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The skin reactions, blood chemistry and physical status of 'normal' men and of clinical patients

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III. DETAILED STUDY OF THE "NORMAL" GROUP AND OF MISCELLANEOUS CLINICAL PATIENTS

In this article we present the results of the clinical response to each of the various tests that we have carried out. The material consists of the 100 so-called normal men, as well as a considerable number of persons with diseases, chiefly exophthalmic goiter, glaucoma, diseases of the skin and certain vascular diseases (Raynaud's, Buerger's, etc.).

In table 1, the identification number, age, sex, occupation, nationality and clinical diagnosis of each person are presented. The identification numbers marked with an asterisk indicate persons included in the group of 100 so-called normal men.

METHOD OF PRESENTATION OF RESULTS

Since many different tests were made on each person, we proceeded to study each reaction separately, and to permit a rapid survey of the results, we adopted the following method: Results of each test for the entire group were arranged in numerical progression. A chart was made of this curve, and at the bottom of the chart we indicated the location on the curve and the clinical classification of the individuals of the group of 100 "normal" men. At the top of each chart, we usually indicated the location and clinical classification of the patients, particularly those with exophthalmic goiter and those with glaucoma. In addition to this chart, we made a tabulation of the twenty persons at each of the extreme ends of the curve and endeavored to correlate the results of other tests with the results of the one under consideration.

As the charts were all prepared in a uniform manner the first one—the chart of the blister time—is explained in some detail.

BLISTER TIME

When one analyzes chart 1, a number of features immediately present themselves. There appear to be proportionately more persons with roentgenologic evidence of healed tuberculosis in the region of the prolonged blister time with the cantharides method. The persons with roentgenologic evidence of active tuberculosis also tend to have a longer blister time. There are more of the persons showing cardiovascular renal changes in this end of the curve. This seems to apply not only to the group with urinary changes but to those with changes in the capillaries of the skin. Advancing age, increasing blister time and more frequent cardiovascular renal injury are obviously associated. The patients with glaucoma, as might be anticipated, are at the end of

TABLE 1.—General Data from Histories of One Hundred and Seventy-Four Persons Employed in the Study of the Correlation of Constitutional Factors in Inflammation

Individual No.	Sex	Age	Nationality	Occupation	Clinical Notes
1	M	23	Jewish	Student	Out of school because of "nervous breakdown"
2	M	13	American	Schoolboy	Epilepsy and vasoneurosis
3*	M	25	Jewish	Instructor	Nervous; healed tuberculosis; father has Raynaud's disease
4*	M	40	American	Instructor	Normal
5	F	48	Jewish	Housewife	Nervous; cardiovascular renal condition; healed tuberculosis
6	M	49	Jewish	Painter	Arteriosclerosis and myocarditis; syphilis; died
7	M	25	American	Student	Gastric ulcer; mother died of exophthalmic goiter
8*	M	38	German	Instructor	Normal
9	M	27	American	.....	Exophthalmic goiter
10*	M	40	Norwegian	Technician	Healed tuberculosis
11	M	46	German	.....	Exophthalmic goiter
12	M	40	Bohemian	Painter	Traumatic atrophy of muscle
13*	M	53	American	Janitor	Healed tuberculosis
14*	M	36	German	Technician	Probably gallbladder disease; cardiovascular renal condition
15*	M	60	American	Technician	Healed tuberculosis
16	M	33	American	.....	Exophthalmic goiter
17*	M	28	German	Student	Normal, but with marked deviations in many tests
18*	M	31	German	Carpenter	Healed tuberculosis
19	M	34	American	Clerk	Normal, but examination not completed
20*	M	42	Irish	Laborer	Roentgenographic proof of active tuberculosis
21*	M	56	German	Clerk	Cardiovascular renal condition
22	M	38	German	Machinist	Exophthalmic goiter
23*	M	54	Dutch	Machinist	Healed tuberculosis
24*	M	30	Irish	Waiter	Healed tuberculosis
25*	M	35	Austrian	Laborer	Roentgenographic evidence of active tuberculosis
26*	M	30	American	Electrician	Syphilis
27	M	30	Negro	Laborer	Syphilis; lead poisoning
28*	M	43	American	Electrician	Healed tuberculosis
29*	M	43	German	Cook	Urine contains bile pigment; subject presents a number of other abnormalities
30*	M	42	Irish	Porter	Cardiovascular renal condition
31	F	42	American	Housewife	Exophthalmic goiter
32*	M	26	American	Salesman	Cardiovascular renal condition
33	M	37	American	Laborer	Epileptic
34*	M	41	American	Railroad worker	Changes in capillaries of the skin; healed tuberculosis
35*	M	44	German	Clerk	Normal
36*	M	43	American	Clerk	Cardiovascular renal condition
37*	M	45	Irish	Miner	Normal
38	M	39	Jewish	Druggist	Angioneurotic edema
39*	M	35	Polish	Porter	Syphilis
40*	M	40	German	Houseman	Capillaries of the skin abnormal
41*	M	40	English	Machinist	Normal
42*	M	33	American	Fireman	Cardiovascular renal condition (myocarditis)
43*	M	45	American	Steamfitter	Normal
44*	M	48	American	Porter	Normal
45*	M	39	American	Painter	Cardiovascular renal condition
46*	M	29	American	Carpenter	Inanition; died later at Cook County Hospital (bronchopneumonia); fainted during examination
47*	M	38	American	Painter	Healed tuberculosis
48*	M	46	American	Woodworker	Syphilis
49*	M	42	Italian	Laborer	Cardiovascular renal condition
50*	M	20	German	Mason	Normal
51	F	58	German	Housewife	Exophthalmic goiter
52*	M	36	German	Steel worker	Healed tuberculosis
53*	M	39	Swedish	Laborer	Normal
54*	M	49	American	Fireman	Cardiovascular renal condition; probably cirrhosis; myocarditis
55*	M	51	American	Metal worker	Cardiovascular renal condition
56*	M	44	English	Fireman	Roentgenographic evidence of active tuberculosis 3 years before; angioneurotic edema
57	F	39	German	Housewife	Postoperative hypothyroidism; on thyroid extract, with basal metabolic rate +31.5

* One of group of 100 "normal" men.

TABLE 1.—General Data from Histories of One Hundred and Seventy-Four Persons Employed in the Study of the Correlation of Constitutional Factors in Inflammation—Continued

Individual No.	Sex	Age	Nationality	Occupation	Clinical Notes
58	F	29	American	Housewife	Exophthalmic goiter
59*	M	37	Irish	Butcher	Normal
60	M	52	American	Salesman	Cardiovascular renal condition
61*	M	51	American	Musician	Cardiovascular renal condition
62*	M	44	American	Carpenter	Cardiovascular renal condition; aortic regurgitation
63*	M	40	American	Fireman	Cardiovascular renal condition
64*	M	31	American	Machinist	Normal, somewhat nervous
65*	M	34	American	Fireman	Cardiovascular renal condition
66*	M	64	American	Engineer	Cardiovascular renal condition
67*	M	47	American	Porter	Dwarf
68*	M	35	American	Draftsman	Healed tuberculosis
69	M	22	Jewish	Student	Duodenal ulcer; nervous; parents both have high blood pressure
70*	M	65	German	Butcher	Cardiovascular renal condition; arthritis deformans
71*	M	42	Scotch	Cook	Cardiovascular renal condition
72*	M	42	Scotch	Laborer	Normal
73*	M	48	American	Engineer	Syphilis
74*	M	49	American	Clerk	Changes in the capillaries of the skin
75*	M	66	American	Laborer	Cardiovascular renal condition
76*	M	43	American	Cook	Cardiovascular renal condition
77*	M	39	Irish	Machinist	Sensitized; drug addict?
78*	M	33	American	Painter	Normal, but with many deviations in examinations
79*	M	58	American	Machinist	Gastric ulcer; occasional peripheral vascular spasms
80*	M	29	American	Electrician	Nervous; has tremor; urticaria in 1922
81*	M	69	American	Elevator operator	Cardiovascular renal condition; pruritis
82*	M	66	English	Laborer	Cardiovascular renal condition
83*	M	45	German	Fireman	Normal
84*	M	73	Canadian	Foundry worker	Cardiovascular renal condition
85*	M	45	American	Tile setter	Fever (bronchitis?)
86*	M	50	American	Exdentist	Nervous
87*	M	46	American	Chauffeur	Normal
88*	M	55	American	Factory worker	Roentgenographic evidence of active tuberculosis
89*	M	41	Irish	Sailor	Healed tuberculosis
90*	M	30	American	Mail sorter	Nervous
91*	M	91	Irish	Gardener	Cardiovascular renal condition
92*	M	22	Jewish	Student	Nervous
93*	M	53	American	Laborer	Cardiovascular renal condition; hay-fever
94*	M	57	American	Laborer	Normal
95*	M	54	German	Cook	Healed tuberculosis
96*	M	70	American	Ironworker	Cardiovascular renal condition
97*	M	53	American	Miner	Normal; nervous
98*	M	34	American	Railroad worker	Cardiovascular renal condition
99*	M	46	Norwegian	Laborer	Healed tuberculosis
100*	M	45	Norwegian	Laborer	Healed tuberculosis
101*	M	55	American	Laborer	Eczema
102*	M	65	American	Metal worker	Roentgenographic evidence of active tuberculosis
103*	M	59	American	Rancher	Cardiovascular renal condition
104*	M	76	American	Laborer	Roentgenographic evidence of active tuberculosis; cardiovascular renal condition
105*	M	56	American	Painter	Healed tuberculosis
106*	M	60	American	Cook	Cardiovascular renal condition
107*	M	62	American	Sailor	Cardiovascular renal condition
108*	M	67	American	Clerk	Roentgenographic evidence of active tuberculosis
109	F	42	American	None	Neurasthenia
110*	M	62	American	Teamster	Healed tuberculosis
111*	M	60	American	Clerk	Cardiovascular renal condition; syphilis 30 years before
112*	M	60	American	Wool sorter	Cardiovascular renal condition
113*	M	59	Irish	Butcher	Cardiovascular renal condition
114*	M	79	English	Engineer	Roentgenographic evidence of active tuberculosis; cardiovascular renal condition
115*	M	66	American	Telegrapher	Cardiovascular renal condition
116	F	30	English	Clerk	Urticaria
117	M	30	English	Stockman	Arthritis; syphilis
118	F	14	American	Schoolgirl	Arthritis; pleural tuberculosis?

* One of group of 100 "normal" men.

TABLE 1.—General Data from Histories of One Hundred and Seventy-Four Persons Employed in the Study of the Correlation of Constitutional Factors in Inflammation—Continued

Individual No.	Sex	Age	Nationality	Occupation	Clinical Notes
119	F	43	Dutch	Housewife	Arthritis deformans; adenoma of thyroid with hyperthyroidism
120	F	18	Hungarian	Housework	Purpura
121	F	56	American	Housewife	Arthritis deformans
122*	M	33	American	Instructor	Normal; fatigue; numerous deviations from normal in examinations
123	F	68	American	Housewife	Carcinoma of thyroid; hyperthyroidism; cardiovascular renal condition
124	F	25	American	Nurse	Arthritis with mitral lesion
125	F	29	American	Housewife	Exophthalmic goiter
126	M	21	American	Metal polisher	Exophthalmic goiter
127*	M	65	Irish	Janitor	Cardiovascular renal condition
128*	M	66	American	Railroad worker	Hay-fever; cardiovascular renal condition
129*	M	66	Irish	Janitor	Roentgenographic evidence of active tuberculosis; cardiovascular renal condition
130*	M	65	Irish	Mason	Cardiovascular renal condition
131	F	59	Austrian	Housewife	Exophthalmic goiter
132	M	26	American	Student	Eczema
133	F	29	Jewish	Housewife	Generalized scleroderma
134*	M	67	American	Carpenter	Cardiovascular renal condition
135	M	26	Jewish	Tailor	Nervous
136	M	44	Italian	Laborer	Pellagra; cardiovascular renal condition
137	F	61	Bohemian	Housewife	Glaucoma
138	M	27	Jewish	Salesman	Fröhlich's syndrome
139	F	29	American	Stenographer	Vitiligo and urticaria
140	M	45	Irish	Laborer	Glaucoma; cardiovascular renal condition; roentgenographic evidence of active tuberculosis; hay-fever
141	F	48	Negro	Housewife	Glaucoma; cardiovascular renal condition
142	M	50	American	Machinist	Brain tumor, Cook County Hospital; syphilis 20 years before
143	M	45	Hungarian	Carpenter	Pellagra; cardiovascular renal condition; syphilis
144	M	47	Lithuanian	Carpenter	Pellagra; cardiovascular renal condition
145	M	71	Swedish	Watchman	Glaucoma; syphilis
146	F	40	American	Sewing	Myasthenia gravis
147	F	19	Polish	Operator	Postencephalitic parkinsonism
148	F	67	American	Housewife	Glaucoma; vitiligo; hay-fever
149	M	35	American	Salesman	Nervous
150	M	67	Jewish	Teamster	Glaucoma
151	F	68	German	Housewife	Postoperative exophthalmic goiter (no. 51)
152	M	27	American	Plumber	Angioneurotic edema
153	M	75	American	Farmer	Glaucoma; cardiovascular renal condition
154	M	55	American	Steel worker	Glaucoma; cardiovascular renal condition
155	M	33	American	Engineer	Postoperative exophthalmic goiter (no. 16)
156	F	30	American	Housewife	Postoperative exophthalmic goiter (no. 125)
157	M	38	American	Plumber	Postoperative exophthalmic goiter (no. 22)
158	M	35	Bohemian	Butcher	Hodgkin's disease
159	M	53	American	Clerk	Exophthalmic goiter
160	M	58	English	Shoemaker	Glaucoma; cardiovascular renal condition; asthma
161	F	43	American	Housewife	Glaucoma; cardiovascular renal condition
162	M	47	German	Railroad worker	Postoperative exophthalmic goiter (no. 11)
163	F	29	American	Housewife	Postoperative exophthalmic goiter (no. 58)
164	M	48	Cuban	Salesman	Glaucoma; syphilis; cardiovascular renal condition
165	M	52	American	Upholsterer	Glaucoma; cardiovascular renal condition
166	M	24	Hindoo	Student	Asthenia; eosinophilia
167	F	77	Swiss	Housewife	Glaucoma; cardiovascular renal condition
168	M	28	American	Physician	Orthostatic albuminuria
169	M	27	American	Chauffeur	Buerger's disease; syphilis
170	F	56	Negro	Servant	Glaucoma; diabetes; cardiovascular renal condition
171	F	23	Jewish	Technician	Urticaria (menstrual)
172	M	30	Greek	Waiter	Raynaud's disease; syphilis in 1921
173	M	39	American	Instructor	Cord tumor
174	F	50	American	Housework	Raynaud's disease

* One of group of 100 "normal" men.

Chart 1.—The scale of the blister time (heavy line) of normal persons and patients with various clinical conditions.

It will be observed that the blister time varies from a short time of $3\frac{1}{2}$ hours in one case to 15 hours in a group of cases. The average for our group of 100 "normal" men is $7\frac{1}{2}$ hours; this is indicated by the horizontal line.

Persons of the actually normal group (twenty in number) are designated by a star in the circle, in the first line below the curve. The range for these is from 4 to 9 hours. As the person (no. 122) with the four-hour blister time is abnormal in several other respects, we have not considered 4 hours as within the true normal range. The normal range is indicated by the shaded diamond in the center of the chart, in case of normal blister time having been placed between 6 and 9 hours.

Individuals of the group who showed healed tuberculosis are indicated by the large crosses in the next line. Individuals of the group with cardiovascular renal conditions of the group who gave roentgenologic evidence of healed tuberculosis are indicated by a small cross placed in the same horizontal space. The persons with positive Wassermann reactions and those with a clear history of previous syphilis are indicated by *W* in the same space. Patients who gave roentgenologic evidence of active tuberculosis can be identified by a black block in the third horizontal space. Those in the various groups of the division with cardiovascular renal conditions can be identified by the devices in the five lowest horizontal compartments, as follows:

○ A patient having a low blood pressure (under 110) with the urine containing either albumin or casts.

⊗ A patient having a normal blood pressure (from 110 to 140) with positive evidence of urinary changes.

● A patient having a blood pressure of over 140 with positive evidence of urinary changes.

⊕ A patient having a blood pressure of over 140 with no evidence of changes in the urine.

⊗ A patient having roentgenologic evidence of arteriosclerosis of the larger vessels. When this has been found incidental to other clinical conditions, a small circle has been used.

○ A person in whom the capillaries of the skin are abnormal. A small *c* has been used to indicate that changes in the capillaries of the skin have been found incidental to other clinical conditions.

All the large symbols used in these lower five horizontal columns refer to the group of 100 "normal" men.

At the top of the curve we have used *G* to indicate the patients with glaucoma and $\times$ *G* to indicate those with exophthalmic goiter. In some charts, the individual numbers of the patients have been appended in the uppermost horizontal column.

An *N* along the curve indicates a nervous person, and an *S* a person who has been sensitized.

This explanation applies to all charts.

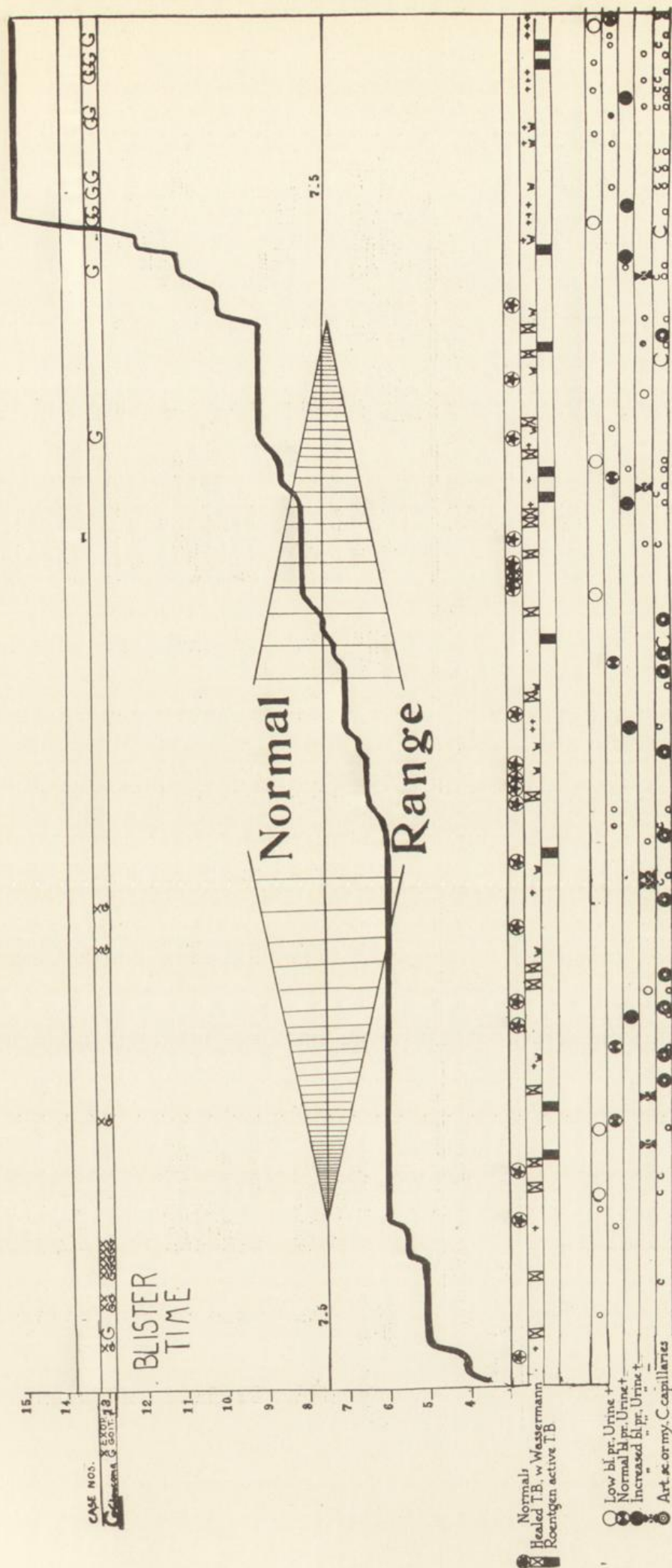


Chart 1

TABLE 2.—The Results of Examinations of the Twelve Persons with the Shortest Blister Time

Individual Number	Blister Time, Hours	Diagnosis	Calcium, Mg.	Potas- sium, Mg.	K/Ca Ratio	Kromayer Light Erythema Time, Minutes	Age	Ice Reaction Time, Seconds	Epinephrine, Vascular Reaction	Epinephrine, Wheal (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Arterio- sclerosis and Changes in Capillaries Urine
116	3.5	Urticaria	10	19.4	1.94	30	30	20	Vagotonic	20.4	7.4	..
69	4	Ulcer and nervous	9.6	16	1.66	120	22	20	Sympatheticotonic	21.2	10	..
152	4	Angioneurotic edema	9.8	20.1	2.05	60	27	15	Vagotonic	26	7.5	..
122*	4	Normal	10.6	19.2	1.81	...	33	5	Vagotonic	20	7.8	..
7	4.25	Ulcer	...	...	...	...	25	...	...	...	...	..
47*	5	Healed tuberculosis	10.4	26.2	2.51	90	38	...	Vagotonic	21.6	...	..
124	5	Heart disease; arthritis	10.5	...	...	90	25	15	Vagotonic	15.2	5.2	..
161	5	Glaucoma	9.17	18.03	1.96	75	43	12	Sympatheticotonic	14	13	Trace†
171	5	Urticaria	12.66	17.89	1.42	75	23	20	Sympatheticotonic	17	10.5	Trace†
38	5	Angioneurotic edema	9.8	21	2.14	90	39	10	Vagotonic	18	8.6	..
10*	5	Healed tuberculosis	10.1	24.6	2.4	130	40	7	Vagotonic	22.4	8.4	..
5	5.5	Neurosis	11.9	25.7	2.16	75	48	..	Vagotonic	...	...	Trace†
Averages	4.6		10.4	20.81	2.005	85.5	32.7	13.4		19.58	8.1	

* One of group of 100 "normal" men.
† Albumin.

TABLE 3.—The Results of Examinations of the Twenty-Three Persons with a Prolonged Blister Time of Fifteen Hours

Individual Number	Blister Time, Hours	Diagnosis	Calcium, Mg.	Potas- sium, Mg.	K/Ca Ratio	Kromayer Light Erythema Time, Minutes	Age	Ice Reaction Time, Seconds	Epinephrine, Vascular Reaction	Epinephrine, Wheal (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Arterio- sclerosis and Changes in Capillaries Urine
167	15	Glaucoma	12	22.7	...	120	77	5	Sympatheticotonic	17	14	..
150	15	Glaucoma	12	21.3	1.78	95	67	7	Vagotonic	17	14	..
86*	15	Nervous	12.6	15.9	1.26	105	50	25	Vagotonic	18.8	14	..
145	15	Glaucoma	10.1	15.7	1.55	180	71	20	Sympatheticotonic	18	13.6	Arteriosclerosis and Wassermann + + + +
146	15	Myasthenia gravis	9.2	14.4	1.56	105	40	30	Vagotonic	18	12	..
148	15	Glaucoma	9.7	24.3	2.5	85	67	10	Vagotonic	18	12	..
147	15	Parkinsonism	9.8	19.7	2	105	19	25	Sympatheticotonic	18	11.6	..
144	15	Pellagra	9.8	17.6	1.79	120	47	10	Sympatheticotonic	14.4	11.5	..
140	15	Pellagra	9.7	16.9	1.74	110	45	15	Sympatheticotonic	16.6	11.3	..
158	15	Hodgkin's disease	9.33	18.53	2	60	49	35	Sympatheticotonic	19.2	11.3	..
169	15	Buerger's disease	12.34	19.24	1.56	120	27	25	Vagotonic	20.8	11	Wassermann positive
107*	15	Glaucoma	8.1	18.2	2.24	130	61	30	Vagotonic	15.4	10.5	Albumin
154	15	Glaucoma	...	23.08	...	90	55	20	...	23	10	..
104*	15	Cardiovascular renal condition	9.9	15.4	1.56	80	67	12	Sympatheticotonic	23.6	9.8	..
106*	15	Pellagra	10	18.8	1.88	105	44	45	Sympatheticotonic	20	9.5	..
79*	15	Ulcer	11.2	20	1.78	240	58	20	Sympatheticotonic	19.2	9.4	..
160	15	Glaucoma	10.86	21.58	1.98	70	58	10	Vagotonic	16	8	..
140	15	Glaucoma and tuberculosis	11.4	29.7	2.61	150	45	40	Vagotonic	18	8	..
170	15	Glaucoma	10.6	23.7	2.2	...	56	56	...	...	...	..
129*	15	Tuberculosis	11.5	19	1.65	90	66	17	Vagotonic	18.4	...	..
155	15	Glaucoma	9	18.7	2.08	90	75	30	Sympatheticotonic	22	6.5	..
130	15	Cardiovascular renal condition	10.4	15.5	1.49	120	65	15	...	20	5.4	..
128*	15	Cardiovascular renal condition	10.2	19.7	1.93	240	66	24	Sympatheticotonic	...	...	..
Averages	15		10.4	19.5	1.86	118	55.4	21.3		18.6	10.4	

* One of group of 100 "normal" men.

the curve representing increased blister time; those with exophthalmic goiter are at the end representing shortened blister time.

In tables 2 and 3, we present the details of the examinations of the twelve persons with the shortest blister times and of the twenty-three with a blister time of approximately fifteen hours. In practically all other tabulations, we have selected the twenty showing the extreme reactions.¹

From tables 2 and 3, the following conclusions seem warranted: Of the twenty-three persons with a prolonged blister time (table 2), twenty show roentgenologic evidence of arteriosclerosis, a positive Wassermann reaction or urinary changes (90 per cent). In the group with the shortest blister times there are none with arteriosclerosis, only one with capillary change and four (25 per cent) with trace of albumin in the urine.

The group in which blister formation is prolonged has a slightly lower level of potassium and a lower K/Ca ratio. The Kromayer light erythema time is longer, as is the reaction to ice. The persons are much older. There are fewer vagotonic reactions to epinephrine and, though the wheal due to the intracutaneous injection of epinephrine hydrochloride is small, the flare is large.

It will be noted that the types of diseases of the one group are different from those of the other group.

CAPILLARY PERMEABILITY

Permeability of the capillaries of the skin, as estimated by the relative proportion of protein in a cantharides blister as compared with the protein in the serum of the capillary blood, averages 62 for the group of 100 "normal" men. In a previous study² of sixty-six normal students in an age group of from 22 to 25, we found the average permeability to be 68, and in another study³ of a small group of young women during the intermenstrual period, we found it to be 72.

The average for our strictly normal group is also 62. When we examine chart 2, we find that a number of the normal persons are grouped at the low end of the scale. In three of the four lowest,

1. Patients with exophthalmic goiter have not been included because we have felt that the extreme changes associated with the disease might tend to distort the averages.

2. Petersen, W. F., and Willis, D. A.: Capillary Permeability and the Inflammatory Index of the Skin in the Normal Person as Determined by the Skin Blister, *Arch. Int. Med.* **38**:663 (Nov.) 1926.

3. Petersen, W. F., and Milles, G.: The Relation of Menstruation to the Permeability of the Skin Capillaries and the Autonomic Tonus of the Skin Vessels, *Arch. Int. Med.* **38**:730 (Dec.) 1926.

