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PERIODIC VARIATIONS IN NORMAL URINE.

BY

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Innumerable analyses of urine have shown that even what may be considered normal samples exhibit considerable differences in composition. The purpose of the experiments here reported was to ascertain whether under ordinary conditions the urine of a single individual shows wide fluctuations in composition within short periods of time, and whether any regularities in these fluctuations could be established.

The experiments were made on urine from one of the writers, a student of twenty-three years, five feet ten inches in height, and weighing one hundred and forty pounds, of sedentary habits, and in fair general health. During the period of experiment, which extended almost continuously from March 8th to April 26th, some slight fever was experienced at times, apparently malarial, but otherwise the health conditions were quite normal.

OUTLINE OF THE EXPERIMENTS.

The experimental work included the determination for known time intervals of the volume excreted, the reaction with litmus paper, the color, the specific gravity, the percentage of urea. From these data there were calculated the volume per hour, the total solids per hour, the urea per hour, and the solids other than urea per hour.

In the following pages the word "excretion" means the entrance of the urine into the bladder; the urine was passed as completely as possible at the beginning and at the end of each period of excretion, and in many cases at other times during the period.

No attempt was made to control the diet, which was of a normal mixed character throughout, three meals being taken at about 7.30 a.m., 12 m. and 5.30 p.m., respectively, and no food at other times during the experiments in Series IV.

The experiments may be grouped in four series, each series covering completely, or nearly so, several consecutive days, except as stated below:—

Series I. Forty-four irregular periods, nearly consecutive, during 17 out of 19 consecutive days.

Series II. Thirty-two six-hour periods, consecutive except at one point, during ten consecutive days.

Series III. Thirty-seven consecutive four-hour periods during seven days.

Series IV. Thirty-six periods, consecutive except at one point, during seven out of eight consecutive days; the periods were so arranged as to cover especially the three hours immediately following each meal, with a view to learning the effect, if any, of gastric digestion.

EXPERIMENTAL METHODS AND CALCULATIONS.

The *volume* in cubic centimeters (c.c.) was measured with graduated cylinders, the *reaction* determined with sensitive litmus paper, the *color* recorded by comparison with Vogel's scale of urine tints as given in James Tyson's "Practical Examination of Urine" (pale yellow, light yellow, yellow, reddish yellow, yellowish red, red, brownish red, reddish brown, brownish black); the *specific gravity* was determined with a Vogel's urinometer, or hydrometer, at room temperature, corrections being made for variations from 15.5° centigrade by adding or subtracting .001 to or from the observed figure for every 3 degrees above or below the standard temperature; the *urea per cent.* was determined with a Doremus' ureometer, the urine being introduced into an alkaline sodium hypobromite solution and the grains of urea in 1 c.c. urine read on the graduations according to the volume occupied by the evolved nitrogen gas, and the reading multiplied by 100.

Certain other figures were calculated from these data, as follows:—The *volume per hour* in cubic centimeters was estimated by dividing the volume of the sample analysed by the number of hours elapsed during its excretion; the *solids per hour* in grams by multiplying the gravity above 1000 (water being taken as 1000) by Haser's coefficient, 2.33, dividing by 1,000 to obtain grams of solids per cubic centimeter, and multiplying the result by the volume per hour; the *urea per hour* in grams was estimated by multiplying the urea per cent by the volume per hour and dividing by 100; the *solids not urea per hour* in grams by subtracting the urea per hour from the solids per hour.

With regard to the accuracy and significance of the analytical results, it may be said briefly that methods commonly used in diagnosis were

purposely employed. The figures representing "solids," "urea," and "solids not urea," are necessarily not very exact, from the nature of the methods employed; different chemists have chosen various factors to apply to the gravity in the calculations of the solids, and it is known that the nitrogen evolved by sodium hypobromite is not all of that present in the urea and includes some from uric acid and creatinin; in spite of these absolute inaccuracies, however, the relative figures may be considered to fairly represent the variations in the constituents.

EXPERIMENTAL RESULTS.

The results obtained are presented in the following tables, each series being discussed separately.

Series I.

Forty-four irregular periods, nearly consecutive, during 17 out of 19 consecutive days.

- A Date of excretion.
 B End of period of excretion.
 C Length of period of excretion (hours).
 D Volume per hour (c.c.)
 E Reaction.
 F Color.
 G Gravity above 1000.
 H Solids per hour (grams).
 I Urea per cent.
 J Urea per hour (grams).
 K Solids not urea per hour (grams).

A	B	C	D	E	F	G	I	I	J	K
Mar. 8, 9	7 A.	12	41.7	Acid	Yel.-red	22	2.14	1.40	0.58	1.56
" 9, 10	6.30 A.	12	34.3	Acid	Red-yel.	23	1.84	1.45	0.50	1.34
" 10	6.30 P.	12	27.1	Neut.	Red-yel.	25	1.58	1.60	0.43	1.15
" 10, 11	6.30 A.	12	27.9	Acid	Red-yel.	27	1.74	2.10	0.59	1.15
" 11	7 P.	12	25.4	Acid	Red-yel.	27	1.60	2.20	0.56	1.04
" 11, 12	7 A.	12	31.7	Acid	Yel.-red	25	1.85	1.75	0.55	1.30
" 12	7 P.	12	28.7	Acid	Yel.-red	27	1.81	1.50	0.43	1.38
" 12, 13	7 A.	12	26.7	Acid	Yel.-red	30	1.87	2.30	0.61	1.26
" 13	1 P.	6	53.3	Alk.	Red-yel.	18	1.30	1.30	0.69	0.61
" 13	7 P.	6	30.8	Acid	Yel.-red	16	1.56	1.20	0.37	1.19
" 13, 14	7 A.	12	35.4	Acid	Yel.-red	21	1.73	1.65	0.58	1.15
" 14	1 P.	6	36.7	Alk.	Red-yel.	22	1.88	1.50	0.55	1.33
" 14	7 P.	6	41.7	Acid	Yel.-red	27	2.62	1.85	0.77	1.85
" 14, 15	7 A.	12	26.2	Acid	Yel.-red	24	1.47	2.20	0.58	0.89
" 15	7 P.	12	32.5	Acid	Yel.-red	29	2.20	2.35	0.77	1.43
" 15, 16	7 A.	12	29.2	Neut.	Red-yel.	23	1.56	2.20	1.01	0.55
" 16	1 P.	6	49.2	Neut.	Yel.-red	23	2.64	1.85	0.91	1.73

A	B	C	D	E	F	G	H	I	J	K
Mar. 16	7 P.	6	26.7	Acid	Yel.-red	32	1.92	3.00	0.80	1.12
" 16, 17	7 A.	12	40.8	Acid	Yel.	21	2.08	2.45	1.00	1.08
" 17	1 P.	6	30.0	Acid	Red-yel.	23	1.61	2.10	0.63	0.98
" 17	7 P.	6	32.5	Acid	Yel.-red	26	1.97	2.50	0.81	1.16
" 17, 18	7 A.	12	39.2	Acid	Red-yel.	20	1.83	2.20	0.86	0.97
" 18	1 P.	6	43.3	Neut.	Red-yel.	21	2.02	2.10	0.91	1.11
" 21	9 P.	4	20.0	Acid	Yel.-red	30	1.39	3.15	0.63	0.76
" 22	12 M.	3	35.0	Acid	Red-yel.	26	2.12	2.50	0.87	1.25
" 22	6 A.	6	40.0	Acid	Red-yel.	20	1.86	2.10	0.84	1.02
" 22	10 A.	4	47.5	Neut.	Red-yel.	19	2.10	1.40	0.66	1.44
" 22	4 P.	4	31.2	Acid	Red-yel.	26	1.90	2.70	0.84	1.06
" 22	9 P.	5	29.0	Acid	Red-yel.	27	1.82	3.15	0.91	0.91
" 22, 23	5 A.	8	28.7	Acid	Yel.-red	24	1.61	3.10	0.89	0.72
" 23	11 A.	4	45.0	Neut.	Yel.-red	23	2.41	2.00	0.90	1.51
" 23	5 P.	4	32.5	Acid	Yel.-red	27	2.05	2.40	0.78	1.27
" 23	10 P.	4	30.0	Acid	Red-yel.	29	2.03	3.00	0.90	1.13
" 23, 24	4 A.	6	36.7	Acid	Red-yel.	23	1.96	2.95	1.08	0.88
" 24	8 A.	4	46.2	Neut.	Red-yel.	21	2.26	2.10	0.97	1.29
" 24	1 P.	5	35.0	Neut.	Yel.-red	22	1.79	2.20	0.77	1.02
" 24	5 P.	4	26.2	Acid	Red-yel.	26	1.59	3.00	0.79	0.80
" 24	9 P.	4	28.7	Acid	Yel.-red	30	2.01	3.10	0.89	1.12
" 24, 25	3 A.	6	31.7	Acid	Red-yel.	24	1.77	2.70	0.86	0.91
" 25	7 A.	4	30.0	Acid	Yel.-red	24	1.71	2.40	0.72	0.99
" 25	11 A.	4	38.7	Neut.	Yel.-red	24	2.20	1.90	0.74	1.46
" 25	10 P.	4	28.7	Acid	Yel.-red	29	1.94	2.85	0.82	1.12
" 25, 26	4 A.	6	48.3	Neut.	Red-yel.	20	2.25	2.25	1.09	1.16
" 26	8 A.	4	75.0	Neut.	Yel.	14	2.45	1.20	0.90	1.55

Inspection of the results in Series I. shows the following:—

a. The volume per hour varied from 20.0 to 75.0 with an average of 35.3 c.c., or 847 c.c. in 24 hours. Considering the day to consist of four six-hour periods—night from just before midnight till just before 6 a.m., forenoon from 6 a.m. till noon, afternoon from noon till 6 p.m., and evening from 6 p.m. till midnight—and for each sample examined taking the middle of its period of excretion, the average for the night was 34.3, the forenoon 44.6, the afternoon 30.5, the evening 27.3 c.c.

b. The reaction was acid in 31, neutral in 11, and alkaline in 2 samples. Of the 13 samples not showing acidity all but 2 were forenoon excretions.

c. The color was yellow in 2, reddish yellow in 21, and yellowish red in 21 samples. As might be expected, the color was usually darker when the gravity was higher, both depending in the main on concentration, the average gravity for yellow samples being 1017, for reddish yellow 1023, and for yellowish red 1025.

d. The gravity varied from 1014 to 1032, with an average of 1024. The average for the night was 1023, the forenoon 1021, the afternoon 1026, the evening 1029.

e. The solids per hour varied from 1.30 to 2.64, with an average of 1.91 grams, or 46 grams in 24 hours. The average for the night was 1.83, the forenoon 2.07, the afternoon 1.90, the evening 1.84 grams.

f. The urea per cent. varied from 1.20 to 3.15, with an average of 2.20 per cent.

g. The urea per hour varied from 0.37 to 1.09, with an average of 0.76 grams, or 18.24 grams in 24 hours. The average for the night was 0.77, the forenoon 0.79, the afternoon 0.67, the evening 0.83 grams per hour.

h. The solids not urea per hour varied from 0.55 to 1.85, with an average of 1.15 grams, or 27.6 grams in 24 hours. The average for the night was 1.06, the forenoon 1.27, the afternoon 1.22, the evening 1.01.

It will be noted that the forenoon period in this series was exceptional in showing the greatest volume per hour, the least acidity, the lowest gravity, the maximum solids per hour, and the maximum solids not urea per hour. The lowest gravity and yet maximum solids indicates an exceptional excretion of water for this period, perhaps due to personal habit in ingesting considerable water early in the forenoon, with a consequent more thorough washing out of the system—not marked, however, in the case of urea. It is possible that this represents the product of the resting period immediately preceding.

Series II.

Thirty-two six-hour periods, consecutive except at one point, during 10 consecutive days.

	A	B	C	D	E	F	G	H	I	J	K
Mar. 28	6.30 P.	6	30.0	Acid	Yel.-red	27	2.05	2.80	0.84	1.21	
" 28, 29	12.30 A.	6	47.5	Acid	Yel.-red	22	2.44	2.60	1.23	1.21	
" 29	6.30 A.	6	24.2	Acid	Yel.-red	26	2.19	3.15	0.76	1.43	
" 29	12.30 P.	6	31.7	Acid	Yel.-red	24	1.77	2.50	0.79	0.98	
" 29	6.30 P.	6	35.8	Acid	Yel.-red	25	2.08	2.30	0.82	1.26	
" 29, 30	12.30 A.	6	63.3	Acid	Red-yel.	19	2.80	1.90	1.20	1.60	
" 30	6.30 A.	6	62.5	Acid	Red-yel.	16	2.33	1.30	0.81	1.52	
" 30	12.30 P.	6	50.8	Neut.	Yel.-red	22	2.60	1.45	0.74	1.86	
" 31	6.30 P.	6	30.8	Acid	Red	25	1.80	2.40	0.74	1.06	
" 31,											
Apr. 1	12.30 A.	6	25.0	Acid	Yel.-red	28	1.63	2.60	0.65	0.98	
" 1	6.30 A.	6	64.2	Acid	Red-yel.	17	2.54	1.40	0.90	1.64	
" 1	12.30 P.	6	66.7	Neut.	Yel.	18	2.80	1.20	0.80	2.00	
" 1	6.30 P.	6	32.5	Acid	Yel.-red	25	1.89	1.50	0.49	1.40	
" 1, 2	12.30 A.	6	25.8	Acid	Yel.-red	28	1.68	2.80	0.72	0.96	

A	B	C	D	E	F	G	H	I	J	K
" 2	6.30 A.	6	38.3	Acid	Red-yel.	23	2.05	2.00	0.77	1.28
" 2	12.30 P.	6	37.5	Acid	Yel.-red	21	2.08	1.70	0.64	1.44
" 2	6.30 P.	6	27.5	Acid	Yel.-red	28	1.79	2.30	0.63	1.16
" 2, 3	12.30 A.	6	26.7	Acid	Red-yel.	30	1.86	2.70	0.72	1.14
" 3	6.30 A.	6	25.8	Acid	Yel.-red	25	1.50	2.20	0.57	0.93
" 3	12.30 P.	6	58.3	Neut.	Yel.	19	2.58	1.45	0.85	1.73
" 3	6.30 P.	6	25.8	Acid	Red-yel.	29	1.74	2.50	0.65	1.09
" 3, 4	12.30 A.	6	30.8	Acid	Yel.-red	27	1.94	2.20	0.68	1.26
" 4	6.30 A.	6	26.7	Acid	Yel.-red	29	1.80	2.70	0.72	1.08
" 4	12.30 P.	6	25.0	Neut.	Yel.-red	28	1.63	2.40	0.60	1.03
" 4	6.30 P.	6	36.7	Neut.	Red-yel.	26	2.22	2.50	0.92	1.30
" 4, 5	12.30 A.	6	32.5	Acid	Red-yel.	27	2.04	2.70	0.88	1.16
" 5	6.30 A.	6	30.0	Acid	Yel.-red	26	1.82	2.40	0.72	1.10
" 5	12.30 P.	6	53.3	Alk.	Red-yel.	22	2.73	1.60	0.85	1.88
" 5	6.30 P.	6	40.0	Acid	Yel.	25	2.33	2.00	0.80	1.51
" 5, 6	12.30 A.	6	27.5	Acid	Yel.-red	24	1.54	2.30	0.63	0.93
" 6	6.30 A.	6	52.5	Acid	Yel.	16	1.96	1.40	0.73	1.23
" 6	12.30 P.	6	58.3	Neut.	Yel.	18	2.45	1.30	0.76	1.69

Inspection of the results in Series II. shows the following:—

a. The volume per hour varied from 24.2 to 66.7, with an average of 38.6 c.c., or 926 c.c. in 24 hours. The average for the night was 40.5, the forenoon 47.7, the afternoon 32.4, the evening 34.9 c.c.

b. The reaction was acid in 25, neutral in 6, and alkaline in 1 sample. Of the seven samples not showing acidity all but one, were forenoon excretions.

c. The color was yellow in 5, reddish brown in 9, yellowish red in 1, red in 1 sample. The color was again dependent on concentration, the average gravity of yellow samples being 1019, of reddish yellow 1023, of yellowish red 1026; the single red sample had a gravity of 1025.

d. The gravity varied from 1016 to 1030, with an average of 1024; the average for night samples was 1022, forenoon 1021, afternoon 1026, and evening 1026.

e. The solids per hour varied from 1.50 to 2.80, with an average of 2.08 grams, or 49.9 grams in 24 hours; the average of night samples was 2.02, forenoon 2.33, afternoon 1.99, evening 1.99 grams.

f. The urea per cent. varied from 1.20 to 3.15, with an average of 2.13 per cent.

g. The urea per hour varied from 0.49 to 1.23 with an average of 0.77 grams, or 18.5 grams in 24 hours; the average of night samples was 0.75, forenoon 0.75, afternoon 0.74, evening 0.84 grams.

h. The solids not urea per hour varied from 0.91 to 2.00, with an average of 1.31 grams, or 31.4 grams in 24 hours; the average for night samples was 1.27, forenoon 1.58, afternoon 1.25, evening 1.15 grams.

