

## 11881 P

**Resting Blood Flow in the Extremities in Hyperthyroid Subjects.\***

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In view of the flushed, moist, warm skin, the wide pulse pressure, and the decrease in circulation time present in thyrotoxicosis, it has generally been assumed that there is an increase in blood flow to the periphery in this state. The recent findings of Stewart and Evans<sup>1</sup> of an increased skin temperature, as determined from the rate of heat radiation, are in accord with this concept. Since all of the above evidence is indirect, it was thought worthwhile to reexamine the subject by studying the actual rate of blood flow to the hand and forearm, using the venous occlusion plethysmographic method.

Five hyperthyroid patients were examined, and in 3, blood flow readings were obtained before and after thyroidectomy. For contrast, the results in a case of moderate hypothyroidism were also included in the study. The exact technique used in determining the rate of blood flow is described in detail elsewhere.<sup>2</sup> The bath temperature in the plethysmograph was maintained at 32°C and the subject was exposed to the ordinary room temperature. Ten readings were obtained in each experiment and from the average of these, the rate of blood flow per minute per 100 cc of limb volume was calculated. The blood pressure, pulse rate, circulation time (arm to tongue), and the basal metabolic rate were also determined.

It is obvious from Table 1 that in every case of hyperthyroidism there was a significant increase in the rate of blood flow to the forearm, since the average normal level under similar conditions was found to be only  $1.8 \pm 0.64$  cc per minute per 100 cc limb volume.<sup>3</sup> In contrast, the forearm blood flow readings in the hypothyroid patient (with a basal metabolic rate of  $-20$ ) was 0.8 cc per minute per 100 cc limb volume. Following lugolization and thyroidectomy, there was a definite decrease in flow in the hyperthyroid subjects,

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<sup>1</sup> Stewart, H. J., and Evans, W. F., *Am. Heart J.*, 1940, **20**, 715.

<sup>2</sup> a. Abramson, D. I., Zazeela, H., and Marrus, J., *Am. Heart J.*, 1939, **17**, 194, 206; b. Ferris, E. B., Jr., and Abramson, D. I., *Am. Heart J.*, 1940, **19**, 233.

<sup>3</sup> Abramson, D. I., *PROC. SOC. EXP. BIOL. AND MED.*, 1940, **45**, 127.

TABLE I.  
Resting Blood Flow to the Extremities in Hypertthyroidism.

Patient	Date	Pulse		Circulation time, sec.	B.M.R.	Blood flow, hand	Blood flow, forearm	Period of lugolization, days	Remarks
		per min.	min.						
M.B.	8/1	124	106	9	+56 +59	11.1	4.7		preoperative
		60							
	8	128	110	9	+53 +49		4.7	1	"
		64							
	27	106	85	10		9.8	2.9		7 days postoperative
		60							
	9/24	110	86	10	— 2 0	11.4	1.0		35 days postoperative
		68							
J.L.	7/6	130	92	11	+37 +42	5.1	6.8	3	preoperative
		88							
	17	136	78	11.5	+19 +24	6.4	3.9	14	"
		88							
	29	142	77	13	+12 + 9	10.3	3.3		10 days postoperative
		90							
	9/25	138	80	12	+16 +18	8.1	1.4		68 days postoperative
		80							
S.S.	2/27	132	134	6.7	+65 +70	13.0	3.8		preoperative
		88							
	4/7	116	74		+ 3 + 1	5.4	0.9		11 days postoperative
		78							
E.H.	2/15	154	83		+61	9.2	4.4		
		84							
A.E.	11/19	116	96	10.5	+23	2.4	3.2		
		66							

Blood flow expressed in cc per min. per 100 cc limb vol.

with a return to the normal level within 11 to 68 days after operation.

In the hand, the blood flow in the hyperthyroid cases was not increased beyond the average normal level of  $10.1 \pm 3.4$  cc per minute

per 100 cc limb volume.<sup>4</sup> Following thyroidectomy there was no significant change in 2 cases, while in one there was a drop from a high normal to a lower normal level. In the hypothyroid subject, the blood flow in the hand was 4.4 cc.

On comparing the blood flow readings with the other data collected at the same time, it was noted that a gross correlation existed between the blood flow to the forearm and the basal metabolic rate, but none between the latter and the blood flow to the hand. No relationship was observed between the circulation time and the blood flow in either the hand or forearm.

In view of the increased cardiac output<sup>5</sup> and increased blood volume<sup>6</sup> found in hyperthyroidism, an augmented rate of blood flow to the extremities might be anticipated. The fact that this was observed only in the forearm and not in the hand would suggest that there is some other factor, possibly related to the intrinsic differences between these 2 vascular beds,<sup>7</sup> which is operating in the hand to modify the vascular responses associated with the hyperthyroid state.

*Conclusion.* The rate of blood flow through the forearm is increased in hyperthyroidism.

## 11882 P

### Regeneration of Olfactory Cells.\*

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It is generally held that nerve cells which have been destroyed are not restored. While this may well be true for the type of nerve cells which are usually considered in this connection, it has not been demonstrated to apply to the neurons of the olfactory nerve, the cell

<sup>4</sup> Abramson, D. I., unpublished observations.

<sup>5</sup> a. Grollman, A., *The Cardiac Output in Health and Disease*, Charles C. Thomas, 1932, p. 242; b. Fullerton, C. W., and Harrop, G. A., Jr., *Bull. Johns Hopkins Hosp.*, 1930, **46**, 203; c. Boothby, W. M., and Rynearson, E. H., *Arch. Int. Med.*, 1935, **55**, 546.

<sup>6</sup> a. Gibson, J. G., 2nd, and Harris, A. W., *J. Clin. Invest.*, 1939, **18**, 59; b. Goldbloom, A. A., and Libin, I., *Arch. Int. Med.*, 1935, **55**, 484.

<sup>7</sup> Abramson, D. I., and Ferris, E. B., Jr., *Am. Heart J.*, 1940, **19**, 541.

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