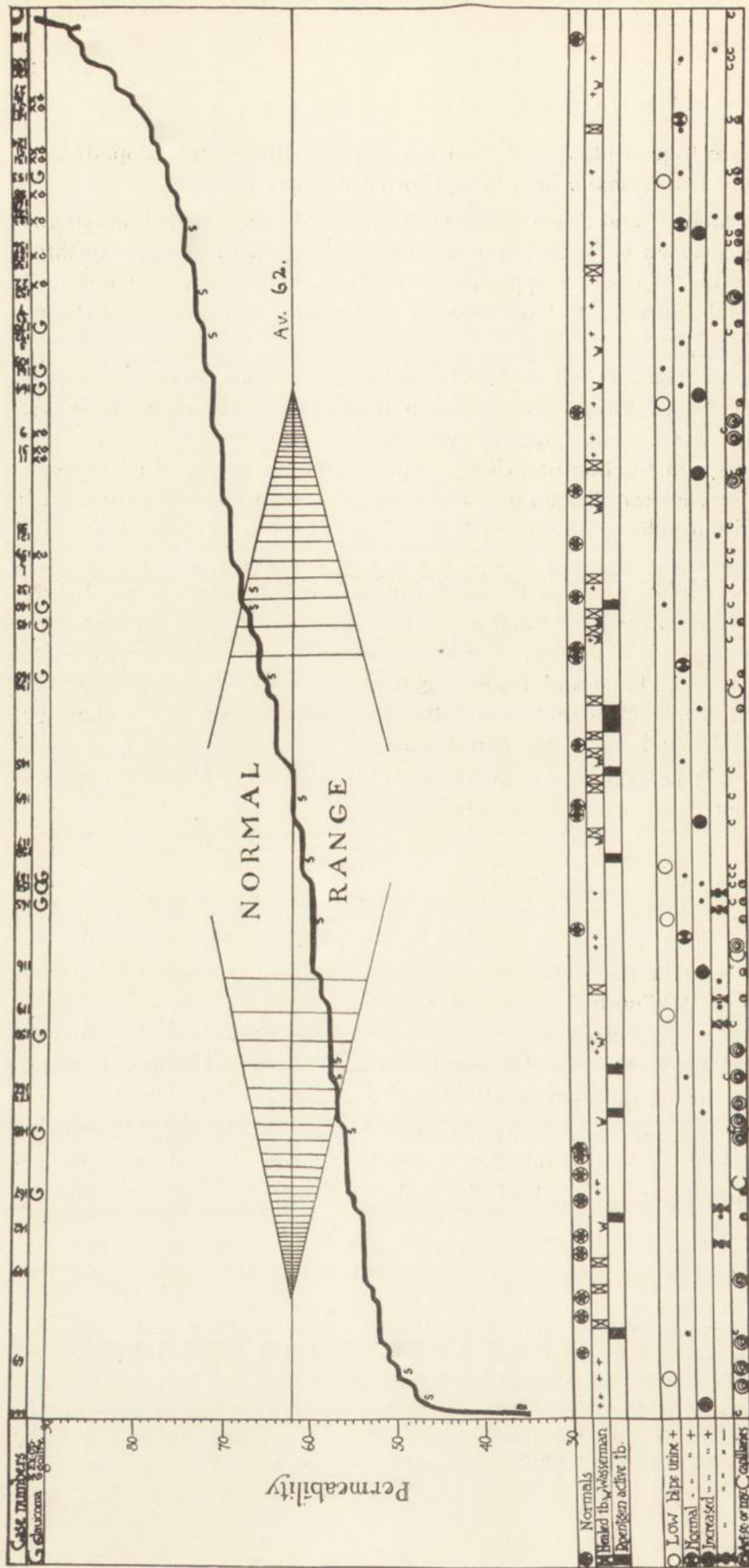


Chart 2.—The permeability of the capillaries of the skin (indicated by heavy line) of normal persons and patients with various clinical conditions. An explanation of the grouping of the normal persons and patients along the curve is given in the legend for chart 1.

TABLE 4.—*The Results of Examinations of the Twenty Persons Having the Lowest Permeability of the Capillaries*

Individual Number	Permeability of Capillaries	Diagnosis	Epinephrine, Wheal (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Thyroxin, Flare (Radius, Mm.)	Weight/Length Ratio	Age	Changes in Capillaries	Changes in Urine
144	35	Pellagra	14.4	11.5	15	0	174	47	+++	0
115	46	Cardiovascular renal condition	17.2	6.2	14.2	8	215	66	..	Trace albumin
101	47	Sensitized	19.6	7	10	0	191	55	Dilatation	..
42	47	Cardiovascular renal condition	19.2	11.8	9.2	4.6	241	33	..	..
127	50	Cardiovascular renal condition	18.4	9.7	15.4	12	180	65	..	Albumin, casts
93	50	Cardiovascular renal condition; sensitized	20.4	8.6	10	0	267	52	0	..
69	51	Nervous and ulcer	21.2	10	14.4	10.2	160	22	..	..
83	51	Normal	17.2	9.2	13.4	11	258	45	Delayed	..
103	52	Cardiovascular renal condition	22.4	9	12.2	0	270	59	..	..
129	52	Tuberculosis; cardiovascular renal condition	18.4	7	12.7	0	249	66	Granulation, sluggish	Casts
89	52	Healed tuberculosis	20.8	9.8	10.2	0	204	41	..	..
59	52	Normal	22	7.2	15.6	8	252	37	..	..
62	52	Aortic regurgitation	17.2	7	11.4	7.8	221	44	..	..
94	53	Normal	20	6	11.2	7.8	236	57	Slow	..
100	53	Healed tuberculosis	18.8	8.6	12	29.2	241	45	..	..
112	54	Cardiovascular renal condition	22.4	7.2	9.8	0	218	60	..	..
149	54	Nervous	20	9.7	19	0	209	35	..	..
110	54	Edema; healed tuberculosis	20.8	4.2	12	9.4	190	62	Diminished	..
35	54	Normal	22.8	11	9.2	0	203	44	..	..
45	54	Cardiovascular renal condition	20.4	9.8	16.4	12	317	39	..	..
50		Averages and totals	19.6	8.5	12.7	6	224	48.7	2 (granulation)	3

TABLE 5.—*The Results of Examinations of the Twenty Persons Having the Highest Permeability of the Capillaries*

Individual Number	Permeability of Capillaries	Diagnosis	Epinephrine, Wheal (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Thyroxin, Flare (Radius, Mm.)	Weight/Length Ratio	Age	Changes in Capillaries	Changes in Urine
80	91	Nervous	14.8	12.4	13.4	9.2	212	29	Granulation	..
77	87	Sensitized	14	10.8	10	15.4	187	39	..	..
118	87	Arthritis, tuberculosis	16.8	7.4	12	8.6	154	14	..	..
78	86	Normal	19.6	12	12.4	6.2	203	33	..	..
79	86	Ulcer	19.2	9.4	8.2	12.2	220	58	Tortuosity	..
135	84	Nervous	12.4	3.2	20	0	183	26	Granulation	Casts
120	82	Purpura	21.2	7.2	12.1	0	172	18	Granulation	..
92	82	Nervous	20.4	10.2	15.2	7.6	210	22	..	..
27	82	Lead poisoning and syphilis	....	....	....	....	217	30	..	..
147	79	Parkinsonism	18	11.6	13	0	142	19	..	..
66	78	Cardiovascular renal condition	20	9.2	10.2	6	257	64	Granulation	+
68	78	Healed tuberculosis	19.2	9.6	12	7	217	35	Rapid flow	Trace albumin
124	78	Arthritis; heart disease	15.2	2.6	....	....	210	25	Diminished flow	..
153	76	Glaucoma, decompensation	22	6.5	18	0	223	75	Dilatation	+ Casts
76	76	Cardiovascular renal condition	20	6.6	11	7	230	43	..	Granular casts
168	75	Orthostatic	18	16	14	0	215	28	..	Albumin
146	75	Myasthenia	18	12	19	0	192	40	..	..
14	74	Cardiovascular renal condition	24.4	6.2	15	5	198	36	..	Casts
70	74	Cardiovascular renal condition	18	11	10	0	264	65	Slow	Casts, albumin
136	74	Pellagra	20	9.5	18	0	180	44	Granulation	Albumin
80		Averages and totals	18.3	9.1	13.4	4.3	204	37	7 (granulation)	9

the examination of the capillaries of the skin revealed that the capillary flow was sluggish or that the number of capillaries was diminished. While, therefore, we cannot regard these persons as abnormal, the change in the flow of the capillaries of the skin must be considered in connection with their diminished permeability. On the other hand, we note that the end of the scale representing higher permeability reveals more persons in whom distinct anatomic changes could be observed in the capillaries in the form of granulations, marked dilatations, etc.

Healed tuberculosis (revealed by roentgen examination) is found at all levels, but the cases in which there is roentgenologic evidence of active tuberculosis are found at the normal or lower levels of permeability. It should be emphasized that these cases are not necessarily clinically active; in the clinically active cases, the tendency is toward greater permeability with progression of the disease.⁴ (In chart 2, persons with roentgenologic evidence of healed tuberculosis other than those of the group of 100 "normal" men are indicated by the cross in the horizontal column designated "Healed Tuberculosis.")

It will be noted that the arteriosclerotic or myocarditic (revealed by roentgen examination) cases are equally common in both regions of the scale. But of the eighteen persons with arteriosclerosis on the side of lower permeability, only five have urinary changes, while of the seventeen on the side of higher permeability, ten have urinary changes.

There are, furthermore, nine with increased blood pressure (over 140), but without urinary changes, in the group of less permeability as compared with four in the group of more permeability.

Capillary changes, i. e., granulations, occur in eleven in the group below the average and in twenty in the group above.

Sensitized persons are reported in all the ranges.

The increased permeability coincident with exophthalmic goiter is apparent.

In table 4, we have tabulated the results of some examinations of the twenty persons with the lowest permeability and in table 5, of those with the highest permeability (excluding those with exophthalmic goiter).

When we examine the averages of tables 4 and 5, we find, of course, that the persons with lessened permeability are older and heavier.

INFLAMMATORY INDEX

The group with low inflammatory indexes is partly identical with a series showing prolonged blister time, i. e., persons of advanced age, with cardiovascular renal lesions or with other evidences of chronic disease.

4. Levinson, S. A., and Petersen, W. F.: *Am. Rev. Tuberc.* **15**:681, 1927.

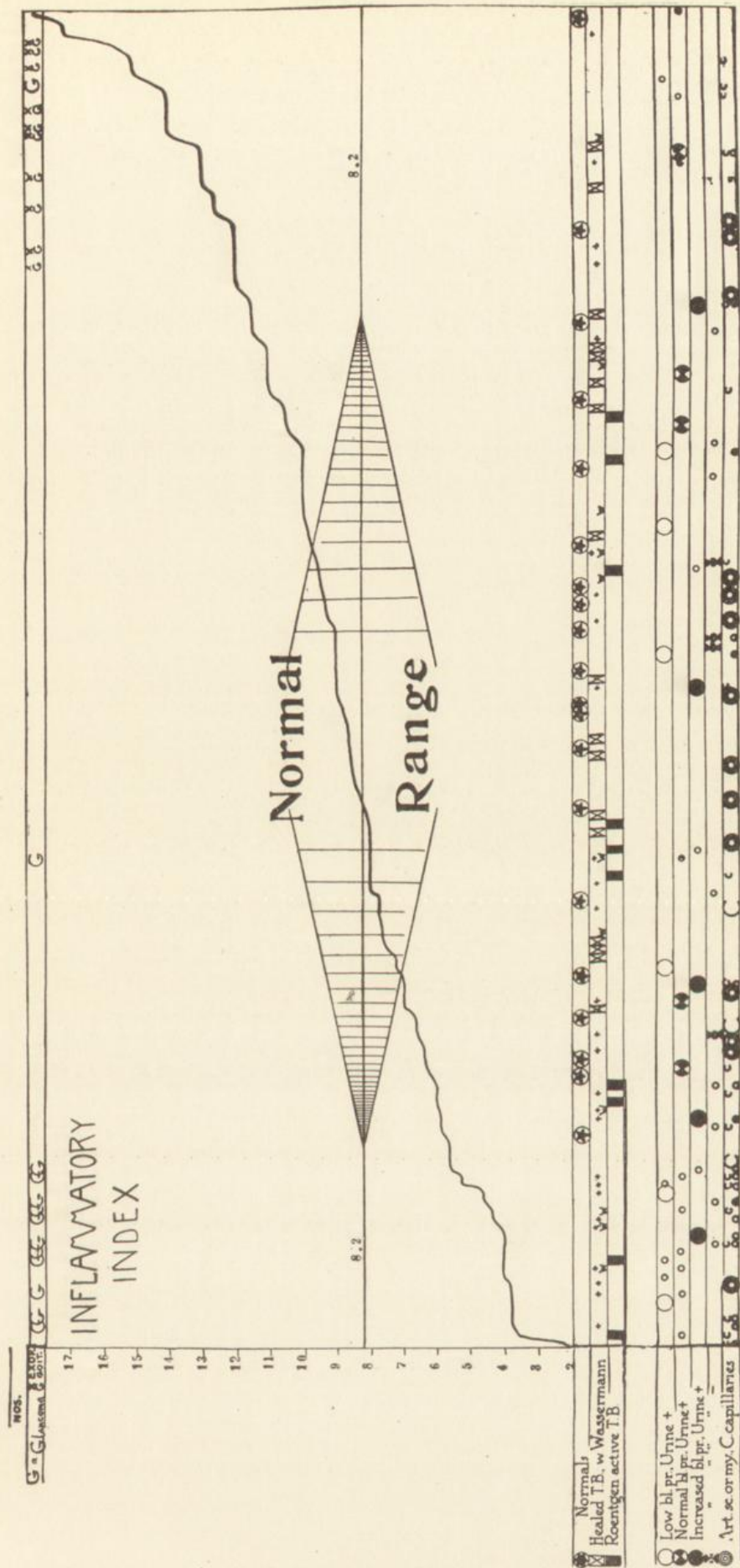


Chart 3.—The inflammatory index (heavy line) of normal persons and patients with various clinical conditions.

TABLE 6.—The Results of the Examinations of the Twenty Persons Having the Lowest Inflammatory Indexes

Individual Number	Inflammatory Index	Diagnosis	Blister Time, Hours	Permeability of Capillaries	Calcium, Mg.	Potassium, Mg.	K/Ca Ratio	Kromayer Light Erythema Time, Mm.	Carbon Dioxide Combining Power	Ice Reaction Time, Seconds	Age	Epinephrine, Vascular Reaction	Epinephrine, Wheal (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Thyroxin, Flare (Radius, Mm.)
136	5	Pellagra	15	74	10	18.8	1.88	105	57.9	45	44	Sympathetictonic	20	9.5	18	0
130*	4.7	Cardiovascular renal condition	15	71	10.4	15.5	1.49	120	55.6	15	65	.....	20	5.4	11.2	0
170	4.6	Aortic syphilis; bronchiectasis; glaucoma	15	72	10.5	23.7	2.2	...	52.5	..	56	.....	....	....	....	....
145	4.4	Glaucoma	15	67	10.1	15.7	1.55	180	55.4	20	71	Sympathetictonic	18	13.6	16	0
160	4.4	Asthma; emphysema; bronchiectasis; glaucoma	15	66	10.8	21.5	1.98	70	62.7	10	58	Vagotonic	16	8	20	0
169	4.1	Buerger's disease	15	62	12.3	19.2	1.56	120	55.1	25	27	Vagotonic	20.8	11	18	0
134*	4	Cardiovascular renal condition	15	60	9.9	15.4	1.56	80	54.8	12	67	Sympathetictonic	23.6	9.8	19.2	9.6
154	4	Glaucoma	15	60	...	23	...	90	56.6	20	66.6	Vagotonic	23	10	26	0
137	4	Cardiovascular renal condition; glaucoma	15	61	8.1	18.2	2.24	130	51.9	30	61	Sympathetictonic	15.4	10.5	13	0
140	4.05	Cardiovascular renal condition; glaucoma	15	68	11.4	29.7	2.61	150	55.6	40	45	Vagotonic	18	8	27	0
143	4	Pellagra	15	63	9.7	16.9	1.74	100	55.4	15	45	Sympathetictonic	16.6	11.3	9	0
158	4	Hodgkin's disease; cardiovascular renal condition	15	61	9.3	18.5	2	60	57.8	35	49	Sympathetictonic	19.2	11.3	28	0
123*	3.8	Cardiovascular renal condition	15	58	10.2	19.7	1.93	240	58.1	24	66	Sympathetictonic	....	....	14.4	0
150	3.8	Glaucoma	15	58	12	21.3	1.78	95	72.7	7	67	Sympathetictonic	17	14	16	0
127*	3.8	Cardiovascular renal condition	13	50	12.2	16.2	1.67	255	59.1	16	65	Sympathetictonic	18.4	9.7	15.4	12
80*	3.8	Nervous	15	58	12.6	15.9	1.26	105	55	25	50	Vagotonic	18.8	14	15.4	12.4
148	3.7	Glaucoma	15	56	9.7	24.3	2.5	85	69.5	10	67	Sympathetictonic	18	12	17	0
167	3.7	Bronchiectasis; glaucoma	15	56	12	22.7	1.9	120	47.9	5	77	.....	17	14.2	15	0
129*	3.5	Tuberculosis; cardiovascular renal condition	15	52	11.5	19	1.05	90	61.6	17	66	Vagotonic	18.4	7	12.2	0
144	2.2	Cardiovascular renal condition; pellagra	15	35	9.8	17.6	1.76	120	54.4	10	47	Sympathetictonic	14.4	11.5	15	0
3.97	Averages and totals		14.9	60	10.6	19.64	1.85	121.8	57.48	20	57.4	5 V., 11 S.	18.47	10.6	17.14	11.3

* One of group of "normal" men.

TABLE 7.—The Results of Examinations of the Twenty Persons Having the Highest Inflammatory Indexes

Individual Number	Inflammatory Index	Diagnosis	Blister Time, Hours	Permeability of Capillaries	Calcium, Mg.	Potassium, Mg.	K/Ca Ratio	Kromayer Light Erythema Time, Mm.	Carbon Dioxide Combining Power	Ice Reaction Time, Seconds	Age	Epinephrine, Vascular Reaction	Epinephrine, Wheel (Diameter, Mm.)	Epinephrine, Flare (Radius, Mm.)	Thyroxin, Wheel (Diameter, Mm.)	Thyroxin, Flare (Radius, Mm.)
142	18	Angioneurotic edema	4	73	9.8	20.5	2.05	60	63.4	15	27	Vagotonic	26	7.5	9	8
122*	17	Normal	4	68	10.6	19.2	1.81	..	56.8	5	33	Sympathetico tonic	20	7.8	12	9
116	17	Urticaria	3.5	60	10	19.4	1.94	30	55.1	20	30	Vagotonic	20.4	7.4	5	0
80*	15.1	Cardiovascular renal condition; nervous	6	91	8.1	13.7	1.7	100	53.2	30	29	Sympathetico tonic	14.8	12.4	13.4	9.2
124	15	Heart disease	5	78	..	..	..	90	53.7	10	25	Vagotonic	15.2	2.6	..	..
161	14.5	Cardiovascular renal condition; glaucoma	5	72	9.17	18.63	1.96	75	49.4	12	43	Sympathetico tonic	14	13	13	0
38	14	Cardiovascular renal condition; angioneurotic edema	5	69	9.8	21	2.14	90	58.5	10	39	Vagotonic	18	8.6	10.2	10.4
135	14	Neurovascular syndrome	6	84	11.9	19.6	1.65	75	54.5	18	26	Vagotonic	12.4	3.2	20	0
171	14	Urticaria	5	73	12.66	17.89	1.42	75	48.7	29	18	..	17.5	10.5	18	0
27	13.6	Lead poisoning	6	82	10	21.4	2.14	..	54.9	..	30	..	..	..	..	..
10*	13	Neurovascular syndrome; healed tuberculosis	5	64	10.1	24.6	2.4	150	60.4	7	40	Sympathetico tonic	22.4	8.4	9	7.2
66*	13	Cardiovascular renal condition	6	78	11	20	1.82	15	53.1	28	54	Sympathetico tonic	20	9.2	10.2	0
5	13	Nervous	5.5	72	11.9	25.7	2.16	75	63.9	..	48	..	..	..	..	..
120	13	Purpura	6	82	10	19.9	1.99	75	52.2	14	18	..	21.2	7.2	12.1	0
47*	12.8	Healed tuberculosis	5	62	10.4	26.2	2.51	90	56.4	15	38	Vagotonic	21.6	5.2	9	0
69	12.7	Ulcer; nervous	4	51	9.6	16	1.66	120	54.8	20	22	Sympathetico tonic	21.2	10	14.4	10.2
79*	12.6	..	6	76	..	..	..	120	57.6	..	..	..	..	..	..	..
98*	12.1	Cardiovascular renal condition	6	73	8.8	17	1.93	105	62.7	15	34	Sympathetico tonic	20	4	11.2	0
78*	12	Normal	7	86	8.4	18.8	2.23	195	62.7	10	33	Sympathetico tonic	19.6	12	12.4	6.2
106*	12	Cardiovascular renal condition	6	71	11.2	19	1.69	90	49.5	30	60	Vagotonic	19.6	7	11.2	0
13.92	Averages and totals		5.3	73.2	10.17	19.9	1.95	90.5	56.07	16.4	34	8 V., 8 S.	19	8	11.8	8.6

* One of group of 100 "normal" men.

If we examine chart 3, we observe the piling up of persons with arteriosclerosis, capillary changes and evidence of renal disease (albumin or casts) at the low end of the scale. It may also be observed that the majority of the patients with roentgenologic evidence of active tuberculosis are found in the low range, where, too, there are more persons with roentgenologic evidence of healed lesions. The patients with glaucoma and the associated prolonged blister time are also in this region.

The persons with high inflammatory indexes include those with diseases of the skin (urticaria and angioneurotic edema) and, of course, patients with exophthalmic goiter. It may be significant that none of those with increased blood pressure (over 140, with or without renal lesions) are found above the normal maximal range of 11.5.

When we examine tables 6 and 7, with the results of examinations in twenty of the extreme cases, several differences become apparent. The relation to permeability of the capillaries and blister time is, of course, obvious. The group of persons with the low inflammatory indexes are much older, their calcium levels are higher, their K/Ca ratios are lower, their Kromayer light erythema times and their ice reaction times are longer and their flares due to epinephrine and wheals due to thyroxin are larger.

There are proportionately more sympatheticotonic persons among those with low than among those with high indexes, despite the fact that persons with cardiovascular renal lesions are found more frequently at the low end of the scale.

CALCIUM, POTASSIUM AND K/CA RATIO

The relation of the calcium and the potassium and the K/Ca ratio of the blood serum of normal persons, as well as of patients ill from various diseases, has been studied with considerable interest in recent years. The relations to the autonomic reactions, in particular, have received much attention. Kylin,⁵ as well as the Kraus school, showed definite relations to asthma⁶ and hyperpiesis.⁷

In the previously published results of examinations of "normal" persons, no evidence was presented as to their actual physical normalcy. In our group of 100 "normal" men, only twenty could actually be as classified. The remaining eighty showed evidence of cardiovascular renal abnormality, healed or active tuberculosis, syphilis, etc.

5. Kylin, E.: *Acta med. Scandinav. (suppl.)* **1**:112, 1927.

6. Kylin, E.: *Klin. Wchnschr.* **6**:1742, 1927.

7. Kylin, E.: *Zentralbl. f. inn. Med.* **48**:431, 1927.

Our determinations were made on fresh serum with the Clark-Collip method for calcium and the Kerr modification for potassium. The results have been tabulated in table 8.

Chart 4 may aid in making the conditions more apparent. It will be noticed that the K/Ca curve commences with a low ratio of 1.12 in a young man (no. 132) 25 years of age (whose interesting series of clinical manifestations of disease is described on page 74) and reaches a high ratio of 3.22 in a man 52 years of age (no. 93), who has had hay-fever each fall, is sensitive to halibut, shows x-ray evidence of myocarditis and is short of breath on exertion.

When we analyze the K/Ca ratios of the so-called normal group of 100, several interesting relations are to be observed.

Normal Persons.—In the first place, the actually normal persons fall, with two exceptions, within the range from 1.7 to 2.4. One of the two exceptions, with a ratio of 1.53, gives a markedly vagotonic reaction to epinephrine. The other, with a ratio of 2.9, is apparently healthy in every respect.

Persons with Roentgenologic Evidence of Healed Parenchymal Tuberculosis and Syphilis.—Of the seventeen persons with roentgenologic evidence of healed parenchymal tuberculosis, who are otherwise normal, eleven fall within the normal range, while seven of the nine syphilitic persons are also included within these limits. Tuberculosis, unless active, and syphilitic infection apparently do not materially alter the status.

Persons with Active Tuberculosis.—When one now turns to the group with roentgenologic evidence of active tuberculosis, one meets an interesting change. The average ratio for the entire group is 2.08, i. e., normal, but inspection of the chart will reveal that the ratios in the active cases are all outside the normal limits. Five persons have low ratios. Of these, one has albuminuria. These five all have low or normal blood pressure. The other five are at the extreme opposite end, with high K/ca ratios. Three of these have increased blood pressure, one normal blood pressure with albuminuria and the fifth a history of angioneurotic edema.

Persons with Cardiovascular Renal Lesions.—The persons with cardiovascular renal lesions are found scattered over the entire range of the K/Ca ratio without any apparent relation to blood pressure, to the degree of sclerosis of the larger vessels (made apparent on roentgen examination) or to capillary changes. There are no true cases of primary hypertension in the group, there being only some with an increase in blood pressure of from 140 to 170 (without changes in the kidneys),

TABLE 8.—The K/Ca Ratios, the Potassium Values and the Calcium Values of One Hundred So-Called Normal Persons, as Well as of Patients with Glaucoma, Exophthalmic Goiter, Etc.

Individual Number		K/Ca Ratio	Calcium, Mg.	Potassium, Mg.
132	Eczema sensitized	1.12	13.4	15
46*	Inanition; worry	1.24	13.8	17.4
86*	Inanition; previous angioneurotic edema.....	1.23	12.6	15.9
62*	Aortic regurgitation	1.3	12.2	15.2
133	Scleroderma	1.32	13.2	17.5
90*	Nervous	1.34	11.4	14.1
110*	Edema under eyes; roentgenographic evidence of healed tuberculosis	1.34	12.1	16.3
118	Arthritis; possibly tuberculosis of lungs.....	1.4	12.2	17.2
88*	Roentgenographic evidence of active tuberculosis.....	1.4	9.4	13
112*	Roentgenographic evidence of arteriosclerosis.....	1.4	12.6	18
171	Menstrual urticaria	1.4	12.66	17.9
173	Cord tumor; worry.....	1.43	12.7	18.7
17*†	Normal (vagotonic reaction to epinephrine).....	1.43	12.7	18.2
77*	Previous sensitization	1.44	10.8	15.6
70*	Arthritis deformans; arteriosclerosis; nephritis.....	1.45	11.4	16.6
18*	Healed tuberculosis	1.46	14.5	21.2
108*	Roentgenographic evidence of active tuberculosis, chronic	1.47	10.4	15.3
3*	Healed tuberculosis; nervous.....	1.47	11.1	16.7
45*	Increased blood pressure; (had nephritis as a result of scarlet fever)	1.48	11.2	16.6
130*	Nephritis; arteriosclerosis	1.49	10.4	15.5
109	Nervous; worry	1.5	10.8	16.1
82*	Increased blood pressure; changes in capillaries.....	1.5	11.4	17.2
22	Exophthalmic goiter	1.5	12.1	18.2
20*	Roentgenographic evidence of active tuberculosis.....	1.53	11.4	17.4
134*	Increased blood pressure; nephritis.....	1.56	9.9	15.6
60	Increased blood pressure; changes in capillaries.....	1.56	11.4	17.5
15*	Healed tuberculosis	1.55	12.1	18.8
111*	Arteriosclerosis; old syphilis.....	1.55	11.8	18.3
145	Changes in capillaries; glaucoma; arthritis; syphilis...	1.55	10.1	15.7
42*	Myocarditis	1.56	11.4	17.8
146	Myasthenia gravis; idiosyncrasy.....	1.56	9.2	14.4
169	Sensitized; healed tuberculosis; Buerger's disease; syphilis	1.56	12.34	19.24
102*	Roentgenographic evidence of active tuberculosis.....	1.63	10.6	17.3
172	Sensitized; Raynaud's disease; healed tuberculosis.....	1.64	13	21.3
129*	Roentgenographic evidence of active tuberculosis; nephritis	1.65	11.5	19
135	Nervous; healed tuberculosis; nephritis.....	1.65	11.9	19.6
69	Nervous; increased blood pressure; ulcer; healed tuberculosis	1.66	9.6	16
65*	Nephritis; changes in capillaries.....	1.67	9.8	16.4
106*	Dilatation of aorta.....	1.69	11.2	19
127*	Nephritis; healed tuberculosis.....	1.68	9.7	16.2
131	Exophthalmic goiter	1.7	10.6	18
80*	Nervous; changes in capillaries; healed tuberculosis; previously sensitized	1.7	8	13.7
40*	Changes in capillaries	1.73	10.8	18.7
72*†	Normal	1.73	10.8	18.7
73*	Positive Wassermann reaction.....	1.74	11.2	19.5
143	Pellagra; syphilis	1.74	9.7	16.9
149	Nervous; worry	1.74	10.1	17.4
14*	Nephritis; sensitized	1.75	11.2	19.6
44*†	Normal	1.76	10	17.6
75*	Increased blood pressure	1.78	10.8	19.2
79*	Increased blood pressure; ulcer; changes in capillaries.....	1.78	11.2	20
84*	Albuminuria; changes in capillaries.....	1.78	10	17.8
150	Glaucoma; healed tuberculosis; hyaline casts.....	1.78	12	21.3
165	Glaucoma; dilated aorta; nephritis.....	1.79	10	17.95
144	Pellagra; changes in capillaries.....	1.79	9.8	17.6
117	Syphilitic arthritis	1.8	9.2	17.5
85*	Slight fever, unknown origin.....	1.8	10.6	19.1
74*	Changes in capillaries.....	1.8	11	19.9
6	Nephritis; arteriosclerosis; myocarditis.....	1.8	10.5	18.9
4*†	Normal	1.8	11.8	21.2
89*	Healed tuberculosis	1.81	9.2	16.7
105*	Healed tuberculosis	1.81	9	17.1
122*†	Normal	1.81	10.6	19.2
66*	Arteriosclerosis; myocarditis; hyaline casts.....	1.82	11	20
113*	Arteriosclerosis; healed tuberculosis.....	1.82	10.2	18.6
63*	Arteriosclerosis; healed tuberculosis.....	1.83	11.4	20.9
126	Exophthalmic goiter	1.83	9.8	18.3
64*†	Normal; slightly nervous.....	1.84	9	16.6
99*	Healed tuberculosis	1.86	9.6	17.9
76*	Nephritis; dilated aorta; granular casts.....	1.87	10.8	20.2
103*	Arteriosclerosis; myocarditis	1.88	9.2	17.3
136	Pellagra; arteriosclerosis; changes in capillaries.....	1.88	10	18.8
138	Fröhlich syndrome (?); myocarditis (?).....	1.88	10.6	19.9

* Indicates that the person is one of the group of 100 so-called normal persons.