In this series, also, the forenoon period is exceptional in showing the maximum volume per hour, least acidity, maximum solids per hour, maximum solids not urea per hour—not, however, the maximum urea per hour.

Series III.

Thirty-seven consecutive four hour periods during seven days.

A	B	C	D	E	F	G	H	I	J	K
Apr. 7	10.30 P.	4	27.5	Acid	Red-yel.	30	1.92	3.00	0.82	1.10
" 7, 8	2.30 A.	4	28.7	Acid	Red-yel.	23	1.54	2.80	0.80	0.74
" 8	6.30 A.	4	30.0	Acid	Red-yel.	25	1.75	2.70	0.81	0.94
" 8	10.30 A.	4	36.2	Neut.	Yel.	26	2.19	2.60	0.94	1.25
" 8	2.30 P.	4	40.0	Acid	Red-yel.	24	2.23	1.90	0.76	1.47
" 8	6.30 P.	4	27.5	Acid	Red-yel.	27	1.73	2.40	0.66	1.07
" 8	10.30 P.	4	26.2	Acid	Red-yel.	30	1.83	3.00	0.79	1.04
" 8, 9	2.30 A.	4	41.2	Acid	Yel.	23	2.18	2.40	0.99	1.19
" 9	6.30 A.	4	36.2	Acid	Red-yel.	23	1.94	2.35	0.85	1.09
" 9	10.30 A.	4	27.5	Neut.	Red-yel.	24	1.54	2.30	0.63	0.91
" 9	2.30 P.	4	38.7	Neut.	Yel.	26	2.34	2.20	0.85	1.49
" 9	6.30 P.	4	35.0	Acid	Red-yel.	28	2.28	2.80	0.98	1.30
" 9	10.30 P.	4	28.7	Acid	Red	31	2.08	3.40	1.23	0.85
" 9, 10	2.30 A.	4	41.2	Acid	Red-yel.	22	2.11	2.80	1.15	0.96
" 10	6.30 A.	4	53.7	Acid	Yel.	18	2.25	2.20	1.18	1.07
" 10	10.30 A.	4	42.5	Neut.	Yel.	23	2.28	2.30	0.98	1.30
" 10	2.30 P.	4	36.2	Acid	Red-yel.	24	2.03	2.40	0.87	1.16
" 10	6.30 P.	4	28.7	Acid	Red-yel.	26	1.74	2.50	0.72	1.02
" 10	10.30 P.	4	30.0	Acid	Yel.-red	27	1.89	2.50	0.75	1.14
" 10, 11	2.30 A.	4	28.7	Acid	Red-yel.	24	1.61	2.40	0.69	0.92
" 11	6.30 A.	4	33.7	Acid	Red-yel.	21	1.65	2.20	0.74	0.91
" 11	10.30 A.	4	27.5	Acid	Yel.-red	24	1.54	2.50	0.69	0.85
" 11	2.30 P.	4	25.0	Acid	Yel.-red	26	1.51	2.00	0.50	1.01
" 11	6.30 P.	4	32.5	Acid	Yel.-red	29	2.19	2.90	0.94	1.25
" 11	10.30 P.	4	27.5	Acid	Yel.-red	31	1.98	3.50	0.96	1.02
" 11, 12	2.30 A.	4	35.0	Acid	Yel.-red	25	2.04	3.10	1.08	0.96
" 12	6.30 A.	4	50.0	Neut.	Red-yel.	19	2.21	2.10	1.05	1.16
" 12	10.30 A.	4	47.5	Neut.	Red-yel.	22	2.42	2.00	0.95	1.47
" 12	2.30 P.	4	35.0	Acid	Red-yel.	24	1.96	2.30	0.80	1.16
" 12	6.30 P.	4	33.7	Acid	Yel.-red	28	2.20	2.60	0.88	1.32
" 12	10.30 P.	4	32.5	Acid	Red-yel.	28	2.12	3.30	1.32	0.80
" 12, 13	2.30 A.	4	78.7	Acid	Yel.	16	2.93	1.40	1.10	1.83
" 13	6.30 A.	4	90.0	Acid	Yel.	15	3.14	1.50	1.35	1.79
" 13	10.30 A.	4	81.2	Neut.	Yel.	16	3.03	1.20	0.97	2.06
" 13	2.30 P.	4	40.7	Acid	Red-yel.	23	2.18	2.30	0.94	1.24
" 13	6.30 P.	4	38.7	Acid	Red-yel.	25	2.27	2.80	1.08	1.19
" 13	10.30 P.	4	33.7	Acid	Red-yel.	26	2.04	3.20	1.08	0.96

Inspection of the results in Series III. shows the following:—

a. The volume per hour varied from 25.0 to 90.0, with an average of 38.5 c.c., or 924 c.c., in 24 hours. The averages for the different periods beginning with that ending at 2.30 a.m. were, in order, 42.2, 48.9, 43.7, 35.9, 32.7, 29.4, c.c.

b. The reaction was acid in 30 and neutral in 7 samples. Of the seven samples not showing acidity five were for the period ending at 10.30 a.m. and the other two for the periods just before and just after this, respectively.

c. The color was yellow in 8, reddish yellow in 21, yellowish red in 7, and red in 1 samples. The color was again dependent on concentration, the average gravity of yellow samples being 1020, of reddish yellow 1025, and of yellowish red 1027; the single red sample had a gravity of 1031.

d. The gravity varied from 1015 to 1031, with an average of 1025; the averages for the different periods beginning with that ending at 2.30 a.m. were, in order, 1022, 1020, 1022, 1024, 1027, 1029.

e. The solids per hour varied from 1.51 to 3.14, with an average of 2.08 grams, or 49.9 grams in 24 hours; the averages for the different periods beginning with that ending at 2.30 a.m. were, in order, 2.07, 2.16, 2.17, 2.04, 2.07, 1.98.

f. The urea per cent. varied from 1.20 to 3.50, with an average of 2.50 per cent.

g. The urea per hour varied from 0.50 to 1.35, with an average of 0.92 grams, or 22.1 grams in 24 hours; the averages for the different periods beginning with that ending at 2.30 a.m. were, in order, 0.97, 1.00, 0.86, 0.79, 0.88, 0.99 grams.

h. The solids not urea per hour varied from 0.73 to 2.05, with an average of 1.16 grams, or 27.8 grams in 24 hours; the averages for the different periods beginning with that ending at 2.30 a.m. were, in order, 1.10, 1.16, 1.31, 1.25, 1.19, 0.99 grams.

In this series also one or other of the forenoon periods—either that ending at 6.30 a.m. or that ending at 10.30 a.m.—shows the maximum volume per hour, the least acidity, lowest gravity, maximum solids per hour, (very slight) maximum urea per hour, maximum solids not urea per hour.

Series IV.

Thirty-six periods, consecutive except at one point, during seven out of eight consecutive days. The periods were so arranged as to cover especially the three hours immediately following each meal, with a

view to learning the effect, if any, of gastric digestion; the meal hours were 7.30 a.m., 12.30 p.m., and 5.30 p.m.

A	B	C	D	E	F	G	H	I	J	K
Apr. 18	10.30 A.	3	46.7	Neut.	Yel.	22	2.39	2.10	0.98	1.41
" 18	12.30 P.	2	47.5	Acid	Red-yel.	23	2.54	2.30	1.09	1.45
" 18	3.30 P.	3	45.0	Neut.	Red-yel.	26	2.72	2.20	0.99	1.73
" 18	5.30 P.	2	37.5	Acid	Yel.	28	2.44	2.70	1.01	1.43
" 18	8.30 P.	3	40.0	Acid	Yel.-red	31	2.89	3.00	1.20	1.69
" 18, 19	7.30 A.	11	31.8	Acid	Yel.-red	24	1.78	2.20	0.70	1.08
" 21	10.30 A.	3	40.0	Acid	Red-yel.	27	2.52	1.90	0.76	1.76
" 21	12.30 P.	2	50.0	Neut.	Yel.	24	2.79	1.80	0.90	1.89
" 21	3.30 P.	3	40.0	Acid	Red-yel.	26	2.42	2.30	0.92	1.50
" 21	5.30 P.	2	35.0	Neut.	Red-yel.	26	2.12	1.90	0.66	1.46
" 21	8.30 P.	3	43.3	Acid	Red-yel.	27	2.72	2.30	1.00	1.72
" 21, 22	7.30 A.	11	54.5	Acid	Red-yel.	20	2.54	1.70	0.93	1.61
" 22	10.30 A.	3	51.7	Neut.	Yel.	22	2.65	1.70	0.88	1.77
" 22	12.30 P.	2	35.0	Acid	Yel.	20	1.63	1.70	0.60	1.03
" 22	3.30 P.	3	40.0	Acid	Red-yel.	25	2.33	1.90	0.76	1.57
" 22	5.30 P.	2	25.0	Acid	Yel.	24	1.40	2.00	0.50	0.90
" 22	8.30 P.	3	38.3	Acid	Red-yel.	27	2.41	2.50	0.96	1.45
" 22, 23	7.30 A.	11	30.9	Acid	Red-yel.	27	1.94	2.30	0.71	1.23
" 23	10.30 A.	3	41.7	Neut.	Red-yel.	26	2.52	2.50	1.04	1.48
" 23	12.30 P.	2	55.0	Neut.	Red-yel.	24	2.80	2.00	1.10	1.70
" 23	3.30 P.	3	40.0	Acid	Red-yel.	27	2.52	2.80	1.12	1.40
" 23	5.30 P.	2	42.5	Acid	Yel.	27	2.67	2.50	1.06	1.61
" 23	8.30 P.	3	46.7	Acid	Red-yel.	26	2.82	2.60	1.21	1.61
" 23, 24	7.30 A.	11	40.9	Acid	Red-yel.	23	2.19	2.40	0.98	1.21
" 24	10.30 A.	3	33.3	Neut.	Yel.-red	27	2.09	2.50	0.83	1.26
" 24	12.30 P.	2	47.5	Neut.	Yel.	25	2.76	2.10	0.99	1.77
" 24	3.30 P.	3	36.7	Acid	Red-yel.	27	2.31	2.60	0.95	1.36
" 24	5.30 P.	2	37.5	Acid	Red-yel.	26	2.27	2.80	1.05	1.22
" 24	8.30 P.	3	30.0	Acid	Red	29	2.03	3.40	1.02	1.01
" 24, 25	7.30 A.	11	29.1	Acid	Red	27	1.83	3.50	1.02	1.81
" 25	10.30 A.	3	25.0	Acid	Red	28	1.63	3.50	0.87	0.76
" 25	12.30 P.	2	50.0	Acid	Red-yel.	28	3.26	3.00	1.50	1.76
" 25	3.30 P.	3	38.3	Acid	Red	26	2.32	2.70	1.03	1.29
" 25	5.30 P.	2	42.5	Acid	Red	25	2.47	2.80	1.19	1.28
" 25	8.30 P.	3	26.7	Acid	Red	27	1.68	3.00	0.80	0.88
" 25, 26	7.30 A.	11	32.7	Acid	Red	25	1.91	2.70	0.88	1.03

Inspection of the results in Series IV. shows the following:—

a. The volume per hour varied from 25.0 to 55.0, with an average of 39.7 c.c., or 953 c.c. in 24 hours; the averages for the different periods beginning with that ending at 7.30 a.m. were, in order, 36.6, 39.7, 47.5, 40.0, 36.7, 37.5, c.c.; the average for periods of gastric digestion was 39.1, for other periods 40.3—practically the same.

b. The reaction was acid in 27 and neutral in 9 samples. Of the nine samples not showing acidity, four were for the period ending 10.30 a.m., three 12.30 p.m., one 3.30 p.m., and one 5.30 p.m.; five were for periods of gastric digestion, four for others—showing no apparent connection.

c. The color was yellow in 8, reddish yellow in 18, yellowish red in 3, and red in 7 samples. The color was nearly proportional to concentration, the average gravity of yellow samples being 1024, of reddish yellow 1026, of yellowish red 1027, and of red 1027.

d. The gravity varied from 1020 to 1031, with an average of 1026; the averages for the different periods beginning with that ending at 7.30 a.m. were in order, 1024, 1025, 1024, 1026, 1026, 1028; the average for periods of gastric digestion was 1024, that for other periods 1026.

e. The solids per hour varied from 1.40 to 3.26, with an average of 2.34 grams, or 56.2 grams in 24 hours. The averages for the different periods beginning with that ending at 7.30 a.m. were, in order, 2.03, 2.30, 2.63, 2.44, 2.23, 2.42; the average for periods of gastric digestion was 2.39; that of other periods 2.30.

f. The urea per cent. varied from 1.70 to 3.50, with an average of 2.40 per cent.

g. The urea per hour varied from 0.50 to 1.50, with an average of 0.95 grams, or 22.8 grams in 24 hours; the averages for the different periods beginning with that ending at 7.30 a.m. were, in order, 0.87, 0.89, 1.03, 0.96, 0.91, 1.03; the average for periods of gastric digestion was 0.96, for other periods 0.94 grams.

h. The solids not urea per hour varied from 0.76 to 1.89, with an average of 1.39 grams, or 33.4 grams in 24 hours; the averages for the different periods, beginning with that ending at 7.30 a.m. were, in order, 1.16, 1.40, 1.60, 1.48, 1.32, 1.39; the average for periods of gastric digestion was 1.42, for other period 1.36 grams.

