

No very definite changes have been noted in the thyroid glands of 6 guinea pigs injected daily for from 9 to 60 days, with from 0.5 to 1.0 cc. of concentrated liver extract. Whether injections for longer periods, or of larger doses, will produce alterations similar to those noted in mice is under investigation at present.

While uninjected control mice showed none of the abnormalities noted in the experimental animals, it seemed possible that the thyroid changes produced by liver extract might be due to non-specific reactions which could also be elicited by extracts of other organs. Accordingly, a control extract was prepared from beef muscle, using the same method as that described for the preparation of liver extract.¹ To date, mice injected up to 90 days with this control extract have been studied. The changes produced in the thyroid gland are similar in character to those produced by liver extract, but they are considerably less in degree. It must be pointed out, therefore, that the thyroid changes described in these experiments cannot as yet be attributed to any specific substance in liver extract. It is quite possible that the difference in reaction between animals injected with control solution and those injected with liver extract are due to differences in the concentration of non-specific protein materials in the 2 solutions, or to some other non-specific factor. We hope to undertake experiments soon which will decide this point.

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Studies in Tissue Pressure.

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Although the part played by tissue pressure in the control of the movement of fluid between blood vessels and tissue spaces is but vaguely understood, recent studies appear to demonstrate that it is a significant factor.^{1, 2, 3} The wide variations in subcutaneous tissue

¹ Liver Extract, Lilly, Concentrated solution, *N. N. R.*, 1936, p. 282.

² Landis, E. M., and Gibbon, J. H., *J. Clin. Invest.*, 1933, **12**, 105.

³ Youmans, J. B., Wells, H. S., Donley, D., and Miller, D. G., *J. Clin. Invest.*, 1934, **13**, 447.

⁴ Weech, A. A., Goettsch, E., and Reeves, E. B., *J. Soc. Exp. Biol. and Med.*, 1934, **60**, 63.

pressure found in the literature^{4, 5, 6} have prompted us to determine directly the tissue pressure by the simple manometric method employed by Henderson⁷ in the determination of muscle tone. A 26 gauge needle was used in place of a 20. In each determination 3 readings were taken which agreed within 2 mm. of water. In this report we are presenting the results in normal subjects. The results in patients with edema will be presented later.

TABLE I.
Subcutaneous Tissue Pressure at Heart Level in Millimeters of Water.

Subject No.	Age	Sex	Dorsum of Hand	Volar Surface Forearm	Pretibial Area	Dorsum of Foot
1	23	M	28	11	22	35
2	49	M	12	29	22	36
3	24	M	19	26	23	24
4	25	F	17	23	54	15
5	25	M	8	40	54	43
6	29	M	15	19	45	36
7	27	F	22	18	40	38
8	23	M	14	17	18	18
9	26	M	14	14	43	25
10	48	M	30	39	50	38
Mean			17.9	23.8	37.1	30.8

TABLE II.
Subcutaneous Tissue Pressure of the Dorsum of the Foot in Millimeters of Water.

Subject No.	Age	Standing without wt. bearing	Standing with wt. bearing (Needle removed and reinserted)
11	33	76	100
12	23	31	38
13	26	66	82
14	26	42	102
Mean		53.9	80.5

The results are summarized in Tables I, II and III. The mean values at heart level varied from 17.9 to 37.1 mm. of water. The tissue pressure in the lower extremity was increased in the erect position, and further increased by weight bearing. Repeated determinations were made in one subject in the dorsum of the foot at heart level with withdrawal of the needle for each determination. The values obtained were 43, 30 and 38 mm. of water. Six subjects stood for one hour against a table inclined at 75°. The tissue pres-

⁴ Landerer, A., *Die Gewebesspannung*, Leipzig, 1884.

⁵ Gildemeister, M., and Hoffmann, L., *Pflüger's Arch.*, 1922, **195**, 153.

⁶ Meyer, F., and Holland, G., *Arch. f. Exp. Path. und Pharmacol.*, 1932, **168**, 581.

⁷ Henderson, Y., Ongleterson, A. W., Greenberg, L. A., and Searle, C. P., *Am. J. Physiol.*, 1935-36, **114**, 261.

sure readings in the dorsum of the foot at the beginning of the hour varied from 22 to 94 mm. of water, at the end of the hour 34 to 104 mm. of water with mean values of 53.7 mm. and 65.2 mm. respectively. The maximum increase in value after the one hour period was 31 mm. of water. In none of our subjects in the standing position even up to an hour did the readings approach the higher values found in the literature.

The effect of venous pressure on tissue pressure readings was determined in the normal subjects. The venous pressure was increased by inflating a blood pressure cuff around the arm in steps of 135 mm. of water (10 mm. of mercury) at 2 minute intervals. In no case was the diastolic blood pressure exceeded. The tissue pressure readings made in the dorsum of the hand are illustrated in Table III. Increase of venous pressure over short intervals of time had relatively slight effect on the tissue pressure readings.

TABLE III.
The Effect of Venous Pressure on Tissue Pressure Determination in 10 Subjects.

Pressure in cuff constricting arm mm. water	Mean estimated tissue pressure mm. water
0	20.3
270	19.0
405	19.4
540	21.3
675	24.6
810	27.1

Summary. With the use of a manometric method for direct determination of tissue pressure it was found that the mean subcutaneous tissue pressure in the extremities at heart level varied between 17.9 and 37.1 mm. of water. The subcutaneous tissue pressure was increased in the foot on assuming the erect position and further on weight bearing. Factors other than venous pressure are important in the regulation of tissue pressure.