† Indicates that the person is apparently normal on examination.

‡ Changes in capillaries means increased dilatation or actual granulation and tortuosity

§ Blood pressures of 140 or over are noted as increased.

TABLE 8.—*The K/Ca Ratios, the Potassium Values and the Calcium Values of One Hundred So-Called Normal Persons, as Well as of Patients with Glaucoma, Exophthalmic Goiter, Etc.—Continued*

Individual Number		K/Ca Ratio	Calcium, Potassium,	
			Mg.	Mg.
168	Orthostatic albuminuria	1.88	9.4	17.7
43*†	Normal	1.89	9.2	19.4
164	Nephritis; glaucoma; syphilitic aortitis.....	1.89	8.7	16.54
139	Urticaria; vitiligo; changes in capillaries.....	1.9	9.7	18.4
167	Glaucoma; arteriosclerosis; changes in capillaries.....	1.9	12	22.72
16	Exophthalmic goiter; healed tuberculosis; changes in urine	1.9	11.4	21.6
39*	Syphilis	1.91	9.4	18
98*	Arteriosclerosis	1.93	8.8	17
125*	Arteriosclerosis; healed tuberculosis; albumin; changes in capillaries	1.93	10.2	19.7
68*	Healed tuberculosis	1.94	8.8	17.1
116	Urticaria	1.94	10	19.4
59*†	Normal	1.95	9.6	18.8
115*	Arteriosclerosis; albumin	1.95	7.8	15.2
142	Neoplasm (syphilis); arteriosclerosis.....	1.95	9.4	18.3
180	Neoplasm (mole)	1.96	11.11	21.86
161	Glaucoma; albumin; changes in capillaries.....	1.96	9.7	18.03
160	Glaucoma; healed tuberculosis; asthma.....	1.98	10.86	21.6
120	Purpura; changes in capillaries.....	1.99	10	19.9
174	Raynaud's disease?	2	10.8	21.5
158	Hodgkin's disease	2	9.33	18.53
147	Epidemic encephalitis	2	9.8	19.7
71*	Arteriosclerosis	2	8.8	17.5
67*	Dwarf	2	8.8	17.6
52*	Healed tuberculosis	2	10.4	20.9
8*†	Normal	2	10.5	21
1	Nervous	2	12.1	24.9
2	Epilepsy; angioneurosis	2	12.9	26.1
9	Exophthalmic goiter; changes in capillaries.....	2.04	11.5	23.5
152	Angioneurotic edema; hyaline casts.....	2.05	9.8	20.1
101*	Healed tuberculosis; eczema	2.06	9.4	19.4
96*	Arteriosclerosis	2.07	8.2	17
94*†	Normal	2.08	8.4	17.5
153	Glaucoma; nephritis; healed tuberculosis.....	2.08	9	18.7
119	Adenoma of thyroid.....	2.1	9	18.7
24*	Healed tuberculosis	2.12	11.7	24.8
27	Syphilis; lead poisoning.....	2.14	10	21.4
38	Angioneurotic edema; changes in capillaries.....	2.14	9.8	21
58	Exophthalmic goiter	2.15	12	25.9
5	Healed tuberculosis	2.16	11.9	25.7
41*†	Normal	2.16	9.8	21.2
36*	Albuminuria	2.17	12.1	26.3
123	Carcinoma of thyroid; arteriosclerosis.....	2.17	9.2	20
159	Exophthalmic goiter	2.17	8.23	17.9
23*	Healed tuberculosis	2.19	13.1	28.6
28*	Healed tuberculosis	2.17	11	24.1
170	Diabetes, etc.; glaucoma; increased blood pressure.....	2.2	10.6	23.71
11	Exophthalmic goiter; healed tuberculosis.....	2.21	10.9	24.1
78*†	Normal	2.23	8.4	18.8
137	Glaucoma; albuminuria	2.24	8.1	18.2
37*†	Normal	2.26	10	22.6
121	Increased blood pressure; arthritis deformans.....	2.27	8.9	20.2
166	Eosinophilia of unknown origin.....	2.27	9.1	20.66
49*	Hyaline casts	2.29	11	25.2
107*	Arteriosclerosis; myocarditis	2.3	8	18.4
83*†	Normal	2.3	8.2	19
87*†	Normal	2.32	8.4	19.5
92*	Neurosis	2.32	8.4	19.5
30*	Arteriosclerosis; increased blood pressure.....	2.33	10.3	24
61*	Arteriosclerosis; changes in capillaries; albuminuria....	2.35	7.6	17.6
97*†	Normal (nervous)	2.37	8.4	20.9
100*	Healed tuberculosis	2.38	9	21.5
29*†	Normal	2.39	10	23.9
114*	Tuberculosis; arteriosclerosis; nephritis.....	2.4	8	19.2
50*†	Normal	2.4	11.4	27.4
10*	Healed tuberculosis	2.4	10.1	24.6
95*	Healed tuberculosis	2.41	7.8	18.8
13*	Healed tuberculosis	2.48	9.6	23.8
148	Glaucoma; vitiligo; arteriosclerosis.....	2.5	9.7	24.3
47*	Healed tuberculosis	2.51	10.4	26.2
21*	Albuminuria; changes in capillaries.....	2.51	10.2	25.6
56*	Tuberculosis; has had angioneurotic edema.....	2.52	9.8	23.6
51	Exophthalmic goiter	2.58	10	25.8
25*	Tuberculosis; albuminuria	2.6	11.1	28.8
140	Glaucoma; tuberculosis; sensitized.....	2.61	11.4	29.7
26*	Syphilis	2.61	10.2	26.6
33	Epileptic	2.73	9.5	26.1
32*	Increased blood pressure.....	2.73	9.5	26.1
48*	Syphilis	2.87	9.6	27.6
34*	Changes in capillaries.....	2.89	9.6	27.7
35*†	Normal	2.9	8.7	25.2
81*	Arteriosclerosis; myocarditis; pruritis.....	3.07	8.4	25.8
104*	High blood pressure; tuberculosis; arteriosclerosis....	3.09	7.4	22.9
55*	Albumin and hyaline casts; healed tuberculosis.....	3.1	8	24.9
93*	Sensitized; myocarditis	3.2	7.6	24.5

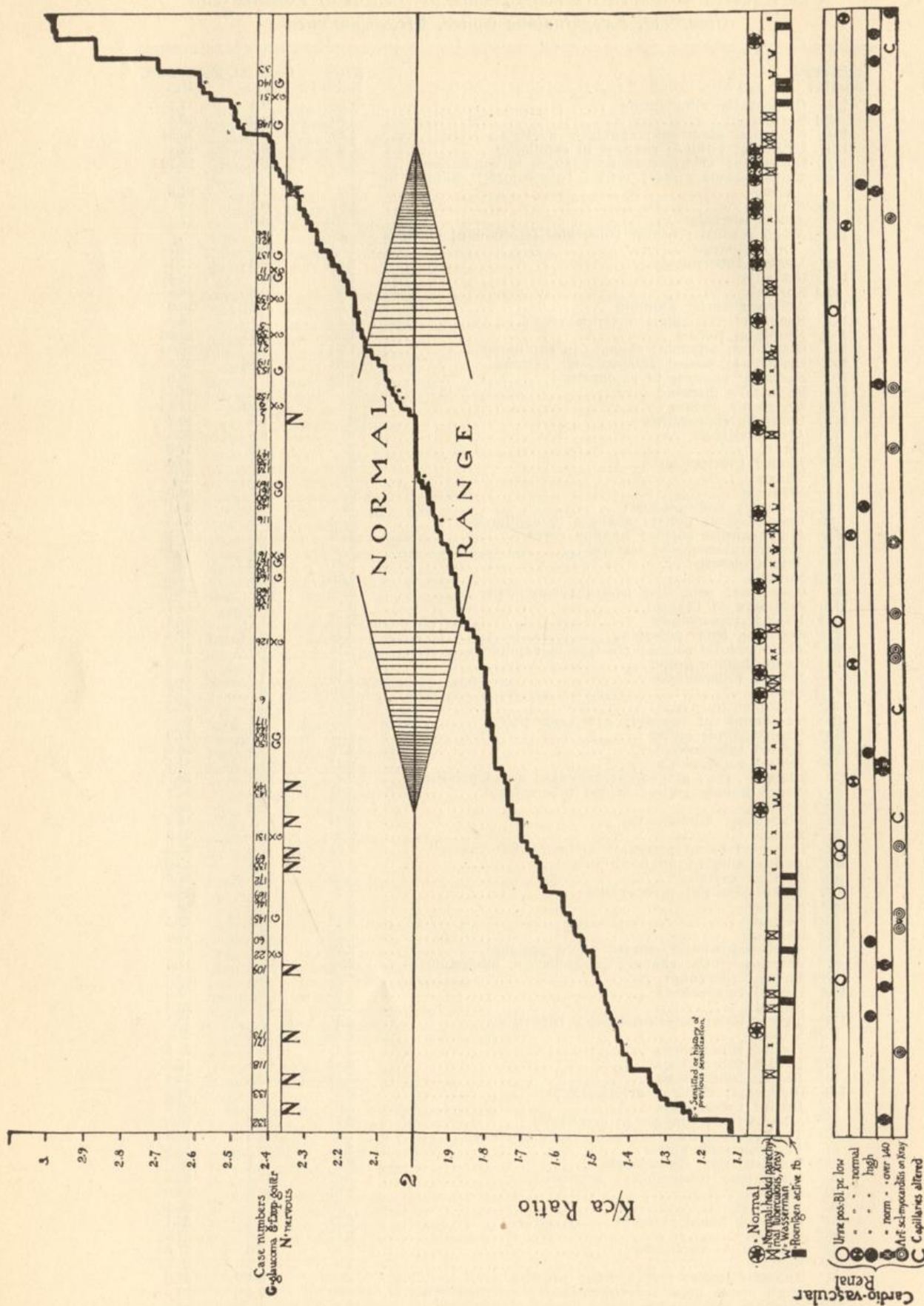


Chart 4.—The K/Ca ratio of normal persons and patients with various clinical conditions (indicated by heavy line). Individual identification marks at bottom are included in the group of 100 "normal" men.

but these are all in persons of advanced age. With one exception, the members of this group all have sthenic hearts.

"Nervous" Persons.—The so-called nervous group seems, without doubt, to be associated with changes in the K/Ca ratios. One must, however, consider the possibility that the changes in the ratios are secondary to the nervous conditions rather than the cause of these. Perhaps some of the symptoms (feeling of weakness, etc.) may be sought in an alteration of the salt balance. These cases include the following:

CASE 86.—A former dentist, American, 50 years of age, had always been the most nervous one of his family. A sister had exophthalmic goiter. The patient had an attack of angioneurotic edema when a dental student. He used alcohol excessively. The death of a child precipitated a "breakdown." He lost his practice and his family, and became "down and out." He worked occasionally as a janitor.

It may be noticed that the sugar and the globulin were increased, the total protein was low, the muscle reactivity was increased and the reaction to epinephrine hydrochloride was vagotonic. The weight/length ratio was diminished.

CASE 90.—A mail sorter, 30 years of age, complained that since the year previously he got "rattled" easily and was nervous. He was extremely sensitive to venipuncture. The family history was negative. The patient reacted markedly to epinephrine with a tremor and a feeling of discomfort. The weight/length ratio was diminished. The intracutaneous reactions to morphine and epinephrine (the flare) were increased; those to thyroxin were diminished. The capillaries of the skin were reduced in number.

CASE 173.—A highly successful and intelligent American business man, 40 years of age, with cord tumor, had suffered from incidental worry for two years. The family history was negative other than that the mother was nervous and died from tuberculosis.

The K/Ca ratio in December, 1927, was 1.57 (calcium, 13.5; potassium, 21.3). The K/Ca ratio in May, 1928, was 1.43 (calcium, 12.7; potassium, 18.17). The sugar was 80, the globulins were diminished, the skin resistance was low, the blood pressure was low and the pulse rate was high. The patient reacted strongly to epinephrine. The weight/length ratio was diminished. The intracutaneous reactions to epinephrine were increased; flares due to morphine, thyroxin and caffeine were absent.

CASE 3.—A highly intelligent Jewish chemist, 25 years of age, had been nervous for several years. The father suffered from Raynaud's disease.

The patient's reaction to epinephrine was vagotonic. The weight/length ratio was normal. The intracutaneous reactions to thyroxin and caffeine (wheals and flares) were diminished.

CASE 109.—An American spinster, 42 years of age, spent much of her time in bed because of "weakness." She had a unilateral ovariectomy fifteen years previously. She menstruated normally. She complained of palpation, nervousness, weakness and excessive perspiration. One sister had an exophthalmic goiter.* The mother, 72 years of age, was nervous, with a blood pressure of 160.

The reaction to epinephrine was slightly sympathetictonic, the weight/length ratio low (140), the skin reactions to ice and the Kromayer light faint and the intracutaneous reactions to thyroxin (flares) increased.

CASE 135.—A Jewish tailor, 26 years of age, was nervous. The mother died of "shock" following an air raid during the war. The patient had lost 15 pounds (6.8 Kg.) during the last year. The reaction to epinephrine was vagotonic. The weight/length ratio was low. The urine showed granular casts. The capillaries of the skin showed granulations. A healed parenchymal tuberculosis was revealed by the x-rays. The globulins were increased. The pharmacologic skin reactions to epinephrine and morphine (wheals and flares) were reduced; the wheals due to thyroxin and caffeine were increased, and the flares were absent.

CASE 69.—A Jewish medical student, 22 years of age, alert and intelligent, had a duodenal ulcer and was nervous. He had an occasional tremor. His blood pressure was increased. The mother was nervous and had high blood pressure (210); the father was nervous and had high blood pressure (175). The patient felt weak when blood was drawn. He gave a marked reaction to epinephrine; he felt ill, had a headache and turned pale, and the vascular reaction was markedly sympathetictonic. The weight/length ratio was low. The pharmacologic skin reactions to epinephrine and thyroxin (wheals and flares) were increased; the wheal due to caffeine was increased.

CASE 80.—An American electrician, 30 years of age, was nervous and had a tremor. He became nervous in 1924 after an explosion in a salt mine. He had urticaria in 1922.

The reaction to epinephrine was not marked. The reaction to the Kromayer light was marked and the capillary permeability was high. The resistance of the skin to electric current was high. The weight/length ratio was normal. All flares due to the pharmacologic substances employed in the intracutaneous injections were increased. The wheal due to epinephrine was diminished and that from thyroxin was increased. The capillaries of the skin showed beginning granulations.

CASE 149.—An American plumber, 35 years of age, had had financial reverses, and was nervous and sleepless. The family history was negative, except for tuberculosis.

The reaction to epinephrine was not marked. The Kromayer light erythema time was shortened, the skin resistance was high and the weight/length ratio was relatively low. The serum globulins were practically absent. The pharmacologic skin reactions to epinephrine were negative, the flares due to other intracutaneous injected substances were reduced or absent and the wheal due to thyroxin was increased.

CASE 1.—A Jewish medical student, 23 years of age, who had a "nervous breakdown" a year before examination, felt weak and had a tremor.

The reaction to epinephrine was marked, the sugar was increased and the Kromayer light, ice and blister reactions were delayed. The weight/length ratio was low. The intracutaneous injection of epinephrine hydrochloride and morphine left the skin unchanged; the wheal and the flare due to thyroxin were increased.

CASE 92.—A Jewish medical student, 23 years of age, was nervous and unable to concentrate, and had a feeling of weakness and an occasional tremor. He had bowel movements once or twice a week; he sweat easily. The father died from hypernephroma; the mother had periarteritis nodosa (?). The reaction to epinephrine was marked. The blister time and ice reaction were delayed. The

reaction to the Kromayer light was faint. The skin resistance was increased. The weight/length ratio was normal. The intracutaneous reactions to epinephrine and morphine were normal. Those to thyroxin were increased.

The K/Ca Ratio.—In one of our examinations of this material in its relation to the vascular reaction to epinephrine⁸ it was found that a small group of outstandingly sympathetotonic persons had low K/Ca ratios as compared with the vagotonic ones. We mentioned, however, that many exceptions were observed.

It is apparent that certain disturbances closely associated with a vascular supply are definitely associated with an alteration of the K/Ca ratio. These manifestations take the form of lesions of the skin, lesions of the gastro-intestinal tract, respiratory diseases (hay-fever, asthma, etc.), glaucoma, etc. A change of the K/Ca ratio may influence the permeability of the endothelial cells, which would result in instability and a probable tendency to sudden alterations producing not only edema but other local disturbances of cell function with pruritis, sclerosis, atrophy, etc. Such a change may also involve the contractile mechanism of the vessels including both capillary and arteriole and arterial elements, through the autonomic nervous supply.

It seems probable that the higher centers may play a rôle in this vegetative reorientation. Our results make it evident that the majority of the so-called nervous persons have a low ratio. In this change, the calcium is less involved than the potassium; the calcium may range from high to normal, but the potassium is usually found to be low.

We have the impression that this may result from mental disturbances. It is difficult, however, to determine whether mental disturbances precede the change in the chemical blood picture or follow as a result of it. Tómasson,⁹ in a series of carefully conducted examinations of persons with psychic disturbances, found that the K/Ca ratio showed alterations before the onset of the mental upset. Certainly, a mere examination of the calcium is insufficient to supply us with the necessary information. In view of the close connection between the mental state and the functioning of certain of the endocrine glands, the change in the K/Ca ratio with change in the mental condition should not surprise us.

It seems probable that it is the abnormality of the ratio rather than its change in any one direction that brings about functional vascular disturbances and with this certain manifestations of disease. Thus, one

8. The Relation of the Reaction to Epinephrine to the Potassium/Calcium Ratio and to Other Ratios, Article IV, p. 121.

9. Tómasson, H.: *Blodets Elektrolyter*, etc., Copenhagen, Levin & Mungsgaard, 1927.

may examine the history of two persons who are, respectively, at the bottom and the top of the K/Ca scale.

CASE 132.—A medical student, 26 years of age, alert and intelligent, had a K/Ca ratio of 1.12. He was the son of a physician. When 12 years of age, he had severe attacks of hyperacidity and dizziness with vomiting. These attacks would occur intermittently several times a month and usually lasted a day; they were relieved by food. The attacks became milder until 1918; then they became more severe. He was free from them at the time of examination. In 1919, he had a severe attack of hiccup, which lasted for forty-eight hours. From 1918 to 1921, he was bedridden with tuberculosis of the right lung. During the course of the tuberculosis, he suffered severely from night sweats. He had hay-fever from the time that he was a young boy until 1919, when it disappeared, and at various times in 1918 he suffered from urticaria. In 1920, he had influenza, associated with a mastoiditis. Since 1919, he had had ulcerative colitis with the possibility of a duodenal ulcer. For one week in 1919, he had diabetes insipidus. During the past three years, he had had hypo-acidity. At the time of examination he was apparently well, except for chronic eczema on both hands. Physical examination revealed no marked changes.

The x-ray picture of the chest was practically negative. However, he had an eosinophilia of from 10 per cent to 14 per cent, and stated that he had never been able to alkalinize the urine, despite large doses of bicarbonate.

CASE 93.—An American laborer of Irish extraction, 53 years of age, rather alert, intelligent and somewhat irritable, had a K/Ca ratio of 3.2. He had always done heavy work. He was a periodic drinker until four years before. He had had hay-fever and asthma all of his life. He was attacked by these in the fall, and he stated that he was sensitive to ragweed. For the past fifteen years, he had been sensitive to halibut. X-ray examination revealed evidence of a myocarditis, and he complained of shortness of breath. The family history was apparently negative.

Calcium.—The lowest amount of serum calcium, 7.4 mg. per hundred cubic centimeters, occurs in a patient (no. 104) with roentgenologic evidence of active tuberculosis and a coincident high blood pressure; the largest amount, 14 mg. per hundred cubic centimeters, occurs in a patient with healed parenchymal tuberculosis. The actually normal group have a range of calcium values from 8.2 to 12.7 mg.

In Table 9, some of the observations on the twenty persons having the highest levels of calcium (averaging 12.7 mg. per hundred cubic centimeters) have been tabulated. The corresponding observations on the persons with outstandingly low levels of calcium are tabulated in table 10. In order to facilitate comparison, table 11 brings together the averages for the group with high levels of calcium, the group of 100 "normal" men and the group with low levels of calcium.

In chart 5, the normal ranges of the calcium levels are presented. The persons with healed tuberculosis are more frequently in the normal range or the high range, while those with roentgenologic evidence of active tuberculosis are scattered. There appears to be no correlation of these conditions with the cardiovascular condition.

TABLE 9.—*The Results of Examinations of the Twenty Persons with the Highest Levels of Serum Calcium*

Individual Number	Diagnosis	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Ice Reaction Time, Seconds	Vascular Reaction to Epinephrine	Epinephrine, Wheal (Diameter, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Blood Pres- sure Systolic Diastolic	Pulse Rate	Permeability of Capillaries	
18	Healed tuberculosis	58.4	70.2	2	1	10	Vagotonic	....	....	120	80	88	70
46	Inanition.....	56.2	61	2	1.70	15	Sympatheti- cotic	21.2	12.2	140	82	76	59
132	Eczema.....	40.3	67	...	0.31	10	Vagotonic	18.4	13.6	132	78	56	68
133	Scleroderma.....	50.2	77	...	0.70	30	Sympatheti- cotic	....	....	92	68	96	..
23	Healed tuberculosis	57.4	85	3	0.42	28	Vagotonic	17.2	7.2	105	58	82	67
172	Raynaud's disease..	....	76	...	0.08	45	Sympatheti- cotic	22.4	18	108	78	94	72
2	Epilepsy.....	55.6	74	...	0.10	..	Sympatheti- cotic	....	....	100	68	100	69
173	Worry.....	55.7	80	...	0.09	15	Sympatheti- cotic	21	18	106	68	92	57
17	Normal.....	59.1	61.5	6	0.22	20	Vagotonic	20.8	20.6	130	70	66	66
86	Nervous.....	55	94	1.4	0.36	25	Vagotonic	18.8	15.4	118	60	74	58
171	Urticaria.....	48.7	72	...	0.08	20	Sympatheti- cotic	17.5	18	114	66	96	73
112	Arteriosclerosis....	57	68	2.4	2.70	18	Vagotonic	22.4	9.8	139	80	75	54
169	Buerger's disease...	55.1	67	...	0.23	25	Sympatheti- cotic	20.8	18	118	78	82	62
62	Aortic regurgita- tion	56.8	67	5	0.15	15	Vagotonic	17.2	11.4	140	40	64	52
118	Chronic arthritis; pleurisy	54.2	80	2.8	1.90	12	Vagotonic	16.8	12	120	60	72	87
127	Nephritis.....	59.1	81	3	1.20	16	Sympatheti- cotic	18.4	15.4	106	76	86	50
110	Healed tuberculosis	57.2	61	2	0.60	30	Vagotonic	20.8	12	110	62	84	54
22	Exophthalmic goiter	52	91	3	0.17	5	Sympatheti- cotic	26.4	5	144	74	92	73
15	Healed tuberculosis	57.6	70	6	0.19	38	Sympatheti- cotic	23.2	11.6	128	68	60	68
1	Nervous.....	62.1	113	...	0.11	25	Sympatheti- cotic	20	13.2	132	74	80	68
Averages and totals.....		55.2	75.7	3.2	0.61	21	9 V., 11 S.	20.2	13.6	120	69	80	64

TABLE 10.—*The Results of Examinations of the Twenty Persons with the Lowest Levels of Serum Calcium*

Individual Number	Diagnosis	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Ice Reaction Time, Seconds	Vascular Reaction to Epinephrine	Epinephrine, Wheal (Diameter, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Blood Pres- sure		Pulse Rate	Permeability of Capillaries
104	Tuberculosis; arte- riosclerosis	57.2	55	1.2	0.08	25	Vagotonic	20.8	12	176	100	84	54
93	Myocarditis; hay- fever	57	70	2.4	0.25	12	Vagotonic	20.4	10	113	71	86	50
61	Arteriosclerosis.....	53.1	72	7.4	0.28	7	Vagotonic	19.6	13.4	142	82	64	70
95	Healed tuberculosis	61.6	77	1.6	0.39	10	Sympatheti- cotic	23.6	12	110	66	68	59
115	Arteriosclerosis.....	51.8	60	2	0.28	10	Vagotonic	17.2	14.2	148	84	84	46
55	Nephritis.....	56.6	73	0.6	0.38	20	Vagotonic	17.6	11.2	128	68	84	60
80	Nervous.....	53.2	69	3.8	1.6	30	Vagotonic	14.8	13.4	116	68	64	91
114	Tuberculosis.....	60.6	75	4	0.14	25	Sympatheti- cotic	20.4	12	174	60	48	64
107	Myocarditis; arte- riosclerosis	55.2	60	2.8	0.33	15	Vagotonic	20.8	13.4	134	72	72	58
137	Glaucoma.....	51.9	73	0.8	1.90	30	Vagotonic	15.4	13	119	67	78	61
83	Normal.....	53.1	68	4	0.16	20	Vagotonic	17.2	13.4	114	64	60	51
96	Arteriosclerosis.....	53.4	77	1.6	0.11	40	Vagotonic	18	12.4	140	85	68	57
159	Exophthalmic goiter	54.8	71	...	0.22	7	Sympatheti- cotic	25	12	132	68	76	60
81	Myocarditis; arte- riosclerosis	57	63	2.3	0.10	45	Vagotonic	14	10	144	63	76	59
97	Normal.....	57.2	60	4.5	0.22	20	Sympatheti- cotic	19.2	12	100	62	68	54
92	Nervous.....	56.8	67	2.9	0.57	20	Sympatheti- cotic	20.4	15.2	110	60	72	82
87	Normal.....	55.4	94	3.5	0.42	18	Sympatheti- cotic	16	12	104	62	70	56
78	Normal.....	62.7	67	1	0.62	10	Sympatheti- cotic	19.6	12.4	122	70	74	86
35	Normal.....	57.6	79	1.8	0.38	20	Vagotonic	22.8	9.2	108	78	62	54
164	Syphilis; glaucoma	55.6	65	...	0.23	15	Vagotonic	18	....	110	75	80	71
Averages and totals.....		56.1	69.7	2.6	0.43	19.3	13 V., 7 S.	19	12.3	127	71	82	62.6

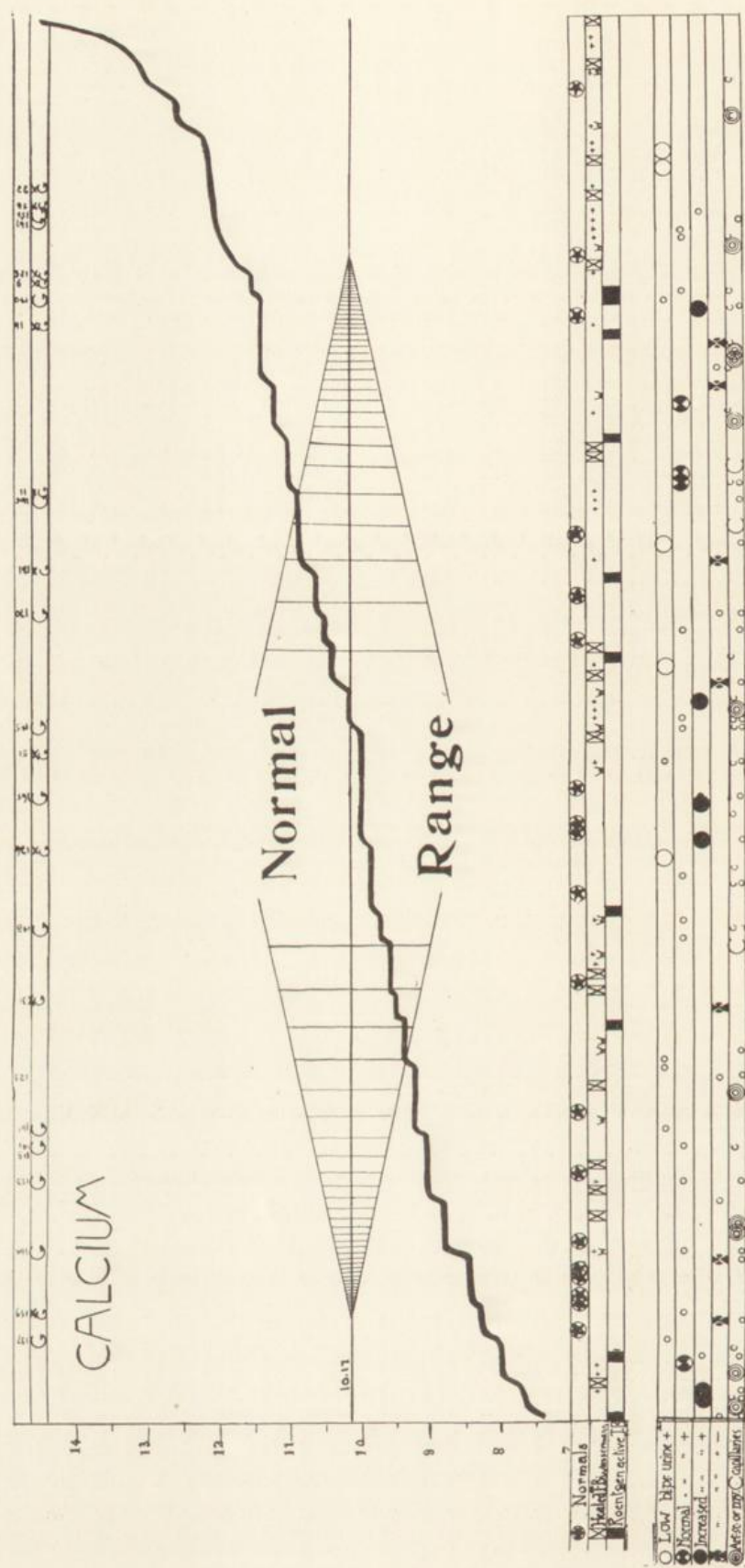


Chart 5.—The calcium level in the serum of normal persons and patients with various clinical conditions.