In this series also the forenoon periods show the maximum volume per hour, least acidity, lowest gravity, maximum solids per hour, and maximum solids not urea per hour; the urea per hour was equally high in the evening. No marked differences are shown between periods of gastric digestion and other periods.

SUMMARY OF RESULTS.

A critical examination of the results presented shows the very wide variations in the urine of a single normal individual even within short time intervals; also, that some constituents differed widely in quantity from the figures commonly accepted as normal; and, further, that certain regularities obtained between properties and time of day.

a. The volume per hour varied from 20.0 to 90.0, with averages of 35.3, 38.6, 38.5, 39.7 in the four series—a grand average of 37.9 c.c., or 910 c.c. in 24 hours. This is decidedly less than the quantity usually accepted as normal—about 1500 c.c. in 24 hours. It may be stated that

numerous observations on students of this university have indicated the average to be not far from 1000 c.c. A decided maximum hourly volume is shown in every series before noon.

b. The reaction was acid in 113, neutral in 33, and alkaline in 3 samples. The supposed connection between alkalinity and gastric digestion is not apparent in any series; 30 of the 36 samples not showing acidity were forenoon samples. The results seem to indicate that rest rather than gastric digestion diminishes the acidity of the urine.

c. The color was yellow in 23, reddish yellow in 59, yellowish red in 48, and red in 9 samples. In the main darker colors accompany higher gravities, but many instances occurred of particular light-colored samples having higher gravities than certain others with dark color, showing that the pigments were roughly proportional in quantity to the total solids.

d. The gravity varied from 1014 to 1032, with averages of 1024, 1024, 1025, 1026 in the four series—a grand average of 1025. The figures agree well with those commonly accepted for normal urine, except that gravities above 1030 were of rather frequent occurrence—10 samples out of 149. In every series the forenoon samples showed decidedly lower gravity than the others.

e. The solids per hour varied from 1.30 to 3.26, with averages of 1.91, 2.08, 2.08, 2.34 in the four series—a grand average of 2.09 grams, or 50.2 grams in 24 hours. This is decidedly less than the quantity usually considered normal—about 72 grams in 24 hours. In every series a decided maximum occurred shortly before noon; this may be a result of the period of rest, or it may be connected with the fact that forenoon samples had a low gravity, as already noted, and a more complete washing out of the system resulted from the passage of larger quantities of water.

f. The urea per cent varied from 1.20 to 3.50, with averages of 2.20, 2.13, 2.50, 2.40 in the four series—a grand average of 2.31 per cent. This figure is somewhat higher than the accepted normal average of 2 per cent.

g. The urea per hour varied from 0.37 to 1.50, with averages of 0.76, 0.77, 0.92, 0.95 in the four series—a grand average of 0.85 grams, or 20.4 grams in 24 hours. This is just two-thirds the quantity usually considered normal—30 grams in 24 hours. No marked regularity involving the time of day is apparent except that the figures were relatively high in the evening in all series.

h. The solids not urea per hour varied from 0.55 to 2.05, with averages of 1.15, 1.31, 1.16, 1.39 in the four series—a grand average of 1.24

grams, or 29.76 grams in 24 hours. This is decidedly less than the quantity usually considered normal—about 42 grams in 24 hours, when the total solids are taken as 72 grams and the urea as 30 grams.

The figures presented show that in a normal individual the composition and character of the urine may vary widely within short periods of time, and that even the twenty-four hours' urine may differ considerably from accepted standards for a man of average size. Also, the urine excreted during the forenoon is in most respects noticeably different from that of other parts of the day.

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HYDATID DISEASE—REPORT OF 12 CASES AT THE MONTREAL GENERAL HOSPITAL: TWO OPERATIONS.

BY

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In presenting the following series of twelve cases of hydatid disease occurring in the service of the Montreal General Hospital and in reporting in detail two operative cases, I desire to call attention to the infrequency of this disease in this section of Canada, and to point out the difficulty in diagnosing intra-abdominal echinococcus cysts.

In 1882, Osler (1) collected from hospital records, journals, museums and personal experience, sixty-one cases for the whole of North America of which forty were native cases. Since then, isolated cases have been reported, from time to time, in Canada—and the rest of North America; but the total number on record is sufficiently small to warrant the collection of even a small series. Lyon (2), in 1902 collected 241 cases prior to this date, of which 58 per cent. occurred in Icelanders; 91 per cent. of all were foreign born; 71 cases occurred in Canada, and two were native Canadians.

The rarity of cases in Eastern Canada is easily explained by the comparatively small number of dogs in ratio to the human population. The *Taenia Echinococcus* finds its host in the dog, wolf and jackal, and, as the ova are excreted in the faeces, and reach the alimentary tract of

man, through contamination of surface water or food, we find that most cases occur amongst races where the number of dogs is large, and the domestic relationships between man and the dog are most close. Lyon's figures, showing 58 per cent. of all cases on this continent to have been Icelanders, are in keeping with the ratio of dogs to man in Iceland, viz. one to three. Iceland, Australia, parts of South America and districts in the Canadian North-West furnish a large majority of all cases reported.

Almost all cases are intra-abdominal, and the liver is the commonest organ affected. The embryos pass quickly from the gastro-intestinal tract into the portal radicals, and the solitary liver cyst is the most frequent result. The conditions of multiple omental and peritoneal cysts as is the second operative case I am reporting, is rather rare; and though I have found several instances recorded, most of them seem to have followed the rupture of a primary liver cyst, as occurred in the cases reported by Hartley (3) and Peyrot (4). Others are recorded by C. Phelps (5), Jackson of Queensland, and O'Connor of Buenos Ayres (6), in some of which the condition of multiple omental, and peritoneal cysts would appear to be primary. In such instances, it is asserted, the ova perforate the stomach, and intestinal walls, and develop into cysts beneath or on the peritoneal coat. All cysts seem to grow from the omentum or mesenterics rather than the parietal peritoneum, and are most common along the line of the colon.

Buck's Handbook of Medical Sciences states that fully 50 per cent. of all cases die within five years of time of infection, unless relieved by surgical means. In the face of such a mortality it would appear that laparotomy and proper surgical treatment of all liver and multiple cysts should be early carried out.

The following two cases, occurring in the summer service of Dr. J. M. Elder, in 1905, and one in 1902, in Dr. Shepherd's service, are the only ones that came to operation in the Montreal General Hospital in over forty years.

Mrs. N., aged 30, widow, admitted to the Montreal General Hospital under Dr. Elder, June 3rd, 1905, complaining of right sided abdominal pain with vomiting.

Personal History. She was born, and lived, in the south of England till she sailed for Canada, reaching Montreal one week prior to admission into hospital. She had been in domestic service since the age of ten, was married at age of twenty-four, had two pregnancies, last one five years ago, with tedious recoveries, and some puerperal infection both times. Ten years ago she suffered from "gastric ulcer," pain, vomiting,

hæmatemesis, for which she was for months in hospital, and later in a convalescent home. She "recovered completely," she states. After the first pregnancy, she was under treatment for "stomach trouble," this time had pain in epigastrium after food, vomiting, no hæmatemesis, but constipation and hæmorrhoids. After seven months she again recovered. This was between five and six years ago. Two years ago, in 1903, she had what she considered "lumbago," at which time she had pain in the back between the shoulder blades, behind the left scapula, and in the right hypochondrium, which was constantly present for considerable time. Associated with this there was tenderness in the epigastrium with some abdominal distension, and patient had to discontinue the wearing of corsets. She vomited several times, and there was an exacerbation of the usual constipation. She had never had jaundice, or attacks of hepatic colic. Appetite had always been good, and weight had been uniform.

For years past there had always been dogs in the house, usually two or more. She knew of no cases of similar disease in vicinity of Woolwich where she lived since her marriage.

Present illness. The patient landed in Canada, May 27th, 1905. Present acute attack began June 1st, preceded by one week's malaise, loss of appetite, and insomnia, with slight pain in the right iliac region. Within four hours of onset of severe pain, patient had to take to bed. She vomited several times. Extreme tenderness and abdominal distension with constipation suggested the diagnosis of acute appendicitis to the attending physician, and she was sent to the Montreal General Hospital in a street car on June 3rd, her symptoms having considerably abated.

On admission, there was slight elevation of temperature, 99°-100°; tongue slightly coated, slight abdominal distension—bowels had been moved with salines—some pain and general tenderness, the latter most marked in upper and lower right quadrants. Tympany was present throughout abdomen. An indefinite tumour mass was palpable on deep pressure in gall bladder region, and deep palpation caused acute tenderness there. There was slight tenderness in right vaginal fornix. There was retention of urine on 3rd and 4th of June. A diagnosis of appendicitis, with local peritonitis, and possible gall bladder disease, was made, and the patient was prepared for operation on June 7th, when local and general conditions had greatly improved.

Operation.—The anæsthetic was ether; the operator, Dr. J. M. Elder. The usual incision was made in the right semi-lunar line, at the level of the appendix and the peritoneum was found congested, but no free

fluid. The appendix was long, larger than usual, showed some adhesions, but was not inflamed or congested. It was removed. Through this incision the lower surface of the liver was palpated, and a large tumour was felt in the region of the gall bladder. The appendix wound was closed without drainage and a second incision one and a half inch long was made vertically from the tip of the eighth rib on the right side. The peritoneum was much thickened, and showed recent inflammatory characteristics. The gall bladder was normal. To the right of this, and attached to the lower edge of the liver was a large, tense, cystic, white, glistening, nodular tumour, the size of a goose's egg. The bowel was adherent to it. The abdomen was well walled off from it by swabs, and aspiration was attempted, but failed. The cyst was incised, and a large quantity of viscid fluid with daughter cysts was evacuated. After irrigation, the laminated mother cyst was pulled out by forceps under continuous irrigation, and the cyst cavity was packed with iodoform gauze. Hæmorrhage was slight. The edges of the cavity were brought up to the abdominal wall by silk worm gut sutures, and the wound closed as usual. Gauze was removed in forty-eight hours, and the patient made a good recovery, there being some discharge till the thirteenth day. Patient was up on the sixteenth day, and discharged on June 28th, three weeks after operation, both wounds perfectly healed, and abdomen presenting nothing abnormal. She reported on July 20th, and was quite well. Later she left Montreal and went to Owen Sound, where the upper wound reopened about September 1st, 1905, discharging some pus, and on last hearing from her, October 19th, 1905, the sinus was still open.

From the history one would judge that the growth of the cyst had begun about two years ago, and that the acute attack of peritonitis was due to a spread of continuity through the cyst wall, rendered tense by this time, of the ptomaines or toxins which are evolved by the echinococcus in its cyst-forming stage. Authors point out the sudden infection, sometimes fatal, that follows on an intra-abdominal rupture of one of these cysts. And, as in gall-bladder disease—empyema, without rupture, but under tension—we get a well marked peritonitis, it is likely that, similarly, the echinococcus produced the condition of peritonitis which brought the patient to the hospital. The infrequency of this intra-abdominal condition predisposes to a mistake in diagnosis as occurred in this case, especially as there was, co-existing with the signs of peritonitis in the gall-bladder region, local pain and tenderness in the region of the appendix vermiformis.

Case I.—S. M. C., aged 37, labourer in coal yard, resident of Montreal.

Personal History.—Born in Ireland, came to Canada sixteen years ago; had smallpox at age of nine, was in Montreal General Hospital with right sided pleurisy and pneumonia in March, 1904; no family history of tuberculosis. The patient lost about fifty pounds in three months prior to admission.

Present Illness began suddenly August 13th, 1905, three days before admission to the medical side of the Montreal General Hospital under Dr. Lafleur, to whom I am indebted for the notes of his case prior to his transference to Dr. Elder's service on September 17th. Onset was with acute pain in the region of the umbilicus, which continued with lessening severity till after admission. Pain was cramplike and worse at night. Abdominal distension was noted next day, and patient vomited but once, on August 15th. Bowels were regular; no special abdominal tenderness was noted.

Condition on admission. Poorly nourished man, complexion muddy, slight icterus of conjunctivæ.

Respiratory system. Has had cough for four years, and mucopurulent expectoration, now showing tubercle bacilli. Both bases and left apex show physical signs of tuberculous infiltration. Temperature range was 99° to 100½.

Alimentary system. Appetite good, bowels regular, tongue coated, abdomen distended and very tense, tenderness about umbilicus. The percussion note is dull all over the abdomen, no change with change of position, marked fluctuation present. A lobulated nodular mass is to be felt in the right hypochondrium.

On August 18th, an aspirating needle was inserted midway between the umbilicus and pubes in the median line and thirty-five ounces of greenish yellow fluid—"bile stained pus"—was withdrawn. It was then made out that the liver was not enlarged, and the spleen was not palpable. A nodular mass could be felt midway between navel and the end of the ninth rib on the right side. Three days later the case history states that dullness was again extending down from the hepatic cardiac dullness to one inch below the umbilicus; marked fluctuation and succussion was found over dull area. On August 27th, six days later, a marked friction rub was felt by the hand laid on the epigastric region. Patient was free from pain and tenderness. He then developed double otitis media, and was under Dr. Stirling's care.

On September 15th Dr. Elder saw him in consultation and agreed with the medical diagnosis of tubercular peritonitis and advised exploratory laparotomy, for which he was transferred to the surgical side on September 17th, and was operated upon, the following day, under ether anæsthesia by Dr. Elder, when a most interesting intra-abdominal con-

dition was found. An incision three inches long in the median line above the umbilicus revealed a thickened peritoneum, but it was smooth and glistening, and showed no miliary tubercles. There was no free fluid. The great omentum was dark red, thickened, somewhat stringy in appearance, and showed numerous firm, tense, whitish bodies, some yellow in colour, varying in size from pin heads to small cystic tumours the size of plums. They had no pedicle; they shelled out readily in most cases without bleeding, and were sub-serous. Some contained a clear, but viscid fluid, whilst others were more fluid. There were general soft adhesions throughout the abdomen, and very dense adhesions of the transverse colon, and in the region of the under surface of the liver. A tongue shaped lobe of liver-substance projected down to the left of the median fissure, dark purple, but showing minute whitish spots, suggestive of miliary tubercles. There was no tumour mass or area of softening made out of it. Gall bladder was normal. The gastro-hepatic omentum was adherent to the liver, also the colon to neighbouring structures, and these adhesions were dense. Along the course of the colon, as far as the sigmoid, were multiple cystic tumours, several large ones in the region of the spleen. The bowel throughout was smooth, and normal, in appearance. No enlarged mesenteric or retro-peritoneal glands were palpable. Many of the tumours were removed; the abdomen was flushed out with hot saline solution, and was closed without drainage. It was noteworthy that there was nothing to be found of the large cyst which was tapped on the medical side, and absolutely no free fluid was found. The patient made an uninterrupted recovery, and left the hospital October 7th, three weeks after operation. On that day his abdomen was moderately and symmetrically distended, but rather more in the region above the umbilicus; it was soft, not tender, and there was no fluctuation, no mass palpable, but the abdomen gave the impression of containing fluid. Percussion above the umbilicus gave a dull note, impairment in flanks, save in the right iliac fossa, which was tympanitic. The patient had no pain, and all functions were normal.

