640	84	4120	61.0	2500	46	760	8.0	140	35.4	15.6	11.6	5.3
147	3100	62.4	2095	85	2875	56.8	1843	62	225	5.6	252	42.2	7.3	9.0	12.0
154	4552	86.3	2958	80	3170	62.0	2058	74	1382	24.3	900	48.9	30.4	28.2	30.4
168	3325	62.6	2190	104	2960	55.0	1936	64	365	7.6	254	38.1	11.0	12.1	11.6
143	3250	69.2	2258	80	3200	53.0	2000	63	50	16.2	258	44.0	1.5	23.4	11.4
174	4500	95.0	3100	105	3380	72.7	2365	69	1120	22.3	735	39.7	24.9	23.5	23.7
150	5100	81.0	2930	91	4555	75.5	2663	59	545	5.5	237	39.3	10.7	6.8	8.9
140	3285	78.0	2570	97	3245	77.3	2535	43	40	0.7	35	30.7	1.2	0.9	1.4

in the afternoon about 3 hours after the noon meal. Patients with fever and organic lesions of the heart were excluded. The results are expressed in cc. of blood per kg. of body weight. The minimum blood volume was 58 cc. per kg. and the maximum, 115 cc., with an average volume of 77.3 cc. The average total blood volume in normal individuals studied with the same method was 66.6 cc. (6)

The blood volume of 14 patients was again determined after their basal metabolism returned to normal following subtotal thyroidectomy. The time between the operation and the determination varied from 10 days to 5 months, and some patients had repeated measurements. On the basis of cc. of blood per kg. of body weight, all but one showed a striking fall in their circulatory volume, the decrease ranging between 6.8 and 28.2%. The percentage decrease in the total volume and in the volume per square meter of surface was approximately of the same magnitude. One patient was followed for a period of one year and 9 months. Her blood volume remained at the same level as that observed soon after operation, about 28% lower than the initial measurement.

Four patients were studied after the administration of Lugol's solution. This treatment seemed to have a definite effect in diminishing the blood volume along with the drop in basal metabolic rate. Following partial removal of the thyroid gland in these patients there was a further decrease in the blood volume.

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A New Form of Apparatus for Determination of Gases by Manometric Measurement.

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In the course of a certain study on hemoglobin it was necessary to mix thoroughly the solution to be analysed with the reagent before evacuation and extraction. As this could not be done in Van Slyke's apparatus,¹ we have devised a new form of the gas burette which, besides serving our special purpose, possesses certain advantages over the form now generally used.

The principal feature of the apparatus (Fig. 1) is that 2 cham-

¹ Van Slyke, D. D., and Neill, J. M., *J. Biol. Chem.*, 1924, lxi, 523.