The groups with high levels of calcium include none of the persons having active tuberculosis, but include a number of persons with skin disorders, as well as those with peripheral vascular changes—scleroderma, Raynaud's disease, Buerger's disease, etc. A number of outstandingly sympatheticotonic persons are included, but vagotonic types also occur.

In general, the carbon dioxide tension is reduced; the sugar, the skin resistance, the pulse rate, the wheals due to epinephrine and thyroxin and the permeability of the capillaries are increased; the ice reaction time is prolonged, and the blood pressure is lower than in the group with low levels of calcium.

The group with low levels of calcium, on the other hand, includes two persons with active tuberculosis, an increased number of arterio-

TABLE 11.—*Comparison of the Averages Obtained for the Groups Showing High Levels and Low Levels of Calcium with the Averages Obtained for the Group of One Hundred Normal Men*

Group	Number in Group	Calcium, Mg.	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Pulse Rate	Ice Reaction Time, Seconds	Intracutaneous Reaction to		Systolic	Diastolic	Permeability of Capillaries
									Epinephrine, Wheal (Diameter, Mm.)	Thyroxin, Wheal (Diameter, Mm.)			
Group with high level of calcium.....	20	12.7	55.2	75.7	3.2	0.61	80	21	20.2	13.6	120	69	64
Group of "normal" men.....	100	10.17	57.7	71	3.2	0.46	72	19	19.2	11.2	124	71	62
Group with low level of calcium.....	20	8.1	56.1	69.7	2.6	0.43	72	19.3	19	12.3	127	71	62.6

sclerotic persons (as proved by roentgen examination), as well as more normal persons. There are, too, apparently more persons of the vagotonic type in this group, thirteen of the twenty giving such a reaction.

Potassium.—The highest potassium value, 29.7 mg. per hundred cubic centimeters, is found in a patient with glaucoma, hay-fever and roentgenologic evidence of active tuberculosis; the lowest 13.1 in a person with roentgenologic evidence of active tuberculosis. The range for the actually normal group is from 16.6 to 27.4.

In tables 12, 13 and 14, some of the observations on the group with high levels of potassium (averaging 26.5) are recorded. In table 13, the corresponding observations on the group with low levels of potassium (averaging 15.1) are recorded. For purposes of comparison, table 14 brings together the averages of the groups with the high levels of potassium, the group of 100 "normal" men and the group with low levels of potassium.

TABLE 12.—Results of Examinations of the Twenty Persons with the Highest Levels of Potassium

Individual Number	Diagnosis	Potassium, Mg.	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Ice Reaction Time, Seconds	Vascular Reaction to Epinephrine	Thyroxin, Wheal (Diameter, Mm.)	Epinephrine, Wheal (Diameter, Mm.)	Blood Pressure Systolic Diastolic		Permeability of Capillaries	Inflammatory Index
140	Glaucoma; tuberculosis; sensitized	29.7	55.6	82	...	0.45	40	Vagotonic	18	27	100	70	68	4
25	Tuberculosis.....	28.8	59.8	67	1.2	0.24	20	Sympathetico- tonic	21.2	9	140	80	57	9.5
23	Healed tuberculosis	28.6	57.4	85	3	0.42	28	Vagotonic	17.2	7.2	102	58	67	11.1
56	Tuberculosis.....	28.6	56.6	65	1	0.32	15	Vagotonic	17.2	13.4	124	88	61	10
141	Glaucoma.....	28.2	64.6	86	...	0.20	15	Vagotonic	17.4	10	118	78	..	....
34	Changes in capillaries	27.7	56.4	78	2.7	0.59	25	Vagotonic	18	7.2	134	78	56	7.7
48	Syphilis.....	27.6	58.3	71	1.6	0.10	35	Sympathetico- tonic	19.2	8	104	72	66	9.7
50	Normal.....	27.4	64.9	..	2.8	0.48	15	Sympathetico- tonic	24.8	10.4	128	70	71	8.8
26	Syphilis.....	26.6	63.4	69	2	0.28	35	Vagotonic	19.6	7.2	92	48	72	11
36	Albuminuria.....	23.3	57.6	90	2.8	0.11	20	Vagotonic	20.8	7.4	104	50	58	7.2
47	Healed tuberculosis	26.2	56.4	72	5	0.13	15	Vagotonic	21.6	9	136	64	62	12.8
32	Arteriosclerosis.....	26.1	54.1	76	7.4	0.18	25	Vagotonic	23.6	9.8	144	86	60	10
33	Epilepsy.....	26.1	54.5	83	2	1.75	12	Sympathetico- tonic	20	5.4	122	66	73	10
2	Epilepsy.....	26.1	55.6	74	...	0.10	..	Sympathetico- tonic	....	....	100	68	69	9.8
58	Exophthalmic goiter	25.9	52.9	120	...	0.10	26	Vagotonic	19.6	11.2	124	60	75	15
81	Arteriosclerosis; myocarditis	25.8	57	63	2.3	0.10	45	Vagotonic	14	10	144	63	59	10
51	Exophthalmic goiter	25.8	55.5	91	5	0.13	..	Sympathetico- tonic	19.2	9.2	124	50	77	14
5	Nervous.....	25.7	63.9	72	3.2	0.21	..	Vagotonic	....	....	132	92	72	13
21	Arteriosclerosis.....	25.6	62.9	72	3.9	0.74	25	Vagotonic	23.2	7.2	140	84	62	9
35	Normal.....	25.2	57.6	79	1.8	0.38	20	Vagotonic	22.8	9.2	108	78	54	6.7
Averages and totals...		26.5	58	75	2.9	0.35	24	14 V., 6 S.	20	9.8	121	70	65	10

TABLE 13.—The Results of Examinations of the Twenty Persons with the Lowest Levels of Potassium

Individual Number	Diagnosis	Potassium, Mg.	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Ice Reaction Time, Seconds	Vascular Reaction to Epinephrine	Epinephrine, Wheal (Diameter, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Blood Pressure Systolic Diastolic		Permeability of Capillaries	Inflammatory Index
88	Tuberculosis.....	13.1	58.1	79	2.5	0.68	15	Vagotonic	18.4	12.4	128	76	58	8.1
80	Nervous.....	13.7	53.2	69	3.8	1.60	30	Vagotonic	14.8	13.4	116	68	91	15.1
146	Myasthenia gravis.	14.4	71.06	77	...	0.55	30	Vagotonic	18	19	120	78	75	5
90	Nervous.....	14.5	57.9	68	...	0.44	10	Sympathetico- tonic	18.4	6.2	122	54	69	7.6
132	Eczema.....	15	40.3	67	...	0.31	10	Vagotonic	18.4	13.4	132	78	68	11.3
62	Aortic regurgitation	15.2	56.8	67	5	0.15	15	Vagotonic	17.2	11.4	140	40	52	8.7
115	Arteriosclerosis.....	15.2	51.8	60	2	0.28	10	Vagotonic	17.2	14.2	148	84	46	5.7
108	Tuberculosis.....	15.3	54.1	63	0.6	0.44	18	Sympathetico- tonic	18	14.8	94	52	63	8
134	Arteriosclerosis.....	15.4	54.8	71	...	0.68	12	Sympathetico- tonic	23.6	19.2	148	86	60	4
130	Nephritis.....	15.5	55.6	86	2	0.35	15	.....	20	11.2	106	..	71	4.7
77	Sensitized.....	15.6	60.6	71	1	1	35	Vagotonic	14	10	126	78	87	10
145	Glaucoma.....	15.7	55.4	70	...	0.35	20	Sympathetico- tonic	18	16	136	80	67	4.4
86	Nervous.....	15.9	55	94	1.4	0.36	25	Vagotonic	18.8	15.4	118	60	58	3.8
69	Nervous.....	16	54.8	70	2	1.90	20	Sympathetico- tonic	21.2	14.4	140	48	51	12.7
109	Nervous.....	16.1	51.4	67	...	0.47	25	Vagotonic	18	12	106	70	72	12
127	Nephritis.....	16.2	59.1	81	3	1.20	16	Sympathetico- tonic	18.4	15.4	106	76	50	3.8
110	Healed tuberculosis	16.3	57.2	61	2	0.60	30	Vagotonic	20.8	12	110	62	54	7.2
65	Nephritis.....	16.4	53.1	65	0.4	0.80	13	Sympathetico- tonic	15.8	9.2	100	70	61	10
64	Normal (nervous) ..	16.6	55	52	5	0.22	7	Sympathetico- tonic	20	6.4	112	60	66	10
45	Arteriosclerosis.....	16.6	54.3	77	7.4	0.28	20	Vagotonic	20.4	16.4	162	114	54	9
Averages and totals...		15.1	55.2	70	2.7	0.63	18.5	11 V., 8 S.	18.4	13.1	123	70	63	8

In the group with the higher levels are three patients with roentgenologic evidence of active tuberculosis, two with syphilis, two with glaucoma and two with epilepsy. The reaction to epinephrine is predominantly vagotonic. The group with the low levels includes the "nervous" persons. In this group eleven react vagotonically.

As compared with the group having low levels of potassium the group having the high levels reveals higher Co_2 combining power, more sugar, larger wheals due to epinephrine, smaller wheals due to thyroxin and a higher inflammatory index. The reaction to ice is delayed.

TABLE 14.—*Comparison of the Averages Found for the Groups with High and Low Levels of Potassium with the Averages Found for the Group of One Hundred "Normal" Men*

	Number in Group	Potassium, Mg.	Carbon Dioxide Combining Power	Sugar, Mg.	Muscle Reaction	Skin Resistance	Ice Reaction Time, Seconds	Vascular Reaction to Epinephrine	Epinephrine, Wheal (Diameter, Mm.)	Thyroxin, Wheal (Diameter, Mm.)	Systolic Blood Pres- sure	Diastolic	Permeability of Capillaries	Inflammatory Index
Group with high level of potassium	20	26.5	58	75	2.9	0.35	24	14.2	20	9.8	121	70	65	10
Group of "nor- mal" men.....	100	20.4	57.7	71	3.2	0.46	19	....	19.2	11.2	124	71	62	8.2
Group with low level of potassium	20	15.1	55.2	70	2.7	0.63	18.5	11.2	18.4	13.1	123	70	63	8

SUMMARY AND CONCLUSIONS

An examination was made of the serum calcium and potassium of 100 so-called normal persons. Of this group, twenty were regarded as actually normal on careful examination.

The K/Ca ratio from 1.7 to 2.4 we regard as normal. Persons with roentgenologic evidence of active tuberculosis are at the extreme ends of the scale. Those with vascular changes in addition to the tuberculosis have the higher ratios. Among abnormal persons, glaucoma and exophthalmic goiter produce no marked deviations from normal. "Nervous" persons have low ratios.

The normal calcium range was found to be from 8.2 to 12.7. In the group with the high range are the persons with diseases of the skin, as well as those with peripheral vascular disturbances, such as scleroderma, Buerger's disease, Raynaud's disease, etc. These persons tend toward the sympatheticotonic type.

The normal potassium range extended from 16.6 to 27.4. The group with low levels of potassium includes the "nervous" persons.

TOTAL PROTEINS

Serum proteins for the normal as well as abnormal groups varied from a low of 6.33 per cent in patient 86 (nervous) to a high reading of 9.87 per cent in a case of so-called Buerger's disease (syphilitic). For the strictly normal group, the range was from 7.5 to 8.5 per cent. Patient 17, classified as normal, but with an abnormal K/Ca ratio, etc.,

TABLE 15.—*The Results of Examinations of the Twenty Persons with the Lowest Concentrations of Protein*

Individual Number	Protein, Mg.	Diagnosis	CO ₂ Combining Power	Weight/Length Ratio	Basal Metabolic Rate
86	6.33	Nervous.....	55	176	6.4
145	6.55	Glaucoma; syphilis.....	55.4	166	19
85	6.65	Fever, unknown origin.....	56.9	187	18.8
140	6.77	Tuberculosis; glaucoma.....	55.6	...	....
60	6.87	Cardiovascular renal condition.....	56.6	229	....
116	7	Urticaria.....	65.1	195	9
67	7	Dwarf.....	56.9	195	32
118	7	Tuberculosis; arthritis.....	54.2	154	-11
77	7	Sensitized.....	60.6	187	7.9
30	7.07	Arteriosclerosis.....	62.5	175	-6
139	7.10	Urticaria.....	50	176	5
123	7.16	Carcinoma of thyroid.....	52.4	263	48
110	7.20	Healed tuberculosis.....	57.2	190	49
11	7.20	Exophthalmic goiter.....	58.1	195	42
24	7.20	Healed tuberculosis.....	53.7	219	1
101	7.20	Eczema.....	57.4	191	31
92	7.20	Nervous.....	56.8	210	-1
96	7.26	Cardiovascular renal condition.....	53.4	243	31
132	7.30	Eczema.....	40.3	234	-1.2
161	7.30	Glaucoma.....	49.4	171	+16

TABLE 16.—*The Results of Examinations of the Twenty Persons with the Highest Concentrations of Protein*

Individual Number	Protein, Mg.	Diagnosis	CO ₂ Combining Power	Weight/Length Ratio	Basal Metabolic Rate
169	9.87	Buerger's disease.....	55.1	...	+7
164	9.56	Glaucoma; syphilis.....	55.6	223	-4.7
136	9.28	Pellagra.....	57.9	180	20
75	9.23	Cardiovascular renal condition.....	61.6	243	+2.5
56	9.14	Tuberculosis.....	56.6	247	-17.9
125	9.13	Exophthalmic goiter.....	55.5	197	59
170	8.92	Glaucoma.....	52.5	170	+33
5	8.92	Neurosis.....	6.39	210	....
32	8.80	Cardiovascular renal condition.....	54.1	190	+22
146	8.80	Myasthenia.....	71.06	192	+ 1.8
79	7.87	Ulcer.....	57	220	-15.2
17	8.72	Normal (?).....	59.1	216	-11
167	8.71	Glaucoma; arteriosclerosis.....	47.9	158	-13
117	8.71	Arthritis; syphilis.....	52.4	195	- 7
40	8.71	Changes in capillaries.....	55.7	201	22
154	8.71	Glaucoma.....	56.6	181	18
10	8.70	Healed tuberculosis.....	59.4	230	-12.4
68	8.66	Healed tuberculosis.....	51.1	217	25.8
121	8.66	Arthritis deformans.....	56.8	294	11
66	8.66	Cardiovascular renal condition.....	53.1	257	1.3

is again unusual in having a somewhat higher protein concentration, 8.75 per cent. We do not regard this as normal. The twenty persons with the lowest concentrations of the entire series are tabulated in table 15 (average, 7 per cent).

The twenty persons with the highest concentrations are presented in table 16 (average 8.9).

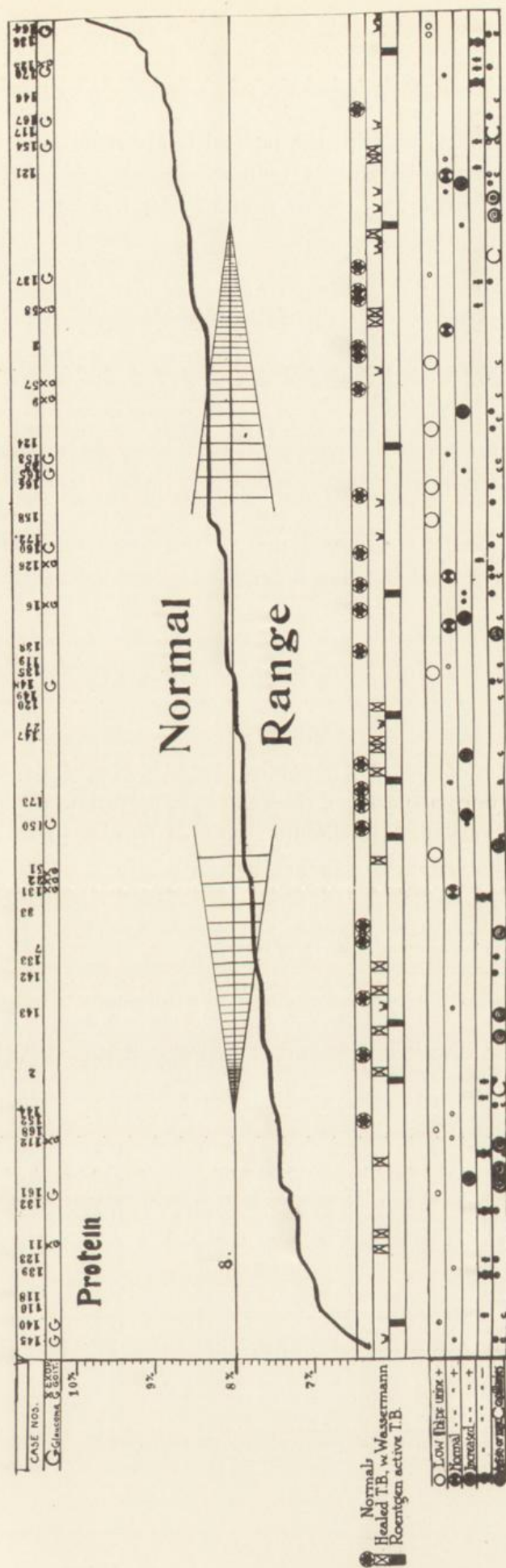


Chart 6.—The amount of protein in the serum of normal persons and patients with various clinical conditions.

A table of comparison with the normal is given in table 17. There are no obvious correlations other than those indicated, and these are by no means striking. A graphic presentation has been prepared in chart 6.

TABLE 17.—*Comparison of the Averages Found for the Groups with High and Low Concentrations of Protein with Those Found for the One Hundred "Normal" Men*

Group	CO ₂ Combining Power	Weight/ Length Ratio	Basal Metabolic Rate
Group with low level of protein.....	54.8	197	+15
Group of 100 "normal" men.....	57.7	217	+ 8
Group with high level of protein.....	57.1	210	+ 6

In general it will be observed that in the group of 100 "normal" persons, both active and inactive tuberculosis revealed by the x-rays is scattered over the entire range. The cases in which there were cardiovascular renal disturbances more frequently showed the higher concentrations. This is true of the cases in which glaucoma is present as well.

GLOBULINS

The range of globulins for the entire series is from 0 to 90 per cent. For the actually normal persons, the range is approximately from 20 to 45 per cent (with an albumin/globulin ratio of from 5 to 1.2). It may be noted from the curve in chart 7 that two normal persons (nos. 17

TABLE 18.—*The Results of Examinations of the Twenty Persons with the Lowest Amounts of Globulin*

Individual Num- ber	Glob- ulin	Diagnosis	Reaction to Epinephrine		Reaction to Thyroxin	
			Wheal, Diameter, Mm.	Flare, Radius, Mm.	Wheal, Diameter, Mm.	Flare, Radius, Mm.
149	0	Nervous.....	20	9.7	19	0
153	0	Edema; glaucoma; nephritis.....	22	6.5	18	0
144	2	Arteriosclerosis; pellagra; changes in capillaries.....	14.4	11.5	15	0
154	3	Arteriosclerosis; glaucoma; changes in capillaries.....	23	10	26	0
173	6	Cord tumor.....	21	12.5	18	0
166	8	Eosinophilia.....	17	11.5	18	0
138	11	Fröhlich's syndrome (?).....	23	9.5	17	6.5
168	13	Orthostatic albuminuria.....	18	16	14	0
150	15	Glaucoma.....	17	14	16	0
165	16	Glaucoma.....	16.8	13	12.5	0
17	17	Normal.....	20.6	10.2	20.6	10.4
49	17	Cardiovascular renal condition.....	12.4	10.2	4.2	1
158	17	Hodgkin's disease.....	19.2	11.3	28	0
59	17	Normal.....	22	7.2	15.6	8
139	18	Urticaria.....	16	11	14	12.5
25	19	Tuberculosis (x-ray evidence).....	21.2	12.2	9	15.2
142	19	Tumor of the brain.....	18.6	8.7	17	0
169	20	Buerger's disease.....	20.8	11	18	0
164	20	Glaucoma.....	18	14.7		
21	20	Cardiovascular renal condition.....	23.2	12.6	7.2	2.6

and 59) are slightly below and three (nos. 41, 29 and 43) are at the upper margin. Of these persons, no. 17 has been noted previously because of his deviations; of the three with high globulin, no. 29 has a trace of bile in the urine and no. 43 a decrease in the number of the capillaries of the skin.

TABLE 19.—*The Results of Examinations of the Twenty Persons with the Highest Amounts of Globulin*

Individual Number	Globulin	Diagnosis	Reaction to Epinephrine		Reaction to Thyroxin: Wheal, Diameter, Mm.
			Wheal, Diameter, Mm.	Flare, Radius, Mm.	
133	90	Scleroderma.....	....	....	....
115	60	Cardiovascular renal condition.....	17.2	6.2	14.2
130	60	Cardiovascular renal condition; arteriosclerosis.....	20	5.4	14.2
24	60	Healed tuberculosis.....	16.8	12.6	6.6
102	55	Tuberculosis.....	23.2	7.4	12.2
128	55	Cardiovascular renal condition; sensitized....	....	....	14.4
145	55	Glaucoma; Wassermann reaction +.....	18	13.6	16
27	52	Lead poisoning; Wassermann reaction +.....	....	....	....
42	50	Cardiovascular renal condition; myocarditis..	19.2	11.8	9.2
43	50	Normal.....	22	7.4	10
108	50	Tuberculosis.....	18	2.4	14.8
84	50	Cardiovascular renal condition.....	16.4	8.4	10.1
120	50	Purpura.....	21.2	7.2	12.1
29	50	Normal.....	22.8	9.8	7.2
41	50	Normal.....	24	13.2	6.2
79	50	Ulcer.....	19.2	9.4	8.2
101	45	Sensitized.....	19.6	7	10
104	45	Tuberculosis.....	20.8	6.2	12
33	45	Epileptic.....	20	12.6	5.4
100	45	Healed tuberculosis.....	18.8	8.6	12

TABLE 20.—*A Comparison of the Averages Obtained for the Groups Showing Low and High Values of Globulin*

Group	Globulin, %	Reaction to Epinephrine		Reaction to Thyroxin: Wheal, Diameter, Mm.
		Wheal, Diameter, Mm.	Flare, Radius, Mm.	
Group with low level of globulin.....	12	19.2	11.3	16
Group with high level of globulin.....	50	18.7	8.3	10.6

In chart 7, it may be observed that the persons with cardiovascular renal lesions tend to accumulate at the high end of the scale of the globulin, as do the patients with active tuberculosis.

In table 18, we have tabulated the results of some examinations of the twenty persons with the lowest values of globulin and in table 19 of those with the highest values. In the latter group, it is of interest to note that the patient with generalized scleroderma had the highest amount.

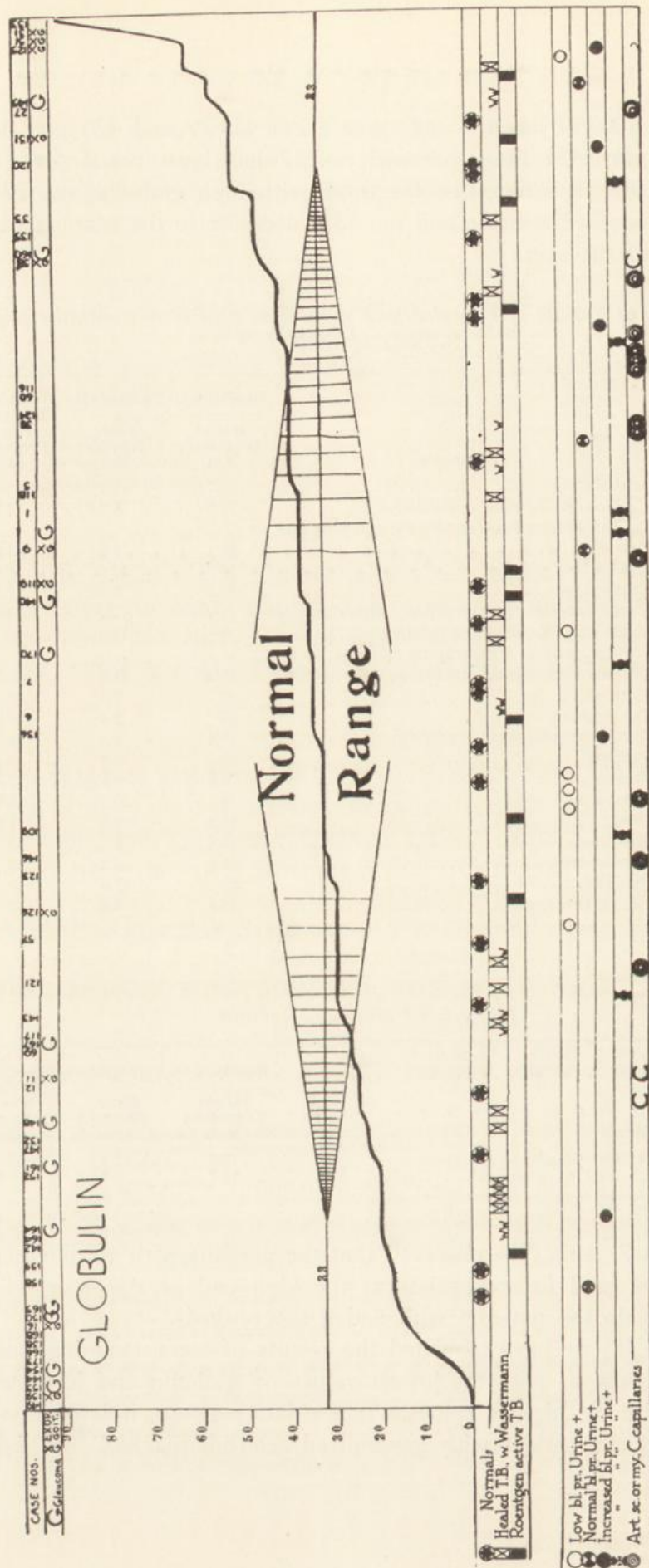


Chart 7.—The amount of globulin in the serum of normal persons and patients with various clinical conditions.