This case was most interesting in that there was a general peritoneal involvement, and no evidence at operation of a primary liver cyst. Patient was shown, December 1st, before the Montreal Medico-Chirurgical Society. He then had a large median cyst above the umbilicus, very tense; and, to its right at the lower border, a second smaller cyst, about the size of a marble could be felt. The large cyst was about seven, by seven and a half inches. There was no tenderness or pain, and the patient was experiencing no difficulty in shovelling coal ten hours a day. The hypogastric veins were enlarged. There was no

ascites. Operation was advised, but for the present refused. Evidently since the operation some of the small cysts have taken on growth, and the number of such cysts still present is difficult of determination. Cases of repeated operation, finally resulting in cure, are noted, and as this patient's physical condition is good this procedure will be carried out if he consents. His pulmonary symptoms are not so evident as they were; he has very little cough or expectoration.

In both cases the hospital pathologist, Dr. B. D. Gillies, reported a laminated cyst wall with numerous hooklets—echinococcus cyst.

The interest which these two cases aroused induced me to search the records of the Montreal General Hospital for cases of hydatid disease, and I find them very rare. Prior to 1882, Osler collected some three cases, two of which were found post-mortem at the Montreal General Hospital, and one was found accidentally in the cadaver at the summer class of operative surgery in 1877. These he has reported.

In searching the records I find a case of hydatid disease recorded in 1871, and this case was discharged from the hospital, not reaching Osler's series. Besides this, a case in 1867 of hydatid cyst of the liver was mentioned in one of the early annual reports of the hospital, and may be the case Osler mentions in his article, as having been said to have come to post-mortem, but which he did not include in his series. Prior to 1882, then, we find four cases of solitary liver cyst. Since 1882 I found but four cases in post-mortem records comprising over 2,500 autopsies up to date, November, 1905, or one in about 850 autopsies. There have been three cases that came to operation, making a total of seven cases since 1882 which, with five cases before that date, make a small total of twelve cases in the records of the Montreal General Hospital. All of these cases I have tabulated briefly in sequence:

Case I.—Mentioned in annual report of the Montreal General Hospital, in year 1867. No history. "Hydatides-hepatis: died." Cannot find autopsy record. (Not published.)

Case II.—Annual report of Montreal General Hospital for 1871. No history. "Hydatides uteri: discharged." (Not published.)

Case III.—Case I in Osler's series and autopsy record found in Pathological Reports of the hospital for 1877 and 1879. This case was the one found in summer class of operative surgery in 1877. Patient was an adult tramp dying of pneumonia; no past history obtained. Cyst was size of orange with daughter cysts and hooklets, situated in the right lobe of the liver.

Case IV.—English woman, æt. 40, died of pneumonia, single cyst in

liver, hooklets found in pultaceous mass in cyst in liver. No history, date not given (Case II in Osler's series).

Case V.—No. 4 in Osler's series was one of a single cyst in liver with no history.

Case VI.—Was one found post-mortem by Dr. Lafleur, and reported by him before the Montreal Medico-Chirurgical Society on February 5th, 1892.⁷ Patient died of thrombotic softening of the pons, and post-mortem revealed a calcified echinococcus cyst in right lobe of liver, specimen No. 37. 48 in the museum of the McGill Medical Faculty. No definite history obtained as to residence or nationality, but was not a native of Canada. This case was found in 1888.

Case VII.—Was one that came to autopsy September 5th, 1896, dying of genito-urinary infection; service Dr. Shepherd. In the liver was a greyish white cyst shelling out easily, containing pale fluid and translucent granules on cyst wall, characteristic laminated wall, and hooklets present. One ascaris was found in stomach, and one in small intestine. Patient was a man aged 69.

Case VIII.—Autopsy No. 82, 1895. Private case of Dr. Glen, no history, male, adult, died of pyloric colloid cancer. Liver showed three encapsulated caseous masses, size of walnuts. These showed laminated walls, and prolonged search showed a few hooklets. (Not published.)

Case IX.—Autopsy No. 21, 1900, female, aged 36, service Dr. Finley (case report medical series 1900, No. 65). Patient was a native of Ireland, had lived in Canada since infancy, no gastric history, cardio-renal case. The post-mortem showed in the dome of right lobe of the liver a white, hard nodule which proved to be an echinococcus cyst. (Not published.)

Case X.—Case of a Roumanian, teacher, male, aged 41, in Montreal five weeks before admission to Dr. Blackader's ward, Montreal General Hospital, complaining of pain and swelling beneath sub-costal margin on right side. Under anæsthetic, tumour made out, giving fluctuation; on aspiration, clear fluid found, no hooklets found. He was transferred to surgical side, and operated on by Dr. Shepherd, when a large cyst attached to the liver was found, and on being incised it was found to contain clear fluid, no bile, and many hooklets and scolices. Drainage used and patient was discharged on 45th day with small sinus at operation site. Case was diagnosed previous to operation by Dr. Ridley McKenzie and reported by him.⁸ This case entered hospital on August 20th, 1902.

Case XI.—Female, native of England, aged 30, entered hospital June 3rd, 1905; single cyst in liver. Operation: recovery. Specimen in museum of McGill Medical Faculty. (Not published.)

Case XII.—Male, in Canada fifteen years, aged 37. Entered hospital August 16th, 1905. Multiple omental and peritoneal cysts. Operation. Specimen in museum of McGill Medical Faculty. (Not published.)

I desire to express my gratitude to Dr. Elder for the privilege of reporting these two cases, and to Dr. Gillies, and others, for aid in the search for cases in the records of the hospital.

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THE CURABILITY OF PULMONARY TUBERCULOSIS; WITH REPORTS OF CASES TREATED BY INHALATION OF OZONE.

BY

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Our progress in the treatment of pulmonary tuberculosis has already been so great, and the results in many cases so satisfactory that it is now very generally admitted by advanced thinkers in the medical profession that pulmonary tuberculosis is a curable disease. The truth of this is frequently verified by post-mortem examinations. Indeed, it is well for the physician to bear this in mind and inspire this belief in the minds of his patients.

Early diagnosis, isolation, education and the careful destruction of the sputa, have already done much to lessen the mortality from what has been appropriately called the white plague.

For many ages, almost since the dawn of medical science, it has been recommended that persons suffering from consumption should reside in an elevated pine forest, living and sleeping in the open air; that is to say, that patients have been advised to live in an atmosphere of fresh air, laden with ozone, and thoroughly permeated with the aroma of a germacidal carbonaceous vegetable oil.

To-day we find, that the open air treatment is the principal feature in the very satisfactory and successful campaigns which are carried on under the most advanced and enlightened opinions of the leading medical men in the various sanatoria, which are now being established in

nearly every civilized country in the world. Many cures, or at least improvements, are reported as having been effected at those institutions.

Attention to the stomach and digestive organs is of first importance, nourishment is the mainspring of success. Upon it depends the success of all treatment. Whatever aids nutrition, digestion, assimilation and metabolism is of the greatest value in the treatment of pulmonary tuberculosis. It is, therefore, very important that the food should be highly nutritious, easily digested and rich in proteids. It should consist chiefly of milk, raw eggs, rare cooked meats, game, fish, oysters, vegetables, wholesome bread, lactalbumin, etc. The most essential of these is lactalbumin, which is the soluble proteid of milk, and is made by treating whey with alcohol. Cow's milk, with the exception of colostrum, contains one-half per cent. of this proteid and immediately after calving sixteen per cent. of lactalbumin, and this diminishes to one-half per cent. on the eighth day. Farmers are well aware that this colostrum or milk during the first eight days has a stimulating and invigorating influence on the young. In the case of the mare immediately after foaling, the milk contains eighteen per cent. of lactalbumin. This excess of lactalbumin in the milk of the mother after the birth of her young is an inconvertible law in the mammalia. Human milk contains three times as much lactalbumin as cows milk. Lactalbumin is soluble, requires no digestion, is rapidly absorbed, easily assimilated and acts not only as a food, but by its stimulating influence through the nervous system aids the digestion and assimilation of other foods. The system will absorb from soluble proteid, five times the amount necessary to sustain the equilibrium of nitrogenous products in the body, thus fortifying nature in her fight with disease.

In addition to the above, during the past five years I have used with marked results, ozone with camphoric super-oxide as a carrier. As is well known to the medical profession, inhalation of ozone in a highly concentrated forms is very irritating to the air passages. We find, however, that this difficulty may be overcome by inhaling nebulized camphoric superoxide for three minutes, when it is then possible to breathe ozone in almost any reasonable strength without irritation. This, no doubt, is due to the fact that the mucus membrane of the air passages becomes coated with the peroxidized oil, which is at once decomposed in the presence of the moisture liberating cineol and passing on nascent or active oxygen into the tissues. The cineol again takes up oxygen from the ozone, and then redecaying, in this way acts as a continual carrier for the oxygen. Ozone thus inhaled into the lungs oxidizes and destroys the various toxins produced by the

bacilli, and also at the same time vitalizes the corpuscles of the blood and consequently the circulation of the entire body. Pure, rich ozonized blood, as is well known, means resistance to disease and offers the best condition of cure where disease has gained a foothold. Camphoric superoxide $C_{10}H_{18}O_2$ is made by passing ozone through cineol $C_{10}H_{18}O$, the active constituent of the oil of eucalyptus globulus. Chemists tell us that this oil has the property of decomposing in the presence of water liberating peroxide of hydrogen.

For the production of ozone I have found it economical, advantageous and convenient to use an electrical generator invented by A. S. Ramage of Cleveland, now of Detroit. It is run by an alternating current of 110 volts. The current is regulated by a controller by means of which any desired strength of ozone can be produced, even to the extent of forming nitrogenous compounds, which may set up an acute bronchitis, but in that event it must be remembered that the inhalation of the ozone should be discontinued for a few days until this active condition has subsided. The generator is placed in the patient's bedroom, which should be large, well ventilated, and situated so that it will receive the greatest possible amount of sunlight. After the patient has inhaled and nebulized camphoric superoxide for three minutes, the current is turned on and the generator allowed to run from eight to thirty minutes, according to the size of the room, strength of current and stage of disease. The patient rests in this atmosphere from 9 p.m. to 7 a.m., and for four hours during the day with windows and doors closed. During the intervals the room should be thoroughly ventilated and the patient should take exercise in the open air. An exception to the above should be taken in cases where patients have high temperatures,—they should then have perfect rest.

I find that five or six weeks of this treatment in cases not too far advanced, have resulted in a marked improvement. There has been a noticeable reduction in the temperature and in the rate of the pulse. The cough and expectoration have diminished, the bacilli have gradually disappeared from the sputum, and the appetite has improved, the patients have gained in strength, and there has been a decided increase in vitality. All the cases treated during the early stages, and also a few in the advanced stages, have been apparently cured in from two to six months. In advanced and hopeless cases, although lives have not been saved, the patients experienced considerable relief and comfort.

Case No. 1.—Miss D., aged 27, consulted me on April 21st, 1900, suffering from pulmonary tuberculosis. She had been in failing health for some time, had an irritating cough with abundant expectoration.

Physical examination showed slight dulness, increased vocal fremitus, dry, moist and crepitant-ales, prolonged expiratory murmur and increased voice sounds over the right supraclavicular, clavicular, and subclavicular regions. Examination of the sputum showed the presence of bacilli of tuberculosis.

I advised fresh air treatment, attention to diet, etc. On September 15th, 1900, physical examination showed the disease to be advancing. There was evidence of a small cavity in the apex of the right lung, temperature ranging from 99 to 102°, pulse 110 to 120, cough and expectoration increased. On September 25th, 1900, treatment with ozone was commenced. She slowly but gradually improved till February 22nd, 1901, when all evidence of active disease in the lungs had disappeared. In May she went out to the Canadian North West, returning on December 16th, 1901, with a relapse. There were a few moist rales over the apex of right lung. She at once resumed treatment with ozone, and after six weeks the lungs were apparently free from active disease. She returned to her home in Colerain, Ont., on February 1st, 1902. It is now three years and eight months since the treatment with ozone was discontinued. There has been no return of the disease and she is at present in perfect health.

Case No. 2.—Mr. S., aged 35, consulted me on October 25th, 1900. Physical examination showed marked dulness, prolonged expiratory murmur, exaggerated voice sounds and moist rales over the upper lobe of left lung, pulse 110, temperature 102. Examination of the sputum showed the presence of the bacilli of tuberculosis.

On November 5th, 1900, treatment with ozone was commenced. After six weeks there was a marked improvement, and at the end of three months all evidence of active disease in the lungs had disappeared. It is now four years and eight months since the treatment with ozone was discontinued. He has had no return of the disease, has followed his usual employment as manager of a lithographic company and is at present in perfect health.

Case No. 3.—Mr. D., aged 25, a farmer, consulted me on May 4th, 1901. For two years before consulting me he had been under treatment for pulmonary tuberculosis. Physical examination showed extensive tubercular deposits in the upper lobes of both lungs. Tubercle bacilli were present in the sputum in numbers, pulse 110, temperature 103, chills and night sweats. I considered the case too far advanced for treatment, but at the earnest solicitation of his father I decided to give him a trial.

He commenced treatment with ozone on May 6th, 1901. After a

few weeks his symptoms showed marked improvement, which continued till August 1st, 1901, when all evidence of active disease in the lungs had disappeared, and he returned to his home in Gorrie, Ont. On February 8th, 1905, three years and six months after the treatment with ozone had been discontinued I received a letter from him in which he states that he has had no return of the disease, and that he is at present feeling perfectly well and strong and working in a flour mill.

Case No. 4.—Miss S., aged 21, a domestic, consulted me on December 1st, 1901. Family history, mother and two sisters died of consumption, the patient being the only survivor of the family. For about two months she had been troubled with cough, profuse expectoration and night sweats. Physical examination showed evidence of a slight deposit in the upper lobe of left lung. Examination of the sputum showed the presence of the bacilli of tuberculosis.

Treatment with ozone was commenced on December 7th, 1901, and continued for eleven weeks, when all evidence of active disease of the lungs had disappeared, and the treatment was discontinued. She resumed her former employment as domestic and enjoyed good health for two years and six months. On October 12th, 1904, she was seized with pleuritic pain in the left side while working as a domestic in a summer hotel in Muskoka. She consulted me on October 25th, 1904. Physical examination showed the left pleural cavity filled with fluid, pulse 104, temperature 102. On November 20th I aspirated and drew off four pints of a clear fluid, slight cough and expectoration continued. On January 10th, 1905, examination of the sputa showed the presence of the bacilli of tuberculosis. She resumed treatment with ozone on February 8th, and gained rapidly in flesh and strength till July 1st, when her pulse and temperature were normal, and the lungs showed marked improvement. On account of financial reasons the treatment was discontinued, and she went to the country to visit friends, returning to Toronto on September 1st, feeling well and strong, but physical examination showed that there was still active disease in the lower part of the upper lobe of left lung. She is at present working in a factory running a sewing machine during the day and studying stenography in the evenings. When circumstances permit she intends having the ozone generator installed in her sleeping apartment.

Case No. 5.—Mr. G., aged 21, consulted me on April 11th, 1902; he had been in failing health for five months, temperature 100, pulse 90. Physical examination showed tubercular deposits in the upper lobe of left lung, and the bacilli of tuberculosis were present in the sputum.

He commenced treatment with ozone on April 20th, 1902, and, after

two months all trace of active disease in the lungs had disappeared. It is now three years and four months since the treatment with ozone was discontinued. He has had no return of the disease, has followed his usual employment, and is at present in good health.

Case No. 6.—Mr. Q., aged 50, consulted me on June 25th, 1902, for hæmoptysis. Physical examination showed dulness, increased vocal fremitus, prolonged expiratory murmur, and moist rales over the upper lobe of right lung, pulse 95, temperature 100. Examination of the sputum showed the presence of the bacilli of tuberculosis.

He commenced treatment with ozone on June 27th, 1902. After two months all evidence of active disease in the lungs had disappeared. It is now three years and two months since the treatment was discontinued. He has had good health, no return of the disease, and follows his usual employment as street car conductor.

Case No. 7.—Miss B., aged 16, consulted me on January 17th, 1903, For the past three months she had been under medical treatment for typhoid fever. She had coughed with slight expectoration, temperature 101, pulse 120, and the bacilli of tuberculosis were present in the sputum. Physical examination showed slight dulness and few moist rales over the apex of the left lung, the abdomen slightly distended and tender.

Treatment with ozone was commenced on January 22nd, 1903. As there was evidence of fluid in the abdominal cavity, I opened the abdomen on February 10th and found the peritoneum studded with tubercles. The peritoneal cavity was thoroughly washed with hot normal salt solution. The patient made a good recovery. On April 6th, 1903, all evidence of active tubercular disease had disappeared, and she returned to her home in Woodstock. It is now two years and six months since the treatment with ozone was discontinued. There has been no return of the disease, and she is at present in perfect health.

Case No. 8.—Miss S., aged 22, a stenographer, consulted me on September 20th, 1903. One year previous she had had two enlarged cervical glands removed from the right side of the neck. For the past six months she had been under medical treatment for pulmonary tuberculosis. The bacilli of tuberculosis were present in the sputum. Temperature 101, pulse 98. Physical examination showed tubercular deposits in the upper lobe of right lung. There was marked dulness, dry and moist rales, prolonged expiratory murmur and increased voice sounds all over this lobe.

Treatment with ozone was commenced on September 25th, 1903. For two weeks the temperature ranged from 99 to 101, pulse 90 to 100. After this the temperature and pulse fell gradually, reaching normal on

November 10th, 1903, when all physical signs of active disease in the lungs had disappeared, and an examination of the sputum showed the absence of the bacilli of tuberculosis. It is now two years since the treatment was discontinued. She has had no return of the disease, has followed her usual employment as stenographer, and is at present in perfect health.

Case No. 9.—Mrs. R., aged 35, consulted me on April 10th, 1904. For the past year she had been under treatment for pulmonary tuberculosis. In February, 1903, she had a severe hæmorrhage from the lungs, after which her physician found the bacilli of tuberculosis present in the sputum.

She had a persistent cough with profuse expectoration, was very weak and emaciated, temperature 101, pulse 120. Examination of the sputum showed the bacilli of tuberculosis still present in numbers. Physical examination showed extensive tubercular deposits in the upper lobes of both lungs.

Treatment with ozone was commenced on April 15th, 1904. For six weeks the temperature ranged from 97 to 102, pulse 115 to 120, cough and expectoration increased. After this there was gradual improvement until August 20th, when all signs of active disease in the lungs had disappeared. Examination of three specimens of sputum showed absence of the bacilli of tuberculosis. On September 1st, 1904, she returned to her home in Newfoundland. I had a report from her ten months later saying that there had been no return of the disease, and that she was enjoying good health.

Case No. 10.—Mrs. H., consulted me on August 16th, 1904. Her father, mother and one son had died from pulmonary tuberculosis, and one daughter, aged 13, had had the disease for three years. For six years she had been in poor health, and for the past two years had been under medical treatment for pulmonary tuberculosis. She suffered much from cough and dyspnœa, temperature 102, pulse 120. The bacilli of tuberculosis were present in numbers in the sputum. Physical examination showed extensive tubercular deposits in the upper lobe of both lungs.

She commenced treatment with ozone on September 10th, 1904, and on September 20th had a severe attack of acute bronchitis, temperature 103, pulse 120, respirations 30, with distressing dyspnœa. The ozone was discontinued for three days when it was resumed. After this she gradually improved until December 10th, when all symptoms of active disease in the lungs had disappeared and the treatment with ozone was discontinued. She had gained rapidly in flesh and strength, and on

December 20th resumed her household duties, doing all the work for a family of eight. In June she seemingly contracted a cold, but on examination I detected a few rales at the apex of the left lung and the bacilli of tuberculosis present in the sputum. She resumed treatment on June 20th by sleeping in the ozone atmosphere during the night and working during the day. She is gradually improving and still under treatment.

Case No. 11.—Miss H., aged 13, mentioned in the report of case No. 10 as daughter, consulted me on September 1st, 1904, pulse 100, temperature 102. Physical examination showed extensive tubercular deposits in the lower lobe of left lung. The bacilli of tuberculosis were present in the sputum.

She commenced treatment with ozone on September 10th, 1904, using it in the same room with her mother. After three months' treatment all evidence of active disease in the lungs had disappeared. It is now ten months since the treatment with ozone was discontinued. There has been no return of the disease and she is at present in good health and working as a clerk in a store.

Case No. 12.—Mr. St. J., aged 23, consulted me on October 31st, 1904. He had been in the National Sanitarium for the past five months. His history, as given by the patient, indicated that the disease was advancing. Physical examination showed tubercular deposits all over the upper lobe of left lung, temperature 101, pulse 120. Treatment with ozone was commenced on November 23rd, 1904, at his home in Uxbridge, and, as the electric current was not available during the day he was only able to be in the ozone atmosphere during the night. After four months' treatment all evidence of active disease in the lungs had disappeared. It is now seven months since the treatment with ozone was discontinued. There has been no return of the disease, he has gained rapidly in flesh and strength and is at present in perfect health.

Case No. 13.—I was called to see Mr. M., on June 16th, 1905. His history as given by the patient indicated that he had been suffering from pulmonary tuberculosis for two years and six months, and had just returned from the National Sanitarium, where he had been under treatment for the past four months. He was very weak and confined to bed.

Physical examination showed extensive tubercular disease all over both lungs. In the right lung there were three large cavities, one in each lobe. I considered his case hopeless, but, at his earnest solicitations I installed in his room an ozone generator. The ozone gave him much relief and comfort, cough and expectoration diminished, his

strength improved, and for two months he had great hopes of recovery.

I visited him on September 10th and found him enjoying a smoke. He expressed himself as feeling well, with scarcely any cough or expectoration, able to take moderate exercise and had visited the Toronto Exhibition.

Physical examination showed very few rales over the lungs. The cavities dry and much contracted. I was called to see him a week later. He was suffering from congestion of the lungs, from which he died after thirty-six hours illness.

Case No. 14.—On March 13th, 1905, I was called to see Miss B., aged 24, who was suffering from pulmonary tuberculosis. She had been confined to bed for the past three months. Physical examination showed extensive tubercular disease of both lungs, with several cavities. The case was too far advanced to hope for any permanent benefit, but, as the patient was very anxious to have the ozone, the generator was installed in her room on April 12th. She experienced great relief, but grew gradually weaker, and died in August.

Case No. 15.—Mr. S. consulted me on May 13th, 1905. His mother died of consumption. He had been under treatment for pulmonary tuberculosis in the National Sanitarium, and from the patient's history the disease had advanced while there. Physical examination showed extensive tubercular disease in the upper lobe of left lung, and in the upper and middle lobe of right lung with three small cavities.

He commenced treatment with ozone on May 15th, and gradually improved until September 21st, when all signs of active disease in the lungs had disappeared and the treatment was discontinued.

Case No. 16.—Mr. F., aged 32, consulted me on May 15th, 1905. He had been under treatment in the National Sanitarium for the past four months for tubercular disease of the larynx and lungs. From his history, as given by the patient, he had not improved, and his symptoms indicated that the disease was advancing. He had lost his voice and could only swallow liquids in small sips. His vocal chords were completely destroyed by tubercular ulceration. Physical examination showed extensive tubercular deposits in the upper and middle lobes of right lung and in the apex of left lung.

Treatment with ozone was commenced on May 20th, 1905. The ulceration in the larynx had almost healed. He can now swallow liquids without discomfort and has gained in flesh and strength. Physical examination shows marked improvement of the lungs. He is still under treatment.

Case No. 17.—Miss B., aged 16, consulted me on June 18th, 1905.

Her physician had diagnosed tubercular disease in the upper lobe of left lung and had found the bacilli of tuberculosis present in two specimens of sputum. Three years previous she had a hæmorrhage from the lungs, and a second slight hæmorrhage two days before consulting me. Pulse 108. temperature 103 2-5.

Physical examination showed dulness, moist and crepitant rales, prolonged expiration and exaggerated voice sounds over the upper lobe of left lung, and pleuritic friction with moist rales over the lower lobe. The bacilli of tuberculosis were still present in the sputum.

Treatment with ozone was commenced on June 21st. On account of the patient having a high temperature she was instructed to take perfect rest in bed. There was a gradual improvement, the pulse falling to 80, temperature to 90, on July 10th. Examination of the sputum on August 22nd and also on September 5th showed the absence of the bacilli of tuberculosis. On September 1st all evidence of active disease in the lungs had disappeared. She was under treatment two months and eight days when the ozone was discontinued. On September 1st she went to Georgian Bay, returning on October 24th. When, on physical examination, I could not detect any evidence of active disease in the lungs. She had gained in flesh and felt well and strong.

Case No. 18.—Miss B., aged 6, sister of case No. 17, consulted me on June 21st, 1905. Two years previous she had had pneumonia in the right lung, followed by typhoid fever of two months' duration, after which she did not regain her former health. Physical examination showed dulness, exaggerated voice sounds, diminished vesicular murmur over the lower lobe of right lung, temperature 103 1-5, pulse 110. As there was absence of cough and expectoration I was unable to get a specimen of sputum for examination.

Treatment with ozone was commenced on June 21st and continued four months. The pulse and temperature fell gradually to normal, and at present the patient is apparently well.

Case No. 19.—Mrs. B., aged 41, consulted me on July 2nd, 1905. From her history, as given by the patient, two physicians had diagnosed tubercular disease of the lungs. In June, 1904, she had a hæmorrhage from the lungs. In January, 1905, had a second severe hæmorrhage and again a third hæmorrhage in March. She had lost six pounds in weight since the last hæmorrhage. Physical examination showed evidence of tubercular infiltration of the upper lobe of the right lung.

Treatment with ozone was commenced on July 4th and continued until September 20th, when all evidence of active disease in the lungs had disappeared, and she returned to her home in Stouffville.

RECURRENT ATTACKS OF CYANOSIS IN INFANTS.

BY

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Montreal.

During the past six months two cases have occurred in my practice which resembled one another very closely and were apparently two examples of the same affection. They presented themselves as attacks of cyanosis recurring at irregular intervals and lasting from five to thirty minutes each. The patients were in both cases infants under one month old.

Case I.—On August 10th, 1905, Mrs. W., a rather delicate woman, was confined of her second child. It was a case of breech presentation, and the pains were frequent with very short intermissions. Thirty minims of Battley's solution administered by the mouth had little effect in checking the pains. Delivery was effected without any special difficulty, expulsion of the after-coming head being assisted by pressure on the fundus. The infant, a small male child, did not at first breathe.

Dr. Gordon, who was kindly assisting me in the case, succeeded in getting respiration established after working for some twenty minutes. The legs and scrotum, however, remained blue, and the colour of the right foot did not become normal for four or five days.

Soon after I arrived home from this case I received a message to return immediately as there was something wrong with the child. On my arrival he was deeply cyanosed and had been so for the half-hour it required for me to get there. Under artificial respiration recovery took place in a few minutes, and the normal colour returned to the face. In about an hour he again turned blue and it seemed that respiration had ceased. He was again brought around by artificial respiration. There were no abnormal sounds to be heard over the heart. I remained in the house for several hours and then taught the nurse how to carry out the artificial respiration and left. During the next day and night this child had about twelve such attacks, the last being when he was twenty-six hours old. From this time on he got along well and is at present a healthy boy of five months old.

Case II.—On November 21st, 1905, Mrs. C. was confined, also of her second child. She was five weeks ahead of her supposed term. This case started as a left occipito-posterior, but at the end of four or five hours of hard pains, just as I was about to get a brother practitioner to give chloroform while I assisted rotation, the head rotated spontaneously, and delivery took place a few minutes afterwards. The child

was a female, well formed, but small, weighing about five pounds. She cried a little shortly after birth, but scarcely any from this on. She slept more than most infants. On December eleventh, when she was twenty days old, I was hastily summoned and found her cyanosed and scarcely breathing. At one time I thought her dead, as she did not breathe at all for some seconds, but soon she began with small weak respirations which gradually increased in force until at last the attack passed off and the cyanosis disappeared. The clothing seemed tight and was loosened. The temperature was sub-normal. The heart sounds were weak, but there was nothing to suggest a murmur or hum. No dulness could be made out over the lungs, and weak breath sounds could be heard all over the chest. This infant kept having attacks of cyanosis for the next six days. She took nourishment in small quantities between the attacks, but became gradually weaker and died. She had fifteen or twenty attacks altogether, of which five were during the last eight hours of life. The attacks usually lasted about twenty minutes. No post-mortem was obtained.

In these two cases the attacks seemed similar and consisted essentially of a cessation, more or less complete, of respiration, and marked cyanosis. As artificial respiration was always carried out it is hard to say how long they would have lasted if left alone; but, as treated, the duration varied from five minutes up to half an hour. After a certain time both children would begin to breathe again gradually without any movements that could be classed as convulsive.

To me these attacks were at first very puzzling. It is a curious fact that in both mothers the confinements were at an interval of less than twelve months after the preceding ones.