KROMAYER ERYTHEMA TIME

When the skin of the forearm is exposed directly to the light of the Kromayer lamp for thirty seconds, and the time from the beginning of the exposure to the appearance of the erythema determined, a considerable variation in the time, as well as in the intensity of the response, is found.

TABLE 21.—*The Results of Examinations of the Twenty Persons Showing the Most Rapid Reactions to Kromayer Light*

Individual Number	Diagnosis	Blister Time, Hr.	Permeability of Capillaries	Inflammatory Index	Basal Metabolic Rate	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Thyroxin, Wheal, Mm.	Pigmentation of Skin*	Color of Hair	Kromayer Light Erythema Time, Hr.	CO ₂ Combining Power
45	Cardiovascular renal condition	6	54	9	20	Vagotonic	20.4	16.4	5	Dark brown	3/4	54.3
116	Urticaria.....	3.5	60	17	9	Vagotonic	20.4	5	4	Brown	1/2	55.1
66	Cardiovascular renal condition; arteriosclerosis; myocarditis	6	78	13	1.3	Sympatheticotonic	20	10.2	3.5	Light brown	5/6	53.1
33	Epilepsy.....	7.5	73	10	-18	Sympatheticotonic	20	5.4	3	Dark brown	1	54.5
100	Healed tuberculosis..	6	53	9	-1.6	Vagotonic	18.8	12	3	Blond	1	58.3
152	Angioneuritic edema; sensitized	4	73	18	4.8	Vagotonic	26	9	3	Dark brown	1	63.4
158	Hodgkin's disease....	15	61	4	+37	Sympatheticotonic	19.2	28	...	Dark brown	1	57.8
142	Tumor of the brain..	7	54	7.7	+05	Sympatheticotonic	18.6	17	5	Dark brown	1	59
168	Orthostatic albuminuria	6	75	12	-9	Vagotonic	18	14	...	Brown	1	55.6
117	Syphilitic arthritis...	6	61	10	-7	Sympatheticotonic	19.2	20	5	Dark brown	1	52.4
60	Cardiovascular renal condition	8	..	....	0	Sympatheticotonic	19.2	21	4.5	Light brown	1	56.6
149	Nervous.....	10	54	5.4	+5	Vagotonic	20	19	4	Dark brown	1	65.4
7	Cardiovascular renal condition	6	70	11.6	+7	Vagotonic	19.2	15.4	4.5	Light brown	1 11/10	57.9
46	Inanition.....	6	59	10	+13	Sympatheticotonic	21.2	12.2	...	.....	1 1/6	56.2
160	Asthma; glaucoma..	15	66	4.4	+16	Vagotonic	16	20	...	.....	1 1/6	62.7
112	Cardiovascular renal condition	6	54	9	+19.6	Vagotonic	22.4	9.8	4	Dark brown	1 1/6	59
111	Cardiovascular renal condition	6	57	9.5	+31	Sympatheticotonic	22	10.8	5	Dark brown	1 1/6	55.3
120	Purpura.....	6	82	13	-5	Sympatheticotonic	21.2	12.1	...	.....	1 1/5	52.2
48	Syphilis.....	6.75	66	9.7	+8	Sympatheticotonic	19.2	8	...	.....	1 1/4	58.3
32	Cardiovascular renal condition	6	60	10	+22	Vagotonic	23.6	9.8	3.5	Brown	1 1/4	54.1

* Indicated on a scale of 1 to 10, 1 being white and 10 "light negro."

Investigators have previously determined that in the white race, the reaction is influenced by, but does not wholly depend on, the degree of pigmentation of the skin. It is known that constitutional factors play a rôle, and in the most practical field, i. e., the treatment of tuberculosis by light, it is common knowledge that a patient who does not react promptly and with production of pigment usually is not benefited by irradiation.

TABLE 22.—*The Results of Examinations of the Twenty Persons with the Slowest Reactions to Kromayer Light*

Individual Number	Diagnosis	Blister Time, Hr.	Permeability of Capillaries	Inflammatory Index	Basal Metabolic Rate	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Thyroxin, Wheal, Mm.	Pigmentation of Skin	Color of Hair	Kromayer Light Erythema Time, Hr.	CO ₂ Combining Power
133	Scleroderma.....	.....	.....	.....	2	Sympatheticotonic	....	....	5	Black	Did not appear	50.2
34	Changes in capillaries	7.25	56	7.7	13.6	Vagotonic	18	7.2	3.5	Black	8	56.4
49	Cardiovascular renal condition	6	66	11	7.1	Sympatheticotonic	12.4	4.2	3.5	Dark brown	5½	59.1
1	Nervous.....	8	68	8.5	7	Sympatheticotonic	20	13.2	4	Brown	5	62.1
63	Cardiovascular renal condition; arteriosclerosis	7.5	71	9.4	0.65	Vagotonic	20	12.2	4	Dark brown	5	62.4
99	Healed tuberculosis..	9	73	8.1	-3	Vagotonic	20.4	12.2	3.5	Blond	4½	57.4
107	Myocarditis; arteriosclerosis; cardiovascular renal condition	9	58	6.4	-65	Vagotonic	20.8	13.4	4	Light brown	4	55.2
127	Cardiovascular renal condition	13	50	3.8	-35	Sympatheticotonic	18.4	15.4	6	Brown	4	59.1
77	Sensitized.....	9	87	10	+7.9	Vagotonic	14	10	3	Dark brown	4	60.6
79	Ulcer (cardiovascular renal condition)	15	86	5.7	-15.2	Sympatheticotonic	19.2	8.2	2.5	Black	4	57
128	Cardiovascular renal condition; sensitized	15	58	3.8	-18	Sympatheticotonic	....	14.4	6	Dark brown	4	58.1
110	Healed tuberculosis..	7.5	54	7.2	.....	Vagotonic	20.8	12	4	Blond	4	57.2
2	Epilepsy.....	7	69	9.8	-11	Sympatheticotonic	....	....	4	Blond	3½	55.6
78	Normal.....	7	86	12	-0.62	Sympatheticotonic	19.6	12.4	3.5	Light brown	3¼	62.7
18	Healed tuberculosis..	8	70	8.7	+4.2	Vagotonic	....	....	3	Brown	3¼	58.4
29	Normal (bile pigment in urine)	6.5	70	10.7	3.5	Sympatheticotonic	22.8	7.2	4.5	Dark brown	3¼	60.1
50	Normal.....	8	71	8.8	21	Sympatheticotonic	24.8	10.4	4	Light brown	3	64.9
85	Fever, unknown origin	6	56	9.3	+18.8	Vagotonic	17.2	14.2	2	Dark brown	3	56.9
75	Cardiovascular renal condition	9	60	6.6	+2.5	Vagotonic	20.4	10	5.5	Dark brown	3	61.6
65	Cardiovascular renal condition	6	61	10	+29	Sympatheticotonic	15.8	9.2	2.5	Blond	3	53.1

TABLE 23.—*A Comparison of the Averages Obtained for the Groups with Fast and Slow Kromayer Lamp Erythema Times with Those Obtained for the Group of One Hundred "Normal" Men*

Group	Kromayer Light Erythema Time, Hr.	Blister Time, Hr.	Permeability of Capillaries	Inflammatory Index	Basal Metabolic Rate	Epinephrine, Wheal, Mm.	Thyroxin, Wheal, Mm.	Pigmentation of Skin	CO ₂ Combining Power
Group with short erythema time.....	1	7.1	65	10	+7	20	13.8	4	56
Group of 100 "normal" men.....	2	7.5	62	8.2	+8	19.2	11.2	.	57.7
Group with long erythema time.....	3	8.5	66	8.3	+3	19	10.9	4	58.4

In our series of cases, we have roughly estimated the pigment content of the skin in each case by comparing it with a series of filter papers stained with varying dilutions of Bismarck brown. A scale from 1 to 10 was used, 1 being white and 10 approximating the color of the skin of a light negro.

The color of the hair was noted as: blond, black, dark brown, light brown and brown.

During the course of our examination of 100 so-called normal persons, it was shown that the prolongation of the erythema time was associated with a longer blister time, a lowering of the inflammatory index, a low basal metabolic rate, high CO_2 combining power and a lessened wheal due to epinephrine.

When we examine the group of 100 and the clinical material, as well, we find that the shortest time (45 minutes) was noted in patient 45, a man 39 years of age, with a vagotonic reaction to epinephrine and a history of urticaria twenty years previously. His blood pressure is 162 systolic and 114 diastolic (when 4 years of age, he had scarlet fever with involvement of the kidneys). The pigmentation of the skin is 5, and the hair dark brown.

On the other hand, two persons did not react at all. One had scleroderma; the other had an exophthalmic goiter, and had a fairly dark skin (pigment 6) and dark brown hair.

Our truly normal group had a range of erythema time from 75 to 195 minutes.

We have grouped the twenty persons with the shortest erythema times (average 1 hour) in table 21; and we present the twenty with the longest erythema times in table 22. For purposes of comparison, in table 23, we include with the averages for these two groups the averages for the 100 so-called normal men.

It appears that pigmentation, as such, plays comparatively little rôle in the relative rapidity or delay in the appearance of the Kromayer light erythema. Other factors with which the inflammatory index seems associated are probably of more importance. The CO_2 combining power and the endocrine status, particularly a difference in the wheals due to thyroxin are, perhaps, concerned.

Blondness per se is not important. In the group showing delayed reactions, we find four blonds and in the group showing rapidity, none at all.

BASAL METABOLIC RATE

In the introduction, we pointed out that determinations of the basal metabolic rate on a group of nonhospitalized workmen without a possibility of recheck affords a most unsatisfactory examination. We were, however, forced to accept this condition for our group of 100 "normal" men. Our average of $+8$ is evidence of a lack of absolute rest,

TABLE 24.—The Results of Examinations of the Twenty Persons with the Lowest Basal Metabolic Rates

Individual Number	Basal Metabolic Rate	Diagnosis	Blister Time, Hr.	Permeability Ratio	Calcium, Mg.	Potassium, Mg.	K / Ca Ratio	Kromayer Light Erythema Time, Min.	Skin Resistance	Pulse Rate	Epinephrine, Pulse Pressure, % Increase	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.	Weight/Length Ratio
37*	-24.4	Normal.....	9	56	10	22.6	2.26	90	0.34	84	-8	Vagotonic	20.4	21.6	10	0	254
13*	-22	Healed tuberculosis.....	8	64	9.6	23.8	2.48	150	0.89	72	+24	Sympatheticotonic	17.6	6.8	22.6	9.2	223
33	-18	Epilepsy.....	7.5	73	9.5	26.1	2.73	60	1.75	76	+2	Sympatheticotonic	20	12.6	5.4	0	240
128*	-18	Cardiovascular renal condition.....	15	58	10.2	19.7	1.93	240	1	84	+13	Sympatheticotonic	....	....	14.4	0	180
56*	-18	Tuberculosis.....	6	61	9.8	28.6	2.92	135	0.32	80	+14	Vagotonic	17.2	5.8	13	7.1	247
79*	-15.2	Ulcer.....	15	86	11.2	20	1.78	240	0.71	76	+8	Sympatheticotonic	19.2	9.4	8.2	12.2	220
167	-13	Glaucoma.....	15	56	12	22.7	1.9	120	0.85	84	+62	Sympatheticotonic	17	14.2	15	0	158
118	-11	Tuberculosis (?): arthritis.....	10	87	12.2	17.2	1.4	110	1.9	72	-8	Vagotonic	16.8	7.4	12	8.6	154
17*	-11	Normal.....	8	66	12.7	18.2	1.43	90	0.22	66	0	Vagotonic	20.8	10.2	20.6	10.4	216
2	-11	Epilepsy.....	7	69	12.9	26.1	2.02	210	0.1	100	+64	Sympatheticotonic	....	....	....	....	...
168	-9	Orthostatic albuminuria.....	6	75	9.40	17.6	1.88	60	0.16	80	+4	Vagotonic	18	16	14	0	215
96*	-8	Nervous.....	9	69	11.4	14.5	1.34	105	0.44	67	+17	Sympatheticotonic	18.4	11.6	6.2	0	192
8*	-8	Normal.....	10	64	10.5	21	2	120	0.48	60	+90	Sympatheticotonic	20.4	9.8	14	0	197
122*	-7.3	Normal.....	4	68	10.6	19.2	1.81	...	0.37	68	-3	Vagotonic	20	7.8	12	9	189
166	-7	Eosinophilia.....	7	57	9.1	20.66	2.27	75	0.08	96	-0	Vagotonic	17	11.5	18	0	200
117	-7	Syphilitic arthritis.....	6	61	9.2	17.5	1.8	60	0.25	78	6	Sympatheticotonic	19.2	6.2	20	0	195
83*	-7	Normal.....	9	51	8.2	19	2.31	90	0.16	90	+10	Vagotonic	17.2	9.2	13.4	11	258
106*	-6.6	Cardiovascular renal condition.....	6	71	11.2	19	1.69	90	0.63	84	-2	Vagotonic	19.6	7	11.2	0	243
3*	-6.5	Healed tuberculosis.....	6.5	67	11.1	16.7	1.47	90	0.33	65	+8	Vagotonic	19.6	12.2	6.4	0	224
107*	-6.5	Cardiovascular renal condition.....	9	58	8.1	18.4	2.3	255	0.33	72	-1	Vagotonic	20.8	5.8	13.4	6.2	265
	11.72	Averages and totals.....	8.65	65.8	10.44	20.4	1.98	125	0.565	76.2	+15	11 V., 9 S.	18.8	10.2	12.6	3.8	214

* One of group of 100 "normal" men.

TABLE 25.—The Results of Examinations of the Twenty Persons with the Highest Basal Metabolic Rates

Individual Number	Basal Metabolic Rate	Diagnosis	Blister Time, Hr.	Permeability Ratio	Calcium, Mg.	Potassium, Mg.	K / Ca Ratio	Skin Resistance	Pulse Rate	Epinephrine, Pulse Pressure, % Increase	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.	Weight/Length Ratio	Kromayer Light Erythema Time, Min.
126	+105	Exophthalmic goiter.....	6	..	9.8	18	1.83	0.20	90	+20	Sympatheticotonic	19.6	7	12	0	174	...
131	+88	Exophthalmic goiter.....	5	77	10.6	18	1.7	0.21	...	...	...	16.8	6.2	10.4	6.2	177	135
31	+73	Exophthalmic goiter.....	5.5	70	9.5	...	...	...	114	...	...	21.6	7	7.2	0	200	...
51	+67	Exophthalmic goiter.....	5.5	77	10	25.8	2.58	0.13	104	+25	Sympatheticotonic	19.2	6.2	9.2	4.8	195	...
125	+59	Exophthalmic goiter.....	6	74	11.51	...	...	0.48	140	...	...	20.4	7	15.2	16.4	197	90
88*	+54.6	Tuberculosis.....	7.25	58	9.4	13.1	1.4	0.68	76	-10	Vagotonic	18.4	11	12.4	12	203	120
9	+49	Exophthalmic goiter.....	5.5	71	11.5	23.5	2.04	0.75	96	+28	Sympatheticotonic	...	...	...	...	200	120
110*	+48.8	Healed tuberculosis.....	7.5	54	12.1	16.3	1.34	0.60	84	-4	Vagotonic	20.8	4.2	12	9.4	190	240
123	+48	Carcinoma of thyroid.....	9.25	74	9.2	20	2.7	...	80	-3	Sympatheticotonic	25	9	12	0	181	70
159	+46	Exophthalmic goiter.....	5	69	8.23	17.9	2.17	0.22	76	+17	...	26.4	10	5	1	233	75
22	+44	Exophthalmic goiter.....	6	73	12.1	18.2	1.5	0.17	92	+31	Sympatheticotonic	19.6	10.4	11.2	6.8	188	66
58	+43.1	Exophthalmic goiter.....	5	75	12	25.9	2.15	0.10	127	+2	Sympatheticotonic	...	...	...	...	195	180
11	+42	Exophthalmic goiter.....	5	70	10.9	24.1	2.21	0.14	108	+06	Sympatheticotonic	17	14	16	0	238	95
150	+39	Glaucoma.....	15	58	12	21.3	1.78	0.22	84	+6	Sympatheticotonic	19.2	11.3	28	0	173	60
158	+37	Hodgkin's disease.....	15	61	9.33	18.53	2	0.29	96	+10	Sympatheticotonic	14	6.2	10	0	209	90
81*	+34.8	Cardiovascular renal condition.....	6	59	8.4	25.8	3.07	0.10	76	+4	Vagotonic	21.6	5.2	9	0	260	90
47*	+34	Healed tuberculosis.....	5	62	10.4	26.2	2.51	0.13	70	-5	Vagotonic	24	5	12	7	206	75
119	+34	Adenoma of thyroid.....	6.45	58	9	18.7	2.1	0.08	96	+13	Sympatheticotonic	...	...	...	...	170	...
170	+33	Glaucoma.....	15	72	10.58	23.71	2.2	0.07	104	...	...	17.2	9	13.6	0	195	80
67*	+32	Dwarf.....	6	71	8.8	17.6	2	0.19	75	+8	Vagotonic	...	...	...	...	...	...
	50.5	Averages and totals.....	7.3	67.5	9.81	20.7	2.07	0.26	94.1	+8	10 S., 5 V.	20	7.9	12	4.9	205	105.7

* One of group of 100 "normal" men.

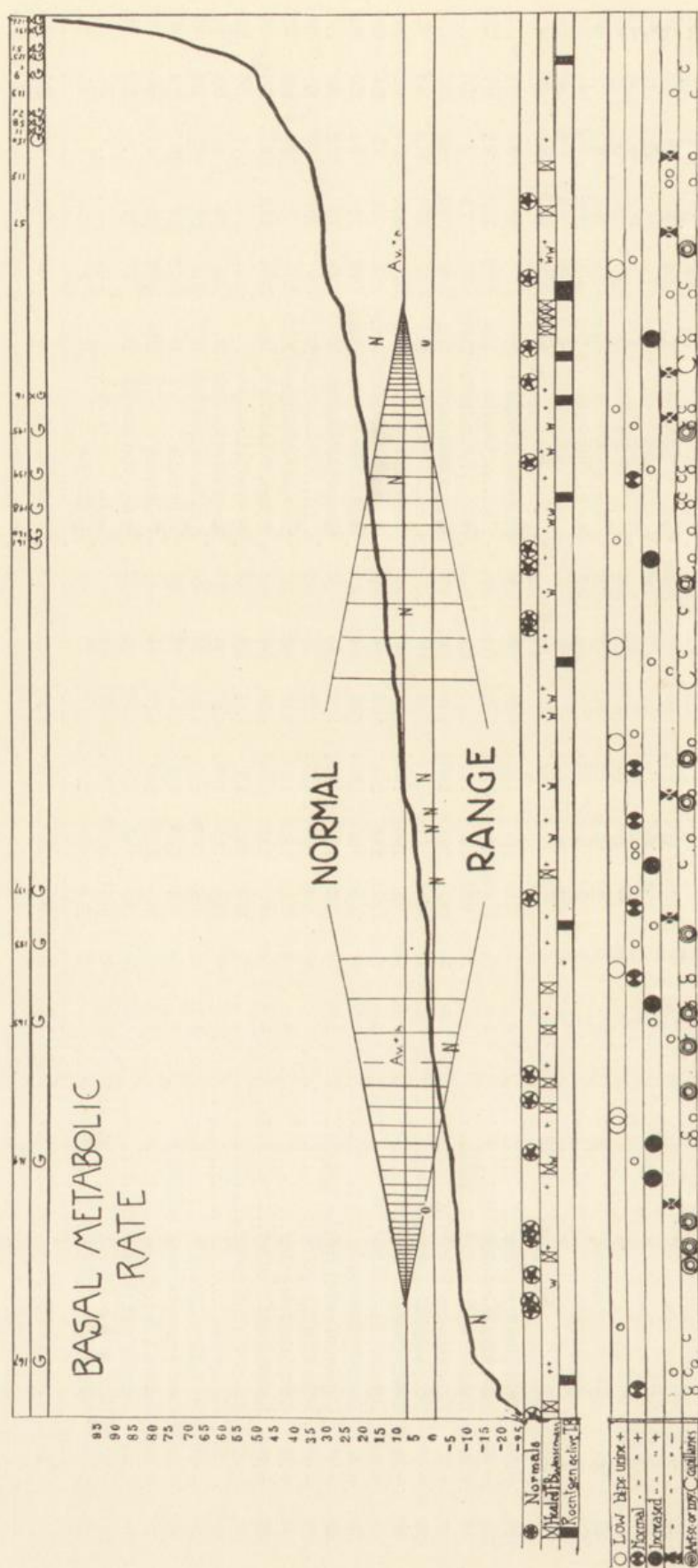


Chart 8.—The basal metabolic rate of normal persons and patients with various clinical conditions.

and the probability exists that, in some cases, food or stimulants had been taken in the morning before the examination.

We have prepared two tables, one including those persons with low basal rates (table 24) and a second including those with extremely high rates (table 25). In this latter table, we have retained the results of the examinations of persons with exophthalmic goiter, contrary to the practice followed in the other tables of results. It will be noted that those with low rates have longer blister times, higher levels of calcium and lower K/Ca ratios, longer Kromayer reaction times and greater skin resistance. They have slower pulse rates and are slightly heavier. The subcutaneous injection of epinephrine hydrochloride shows that, as far as the effect on pulse pressure is concerned, the group with the low ratios has an increase of +15 per cent as compared with +8 per cent of the group with the high ratios, but that there are more sympathicotonic types in the latter group. The intracutaneous injections indicate that the group with the high ratios has smaller flares due to epinephrine and larger flares due to thyroxin.

Examination of chart 8 indicates that the group with roentgenologic evidence of active tuberculosis has higher rates. There is no apparent connection with the cardiovascular renal condition.

RESISTANCE OF THE SKIN TO ELECTRIC CURRENT

The resistance of the skin to electric current varies from a "low" of 0.07 megohms to a "high" of 6.1. The average for the entire group of 100 "normal" men is 0.46.

For the actually normal persons, the range is approximately from 0.15 to 0.45 (average 0.33). Two of our normal group fall outside these limits, patients 29 and 78. These persons have repeatedly been found at the extremes or beyond the normal range, patient 29 being the one in whom a trace of bile was found in the urine.

In table 26, the results of examinations of the ten persons with the lowest skin resistance are tabulated, and in table 27, those of the ten persons with the highest resistance.

Chart 9 shows the curve of the skin resistance. It will be noted that the majority of the persons with roentgenologic evidence of active tuberculosis are on the side of low resistance. There appears to be nothing characteristic about the persons with cardiovascular renal conditions; the persons with glaucoma are scattered over the entire range. On the other hand, the persons with exophthalmic goiter appear to be on the side of low resistance.

TABLE 26.—*The Results of Examinations of the Ten Persons with the Lowest Resistance of the Skin to Electric Current*

Individual Number	Skin Resistance	Diagnosis	Permeability of Capillaries	Basal Metabolic Rate	Weight/Length Ratio	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
138	0.07	Fröhlich's syndrome.....	73	+ 8	270	Vagotonic	23	9.5	17	6.5
170	0.07	Glaucoma.....	72	+33	170	.....	....	....	....	...
172	0.08	Syphilis; Raynaud's disease...	72	+18	166	Sympatheticotonic	22.4	16	18	16
166	0.08	Eosinophilia.....	57	— 7	200	Vagotonic	17	11.5	18	0
28	0.08	Healed tuberculosis.....	64	+24.5	200	Sympatheticotonic	20	12.2	7.4	0
104	0.08	Tuberculosis.....	54	+27.5	235	Vagotonic	20.8	6.2	12	0
154	0.09	Glaucoma; arteriosclerosis....	60	+18	181	.....	23	10	26	0
173	0.09	Tumor of the cord.....	57	+12	177	Sympatheticotonic	21	12.5	18	0
105	0.09	Healed tuberculosis.....	62	+31.6	194	Vagotonic	19.6	5.6	12	10.4
135	0.09	Nervous.....	84	+17	183	Vagotonic	12.4	3.2	20	0
—	0.07	Averages.....	65.5	18.26	197		20	9.5	16.5	

TABLE 27.—*The Results of Examinations of the Ten Persons with the Highest Resistance of the Skin to Electric Current*

Individual Number	Skin Resistance	Diagnosis	Permeability of Capillaries	Basal Metabolic Rate	Weight/Length Ratio	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
27	6.1	Lead poisoning; syphilis.....	82	+17	217	.....	....	....	....	....
112	2.7	Arteriosclerosis; cardiovascular renal condition	54	+19.6	218	Vagotonic	22.4	7.2	9.8	0
73	2.0	Syphilis.....	69	+16.3	191	Vagotonic	17.6	8.2	15.6	0
118	1.9	Tuberculosis; arthritis.....	87	—11	154	Vagotonic	16.8	7.4	12	8.6
137	1.9	Glaucoma.....	61	+ 3.6	16.6	Vagotonic	15.4	10.5	13	0
69	1.9	Nervous; ulcer.....	51	+ 4	160	Sympatheticotonic	21	10	14.4	10.2
33	1.8	Epilepsy.....	73	—18	240	Sympatheticotonic	20	12.6	5.4	0
46	1.7	Inanition.....	59	+13	168	Sympatheticotonic	21.2	13.2	12.2	11.2
80	1.6	Nervous.....	91	+13	212	Vagotonic	14.8	12.4	13.4	9.2
161	1.4	Nervous; glaucoma.....	72	—16	171	Sympatheticotonic	14	13	13	0
—	2.3	Averages.....	69.9	7.4	189.7		18	10.5	12	

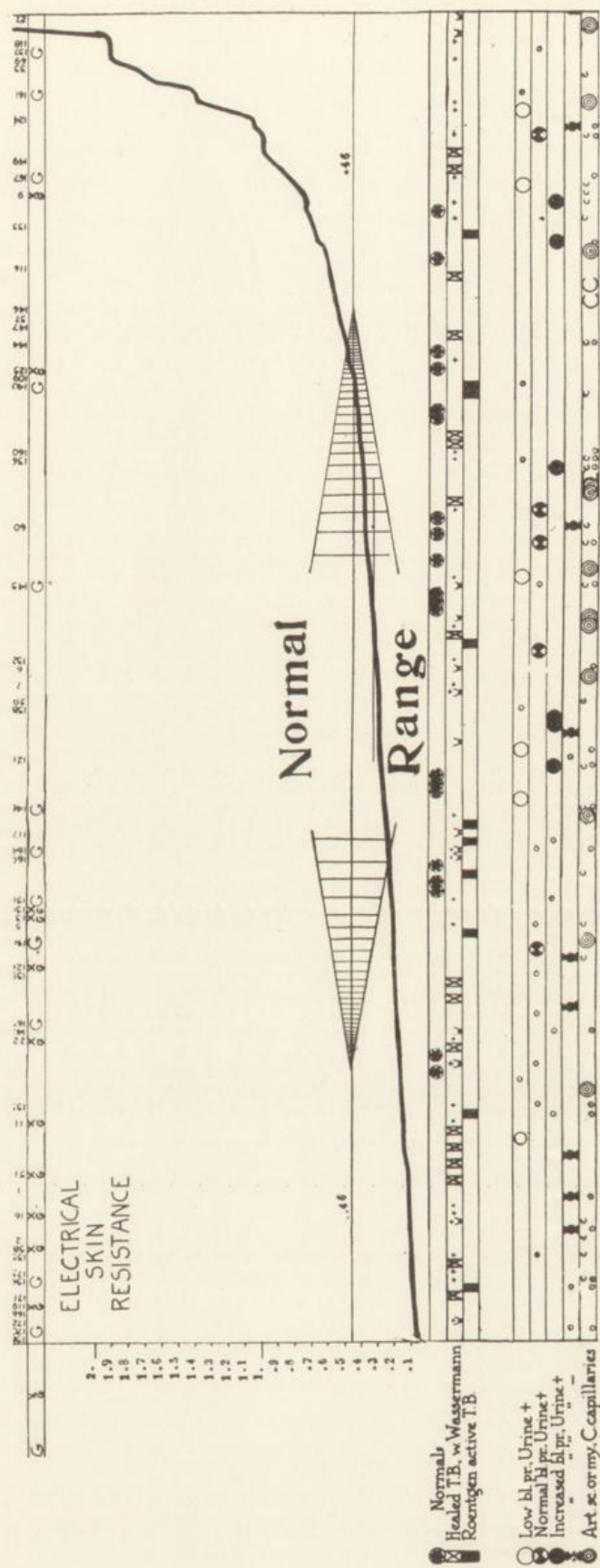


Chart 9.—The resistance of the skin to electric current of normal persons and patients with various clinical conditions.