As to diagnosis, the possibility of some cerebral lesion, laryngismus stridulus and patent foramen ovale were all considered, and tongue swallowing was suggested by an eminent confrère, but I do not think that any of these affections explain the symptoms satisfactorily. Emmet Holt describes cases in which the symptoms seem to have been similar to those observed in my cases and he found at the post-mortem examination that the condition present was "congenital atelectasis." The following quotations are taken from his account of this disease:

"The condition is one in which there is a persistence of the fetal state in the whole or in any part of the lung."

"It is frequently a great surprise to discover that a child has lived two or three months without using more than one-third of its pulmonary area."

“There may develop at any time, often quite suddenly and often without any assignable cause, attacks of cyanosis with prostration.”

“Children may have several such attacks which do not excite suspicion since they pass away spontaneously. In other cases the symptoms are so severe that they may result fatally in a few hours, death being frequently preceded by convulsions. If energetically treated, the symptoms may pass away, but reappearing in a few hours or again in a week or more they gradually deepen in intensity until death occurs.”

As an aid to diagnosis, he states that the symptoms are more important than the physical signs, as the latter are not usually characteristic.

As to treatment, the great thing is to get the child crying by cold water or slapping; failing this, artificial respiration must be practiced. As might be supposed, energetic treatment is often followed by recovery as in my first case.

There are some interesting questions raised by these cases.

Why should the cyanosis come and go? Why, when the child is suffering from lack of oxygen, should respiration be discontinued? I can only suggest a possible explanation.

It is a well known fact that there are fibres passing up from the lung in the pneumogastric nerve through which the pneumogastric nerve may be inhibited. It has also been proven that distension of the lung acts as a stimulus to these inhibitory fibres. In other words, any cause which brings about distension of the whole or part of the lung causes more or less inhibition of the respiratory centre.

Now, it seems clear that if part of the lung is in a condition of atelectasis and does not open up at all, the remaining part will tend to be over distended when the chest expands. Such over-distension might at any time reach a point when it would become a sufficient stimulus to the inhibitory nerves of the respiratory centre, and in this way there might be brought about the cessation of respiration and consequent cyanosis, which were observed in these two infants. The attack might come on quite suddenly as a result of a slight increase in the distension of the lung.

INTESTINAL OBSTRUCTION.

BY

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Montreal.

Intestinal Obstruction is of interest to most of the members of the Society; the family physician, the man devoted to internal medicine, and the surgeon. Of the pathology, etiology, symptoms and treatment of intestinal obstruction we are not ignorant. It is a condition essentially remediable—so far as concerns the obstruction—and yet a condition in which the mortality is very considerable.

I do not purpose inflicting you with a resume of the literature of ileus. The subject is well worked out and clearly described in many text-books. I take it that there are two chief reasons for the unsatisfactory results obtained in so many cases, and these are, the delay in its recognition and faulty judgment in its treatment.

The reason for a tardy diagnosis is the fact that in acute obstruction but few of the symptoms are the result of the obstruction. The *collapse* results from the injury to the bowel wall, and its degree corresponds to the nature and severity of the lesion, its situation and the amount of bowel involved. Similar symptoms may be due to a perforation in the caecum, or a typhoid ulcer, the passage of a gall-stone or the twisting of the pedicle of an ovarian cyst, or, as in a case I recently saw in Murphy's clinic in Chicago, to the rupture of an artery. Later on it may be due to profound septic intoxication. The point I wish to make clear is that at the onset it is not due to obstruction *per se*, but to the injury to the bowel wall.

The same may be added of "pain," which also is due to and in proportion to the lesion of the intestinal wall, its site or locus, and number of coils involved.

The vomiting, which is an important symptom, is reflex in the early stage and not due to the fact that the lumen of the bowel is occluded.

Constipation is the one symptom which may be due to the obstruction. We all know, however, that constipation may in itself be reflex and due to other influences, and again may be incomplete.

Meteorism, scanty urine, and indican urine, all occur at times independently of intestinal obstruction.

I think that it must be admitted that at the outset, at the first visit, the most expert hospital physician or surgeon is sometimes unable to make a definite diagnosis. If, however, these symptoms persist for 12,

24 or 36 hours, unrelieved by appropriate treatment, the diagnosis of obstruction becomes highly probable and almost a certainty. The persistence of these symptoms for 24 hours, unrelieved by treatment, not only renders exploratory laparotomy justifiable but obligatory. My experience leads me to think that family physicians are misled by the past history of the patient and by the injudicious use of drugs. As an example of the former I will recite one typical instance. I could give many equally striking examples:—

On the 19th of June, 1902, I saw Mrs. C., aged 72, with the family and the consulting physicians. The woman lay partly on her side and vomited every few minutes. The abdomen was enormously distended, tender, and the skin discoloured from hot applications. As a result of enemata and purgatives several stools had been passed, none of them being considered satisfactory. It was the 5th day of her illness; pulse 140 and compressible; surface, clammy; temperature, 98.4-5; Hippocratic facies well marked.

In this case the family physician was a particularly strong, accurate, capable man. He had attended this woman for over 40 years. During the past ten years he had attended her during six or eight similar attacks. In each one of these attacks recovery had promptly followed a free movement of the bowels. They had never lasted more than 24 or 36 hours. The husband and friends objected strongly to operation, because she had had so many attacks just like this one, and as soon as the bowels moved she had got better.

On opening the abdomen the peritoneal cavity was found to contain air, pus and faeces. A very large gall-stone was found in the ileum about six feet above the ileo-cæcal valve, and removed. About two feet above this was found a perforation situated close to the mesenteric attachment of the bowel and in size of sufficient diameter to admit a crow-quill. The edges were necrotic and the bowel and adjacent mesentery were covered with lymph.

At the autopsy the gall-bladder was found adherent to the liver and to the small intestine. Nature had performed chole-cystenterostomy. The gall ducts were patent.

Here then was the explanation of the preceding clinical history. The family physician had been misled by the patient's previous history. If laparotomy had been undertaken on the second day the result might have been more satisfactory. Time limit is useful in differentiating between malignant or benign conditions and should be a sign of importance in acute and chronic intestinal obstruction.

The injudicious and free administration of opium disguises the con-

dition of the patient, deceives the attending physician, and leads to dangerous delay. Only a few days ago a man was admitted to my ward with symptoms of intestinal obstruction. He had been discharged only ten days before, recovered from generalized peritonitis secondary to perforative appendicitis. He complained loudly of intermittent abdominal pain of a griping character. Vomiting was present and the vomitus was dark and odourless. Repeated enemata were given, each being returned well coloured. No flatus passed. The pain and vomiting continued and the abdomen gradually assumed a rounded form. Eighteen hours after admission he refused operation. Six hours later he accepted gladly. I found a small horseshoe shaped loop about the middle of the ileum. It was black, the mesenteric vessels leading to it thrombosed, the gut on the proximal side dilated and on the distal side collapsed. No band was observed. There was no volvulus. The obstruction was apparently due to the thrombosis of the mesenteric vessels and paralysis of the loop deprived of its blood supply.

I mention this case to illustrate my point, that is, had I allowed morphine, the pain would have been relieved, the patient and attendant deceived as to the progress of events and surgical relief unduly postponed.

Relief from pain and distress is a natural and legitimate demand. How can it best be afforded? By washing out the stomach, withholding all food and drink by the mouth and the liberal application of ice bags. If these measures are applied morphine will seldom be needed. If these measures are not effective and sufficient, operative measures should be seriously considered.

In another case the previous history of the patient led me to make a wrong diagnosis. Symptoms of acute intestinal obstruction developed twelve months after the supposed occurrence of a severe and prolonged attack of appendicitis recovering without operation. I thought that the obstruction was probably due to strangulation by bands. Instead of bands I found a gall-stone about the middle of the ileum. The patient made an uninterrupted recovery.

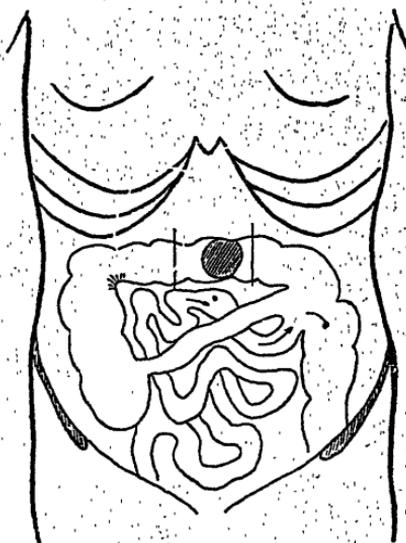
A history of chronic obstruction, preceding the symptoms of the acute form should aid in the diagnosis. Unfortunately it is not always duly appreciated. The spurious diarrhoea as well as the acute symptoms are only too often attributed to errors in diet, or other indiscretions. Here again the continuance of the symptoms in spite of ordinary treatment is the sign of great diagnostic value.

The surgical methods to be adopted in acute obstructions are, as a rule, clearly indicated; not so, however, in acute obstruction following the chronic form. Here great judgment and resource are required to

conduct the case to a successful issue. The most desirable alternative depends upon the cause and locus of the primary chronic obstruction, the condition of patient and the opportunities and surroundings of the operator.

I can best illustrate the procedures that may be adopted in varying conditions by a brief outline of illustrative cases:—

Mrs. L., aged 58, was brought to the Montreal General Hospital, December 2nd, 1902, with a diagnosis of appendicitis. She gave a history of having suffered for a period of seven months from recurring attacks of pain in the right side of the abdomen, radiating down to the groin, and accompanied by vomiting. She had suffered greatly



CASE 1.

from constipation, and on several occasions diarrhoea had alternated with the constipation. During this period of seven months she had lost 44 pounds in weight. She was thin, poorly nourished, and the subcutaneous fat absent. Skin dry and loose; mucous membranes pale.

On palpation a hard mass about the size of a small apple was felt just below the costal margin to the right of the median line. On opening the abdomen the appendix was found to be normal. The growth was situated in the transverse colon. It was hard. The lumen of the bowel was nearly occluded. A few mesenteric glands were enlarged and hard.

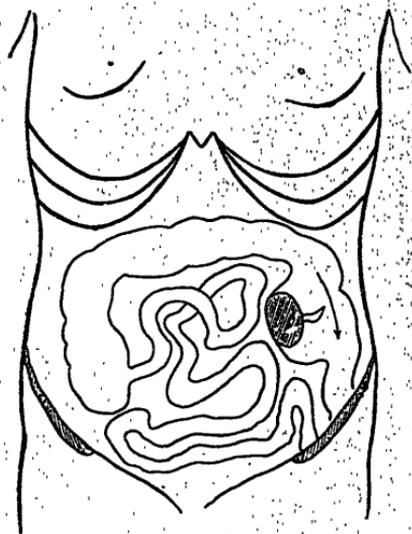
The condition of the patient was, I thought, sufficiently good to justify the immediate removal of the growth. I therefore made a lateral

anastomosis between the ascending and transverse colon, making a suture line of four inches. This insured an opening large enough to avert danger of future contraction. The condition of the patient being still good I removed the growth and the enlarged glands and closed both ends of the divided bowel. The pathologist reported the growth to be an adeno-carcinoma.

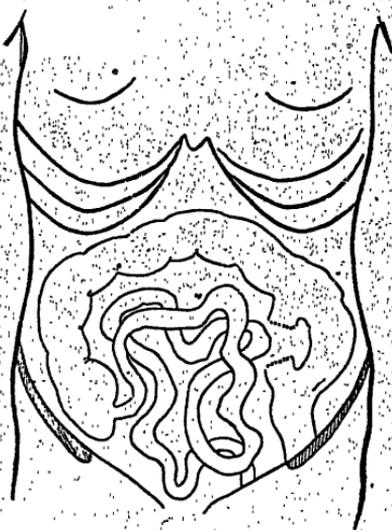
An excellent recovery followed and the woman is to-day, nearly three years later, in apparently perfect health, without any sign of recurrence. After the operation she gained 25 or 30 lbs. in weight.

This plan is ideal, but can only be attempted when the case is seen early before there is very great distension, and before the intestinal wall has become sodden and the patient profoundly toxic. The case also is evidence of the immunity from recurrence and of the comparative good health for a number of years, that may be expected when a carcinoma of the large bowel is removed early.

Mrs. W., aged 57, was admitted to the Montreal General Hospital on the 8th of August, 1903. The clinical history illustrates one or two of the difficulties of making an early diagnosis. Her complaints



CASE 2. No. 2.
After first operation.



CASE 2. No. 3.
After removal of growth.

on admission were: Pain and swelling in the left side of the abdomen; vomiting, constipation and loss of appetite. About seven months before admission she fell down stairs and received a severe blow on the left lower quadrant of the abdomen. She continued at work during the day but at night suffered from nausea and vomiting, and abdominal

pain. The pain in the left iliac region has bothered her ever since her accident, being often worse at night and aggravated by eating. She continued at work, however, until three days before coming into the hospital. Says she has lost weight. Has felt a constant desire to go to stool but unable to pass anything without taking medicine. Her chief diet has been raw eggs and brandy. The swelling of the abdomen has been present about a week. She works as a charwoman. Her mother's father died of cancer of the lip.

She is a small woman, about 5 feet 2 inches in height, and weighs 95 lbs. The abdomen is considerably distended and somewhat tender. Enemata bring away flatus and liquid faeces in considerable quantity. No vomiting. She was carefully fed and received enemata for 13 days. The enemata were nearly always effective but the distension did not diminish appreciably, and it was quite evident that she was losing ground. No tumour could be felt. Fluid was present in the abdomen. There were visible peristaltic waves. She never passed blood or mucous in the stools. From the foregoing it became pretty clear that she was suffering from incomplete chronic obstruction, probably due to a malignant growth.

On the 21st of August, 1903, through a lower median incision, I discovered a hard growth in the upper part of the sigmoid flexure.

So far as I could judge it would admit an ordinary lead pencil. The distended condition of the small intestines and the poor condition of the patient seemed to render radical procedure at the time inadvisable, so I made a large lateral anastomosis between the descending colon above the growth and the lower part of the sigmoid and closed the abdomen with drainage.

Her general condition gradually improved and she gained strength. Three weeks later, through a criss-cross incision on the left side, I removed the growth, closing both ends of the gut. This time I used drainage. A sinus persisted for a fortnight. She is now, two years later, free from any evidence of recurrence, and earning her living as a charwoman.

The report of the pathologist was as follows:

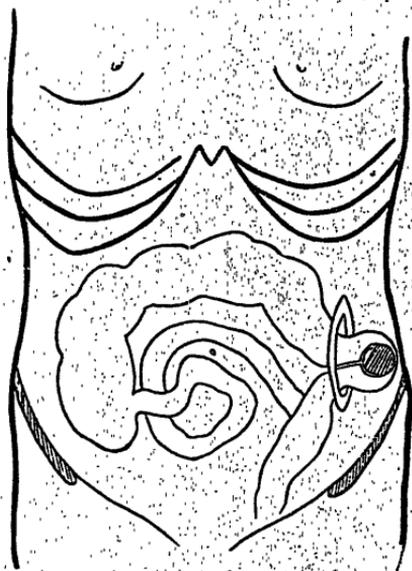
Adenoma-carcinoma of upper end of sigmoid.

In looking back on this case I think that in not attempting to remove the growth at the first operation there was greater safety. The operation would have been prolonged with added danger of sepsis and a little more loss of blood. As it was, very careful after-treatment was required to get her through the first 48 hours. The lateral anastomosis

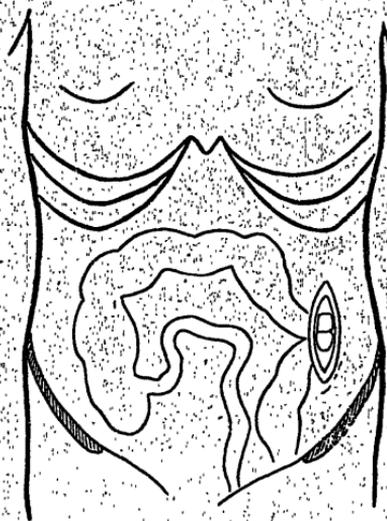
accomplished all that a colotomy could have done without the many obvious disadvantages of the latter.

The following case illustrates another method of dealing with chronic obstruction becoming acute and complete:

Mrs. L., aged 65, was admitted to the hospital on the 24th of June, 1905, complaining of abdominal pain, vomiting and constipation. She told us that her illness began 24 days before with griping pain in the abdomen and a desire to go to stool, but when she went she could not pass anything. During the first week of her illness she obtained some relief from purgation. She vomited several times during this week.



CASE 3. No. 4.
Showing tumour delivered.



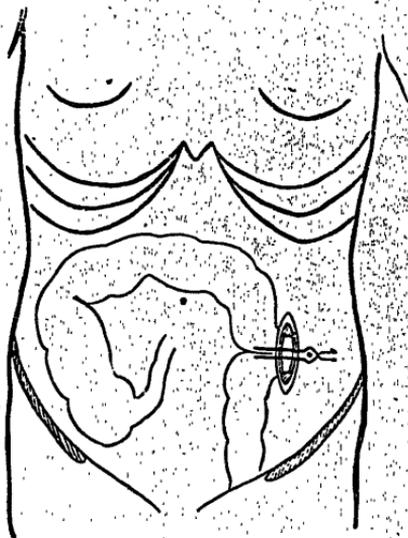
CASE 3. No. 5.
Tumour removed.

During the second week occasional vomiting occurred; purgatives failed, but she got relief from enemata containing turpentine. During the week immediately preceding her admission to hospital neither purgatives nor enemata were effectual.

On admission her temperature was 97.4° , pulse 124, respirations 48. The abdomen was uniformly distended, and on deep pressure was tender; tenderness in region of liver. No mass could be felt. She positively refused operation. During the following day the gravity of her condition was made plain to her, and her family and spiritual adviser urged her to submit to operation, but she still refused. On

the third day she consented. At this time her general condition was very bad and the abdomen greatly distended.

Through a median incision I felt a hard mass fixed in the sigmoid. The intestines were greatly distended, but the walls appeared to be in a fairly good condition. The median incision was closed and an incision made over the tumour. After ligating some of the mesenteric vessels I was able to deliver that portion of the sigmoid involved in the growth. At this stage the anaesthetist informed me that her condition was becoming desperate, I therefore anchored the growth well



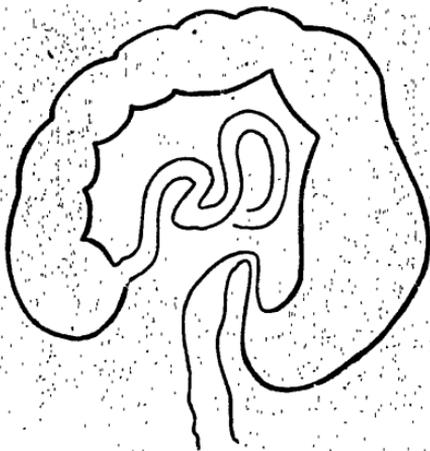
CASE 3. No. 6.
Mikulicz clamp in position.

outside the abdomen, sutured the parietal peritoneum carefully around and inserted a small tube on the proximal side of the tumour and washed out the stomach. She slowly recovered. The evidences of toxæmia gradually disappeared and she became able to retain food. The next step was to remove the growth. About two weeks later, the abdomen being then soft and flat and the adhesions around the gut firm, I placed a Mikulicz anastomosis clamp in position. It came away on the third day. I think that she pulled it out. She was of an exceedingly low order of intelligence and we had great difficulty all along in controlling her. About a month later I placed the anastomosis clamp in position and succeeded this time in getting a very satisfactory anastomosis.

The growth proved to be an adeno-carcinoma.

On the third of August last I was asked to see M. S., aged 54; he was a patient in the Verdun Insane Asylum. A distinguished American surgeon was spending the day in Montreal and I asked him to go with me. We found the man in the infirmary suffering from abdominal pain and distension, diarrhoea and vomiting. He had been subject to so-called bilious attacks all his life, at intervals of about six months. These attacks have been accompanied by griping pain. Twenty years ago, he says, he had an attack similar to the present, but not nearly so severe, accompanied by pain and distension. Had been in the asylum for about ten years, and during that time has frequently suffered from abdominal pain and distension, but until the present, these attacks have yielded to enemata.

Seven days before admission to the hospital, while at work, he was suddenly seized with severe pain across the abdomen and extending into



CASE 4. No. 7.
Angulation of sigmoid.

the back. During the past week he has vomited several times. Has passed a liquid stool every day but one and sometimes two. Nevertheless, the abdominal distension is increasing. On admission the whole abdomen was markedly distended. There was slight tenderness on pressure but no resistance and no rigidity. No evidence of fluid. The superficial veins were prominent; heart displaced upward.

We differed in opinion as to the nature of the condition. My American friend was inclined to give a good deal of weight to the previous history of recurring bilious attacks, and suggested the possibility of these having been connected with the vermiform appendix. If so, the

present might have started as an appendicitis and the distension be due to a generalized peritoneal infection with adynamic obstruction. In my opinion the gradual but continuous and increasing distension developing concurrently with the passage of small watery stools and the absence of marked rigidity pointed rather to a chronic obstruction from malignant disease suddenly become acute but incomplete. I think that we each saw the force of the other's argument and we certainly were in perfect accord in advising an immediate exploratory incision.

As soon as he was removed to the General Hospital I opened the abdomen in the median line below the umbilicus, when there rolled out a distended sigmoid. The dilatation was very extreme, the walls of the gut being thin and transparent. The dilatation was apparently confined to a comparatively short bit of gut about 18 inches long and over 14 inches in circumference. The veins were dilated; the lymphatic glands enlarged. The upper end of sigmoid was apparently bound down by an abnormal and apparently congenital fold of peritoneum. The obstruction was clearly due to the dilatation and folding downward of the sigmoid over the more fixed first portion of the rectum. An assistant passed a tube up through the anus and rectum and then the distension of the intestines was easily made to disappear by gentle compression of the abdominal wall. The condition was interesting and quite unusual. Honours were easy in the matter of diagnosis.

I laid the two arms of the sigmoid side by side and made a large lateral anastomosis, the sew-line measuring $4\frac{1}{2}$ inches. The man is now in good health. My sutures failed at one point and there remains a sinus through which some gas and faecal matter escape, but this is gradually lessening. Occasionally there is trouble in getting the bowels to move satisfactorily. On two occasions when this occurred I inserted my finger through the sinus and found the loop of sigmoid filled with hardened faeces. It may be necessary to excise the loop, but of this I am not yet sure.

In a very interesting article, "Ueber eine typische peritoneale adhäsion," in the *Archiv. Fur Klinische Chirurgie*, Gersunny describes a somewhat similar condition that he has observed associated with volvulus of the sigmoid and invagination of the sigmoid into the rectum, as well as in other conditions.

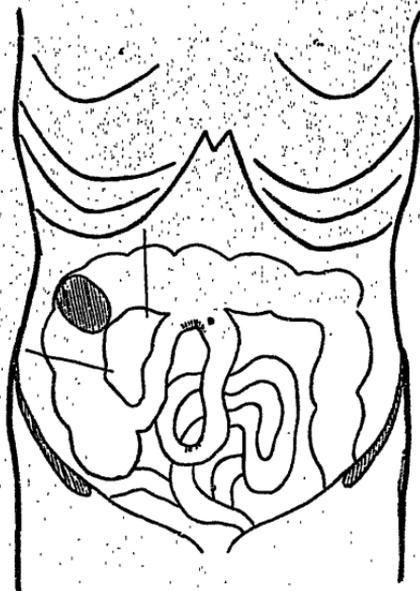
Ries has described a somewhat similar case in which, when the abdomen was opened the sigmoid was not twisted; but a slight impulse given to the upper half of it sufficed to make it drop over the lower half.

Kuhn has reported two cases in which mesosigmoiditis and symptoms of volvulus were present, and the patients died of perforation peritonitis when there was no real volvulus.

Delatour has reported four or five cases of a somewhat similar character. He has very appropriately termed the condition "Angulation at the sigmoid."

Ries may be right in considering the condition as one originally of mesosigmoiditis. In my case, the bands appeared to those present, and to myself, as congenital, but it is quite possible that they were acquired, and secondary to a chronic inflammatory condition of the intestine; that while some of the bands over the sigmoid were greatly stretched and thinned, yet other bands, by contracting and gradually approximating the two more fixed points, the lower end of the descending colon and the first portion of the rectum, had contributed to the development of the more obvious condition of the enormously dilated sigmoid flexure. Graser's diverticulæ were not observed.

In another instance I was asked to operate on a man in Cornwall, Ontario, in whom symptoms of acute had developed upon those of



CASE 5. No. 8.

Short circuiting of growth at hepatic flexure.

chronic obstruction. The very great distension and persistent vomiting had been present for 90 hours. The feeble, rapid pulse, dry tongue,

livid lips and cold, clammy surface were indications of the pronounced toxæmia present. No tumour could be felt.

Through a median incision I felt a hard mass in the hepatic flexure of the colon. The enormously distended condition of the small intestines made it very difficult to work. I therefore selected a loop of small bowel about the centre of the ileum, brought it outside the abdomen and through an opening succeeded in evacuating without the Wolf tube sufficient liquid faecal matter to reduce the bulk of the intestine, and then joined the lower ileum to the transverse colon, leaving the removal of the neoplasm to the local surgeons, at a future date when the bowels had emptied, recovered their tone and the patient recovered from his toxæmia.

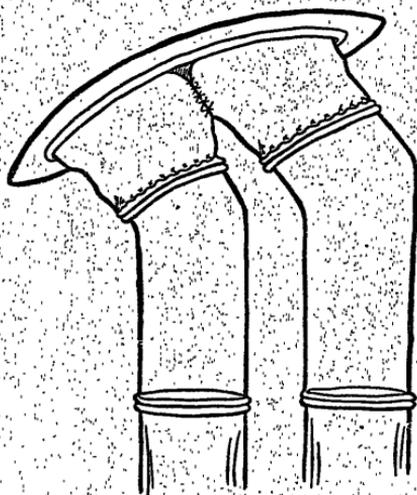
The recovery from this operation was uneventful so far as the abdomen was concerned. When preparing this paper I wrote to Cornwall for the future history of this case and was told in reply that he subsequently developed pneumonia and gangrene of the lung, from which he died after a rather long illness. The neoplasm had not been removed.

The cases in practice, of which I have given the condensed history, are types selected to illustrate the difficulties in diagnosis and the resources at our disposal. You may have noticed that two of these patients in their own words have stated that they suffered from griping pains and a desire to go to stool with ineffectual results. This is a symptom of great value, and in my experience is generally present in a modified form when the obstruction is in the small as well as when in the large bowel. There is this difference, that when the narrowing is in the small intestine there is more frequently a passage of a small amount of faeces, but the passage is not followed by a sense of relief, and even if these small stools are comparatively frequent the distension remains as before or gradually increases.

If I may repeat, the family physician is too ready to relieve distress by the use of his hypodermic syringe. It is a laudable desire on his part and a reasonable demand upon the part of the patient. But still higher ground is taken when time and opportunity are asked in which to come to an intelligent appreciation of the condition causing the pain. As a rule, for which there are few exceptions, patients are generally reasonable and patient when the difficulties and dangers are clearly, frankly and kindly put to them. Again, these are what may be called border-land cases, in which the truth is generally more quickly and correctly determined by a physician and surgeon acting together.

In the treatment of these cases I am satisfied that in the past, speaking at least for myself. I have often tried to do too much. Ideal sur-

gery is very fine, but it is sometimes followed by a high death rate. If the patient is in good condition and the walls of the intestines normal or nearly so, then remove the growth. If the patient's condition is worse, but the intestinal walls fairly good, one may, without or after emptying some of the distended coils, do a short circuiting operation and later on remove the growth, closing in the divided ends. This procedure is very much better than bringing out a loop as in colotomy. An ileo-colostomy or a sigmoidorectostomy is a clean operation; a colostomy is dirty, an annoyance to the patient and to the whole ward. If, however, the distension is great and the intestinal walls sodden the



CASE 6. No. 9.
Paul's tubes in position.

mechanical difficulty in doing any anastomosis is great and the puncture of such a loop of bowel hazardous. A temporary anastomosis possesses another very great and obvious advantage. It leaves the abdominal wall clean, therefore the second operation to be undertaken for the removal of the growth, one of greater safety. The delivery of the growth and the opening of the proximal gut is very safe, but the illness is much prolonged. The Mikulicz anastomosis clamp is satisfactory; it gives a good and safe result, but the external opening is slow in closing. Paul's operation, I believe, has not received the attention it merits. It is safe, clean, and in suitable cases to be commended. I have used the tubes in a recent case of unremovable carcinoma of the rectum with very satisfactory results.

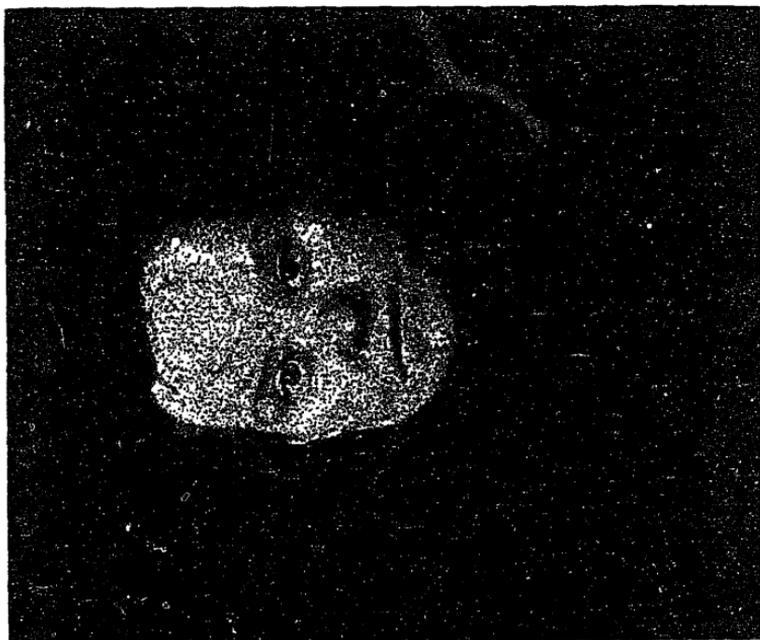
Another point is that malignant disease of the intestines is not such a hopeless one as may have appeared. It is a slow disease, and once thoroughly removed, the results, I believe, will compare favourably with those obtained in malignant disease in other situations where operative treatment is more readily resorted to. A history of mucous discharge from the rectum indicating the presence of colitis or of bleeding, indicating that the growth was breaking down, were not present. They are late symptoms and are given undue importance in many textbooks.