MUSCLE REACTIVITY

Hopman¹⁰ has sought to establish the fact that the muscle irritability may be used as a criterion of the autonomic status of a person at the time of examination. In general, it has been assumed that the vagotonic person inclines toward alkalosis and, therefore, shows a greater irrita-

TABLE 28.—*The Results of Examinations of the Twenty Persons with the Highest Reactivity of the Muscles*

Individual Number	Muscle Reaction	Diagnosis	CO ₂ Combining Power	Potassium, Mg.	K / Ca Ratio	Skin Resistance to Electric Current	Weight/Length Ratio	Pulse Rate	Vascular Reaction to Epinephrine	Systolic Blood Pressure
140	0.2	Glaucoma; tuberculosis; sensitized	55.6	29.7	2.61	0.45	...	70	Vagotonic	100
132	0.3	Sensitized; healed tuberculosis; eczema	40.3	15	1.12	0.31	234	56	Vagotonic	132
65*	0.4	Cardiovascular renal condition	53.1	16.4	1.67	0.80	221	63	Sympatheticotonic	100
141	0.4	Glaucoma.....	64.6	28.2	....	0.20	...	84	Vagotonic	118
108*	0.6	Tuberculosis.....	54.1	15.3	1.47	0.44	196	71	Sympatheticotonic	94
55*	0.6	Cardiovascular renal condition	56.6	24.9	3.10	0.38	170	84	Vagotonic	128
128*	0.6	Sensitized; cardiovascular renal condition	58.1	19.7	1.93	1	180	84	Sympatheticotonic	122
139	0.8	Urticaria.....	50	18.4	1.90	0.20	176	104	Vagotonic	113
137	0.8	Glaucoma.....	51.9	18.2	2.24	1.90	166	78	Vagotonic	119
52*	1	Healed tuberculosis.....	52.9	20.9	2	0.13	213	75	Vagotonic	110
78*	1	Normal.....	62.7	18.8	2.23	0.62	203	74	Sympatheticotonic	122
135	1	Nervous.....	54.5	19.6	1.65	0.09	183	88	Vagotonic	120
77*	1	Sensitized.....	60.6	15.6	1.44	1	187	82	Vagotonic	126
56*	1	Tuberculosis.....	56.6	28.6	2.52	0.32	247	80	Vagotonic	124
117	1	Syphilitic arthritis.....	52.4	17.5	1.80	0.25	195	78	Sympatheticotonic	130
29*	1	Normal (bile in urine).....	60.1	23.9	2.39	0.74	214	76	Sympatheticotonic	134
7	1.2	.....	55	....	....	0.30	202	68	.....	118
25*	1.2	Tuberculosis.....	59.8	28.8	2.60	0.24	183	86	Sympatheticotonic	140
14*	1.2	Syphilis; cardiovascular renal condition	55.3	18.3	1.55	0.33	200	92	Sympatheticotonic	122
104*	1.2	Tuberculosis.....	57.2	22.9	3.09	0.08	235	84	Vagotonic	176
	0.82	Averages and totals.....	55.5	21	2.07	4.89	200	78.8	11 V., 8 S.	122

* One of group of 100 "normal" men.

bility. We have not been able to find any such correlation. Goebel and Hillenberg¹¹ were unable to confirm Hopman's conclusions. In the acidosis of pregnancy, Adersberg and Klafter¹² found a distinct increase in irritability.

10. Hopman, R.: *Klin. Wchnschr.* **5**:1553, 1926.

11. Goebel, F., and Hillenberg, S.: *Arch. f. Kinderh.* **78**:1, 1926.

12. Adersberg, D., and Klafter, E.: *Klin. Wchnschr.* **6**:2091, 1927.

When the tables of the results of the examinations of our extreme cases are examined, we find a distinct difference in the types of cases comprising them, as well as marked differences in the blood chemistry. Thus, it will be found that in the group with the greatest irritability are included a number of persons with roentgenologic evidence of active

TABLE 29.—*The Results of Examinations of the Twenty Persons with the Lowest Reactivity of the Muscles*

Individual Number	Muscle Reaction	Diagnosis	CO ₂ Combining Power	Potassium, Mg.	K / Ca Ratio	Skin Resistance to Electric Current	Weight/Length Ratio	Pulse Rate	Vascular Reaction to Epinephrine	Systolic Blood Pressure
94*	10	Normal.....	55.1	17.5	2.08	0.45	236	53	Vagotonic	134
76*	9.6	Cardiovascular renal condition	57.9	20.2	1.87	0.28	230	64	Sympathetico-tonic	108
71*	9	Cardiovascular renal condition	57.9	17.5	2	0.36	195	88	Vagotonic	114
39*	8.5	Syphilis.....	55.7	18	1.91	0.29	254	82	Vagotonic	138
79*	7.7	Ulcer; cardiovascular renal condition	57	20	1.78	0.71	220	76	Sympathetico-tonic	140
61*	7.4	Cardiovascular renal condition	53.1	17.9	2.35	0.28	208	64	Vagotonic	142
45*	7.4	Cardiovascular renal condition	54.3	16.6	1.48	0.28	317	84	Vagotonic	162
32*	7.4	Cardiovascular renal condition	54.1	26.1	2.73	0.18	190	74	Vagotonic	144
53*	6.7	Normal.....	53.9	22.8	....	0.35	231	80	Vagotonic	125
15*	6	Healed tuberculosis.....	57.6	18.8	1.55	0.19	210	60	Sympathetico-tonic	128
17*	6	Normal.....	59.1	18.2	1.43	0.22	216	66	Vagotonic	130
82*	5.7	Cardiovascular renal condition	58.8	17.2	1.50	0.20	208	62	Sympathetico-tonic	170
98*	5.5	Cardiovascular renal condition	62.7	17	1.93	0.20	212	64	Vagotonic	136
75*	5.4	Cardiovascular renal condition	61.6	19.2	1.78	0.13	243	77	Vagotonic	146
47*	5	Healed tuberculosis.....	56.4	26.2	2.51	0.13	260	70	Vagotonic	136
20*	5	Tuberculosis.....	62.7	17.4	1.53	0.25	226	80	Vagotonic	130
62*	5	Cardiovascular renal condition	56.8	15.2	1.30	0.15	221	64	Vagotonic	140
64*	5	Normal; nervous.....	55	16.6	1.84	0.22	208	64	Vagotonic	112
68*	4.4	Healed tuberculosis.....	51.1	17.1	1.94	0.53	217	89	Sympathetico-tonic	131
63*	5	Cardiovascular renal condition	62.4	20.9	1.83	0.65	190	60	Vagotonic	116
6.58 Averages and totals.....			57.1	19.1	1.85	0.30	224	71	15 V., 5 S.	134

* One of group of 100 "normal" men.

tuberculosis, as well as sensitized persons. In the group with the lower irritability are many persons with cardiovascular renal lesions and increased blood pressure (tables 28 and 29).

The persons with the greatest irritability have more serum potassium, higher K/Ca ratios, greater skin resistance and higher pulse rates and are somewhat lighter in weight.

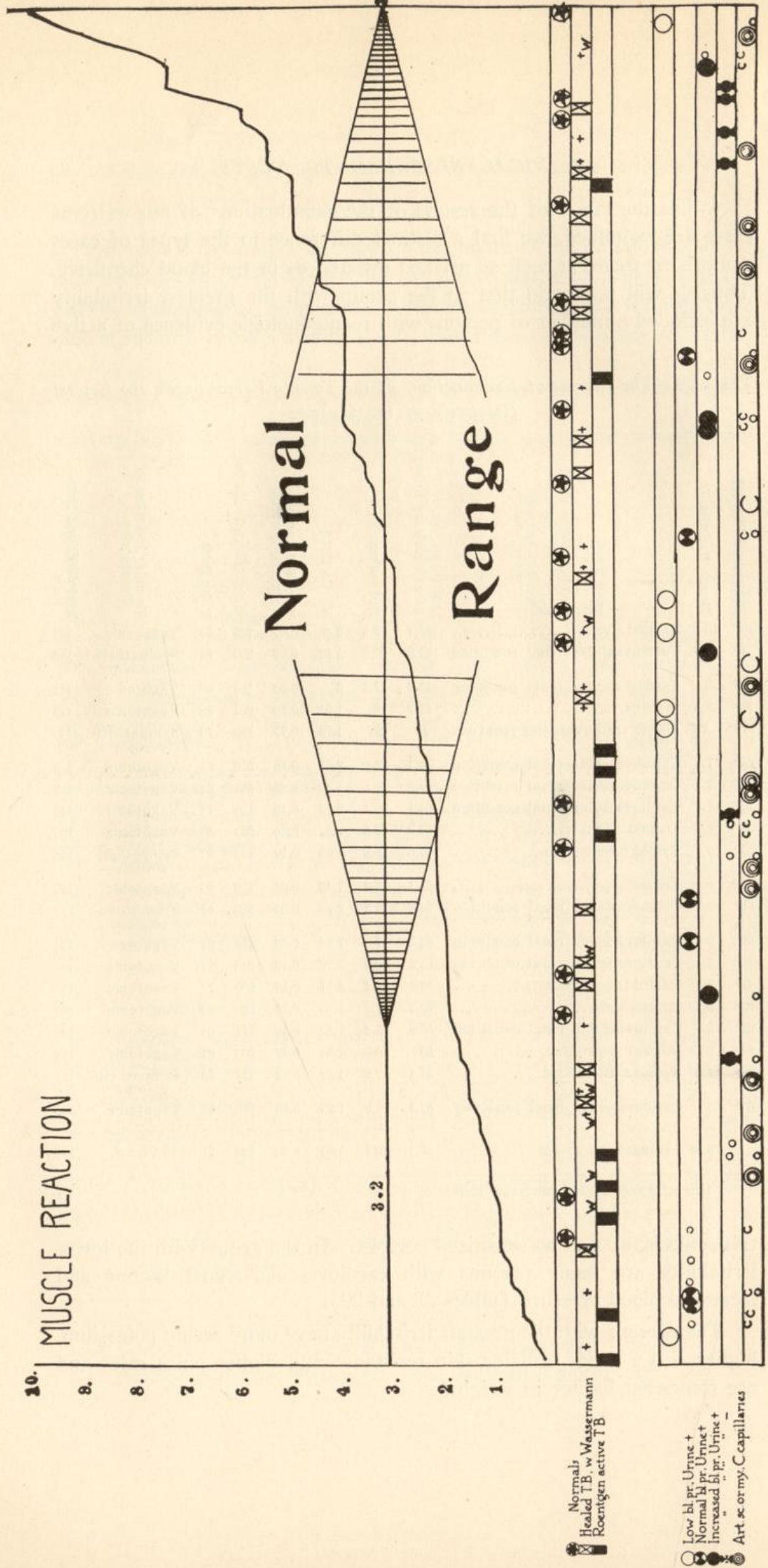


Chart 10.—The muscle reactivity of normal persons and patients with various clinical conditions.

REACTION OF PULSE PRESSURE TO EPINEPHRINE

On page 121, we report an analysis of the present material when the results of the reaction to epinephrine (subcutaneous injection of 0.5 cc. of epinephrine hydrochloride, 1 to 1,000) are estimated wholly on the increase or decrease in the systolic blood pressure. There, we point out that when we select a group of ten of the most markedly sympatheticotonic persons and compare them with the ten most markedly vagotonic persons, the sympatheticotonic ones have higher calcium levels, but lower K/Ca ratios, shorter Kromayer lamp erythema times, lower blood pressures and CO_2 combining powers, lower weight/length ratios and somewhat greater wheals due to thyroxin, and greater flares due to epinephrine and thyroxin.

When we examine tables 30 and 31 containing the results of the examinations of the twenty persons showing the greatest and the least reactivity to epinephrine based on the percentage of increase or decrease in pulse pressure for one hour following the injection, we, of course, deal with a somewhat different group of persons. In both instances, we deal with persons who give either a primary sympatheticotonic or a vagotonic systolic reaction, but inclusion in this group will depend rather on the sustained character of these reactions.

The blister times for the sympatheticotonic group so constituted are longer, the levels of calcium are somewhat higher, the blood pressures are lower, the levels of the blood sugar are higher and the persons are not so heavy. The flares due to epinephrine and the wheals due to thyroxin are larger.

In our former study of this material, we found that the low K/Ca ratio which Kylin assumed for the sympatheticotonic group was apparent only for a relatively small, selected group, while many of the persons with a distinctly sympatheticotonic type of reaction had high ratios. It should be noted that with the present classification, the difference in the ratio which Kylin postulates does not appear. In general, however, the sympatheticotonic group has a higher level of calcium.

Chart 11 reveals the wide range of our normal persons, as well as of the persons with cardiovascular renal conditions. In the latter group, however, certain differences do appear. Those with low blood pressures and positive evidence of changes in the urine appear at the vagotonic end. Patients with exophthalmic goiter, as might be anticipated, are found toward the sympatheticotonic end.

TABLE 30.—The Results of Examinations of the Twenty Persons with the Greatest Increases of Pulse Pressure Following the Subcutaneous Injection of Epinephrine Hydrochloride

Individual Number	Reaction to Epinephrine: Pulse Pressure Increase, %	Diagnosis	Blister Time, Hr.	Permeability of Capillaries	Inflammatory Index	Calcium, Mg.	Potassium, Mg.	K / Ca Ratio	Globulin, Mg.	Blood Pressure, Systolic	Blood Pressure, Diastolic	Sugar, Mg.	Weight/Length Ratio	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
8*	90	Normal.....	10	64	6.4	10.5	21	2	45	120	86	73	197	Sympatheticotonic +	20.4	9.8	14.2	0
54*	66	Cirrhosis; cardiovascular renal condition.....	6	60	10	....	22	....	33	108	68	80	256	Sympatheticotonic -	21.2	13.4	12	0
2*	64	Epilepsy.....	7	69	9.8	12.9	26.1	2	..	100	68	74	...	Sympatheticotonic +	....	....	....	....
167	62	Glaucoma.....	15	56	3.7	12	22.7	1.9	27	137	92	81	153	Sympatheticotonic +	17	14.2	15	0
127*	60	Cardiovascular renal condition.....	13	50	3.8	12.2	16.2	1.33	33	106	76	81	180	Sympatheticotonic +	18.4	9.7	15.4	12
172	57	Raynaud's disease.....	12	72	6	13	21.3	1.64	..	108	78	76	166	Sympatheticotonic +	22.4	16	18	16
24*	50	Healed tuberculosis.....	6	70	11.6	11.7	24.8	2.12	60	116	58	81	219	Sympatheticotonic +	16.8	12.6	6.6	0
144	50	Cardiovascular renal condition; pellagra.....	15	35	2.2	9.8	17.9	1.79	2	100	80	90	174	Sympatheticotonic +	14.4	11.5	15	0
92*	46	Nervous.....	9	82	9	8.4	19.5	2.32	26	110	60	67	210	Sympatheticotonic +	20.4	10.2	15.2	7.6
145	43	Glaucoma.....	15	67	4.4	10.1	15.7	1.55	55	136	80	70	166	Sympatheticotonic -	18	13.6	16	0
87*	40	Normal.....	6	56	9.3	8.4	19.5	2.32	30	104	62	94	200	Sympatheticotonic +	16	8.8	12	5.4
66*	37	Cardiovascular renal condition.....	6	78	13	11	20	1.8	..	128	66	67	237	Sympatheticotonic +	20	9.2	10.2	0
133	36	Scleroderma.....	..	..	....	13.2	17.5	1.32	90	92	68	77	...	Sympatheticotonic +	....	....	....	....
1	35	Neurosis.....	8	68	8.5	12.1	24.9	2	38	132	74	113	262	Sympatheticotonic +	20	8	13.2	9.6
25*	35	Tuberculosis.....	6	57	9.5	11.1	23.8	2.6	19	140	80	67	183	Sympatheticotonic	21.2	12.2	9	15.2
142	33	Tumor of the brain.....	7	54	7.7	9.4	18.3	1.95	19	108	78	97	200	Sympatheticotonic	18.6	8.7	17	0
35*	33	Normal.....	8	54	6.7	8.7	25.2	2.9	33	108	78	79	203	Sympatheticotonic -	22.8	11	9.2	0
53*	32	Normal.....	8	62	7.7	....	22.8	....	25	125	73	77	231	Sympatheticotonic -	17.2	11.8	12.2	11.2
68*	31	Healed tuberculosis.....	7	78	11	8.8	17.1	1.94	30	131	76	68	217	Sympatheticotonic	19.2	9.6	12	7
82*	31	Cardiovascular renal condition.....	6	58	9.6	11.4	17.2	1.5	33	170	98	58	208	Sympatheticotonic +	21.2	7	11	0
20	41	Averages.....	8.9	62	7.8	10.8	20.9	1.93	35	113	73	78	195		20	10.8	13	4.6

* One of group of 100 "normal" men.

TABLE 31.—The Results of Examinations of the Twenty Persons with the Lowest Increases of Pulse Pressure Following the Subcutaneous Injection of Epinephrine Hydrochloride

Individual Number	Reaction to Epinephrine: Pulse Pressure Increase, %	Diagnosis	Blister Time, Hr.	Permeability of Capillaries	Inflammatory Index	Calcium, Mg.	Potassium, Mg.	K / Ca Ratio	Globulin, Mg.	Blood Pressure, Systolic	Blood Pressure, Diastolic	Sugar, Mg.	Weight/Length Ratio	Vascular Reaction to Epinephrine	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
116	—17	Urticaria.....	3.5	60	17	10	19.4	1.94	40	128	50	78	195	Vagotonic	20.4	7.4	5	0
121	—13	Arthritis deformans.....	6	69	11.5	8.9	20.2	2.27	30	148	80	74	294	Vagotonic	26	5.6	8	0
86*	—12	Nervous.....	15	58	3.8	12.6	15.9	1.26	40	118	60	94	176	Vagotonic	18.8	14	15.4	12.4
129*	—10	Tuberculosis.....	15	52	3.5	11.5	19	1.65	42	116	65	83	219	Vagotonic	18.4	7	12.2	0
88*	—10	Tuberculosis.....	7.25	58	8.1	9.4	13.1	1.4	33	128	76	79	233	Vagotonic	18.4	11	12.4	12
135	—10	Nervous.....	6	84	14	11.9	19.6	1.65	45	120	60	75	183	Vagotonic	12.4	3.2	20	0
75*	—9	Cardiovascular renal condition.....	9	60	6.6	10.8	19.2	1.78	38	146	80	75	243	Vagotonic	20.4	10.8	10	0
118	—8	Arthritis.....	10	87	8.7	12.2	17.2	1.4	38	120	60	80	151	Vagotonic	16.8	7.4	12	8.6
67*	—8	Dwarf.....	6	71	11.8	8.8	17.6	2	33	128	80	56	195	Vagotonic	17.2	9	13.6	0
37*	—8	Normal.....	9	56	6.2	10	22.6	2.26	42	116	70	75	254	Vagotonic	20.4	21.6	10	0
70*	—8	Arthritis.....	10.5	74	7	11.4	16.6	1.45	34	148	50	67	231	Vagotonic	18	11	10	0
47*	—5	Healed tuberculosis.....	5	62	12.8	10.4	26.2	2.51	40	136	64	72	269	Vagotonic	21.6	5	9	0
152	—5	Angioneurotic edema.....	4	73	18	9.8	20.1	2.05	20	120	74	63	243	Vagotonic	23	7.5	9	8
106*	—5	Cardiovascular renal condition.....	6	71	12	11.2	19	1.69	37	120	80	65	243	Vagotonic	19.6	7	11.2	0
110*	—4	Healed tuberculosis.....	7.5	54	7.2	12.1	16.3	1.34	28	110	62	61	190	Vagotonic	20.8	4.2	12	9.4
123	—3	Carcinoma of thyroid; hyperthyroidism	9.25	74	8	9.2	20	2.17	32	165	110	81	263	Vagotonic	20	6.8	10	12.2
45*	—3	Cardiovascular renal condition.....	6	54	9	11.2	16.6	1.48	40	162	114	77	317	Vagotonic	20.4	9.8	16.4	12
122*	—3	Normal.....	4	68	17	10.6	19.2	1.81	35	102	50	50	189	Vagotonic	20	7.8	12	9
103*	—1	Cardiovascular renal condition.....	6	52	8.6	9.2	17.3	1.88	40	126	70	57	270	Vagotonic	22.4	9	12.2	0
107*	—1	Cardiovascular renal condition.....	9	58	6.4	8	18.4	2.3	40	134	72	60	265	Vagotonic	20.8	5.8	13.4	6.2
—7	Averages.....		7.7	64	9.6	10.4	18.6	1.8	44	128	71	71	232		19.8	8.3	11.6	4.4

* One of group of 100 "normal" men.

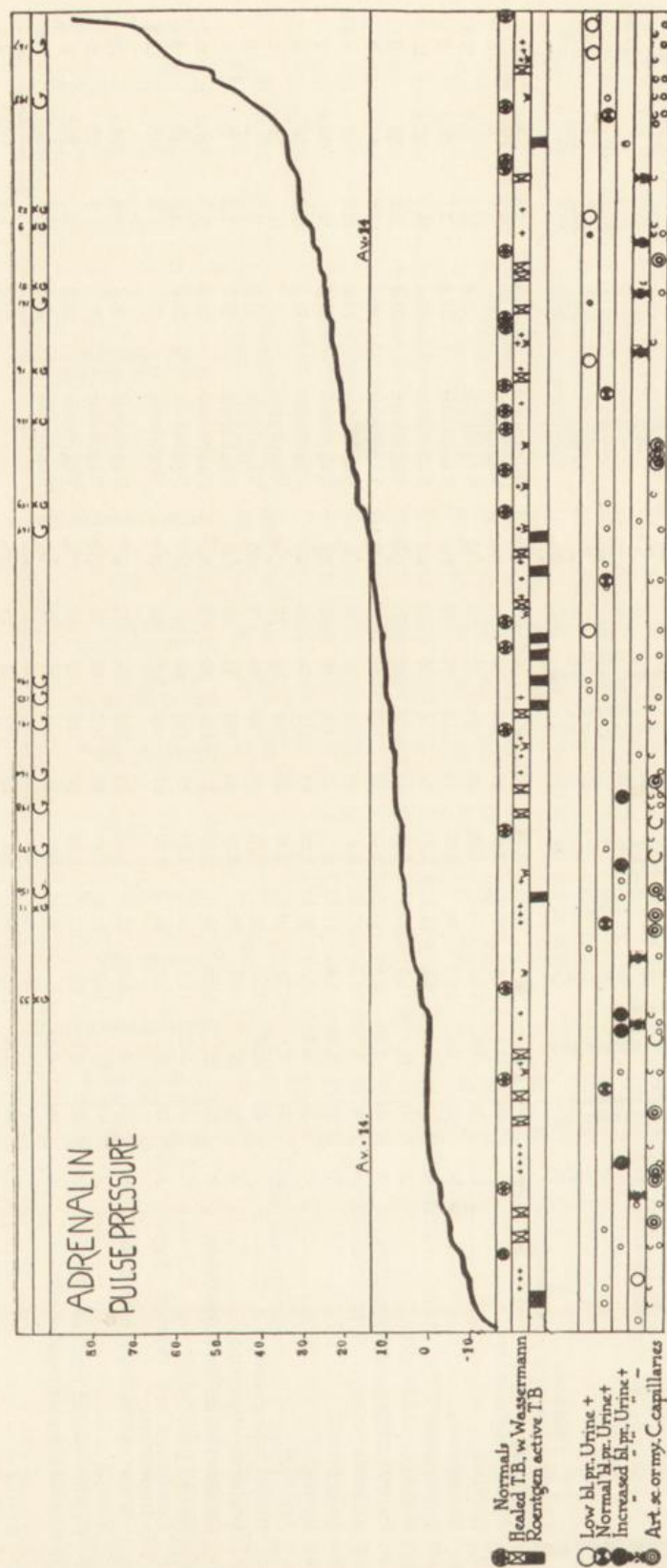


Chart 11.—The pulse pressure increase following the subcutaneous injection of epinephrine hydrochloride in normal persons and patients with various clinical conditions.

CO₂ COMBINING POWER

The average CO₂ combining power of the serum of the 100 "normal" men was 57.7. The range for the strictly normal persons was from 52 to 65. Chart 12 indicates that all the persons in the healed tuberculous group are uniformly distributed over the normal range; the per-

TABLE 32.—*The Results of Examinations of the Ten Persons with the Lowest CO₂ Combining Powers*

Individual Number	CO ₂ Combining Power	Diagnosis	Potassium, Mg.	Calcium, Mg.	Ice Reaction Time, Seconds	Weight/Length Ratio	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
132	40.3	Eczema.....	15	13.4	10	234	18.4	9.4	13.4	5
167	47.9	Glaucoma.....	22.7	12	5	158	17	14.2	15	0
171	48.7	Urticaria.....	17.9	12.6	20	161	17.5	10.5	18	0
161	49.4	Glaucoma.....	18	9.2	12	171	14	13	13	0
106	49.5	Cardiovascular renal condition	19	11.2	30	243	19.6	7	11.2	0
139	50	Urticaria.....	18.4	9.7	8	176	16	11	14	12.5
68	51	Healed tuberculosis.....	17.1	8.8	10	217	19.2	9.6	12	7
109	51.4	Neurosis.....	16.1	10.8	25	140	18	9	12	9.4
115	51.8	Cardiovascular renal condition	15.2	7.8	10	215	17.2	6	14.2	8
137	51.9	Glaucoma.....	18.2	8.1	30	166	15.4	10.5	13	0
	49.2	Averages.....	17.7	10.36	16	188	17.2	10	13.5	4.19

TABLE 33.—*The Results of Examinations of the Ten Persons with the Highest CO₂ Combining Powers*

Individual Number	CO ₂ Combining Power	Diagnosis	Potassium, Mg.	Calcium, Mg.	Ice Reaction Time, Seconds	Weight/Length Ratio	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
153	73.2	Glaucoma.....	18.7	9	30	223	22	6.5	18	0
150	72.7	Glaucoma.....	21.3	12	7	238	17	14	16	0
146	71	Myasthenia.....	14.4	9.2	30	192	18	12	19	0
148	69.6	Glaucoma.....	24.3	9.7	10	182	18	12	17	0
28	66	Healed tuberculosis.....	24.1	11	25	200	20	12.2	7.4	0
149	65.4	Nervous.....	17	10.1	15	209	20	9.7	19	0
14	65	Cardiovascular renal condition	19.6	11.2	40	198	24.4	6.2	15	5
50	65	Normal.....	27.4	18.4	15	237	24.8	10.6	10.4	10
4	64.3	Normal.....	21.2	11.8	40	237	22.8	10.6	10.2	0
105	64.4	Healed tuberculosis.....	17.1	9	15	194	19.6	5.6	12	10.4
	67.6	Averages.....	20.5	10.4	22.7	211	20.6	9.94	14.4	2.5

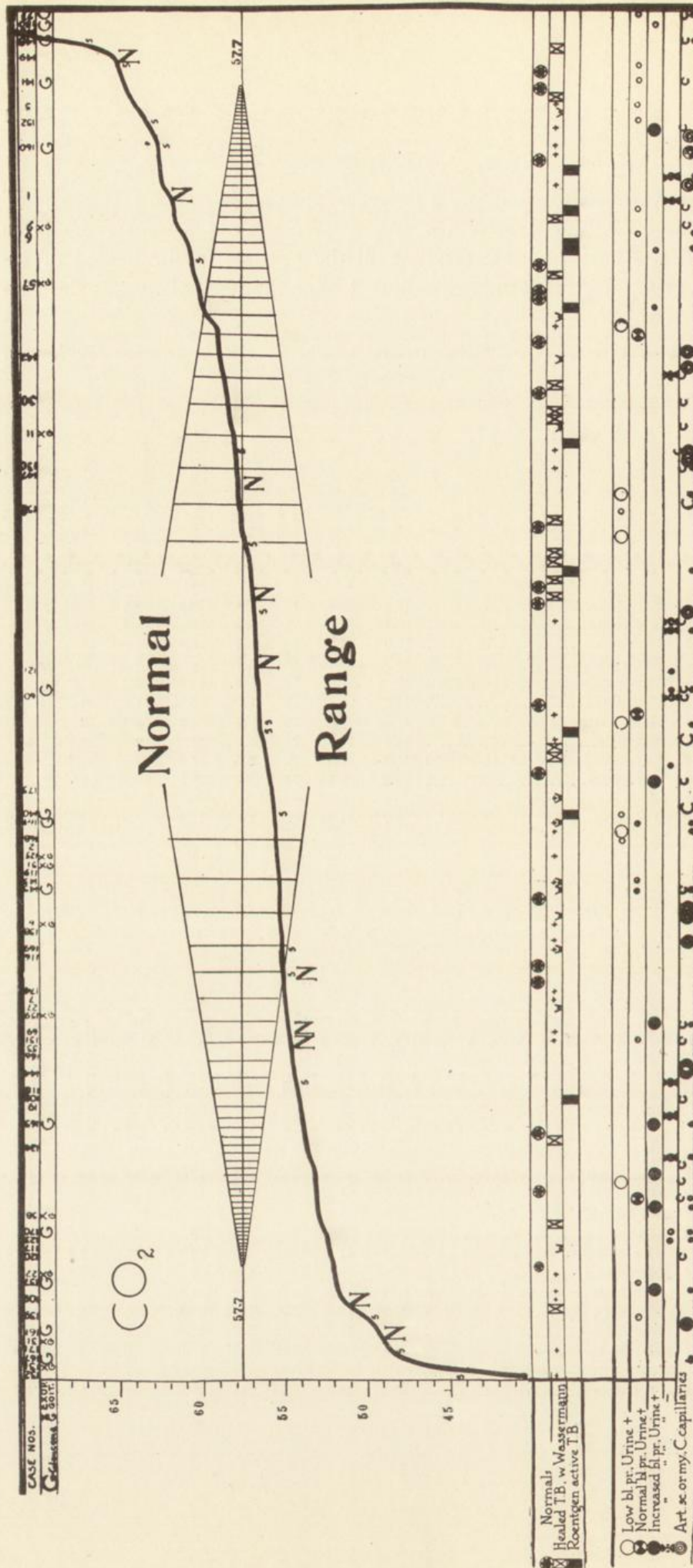


Chart 12.—The CO₂ combining power of the serum of normal persons and patients with various clinical conditions.

sons with active tuberculosis tend to appear at the upper end of the curve. There appears to be nothing characteristic in the distribution of the various groups with cardiovascular renal conditions, unless it is the fact that those with increased blood pressure and urinary changes appear at the low end of the scale.

Sensitized and nervous persons are found over the entire range. More of the patients with exophthalmic goiter and glaucoma are found on the side below the average.

We have tabulated the results of some examinations of the ten persons with the lowest and of the ten with the highest CO_2 combining powers in tables 32 and 33.

It will be observed that the person (no. 132) with the lowest CO_2 combining power is the one with eczema who previously was outstanding because of a low K/Ca ratio. Two persons with urticaria also appear in this group. The types of persons in the group with high CO_2 combining power are of no particular interest. The chief divergencies of the group with low CO_2 combining power appear to be their shorter ice reaction times and smaller wheals due to epinephrine. The potassium values, too, are perceptibly diminished.

ICE REACTION TIME

The rapidity with which an erythema appears following the local application of ice to the skin affords some insight concerning the activity of the peripheral vasomotor apparatus. In these observations, we have uniformly used the chest wall. In the table of correlation (part I, table 1), we have shown the following apparent correlations of the ice reaction time: delay of the reaction (1) with increasing level of calcium; (2) with increasing metabolic rate; (3) with increasing CO_2 combining power (except with exophthalmic goiter); (4) with increasing age; (5) with decrease of the flare due to thyroxin and of the wheal to caffeine; and acceleration with increasing weight/length ratio.

Tables 34 and 35, based, respectively, on the extremely rapid reaction and the delayed reaction, confirm the relation to the level of calcium, to the metabolic rate, to the weight/length ratio, to age and to the flare due to thyroxin. In addition, it appears that with delayed ice reaction, the resistance of the skin to electric current is greater. The proportion of sympathetotonic persons is slightly larger in the group with short ice reaction time.

When we examine chart 13, we find the strictly normal group scattered over the entire curve, but it may be observed that almost half of the group are clustered in one region (the range from 18 to

TABLE 34.—*The Results of Examinations of the Twenty Persons with the Most Rapid Reactions to Local Application of Ice to the Chest*

Individual Number	Ice Reaction Time, Seconds	Diagnosis	Calcium, Mg.	Inflammatory Index	Protein, Mg.	Skin Resistance to Electric Current	Basal Metabolic Rate	Vascular Reaction to Epinephrine	Thyroxin, Flare, Mm.	Caffein, Wheel, Mm.	Weight/Length Ratio	Age
67*	4	Dwarf.....	8.8	11.8	6.98	0.19	32	Vagotonic	0	33.4	195	47
129*	5	Normal.....	10.6	17	8.06	0.37	-7.3	Vagotonic	9	21.2	189	33
100*	5	Healed tuberculosis.....	9	9	7.85	0.11	-1.6	Vagotonic	29.2	27	241	45
165	5	Glaucoma.....	10	5.4	8.28	0.18	0.5	.....	0	15	250	52
168	5	Orthostatic albuminuria..	9.4	12	7.41	0.16	-9	Vagotonic	0	22	215	28
167	5	Glaucoma.....	12	3.7	8.71	0.85	-13	Sympatheticotonic	0	....	158	77
142	5	Tumor of the brain.....	9.4	7.7	7.69	0.17	+5	Sympatheticotonic	0	30	200	53
103*	5	Cardiovascular renal condition	9.2	8.6	7.73	0.39	+2	Vagotonic	0	18.2	270	59
61*	7	Cardiovascular renal condition	7.6	11.6	7.41	0.23	+1	Vagotonic	0	20.2	208	51
41*	7	Normal.....	9.8	9.1	8.49	0.26	+15	Vagotonic	0	5.8	216	40
10*	7	Healed tuberculosis.....	10.1	13	8.70	0.42	-12.4	Vagotonic	7.2	12.2	230	40
64*	7	Normal.....	9	10	7.41	0.22	+23	Sympatheticotonic	11.6	16.2	208	31
43*	7	Normal.....	9.2	9.7	7.63	0.27	-4.4	Sympatheticotonic	0	11	231	45
150	7	Glaucoma.....	12	3.8	7.85	0.22	+39	Vagotonic	0	22	238	67
139	8	Urticaria.....	9.7	11	7.10	0.20	+5	Vagotonic	12.5	14	176	29
78*	10	Normal.....	8.4	12	8.49	0.62	-6.2	Sympatheticotonic	6.2	20	203	33
18*	10	Healed tuberculosis.....	14.5	8.7	8.30	1	+4.2	Vagotonic	....	....	200	31
95*	10	Healed tuberculosis.....	7.8	9.8	8.5	0.39	+26	Sympatheticotonic	6.2	26.2	220	54
59*	10	Normal.....	9.6	8.6	7.85	0.16	-6.5	Vagotonic	8	23.4	252	37
68*	10	Healed tuberculosis.....	8.8	11	8.66	0.53	+25.8	Sympatheticotonic	7	22.4	217	35
6.9	Averages and totals....		9.74	9.67	7.95	0.349	+5.9	7 S., 12 V.	5.1	20	215	44.3

* One of group of 100 "normal" men.

TABLE 35.—*The Results of Examinations of the Twenty Persons with the Least Rapid Reactions to the Application of Ice to the Chest*

Individual Number	Ice Reaction Time, Seconds	Diagnosis	Calcium, Mg.	Inflammatory Index	Protein, Mg.	Skin Resistance to Electric Current	Basal Metabolic Rate	Vascular Reaction to Epinephrine	Thyroxin, Flare, Mm.	Caffein, Wheel, Mm.	Weight/Length Ratio	Age
91*	45	Cardiovascular renal condition	....	8	7.85	0.30	-1.7	Vagotonic	9.4	22.2	208	66
70*	45	Arthritis; cardiovascular renal condition	11.4	7	8.65	0.39	+23	Vagotonic	0	24.6	264	65
81*	45	Pruritis; cardiovascular renal condition	8.4	10	8.49	0.10	+34.8	Vagotonic	0	16.4	209	69
136	45	Arteriosclerosis; pellagra	10	5	9.28	0.39	+20	Sympatheticotonic	0	16	180	44
172	45	Raynaud's disease.....	13	6	8.16	0.08	+18	Sympatheticotonic	16	20	166	30
14*	40	Cardiovascular renal condition	11.2	10.5	8.06	0.20	+2.7	Vagotonic	5	9.8	198	36
40*	40	Changes in capillaries.....	10.8	6.6	8.70	0.39	+22	Vagotonic	0	5.8	201	40
40*	40	Changes in capillaries.....	10.2	6.6	8.70	0.39	+22	Vagotonic	0	5.8	201	40
96*	40	Cardiovascular renal condition	8.2	7	7.26	0.11	+31	Vagotonic	0	28.4	243	70
102*	40	Tuberculosis.....	10.6	5.8	7.95	0.20	+22	Vagotonic	0	18.2	170	65
140	40	Tuberculosis; glaucoma..	11.4	4.05	6.77	0.45	.....	Vagotonic	0	30	....	45
15*	38	Healed tuberculosis.....	12.1	7.5	7.95	0.19	-4.5	Sympatheticotonic	12	12.4	210	60
26*	35	Syphilis.....	10.2	11	8.28	0.28	+9.6	Vagotonic	6.4	11.6	210	30
48*	35	Syphilis.....	9.6	9.7	8.59	0.10	8.3	Sympatheticotonic	0	7	222	46
77*	35	Sensitized.....	10.8	10	6.98	1	7.9	Vagotonic	15.4	17	187	39
73*	35	Syphilis.....	11.2	7.6	8.5	2	16.3	Vagotonic	0	20	191	48
158	35	Hodgkin's disease.....	9.3	4	8.28	0.29	37	Sympatheticotonic	0	22	173	49
42*	32	Cardiovascular renal condition	11.4	6.5	7.63	0.15	6.8	Vagotonic	4.6	5.8	241	33
80*	30	Nervous.....	8	15.1	8.28	1.6	13	Vagotonic	9.2	16.2	212	30
106*	30	Cardiovascular renal condition	11.2	12	8.06	0.63	-6.6	Vagotonic	0	25.6	243	60
137	30	Glaucoma.....	8.1	4	8.49	1.9	3.6	Vagotonic	0	18	166	61
38	Averages and totals....		10.3	7.86	8.11	0.537	+12	15 V., 5 S.	3.9	19.96	204	49.3

* One of group of 100 "normal" men.



Chart 13.—The ice reaction time of normal persons and patients with various clinical conditions.

20 minutes). This group is composed of those persons who were noted for relatively low capillary permeability, and some of them show a sluggish capillary circulation.

The persons with roentgenologic evidence of active tuberculosis appear toward the side of the curve representing delay, and it seems that more of the group with cardiovascular renal conditions are found here. The advanced ages of the members of both these groups must be taken into consideration.

WEIGHT/LENGTH RATIOS

The average weight/length ratio (weight in pounds, length in inches) for our group of 100 "normal" men is 217 (chart 14). When we select the twenty persons with the highest ratios, it is evident that the group includes most of the persons in whose cases a roentgenologic diagnosis of myocarditis was made. The majority give a vagotonic reaction to epinephrine, and their K/Ca ratios average 2.06.

In part I, table 1, the correlations with the weight/length ratio indicate that as the ratio increases the capillary permeability diminishes, the K/Ca ratio increases, the sugar increases, the basal metabolic rate decreases, as also does the skin resistance, the pulse pressure on subcutaneous injection of epinephrine hydrochloride and the CO₂ combining power increase, and the wheal due to epinephrine and the flare due to morphine increase.

In tables 36 and 37, the averages for the sugar and the basal metabolic rate show little difference between the two extreme groups, but there are more persons with high skin resistance in the group with the highest ratios. The wheals due to epinephrine are larger here, as are the flares due to morphine, while the wheals due to thyroxin are smaller.

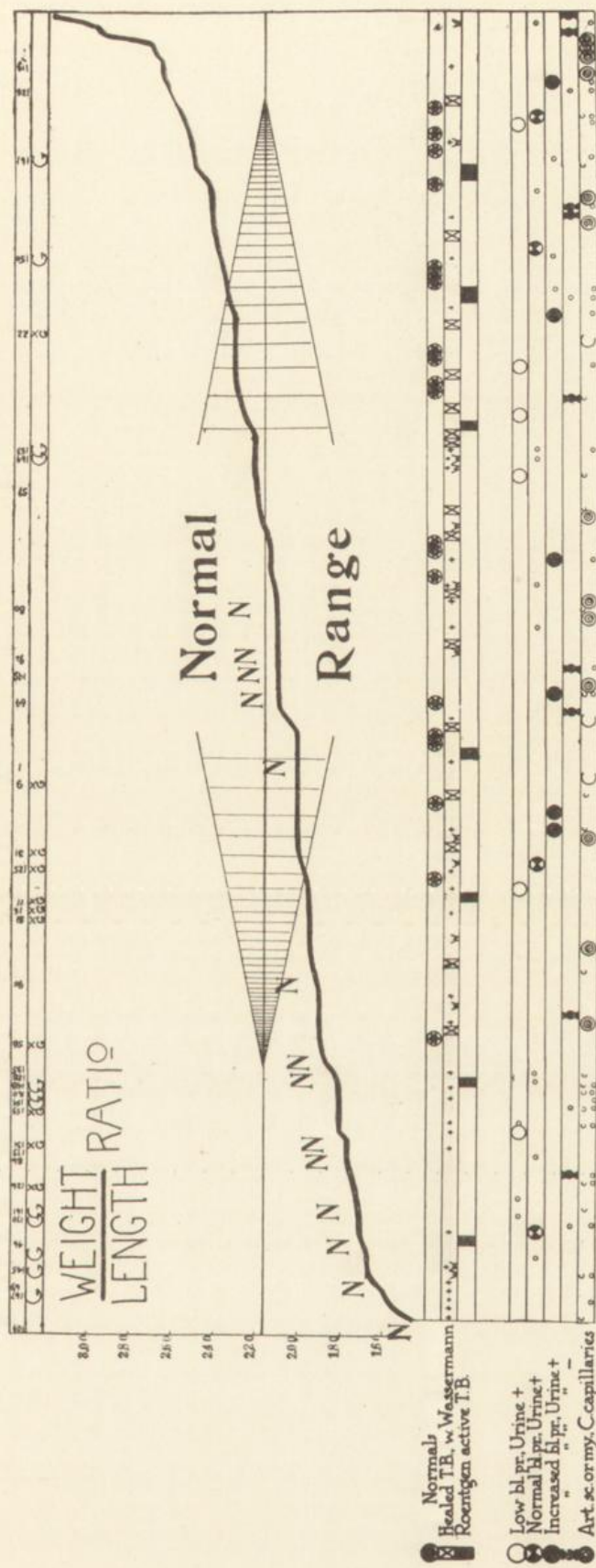


Chart 14.—The weight length ratio of normal persons and of patients with various clinical conditions.

TABLE 36.—The Results of Examinations of the Twenty Persons with the Lowest Weight/Length Ratios

Individual Number	Weight/Length Ratio	Diagnosis	K / Ca Ratio	Sugar, Mg.	Basal Metabolic Rate	Skin Resistance to Electric Current	CO ₂ Combining Power	Vascular Reaction to Epinephrine	Epinephrine, Pulse Pressure, % Increase	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Morphine, Wheal, Mm.	Morphine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
174	143	Raynaud's disease	2	90	4	....	55	Vagotonic	0	..	....	....	....	....	....
169	140	Neurosis	1.5	67	....	0.47	51.4	Vagotonic	3	18	9	9	7.2	12	9.4
147	142	Postencephalitis	2	79	-6	0.54	57.9	Sympathetico-tonic	8	18	11.6	12	7.4	13	0
118	154	Arthritis	1.4	80	-11	1.9	54.2	Vagotonic	-8	16.8	7.4	10	6.8	12	8.6
167	158	Glaucoma	1.9	81	-13	0.85	47.9	Sympathetico-tonic	+02	17	14.2	12	9	15	0
69	160	Uleer; nervous	1.66	70	+	1.9	54.8	Sympathetico-tonic	0	21.2	10	12.2	22	14.4	10.2
171	161	Urticaria	1.42	72	8	0.08	48.7	Sympathetico-tonic	12	17.5	10.5	12.5	0	18	0
145	166	Wassermann reaction +; glaucoma	1.55	70	19	0.35	55.4	Sympathetico-tonic	43	18	13.6	16	0	16	0
172	163	Raynaud's disease	1.64	76	18	0.08	....	Sympathetico-tonic	57	22.4	16	15.5	8.5	18	16
137	163	Glaucoma	2.21	73	3.6	1.9	51.9	Vagotonic	7	15.4	10.5	12.5	10	13	0
46*	168	Inanition	1.24	61	13	1.7	56.2	Sympathetico-tonic	15	21.2	13.2	15	16.2	12.2	11
162*	170	Tuberculosis	1.63	62	22	0.20	60.9	Vagotonic	11	23.2	7.4	10.8	15	12.2	0
55*	170	Cardiovascular renal condition (urine)	3.1	73	6.2	0.38	56.6	Vagotonic	5	17.6	8.2	10.2	19.6	11.2	0
170	170	Glaucoma	2.2	320	33	0.07	52.5	.....	....	....	....	....	....	....	....
161	171	Glaucoma	1.96	86	16	1.4	49.4	Sympathetico-tonic	25	14	13	5.5	10.7	13	0
120	172	Purpura	1.99	71	-5	....	52.2	.....	....	21.2	7.2	9.6	8.2	12	0
158	173	Hodgkin's disease	2	83	+37	0.29	57.8	Sympathetico-tonic	10	19.2	11.3	13	0	28	0
144	174	Pellagra	1.79	90	-3.7	0.5	54.4	Sympathetico-tonic	50	14.4	11.5	12.6	12.5	15	0
30*	175	Arteriosclerosis; cardiovascular renal condition	2.33	76	-5.9	1.05	62.5	Vagotonic	0	20	8.8	8.2	16	7.2	0
86*	176	Nervous	1.26	94	+6.4	0.33	55	Vagotonic	-12	18	14	11.8	19.6	15.4	12.4
163		Averages and totals	1.89	76	7.6	0.77	53.9	10 S., 8 V.	15	1.85	10.9	11.6	9.9	14.3	3.7

* One of group of 100 "normal" men.

TABLE 37.—The Results of Examinations of the Twenty Persons with the Highest Weight/Length Ratios

Individual Number	Weight/Length Ratio	Diagnosis	K / Ca Ratio	Sugar, Mg.	Basal Metabolic Rate	Skin Resistance to Electric Current	Vascular Reaction to Epinephrine	Epinephrine, Pulse Pressure, % Increase	Epinephrine, Wheal, Mm.	Epinephrine, Flare, Mm.	Morphine, Wheal, Mm.	Morphine, Flare, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
45*	317	Increased blood pressure (above 140).....	1.48	77	20	0.28	Vagotonic	- 3	20.4	9.8	14.2	21.4	16.4	12
6	300	Arteriosclerosis; myocarditis	1.80	70	29	0.30	Vagotonic	0	....	....	....	....	....	....
121	294	Arthritis deformans	2.27	74	11	0.28	Vagotonic	-13	26	5.6	10.2	8.8	8	0
103*	270	Arteriosclerosis; myocarditis	1.88	57	2	0.39	Vagotonic	- 1	22.4	9	12.2	18.2	12.2	0
138	270	Myocarditis; Fröhlich's syndrome.....	1.88	83	8	0.07	Vagotonic	- 0	23	9.5	12.5	8.7	17	6.5
93*	267	Myocarditis; hay-fever	3.22	70	0	0.25	Sympatheticotonic	+19	20.4	8.6	12.4	15	10	0
119	266	Adenoma of the thyroid.....	2.1	75	34	0.08	Sympatheticotonic	+13	24	5	12	11.2	12	7
107*	265	Arteriosclerosis; myocarditis	2.3	60	-6.5	0.33	Vagotonic	- 1	20.8	5.8	8.6	11.2	13.4	6.2
70*	264	Arteriosclerosis; arthritis deformans.....	1.45	67	23	0.39	Vagotonic	- 6	18	11	9.8	18.2	10	0
123	263	Arteriosclerosis; carcinoma of the thyroid.....	2.17	81	48	....	Vagotonic	- 3	20	6.8	11.2	10.2	10	12.2
47*	260	Healed tuberculosis	2.51	72	34	0.13	Vagotonic	- 5	21.6	5.2	14.2	10.8	9	0
83*	258	Normal	2.31	68	-7	0.16	Vagotonic	+ 9.6	17.2	9.2	9.2	20.8	13.4	11
66*	257	Arteriosclerosis; myocarditis	1.82	67	1.3	0.37	Sympatheticotonic	+37	20	9.2	13.6	16.6	10.2	0
54*	256	Myocarditis .....	....	80	-3.4	0.26	Sympatheticotonic	+66	21.2	10.4	11	18	12	0
37*	254	Normal	2.26	75	-24.4	0.34	Vagotonic	- 8	20.4	21.6	18	15.2	10	0
39*	254	Syphilis	1.91	79	13.1	0.29	Vagotonic	+17	18	9.8	13.8	21.8	7.6	5
59*	252	Normal	1.88	85	-6.5	0.16	Vagotonic	+ 2	22	7.2	9.2	21.4	15.6	8
165	250	Arteriosclerosis; glaucoma	1.79	80	0.5	0.18	.....	.....	16.8	13	10	14.5	12.5	0
129*	249	Tuberculosis	1.55	83	+28	0.22	Vagotonic	-10	18.4	7	10.6	9.6	12.2	0
56*	247	Tuberculosis	2.52	65	+17.9	0.32	Vagotonic	+14	17.2	5.8	10.8	22.4	13.4	7
265.6		Averages and totals.....	2.06	73.4	9.3	0.25	15 V., 4 S.	6.2	19.8	8.9	11.7	15.4	11.8	3.9

CHOLESTEROL

The determinations of cholesterol were made on 109 members of the groups of "normal" persons and patients, the average amount for the persons of the "normal" group being 207 mg.

In chart 15 we illustrate this material. Of the actually normal persons, we have only eight for consideration, and have placed the normal range at from approximately 160 to 245. Of this group, patient 92 falls far outside this range, having a cholesterol level of over 300.

Furthermore, it appears that the group with the higher levels of cholesterol includes more persons with roentgenologic evidence of

TABLE 38.—*The Results of Examinations of the Twenty Persons with the Highest Values of Cholesterol*

Individual Number	Cholesterol, Mg.	Diagnosis	Reaction to Epinephrine
95	318	Healed tuberculosis.....	Sympatheticotonic
148	317	Vitiligo; glaucoma.....	Vagotonic
94	303	Normal.....	Vagotonic
111	290	Cardiovascular renal condition.....	Sympatheticotonic
14	278	Cardiovascular renal condition.....	Vagotonic
75	278	Cardiovascular renal condition.....	Vagotonic
109	269	Neurosis.....	Vagotonic
141	267	Glaucoma.....	Vagotonic
173	267	Tumor of the cord.....	Sympatheticotonic
61	264	Cardiovascular renal condition.....	Vagotonic
62	256	Cardiovascular renal condition.....	Vagotonic
167	256	Glaucoma.....	Sympatheticotonic
107	256	Cardiovascular renal condition.....	Vagotonic
132	256	Eczema.....	Vagotonic
71	256	Cardiovascular renal condition.....	Vagotonic
136	256	Pellagra.....	Sympatheticotonic
115	247	Cardiovascular renal condition.....	Vagotonic
127	247	Cardiovascular renal condition.....	Sympatheticotonic
150	247	Glaucoma.....	Vagotonic
73	247	Syphilis.....	Vagotonic
Average.....	268	Total.....	6 S., 14 V.

healed parenchymal tuberculosis. In connection with the group with cardiovascular renal lesions, the outstanding fact seems to be that there are more persons with arteriosclerosis in the group with the high levels of cholesterol. This seems true for the 100 "normal" men, as well as for all the persons examined.

In tables 38 and 39, we have tabulated the results of some examinations of the twenty persons with the highest and lowest cholesterol values (excluding those with exophthalmic goiter). There are obviously more persons with arteriosclerotic changes and increased blood pressure on the side of the high values of cholesterol than on the side of the low values. It appears, too, that this group includes more persons with a distinctly vagotonic reaction to epinephrine.

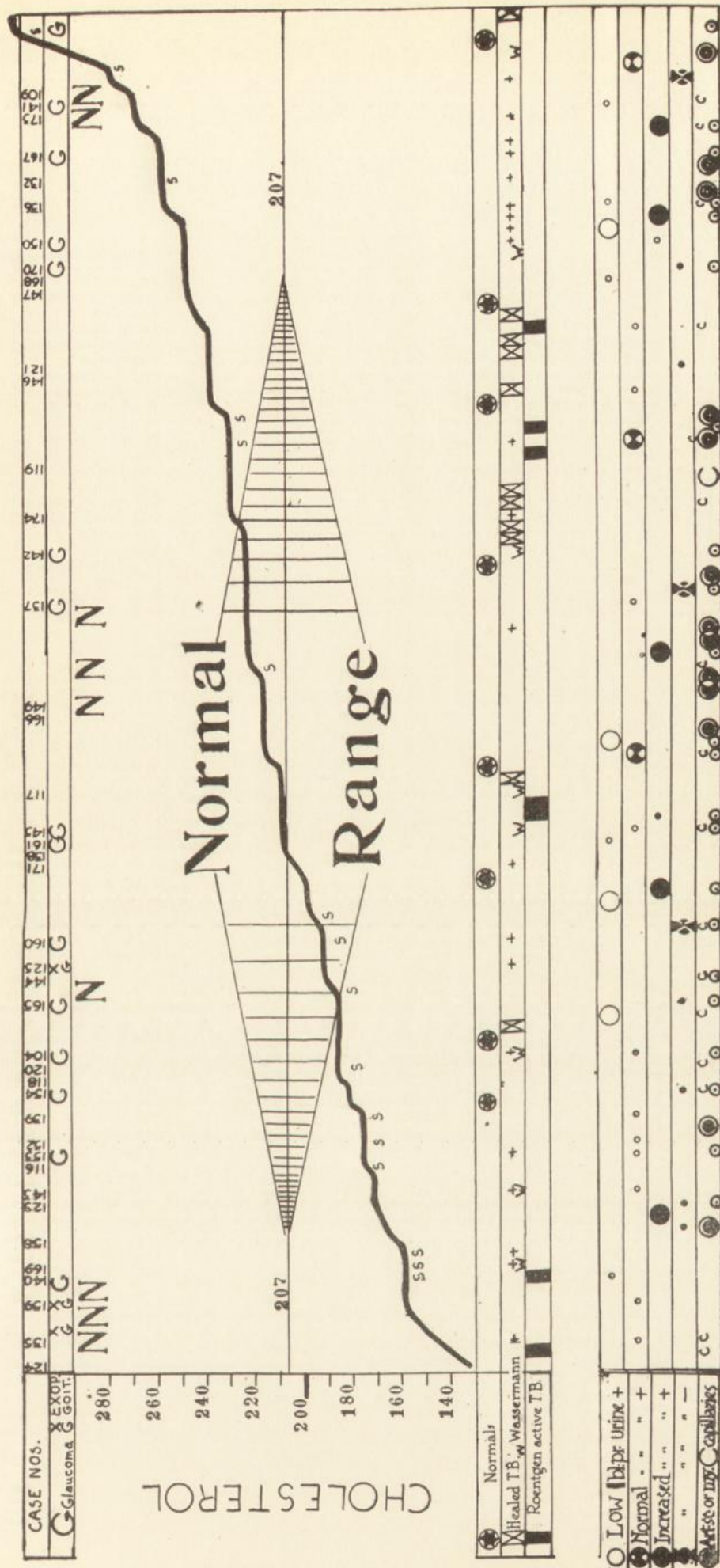


Chart 15.—The cholesterol content of the blood of normal persons and patients with various clinical conditions.

TABLE 39.—*The Results of Examinations Similar to Those in Table 38 of the Twenty Persons with the Lowest Values of Cholesterol*

Individual Number	Cholesterol, Mg.	Diagnosis	Reaction to Epinephrine
124	133	Heart disease and arthritis.....	Vagotonic
108	139	Tuberculosis.....	Sympatheticotonic
135	145	Nervous.....	Vagotonic
92	158	Nervous.....	Sympatheticotonic
1	158	Nervous.....	Sympatheticotonic
140	158	Tuberculosis; glaucoma.....	Vagotonic
109	158	Syphilis; Buerger's disease.....	Sympatheticotonic
101	158	Sensitized.....	Sympatheticotonic
158	163	Hodgkin's disease.....	Sympatheticotonic
96	167	Cardiovascular renal condition.....	Vagotonic
84	167	Cardiovascular renal condition.....	Sympatheticotonic
143	171	Pellagra.....	Sympatheticotonic
85	171	Fever, unknown origin.....	Vagotonic
116	175	Urticaria.....	Vagotonic
153	175	Glaucoma.....	Sympatheticotonic
152	175	Sensitized.....	Vagotonic
98	175	Cardiovascular renal condition.....	Vagotonic
139	175	Urticaria.....	Vagotonic
64	180	Normal (nervous).....	Sympatheticotonic
154	180	Glaucoma.....	.....
Average.....	162	Total.....	10 S., 9 V.

REACTIVITY TO EPINEPHRINE: THE WHEAL

The average diameter of the wheals due to epinephrine of our group of 100 "normal" men is 19.2 mm., and there appear to be relations to the calcium level, the Kromayer lamp erythema time, the basal metabolic rate, the pulse pressure and the weight/length ratio.

TABLE 40.—*The Results of Examinations of the Twenty Persons Showing the Smallest Wheals on the Intracutaneous Injection of Epinephrine Hydrochloride*

Individual Number	Epinephrine, Mm.	Diagnosis	Calcium, Mg.	Kromayer Light Erythema Time, Min.	Pulse Rate	Carbon Dioxide Combining Power	Ice Reaction Time, Seconds
135	12.4	Changes in capillaries; nervous.....	11.9	75	88	54.5	18
49*	12.4	Cardiovascular renal condition.....	11	330	60	59.1	15
81*	14	Cardiovascular renal condition.....	8.4	90	76	57	45
161	14	Glaucoma.....	9.17	75	88	49.4	12
77*	14	Sensitized.....	10.8	240	82	60.6	35
144	14.4	Pellagra.....	9.8	120	92	54.4	10
80*	14.8	Nervous.....	8	100	64	53.2	30
124	15.2	Arthritis.....	10.5	90	98	53.7	10
137	15.4	Glaucoma.....	8.1	130	78	51.9	30
65*	15.8	Cardiovascular renal condition.....	9.8	180	63	53.1	13
160	16	Glaucoma.....	10.86	70	68	62.7	10
87*	16	Normal.....	8.4	90	70	55.4	18
139	16	Urticaria.....	9.7	120	104	50	8
84*	16.4	Cardiovascular renal condition.....	10	90	80	53.1	20
143	16.6	Wassermann reaction +++; pellagra..	9.7	110	118	55.4	15
118	16.8	Arthritis.....	12.2	110	72	54	12
24*	16.8	Healed tuberculosis.....	11.7	120	78	53.7	20
91*	16.8	Cardiovascular renal condition.....	....	150	76	58.9	45
165	16.8	Glaucoma.....	10	80	110	53.9	5
167	17	Glaucoma.....	12	120	84	47.9	5
Averages	15.5	.....	10.1	124	82	54.6	18.8

* One of group of 100 "normal" men.



Chart 16.—The diameter of the wheal in the reaction to epinephrine of normal persons and patients with various clinical conditions.

TABLE 41.—The Results of Examinations of the Twenty Persons Showing the Largest Wheals on the Intracutaneous Injection of Epinephrine Hydrochloride

Individual Number	Epinephrine, Wheal, Mm.	Diagnosis	Calcium, Mg.	Sugar, Mg.	Kromayer Light Erythema Time, Min.	Basal Metabolic Rate	Blood Pressure, Systolic	Pulse Pressure	Pulse Rate	Vascular Reaction to Epinephrine	Epinephrine, Pulse Pressure, % Increase	CO ₂ Combining Power	Ice Reaction, Seconds	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.
121	23	Arthritis deformans.....	8.9	74	120	+11	148	68	88	Vagotonic	-13	56.8	10	8	0
152	26	Angioneurotic edema.....	9.8	63	60	+4.8	120	46	80	Vagotonic	-5	63.4	15	9	8
20*	25.2	Tuberculosis.....	11.4	85	90	+20.4	130	54	80	Vagotonic	+13	62.7	15	10	2.6
50*	24.8	Normal.....	11.4	..	180	+21	128	58	67	Sympathetico-tonic	+12	64.9	15	10.4	10
14*	24.4	Cardiovascular renal condition.....	11.2	67	90	+2.7	128	48	76	Vagotonic	10	65	40	15	5
41*	24.4	Normal.....	9.8	70	75	+15	110	36	64	Vagotonic	+26	58.5	7	6.2	0
40*	24	Changes in capillaries.....	10.8	55	75	+22	110	46	60	Vagotonic	+6	55.7	40	6.2	0
95*	23.6	Healed tuberculosis.....	7.8	77	110	+23	110	44	68	Sympathetico-tonic	+9	61.6	10	12	6.2
134	23.6	Cardiovascular renal condition.....	9.9	71	80	-4.4	148	62	78	Sympathetico-tonic	-0	54.8	12	19.2	9.6
32*	23.6	Cardiovascular renal condition.....	9.5	76	75	+22	144	58	74	Vagotonic	+22	54.1	25	9.8	0
21*	23.2	Cardiovascular renal condition.....	10.2	72	105	+4.3	140	56	72	Vagotonic	0	62.9	25	7.2	2.6
15*	23.2	Healed tuberculosis.....	12.1	70	90	-4.9	128	60	60	Sympathetico-tonic	+13	57.6	38	11.6	12
102*	23.2	Tuberculosis.....	10.6	62	90	+22	114	44	96	Vagotonic	+11	60.9	40	12.2	0
138	23	Fröhlich's syndrome.....	10.6	83	90	8	122	46	80	Vagotonic	....	55.2	17	17	6.5
154	23	Glaucoma.....	....	71	90	18	194	76	70	.....	....	56.6	20	26	0
33*	22.8	Normal.....	8.7	79	75	12.3	108	30	62	Vagotonic	+33	57.6	20	9.2	0
29*	22.8	Normal (bile in urine).....	10	76	195	3.5	134	46	76	Sympathetico-tonic	+24	60.1	15	7.2	0
4*	22.8	Normal.....	11.8	94	120	12	114	34	80	Sympathetico-tonic	+21	64.3	20	10.2	0
172	22.4	Raynaud's disease.....	13	76	105	18	108	30	94	Sympathetico-tonic	+57	....	45	18	16
153	22	Glaucoma.....	....	83	90	2	124	64	64	Sympathetico-tonic	+10	73.2	30	18	0
23.8		Averages and totals.....	10.3	74	99	11.7	128	50	74	8 S., 11 V.	+12	60	22.9	12	3.9

* One of group of 100 "normal" men.

When we include our entire material and examine the results, some of these correlations are maintained. The differences in calcium levels are not marked, but the Kromayer lamp erythema time is shortened in the group with the larger wheals and the difference between the groups in the CO_2 combining power is well marked, as is that in the ice reaction time (tables 40 and 41).

There are no apparent correlations with blood sugar level, the blood pressure, the pulse pressure or the vascular reactions to epinephrine. The pulse rate is somewhat increased in the group with the smaller wheals.

Chart 16 shows the truly "normal" persons scattered over the entire length of the curve. There appear to be no correlations with the cases of healed or active tuberculosis (roentgenologic evidence) nor with the cardiovascular renal conditions.

REACTIVITY TO EPINEPHRINE: THE FLARE

The flare from epinephrine is, as has been shown in chart 1, correlated with a number of other reactions. Thus, it is larger in persons with more calcium, more sugar, higher skin resistance, less globulin and greater vascular reaction to epinephrine. The reactions to thyroxin are not closely related, but the flare due to morphine increases with increase in the flare due to epinephrine.

These observations made on the "normal" group are all confirmed when our averages include the clinical material. In tables 42 and 43, the corresponding results are tabulated for the groups with the greatest and the smallest flares. It will be noted, among other things, that there are more persons with primarily sympatheticotonic reactions in the group with the large flares.

Chart 17 indicates that our truly "normal" group, as well as the group showing roentgenologic evidence of healed tuberculosis, are scattered over the entire curve, while more of the group with roentgenologic evidence of active tuberculosis appear at the lower end of the curve. The groups with cardiovascular renal conditions offer nothing that is characteristic, but the group with exophthalmic goiter appears to have smaller flares in contradistinction from the group with glaucoma. The "nervous" persons apparently are more apt to have large flares.



Chart 17.—The radius of the flare in the reaction to epinephrine of normal persons and patients with various clinical conditions.

TABLE 42.—*The Results of Examinations of the Twenty Persons Showing the Smallest Flares Following the Intracutaneously Injection of Epinephrine Hydrochloride*

Individual Number	Epinephrine, Flare, Mm.	Diagnosis	Calcium, Mg.	Sugar, Mg.	Globulin, Mg.	Skin Resistance to Electric Current	Blood Pressure, Systolic	Vascular Reaction to Epinephrine	Epinephrine, Pulse Pressure, % Increase	Epinephrine, Wheal, Mm.	Thyroxin, Wheal, Mm.	Thyroxin, Flare, Mm.	Morphine, Flare, Mm.
85*	1.8	Fever.....	10.6	79	33	0.41	110	Vagotonic	+19	17.2	14.2	0	13.8
108*	2.4	Tuberculosis.....	10.4	63	50	0.44	94	Sympatheticotonic	+9	18	14.8	13.2	11
124	2.6	Heart disease; arthritis.	10.5	71	40	1.05	122	Vagotonic	+2	15.2	....	....	6.8
135	3.2	Nervous.....	11.9	75	45	0.09	120	Vagotonic	-10	12.4	20	....	2
98*	4	Cardiovascular renal condition	8.8	63	42	0.20	136	Vagotonic	+6	20	11.2	0	3
110*	4.2	Healed tuberculosis.....	12.1	61	28	0.60	110	Vagotonic	-4	20.8	12	9.4	14.6
47*	5.2	Healed tuberculosis.....	10.4	72	40	0.13	136	Vagotonic	-5	21.6	9	0	10.8
130*	5.4	Cardiovascular renal condition	10.4	86	60	0.35	106	.....	....	20	11.2	0	12.6
121	5.6	Arthritis deformans.....	8.9	74	30	0.28	148	Vagotonic	-13	26	8	0	8.8
101*	5.6	Healed tuberculosis.....	9	52	38	0.09	118	Vagotonic	23	19.6	12	10.4	16
107*	5.8	Cardiovascular renal condition	8	60	40	0.33	134	Vagotonic	-1	20.8	13.4	6.2	11.2
56*	5.8	Tuberculosis.....	9.8	65	35	0.32	124	Vagotonic	+14	17.2	13.4	7	22.8
94*	6	Normal.....	8.4	75	37	0.43	134	Vagotonic	20	20	11.2	7.8	14
14*	6.2	Tuberculosis.....	7.4	55	45	0.08	176	Vagotonic	11	20.8	12	0	10
104*	6.2	Cardiovascular renal condition	11.2	67	37	0.20	128	Vagotonic	0	24.4	15	5	7.2
117	6.2	Syphilitic arthritis.....	9.2	60	27	0.25	130	Sympatheticotonic	6	19.2	20.2	0	6.2
115*	6.2	Cardiovascular renal condition	7.8	60	60	0.28	148	Vagotonic	-4	17.2	14.2	8	13.2
81*	6.4	Healed tuberculosis.....	7.8	77	30	0.39	110	Sympatheticotonic	+9	23.6	12	6.2	12.6
95*	6.2	Cardiovascular renal condition	8.4	63	37	0.10	144	Vagotonic	+4	14	10	0	15
153	6.5	Glaucoma.....	9	83	0	0.15	124	Sympatheticotonic	+10	22	18	0	0
5.07	Averages and totals....		9.5	68	39.7	0.308	127.6	4 S., 15 V.	+4	195	13	4	10.5

* One of group of 100 "normal" men.

TABLE 43.—*The Results of Examinations of the Twenty Persons Showing the Largest Flares Following the Intracutaneous Injection of Epinephrine Hydrochloride*

Individual Number	Epinephrine, Flare, Mm.	Diagnosis	Calcium, Mg.	Sugar, Mg.	Globulin, Mg.	Skin Resistance to Electric Current	Blood Pressure, Systolic	Vascular Reaction to Epinephrine	Epinephrine, Pulse Pressure, % Increase	Epinephrine, Wheal, Mm.	Morphine, Flare, Mm.
37*	12.6	Epilepsy.....	9.5	83	45	1.75	122	Sympatheticotonic	+2	20	22.2
172	16	Raynaud's disease.....	13	76	..	0.08	108	Sympatheticotonic	+57	22.4	8.5
168	16	Orthostatic albuminuria	9.4	45	13	0.16	105	Vagotonic	+4	18	0
164	14.7	Wassermann reaction +; glaucoma	8.7	65	20	0.23	110	Sympatheticotonic	+14	18	7.5
167	14.2	Glaucoma.....	12	81	27	0.85	137	Sympatheticotonic	+62	17	9
36*	14.2	Cardiovascular renal condition	12.1	90	33	0.11	104	Vagotonic	22	20.8	18
150	14	Glaucoma.....	12	82	15	0.22	140	Vagotonic	+6	17	9.5
86*	14	Nervous.....	12.6	94	40	0.36	118	Vagotonic	-12	18.8	19.6
45	13.6	Glaucoma.....	10.1	70	55	0.35	136	Sympatheticotonic	+43	18	0
41*	13.2	Normal.....	9.8	70	50	0.26	110	Vagotonic	+26	24	18.8
46*	13.2	Inanition.....	13.8	61	30	1.7	140	Sympatheticotonic	+15	21.2	16.2
161	13	Glaucoma.....	9.17	86	20	1.4	108	Sympatheticotonic	+25	14	17.5
65*	13	Cardiovascular renal condition	9.8	65	36	0.80	100	Sympatheticotonic	+30	15.8	19.8
165	13	Glaucoma.....	10	80	16	0.18	170	.....	....	16.8	14.5
21*	12.6	Cardiovascular renal condition	10.2	72	20	0.74	140	Vagotonic	0	23.2	13.6
15*	12.6	Healed tuberculosis.....	12.1	70	20	0.19	128	Sympatheticotonic	13	23.2	12.4
33	21.6	Normal.....	10	75	42	0.34	116	Vagotonic	-8	20.4	15.2
24*	12.6	Healed tuberculosis.....	11.7	81	60	0.19	116	Sympatheticotonic	50	16.8	27.2
173	12.5	Tumor of the cord.....	10.5	80	6	0.09	106	Sympatheticotonic	23	21	0
80*	12.4	Nervous.....	8	69	33	1.60	116	Vagotonic	+7	14.8	19.2
13.95	Averages and totals....		10.7	74	30	0.562	121.5	11 S., 8 V.	+20	19	13

* One of group of 100 "normal" men.

REACTIVITY TO THYROXIN: THE WHEAL

The size of the wheal due to thyroxin, as has been shown in table 1, is related to the inflammatory index, to the potassium level and to the K/Ca ratio, as well as to the amounts of the globulins.

When we examine the inclusive material, we find these conclusions confirmed, as becomes evident from a survey of the results of the examinations in twenty cases of the smallest and twenty of the largest wheals (tables 44 and 45).

Chart 18 shows the wide range of the purely normal as well as of the groups with roentgenologic evidence of healed tuberculosis, but also makes evident the fact that the groups with roentgenologic evidence of active tuberculosis are apt to have the larger wheals.

The cardiovascular renal groups show no clear-cut relation, unless it is that the arteriosclerotic changes have not been made apparent in those with the small wheals.

TABLE 44.—*The Results of Examinations of the Twenty Persons Showing the Smallest Wheals Following the Intracutaneous Injection of Thyroxin*

Indi- vidual Number	Thyroxin, Mm.	Diagnosis	Inflam- matory Index	Potas- sium, Mg.	K / Ca Ratio	Globulin, Mg.
49*	4.2	Cardiovascular renal condition.....	11	25.2	2.29	17
116	5	Urticaria.....	17	19.4	1.94	40
33	5.4	Epilepsy.....	10	26.1	2.73	45
64*	6.2	Nervous.....	10	16.6	1.84	22
41*	6.2	Normal.....	9.1	21.2	2.16	50
40*	6.2	Changes in capillaries.....	6.6	18.7	1.73	44
90*	6.2	Nervous.....	7.6	14.5	1.34	33
3*	6.4	Healed tuberculosis.....	11.1	16.7	1.47	23
24*	6.6	Healed tuberculosis.....	11.6	24.8	2.12	60
26*	7.2	Syphilis.....	11	26.6	2.61	35
29*	7.2	Normal (bile in urine).....	10.7	23.9	2.39	50
23*	7.2	Healed tuberculosis.....	11.1	28.6	2.19	..
21*	7.2	Cardiovascular renal condition.....	9	25.6	2.51	20
34*	7.2	Changes in capillaries.....	7.7	27.7	2.89	25
28*	7.4	Healed tuberculosis.....	10.6	24.1	2.19	42
36*	7.4	Cardiovascular renal condition.....	7.2	26.3	2.17	33
39*	7.6	Syphilis.....	5.8	18	1.91	43
48*	8	Syphilis.....	9.7	27.6	2.87	40
121	8	Arthritis deformans.....	11.5	20.2	2.27	30
79*	8.2	Ulcer.....	5.7	20	1.78	50
Averages	6.75		9.7	22.5	2.17	36.9

* One of group of 100 "normal" men.

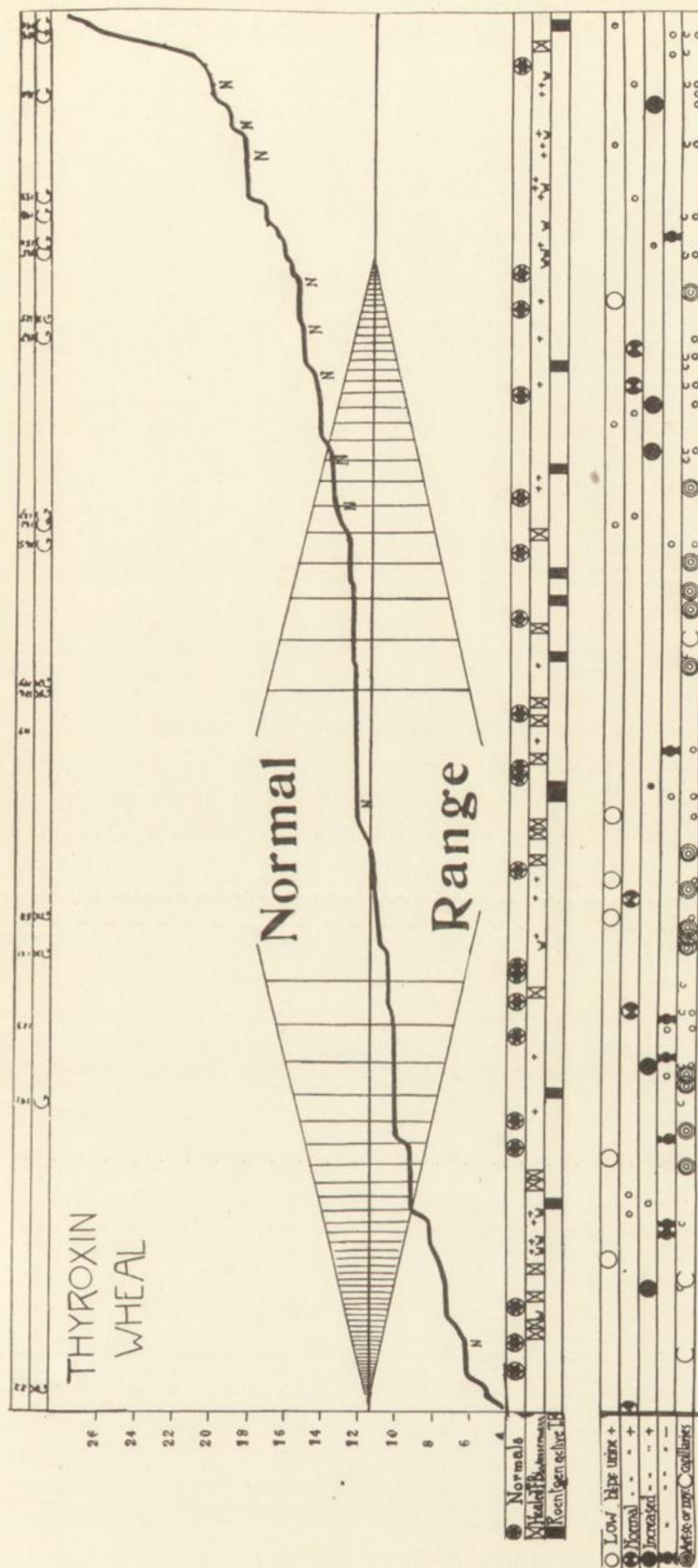


Chart 18.—The diameter of the wheal in the reaction to thyroxin of normal persons and patients with various clinical conditions.

Individual Number	Thyroxin, Wheal, Mm.	Diagnosis	Permeability of Capillaries Ratio	Inflammatory Index	Potassium, Mg.	K / Ca Ratio	Globulin, Mg.
158	28	Hodgkin's disease.....	61	4	18.53	2	17
140	27	Tuberculosis; glaucoma.....	68	4	29.7	2.6	37.5
154	26	Glaucoma.....	60	4	23.08	....	3
13*	22.6	Healed tuberculosis.....	64	8	23.8	2.48	20
60	21	Cardiovascular renal condition...	..	....	17.5	1.53	40
17*	20.6	Normal.....	66	8.2	18.2	1.43	17
117	20.2	Syphilitic arthritis.....	61	10	17.5	1.8	27
135	20	Nervous.....	84	14	19.6	1.65	45
160	20	Glaucoma.....	66	4.4	21.58	1.98	44
134*	19.2	Cardiovascular renal condition...	60	4	15.4	1.56	42
146	19	Myasthenia.....	75	5	14.4	1.56	32
149	19	Nervous.....	54	5.4	17.4	1.74	0
172	18	Raynaud's disease.....	72	0	21.3	1.64	....
136	18	Cardiovascular renal condition; pellagra	74	5	18.8	1.88	35
173	18	Tumor of the cord.....	57	8	21.3	1.57	6
166	18	Eosinophilia.....	57	8	20.6	2.27	8
171	18	Urticaria.....	64	10	21.37	1.68	....
169	18	Wassermann reaction +++; Buerger's disease	62	4.1	19.24	1.56	20
153	18	Glaucoma.....	76	5	18.7	2.08	0
138	17	Fröhlich's (?) syndrome.....	73	12	19.9	1.88	11
Averages	20.2		66	6.7	19.88	1.83	25.2

REACTIVITY TO THYROXIN: THE FLARE

In seventy-five persons, the intracutaneous injection of thyroxin produced no flare. This group includes the majority of the persons with glaucoma (eleven). Among those with flares, the "nervous" persons are numerous. No tables based on extremes have been prepared because of the large number of those with negative reactions (chart 19).

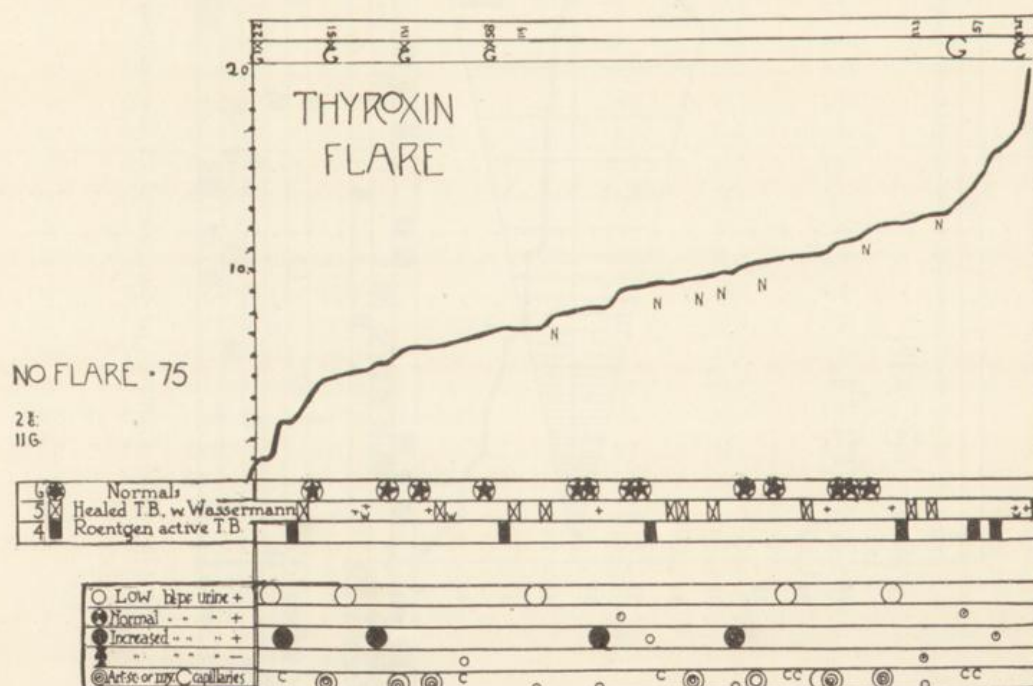


Chart 19.—The radius of the flare in the reaction to thyroxin of normal persons and patients with various clinical conditions.

IV. THE RELATION OF THE REACTION TO EPI- NEPHRINE TO THE POTASSIUM/CALCIUM RATIO AND TO OTHER RATIOS*

During the course of investigations dealing with a correlation of skin reactions with the blood chemistry and certain cardiovascular renal reactions, we have had occasion to study the effect of subcutaneous injections of epinephrine on the blood pressure of one hundred so-called "normal" men, as well as on about fifty patients who were ill from various diseases (glaucoma, exophthalmic goiter and other conditions). It is our purpose to enter into an analysis of these correlations in this paper.

It is agreed, we believe, that the original efforts of Eppinger and Hess¹ to classify all persons into groups that were vagotonic or sympathicotonic proved unsatisfactory, indeed confusing. There is no doubt that the emphasis placed on the study of the autonomic reactions of the patient has contributed immensely to the concept of the underlying factors of a number of disease conditions, but this study has added, for the time being at least, much uncertainty as well. Some of the confusion is due to the earlier concept that the autonomic apparatus consists merely of an equilibrated nervous mechanism with antagonistic impulses; to the pharmacologic aspect which has probably not infrequently failed to distinguish between direct protoplasmic action and selective action of the so-called autonomic drugs; to the fact that the cardiovascular response to epinephrine, for instance, need not be a criterion of its effect on other tissues. The great dependence of the reaction of individual organs or tissues on their state of activity when the autonomic impulse might become operative; the importance of the endocrine and humoral ionic milieu has been almost wholly disregarded. We seem warranted in believing at present that the original idea of Eppinger and Hess as to a one-sided preponderance of either the vagus or sympathetic nerve is incorrect; indeed, that when alterations do occur in the autonomic apparatus, both vagus and sympathetic nerves are involved; that when an apparent overbalance exists, overcorrection is usually apparent either in the organ or in remote regions; and that we deal not merely with an autonomic apparatus as such, but with more fundamental

* Article by Petersen, W. F.; Levinson, S. A., and Arquin, S., reprinted from Arch. Int. Med. **42**:256 (Aug.) 1928.

1. Eppinger, H., and Hess, L.: Ztschr. f. klin. Med. **68**:205, 230, 1909.