Now, gentlemen, while I am aware that I have not been able to bring before you any new methods, I hope that in drawing your attention to the important subject of intestinal obstruction I have suggested a line of thought and provoked a discussion that may clarify and classify our ideas, so that we may have a clearer understanding of this important group of cases.

The third international congress of Electro-therapeutics and Radiology will be held in Milan, from the 5th to 9th September, 1906. The General Secretary is Prof. Doumer, of Lille.

We welcome the first number of *Le Journal de Médecine et de Chirurgie*, a new monthly journal published in Montreal. The editor is Dr. W. I. Derome, whose collaboration we have had for two years; and the directors also include Drs. Monod, de Martigny and Masson. The quality and tone of the first number leave nothing to be desired.

The *Queen's Medical Quarterly*, published by the medical faculty of Queen's University, Kingston, contains a strong plea in favour of a public grant in aid of medical education in Kingston. This is based upon the fact that a large sum has recently been granted to promote medical education in Toronto. As this is a departure from the educational policy of the past, the Faculty of Queen's naturally ask for proportionate consideration for what has been done in Kingston for the past fifty years.



Ten months after operation.



Before operation.

The photograph illustrating the condition before operation in the case of Dr. Gray and Dr. Archibald, "Syphilitic Necrosis of the Frontal Bone," published in the last issue, was omitted. Those printed represented the condition immediately after, and again ten months after operation. The mistake is here rectified.

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FEBRUARY, 1906.

No. 2.

RECENT WORK ON THE HEART.

We have in our possession a dissertation written some twenty-five years ago upon the subject of "Physiological Diagnosis as a Basis for Rational Therapy." This title has always seemed to us a peculiarly suggestive one. It might well be adopted as the watchword of a certain school of clinical workers who are to-day reaping golden harvests in the field of disorders of the heart.

Ten years ago it was the commonly accepted view that the rhythm and activity of the heart in higher animals was to be referred to the ganglion cells found especially in the great veins and auricles. Now a great many physiologists and some of the most active clinical men are accepting the contrary views of Gaskell and Engelmann, who claim that the cardiac muscle fibres possess all the properties necessary to develop, conduct and execute the rhythmic contraction of the heart.

They do not minimise the great importance of the nerve impulses reaching the heart by the cardiac nerves, but they regard these impulses as accelerating or inhibiting processes already in operation and not, as many others still believe, initiating activities which could not otherwise be developed.

Engelmann attributes four functions to the heart muscle, as follows:

1. The production of a stimulus adequate to initiate a contraction.
2. An excitability through which this stimulus may become operative.
3. A power of conduction by which it may be carried from one part of the heart to another.
4. The power to contract.

To these Gaskell adds a condition of tone as a fifth property or function.

Engelmann has shown in the frog that the four functions which he ascribes to the heart muscles are to a great extent independent of one another. The conductivity of the heart may vary; apart from the excitability, and the contractive power may increase or decrease without any change taking place in the production of the essential stimulus. He has published tracings from experiments performed on the heart where one or other of these functions has alone undergone a change. He claims too that each function may be independently affected by outside influences reaching the heart by the nerves. He gives names to these influences according to the function they affect and it seems that his terms are being accepted by English writers. They are as follows: Influences that affect the production of the motor stimulus are called "chronotropic." If they accelerate the stimulus production and thus quicken the rate of the heart they are called "positive chronotropic," if the reverse, "negative chronotropic." Similarly we have positive and negative "dromotropic" influences affecting the conducting power, "bathmotropic" influences affecting the excitability, and "inotropic" the contractility.

This may all seem very theoretical, but it has been put to the test of clinical application and has not been found wanting. A book on "Arrhythmia of the Heart," by Dr. K. F. Wenkenbach, professor of medicine at Groningen, has recently been translated into English, and in it he demonstrates that in great numbers of human pulse tracings he found it possible to decide which of the four functions was at fault in causing the arrhythmia.

In England the work has been taken up by James Mackenzie who, by means of his simultaneous tracings of venous and arterial pulses, has added very much to our knowledge of the irregular heart action and its relations to the four cardinal functions. He can allot to the auricles and ventricles respectively their parts in the production of the arrhythmia, and can measure the time elapsing between the auricular

and ventricular systoles and thence judge of the conducting power. He points out that while some cases of bradycardia are chronotropic in origin, others depend upon affections of conductivity. In cases of tachycardia we may have either the stimulus production or the excitability at fault. Pulsus alternans is found to depend upon a failure in contractive power, and this function seems to be the one most affected in cases of angina pectoris. The actions of various drugs have been analyzed with reference to the special functions affected by them.

It seems, indeed, that these new views on heart physiology have opened up the way for very important advances in our knowledge of arrhythmia and of heart disease generally.

THE PHYSIOLOGY OF THE VOICE.

At a recent meeting of the Medico-Chirurgical Society Professor Wesley Mills gave some forecast of the work upon which he is engaged in connexion with the physiology and hygiene of the voice. His address was illustrated by the violin, by various pieces of apparatus and by the speaking and singing voice. Dr. Mills expects to have the work completed within the next two months; and, in the meantime, we may be permitted to give some indication of its scope.

The same principles apply to the use of the voice in singing and speaking. The following are concerned in all voice productions: the respiratory apparatus which furnishes the mechanism and the power that drives the rest of the machinery; the larynx which is acted upon by this; and the resonance chambers which respond. Tones are ultimately due to the vibration of the air within the resonance chambers, brought about through the action of the mechanism below them.

The pitch of the tone was formerly supposed to correspond exactly with the rate of vibrations of the vocal bands. It seems more probable that pitch, as well as quality, is determined by the resonance chambers, the vocal bands not necessarily vibrating at a rate corresponding to the pitch of the tone produced, though the air in the resonance chambers must do so. In strictness the resonance chambers are not really resonance cavities.

The expiratory blast is the effective cause of the vibration of the vocal cords. It is to them what the bow is to the violin, while the action of the laryngeal muscles determines the position and tension of the vocal bands.

The total result—the formation of a tone of a definite pitch, quality and loudness, may be said to be due to the harmonious co-operation

of the three sets of mechanism referred to above. Though simple in statement this co-ordination is of a highly complex character, involving the simultaneous contraction, and relaxation, of many muscles, and the use of widely separated areas of the nervous system which are brought into united action by association fibres.

The difference in speaking and singing is one of degree—chiefly in the range and the duration of the sounds produced. The quality of a sound is dependent on the shape of the resonance chambers. Vowels differ chiefly in quality, but also in pitch. Consonants are due to interruptions in the breath stream—produced in a variety of ways—made by a certain position and action of the organs of speech. In whispering the vocal bands take little or no part. Consonants are absolutely necessary for speech and may be compared to punctuation of a higher order. For purposes of singing they are a nuisance.

Breathing is of the utmost importance in both singing and speaking. All modes of dress that interfere with it should from this point of view, and from a still higher one—the general welfare of the body—be done away with. Corsets are especially to be condemned. In singing or speaking one should be unconscious of his larynx at any time. Singing and speaking in which the reverse is the case is by a wrong method. The important consciously guiding sensations come from the resonance chambers chiefly.

The common errors in speech of the day are referable largely to faulty or inadequate action, in either the back or the front of the mouth cavity. Nasal resonance is important, but nasality is an abomination due to a faulty behaviour of tongue or soft palate, usually both. Defective articulation is due chiefly to an indolent action of the tongue.

Behind these physical defects are psychic ones. What people wish to accomplish they generally do accomplish. Persons rarely aim at a good result in speaking unless it appeals to them æsthetically and intellectually. Indifference is the chief cause of the imperfections and faults which characterize our speech. It is no great stigma to even an educated person in America to fail in elegance of speech, though grammatical accuracy is demanded. The age of poetry and eloquence is largely past hence high class utterance is not valued. The best age of vocalization was that of the old Italian Masters—the time of Handel, of 150 to 200 years ago. Then the composer was often obliged to write to please the recognized singers of the day. We have gone to the other extreme and the composer is often ignorant of the voice and writes what is sometimes impossible of perfect production.

The change in the thought of the day has led to a comparative under-

valuation of technically fine vocalization, and beautiful tones, produced with ease by the singer, and delight to an unspoiled nature, and a really discriminating ear. Much that passes for singing to-day might be termed elocution in song—good in conception, but defective as vocalization. This is due to alteration in the public mind which has grown so dissatisfied with what is simple, however beautiful, and demands the complex, the involved, the subtle. As is the modern novel to one of Dickens or Scott, so is the modern song to one of Handel, Hayden or Mozart.

The factor that has most of all contributed to the decay of pure and beautiful sound production in speech and song, is modern rush. The pupil wishes to learn to sing, but is willing to give only months to accomplish an end, to which formerly the student devoted years. He is unwilling to train. He wishes only to furnish the completed performance, and that after imperfect preparation.

It is against all laws of physiology and psychology to believe this possible. Such attempts are apt to be followed by injury to the vocal organs and must lead with all the other causes to a degradation of vocal and musical art, and such has actually taken place.

The troubles from which singers and speakers suffer are usually traceable to bad methods of voice production which induce congestion and its consequences.

ON THE COMPOUND TINCTURE OF VIPERS.

Of late the chief food inspector and the customs officials have been perplexed, and the Montreal papers have made merry over the case of Lum Kan, launderer, and the three carboys of wine which had been consigned to him, the wine upon examination being found to contain the dressed bodies of sundry beasts that go upon their bellies, together with certain herbs which the City analyst could not seem to have assigned to their respective genera. The wine in the cup looked good, and was of pleasant savour: "Why," communed the food inspector, "defile it with these noxious reptiles? Can that be to any proper end? Vipers are venomous. This matter must be probed."

And so the wine was analysed, the consignee interrogated, and, last stage of all, the quandary, and the carboys, brought before the Health Committee; and these, despite the solemn declaration of Lum Kan, duly attested, that he was accustomed to partake of this wine containing snakes, lizards and herbs, prepared in China, as a remedy for rheumatism, that he had complete confidence in its efficacy, and that he

had procured it for his own use and not for sale, the aldermen were yet mistrustful. There are, it is evident, limits to what an alderman will consume—and when a sample glass was passed round the board, cheerful as was its appearance, and ethereal as was its odour, not one would taste the celestial beverage.

But the burden of the comment aroused by this incident has undoubtedly been “those strange Celestials”; and this tincture of snakes as a remedy for rheumatism has been docketted along with puppy dogs, unhatched ducks, and bird-nest soup, whereas the strangeness lies in our forgetfulness.

Judged by the description, the Chinese wine is a far more “elegant preparation” than were a host of the medicines taken uncomplainedly by our forefathers of a few generations ago. It is only that the orientals are some few years behind us—and they are rapidly catching up—and that they are more conservative. As a matter of fact, various preparations of vipers held a place of respect among our eighteenth century drugs. Nay, according to the paradox principles which have dominated pharmacology even up to our own day of grace and of enlightenment—and that not entirely without some show of reason—the very noxious characters of these bodies singled them as being more than ordinarily virtuous; that principle assured their presence in the Pharmacopœia.

We happened some little time ago upon the fourth edition of Dr. John Quincy’s “Compleat English Dispensatory,” published in London in the year 1722, and made a note of some of the more abominable, or, to be liberal minded, more repugnant, inventions therein set forth. Dr. Quincy evidently held the same opinion of his task as set forth by the compilers of the last edition of the United States Pharmacopœia: that it was his duty to afford a description of not merely those medicaments which he believed to be sound and serviceable, but of all those for which there was a general demand. Thus he writes of *Sperma Ranarum* (frogs spawn) that “there is only a simple water made of it which stands in the account of some for many good purposes; but it’s an insipid phlegm and good for nothing more than common rain water,” and of “*Urina Hominis*,” that “Some have got a notion of this being good for scurvy and drink their own water for that reason; but I cannot see with what reason.” And he adds: “Some commend it boiled into the consistency of Honey, for Rheumatick Pains, rubbing it into the Parts affected; in which case it may do good because it cannot but be very penetrating.” Here, perchance the doctor confounded an accidental with its proper action—the odour, that is liberated by it

in the process of being boiled down is beyond measure penetrating, as the Reverend the professor of astronomy in one of the older English Universities discovered, when the lecturer on physiology in the chamber adjoining, proceeded to make a lengthy investigation into urinary pigments and incidentally to enlarge his laboratory space by annexing the room assigned by the University to the professor. Of other equally repugnant remedies he gives "*Urina vaccae*" ("Some drink this as a purge. It will operate violently"). *Fimus vaccae* ("This seems to be of a hot, penetrating nature, and is experienced to do good in Erysipelatous swellings.") We still hear of cow dung being used in country districts and used as Quincy recommends it: "with a mixture of enough of some unctions (*sic*) matter to prevent its hardening upon the Part"). *Album graecum* ("This is the white dung of some dogs; it is reckon'd to have a detersive quality, but upon that foot is used only by the common people"). He had a higher opinion of *Fimus Columbae*: "This is sometimes ordered in Cataplasms, applied to the soles of the feet in Malignant Fevers and Delirium, as they are supposed to draw the Humours downwards; which may not be ill guessed. For, if we may judge of the nature of this from that of the bird of which it is produced, which is no ill Rule, it certainly consists of subtile hot parts, which open the Pores where it is apply'd and by rarefying and expanding them, occasions a greater Flux or Fluid that way." We are inclined to think that in these sentiments Dr. Quincy traduced the gentle dove.

Of preparations from the snake he affords no less than four, to wit: *Sal Viperarum Volatile*, *Essentia Viperarum*, *Oleum Aethereum Viperarum* ("which is sudorific and a specific in venomous bites") and *Tinctura Viperarum Composita*. And he gives instructions how they are to be prepared which may be of some present interest. Thus, first as to the *Distillation of Vipers*: "Take any number of vipers, open and clean them from all worms and excrements, and the Females from their Eggs: Take out their Hearts and Livers, dry them in the shade separately from their Bodies; and when they are dry, cut the Bodies into small pieces, and fill a coated Retort three-quarters full; place it in a fit Reverberatory, lute to it its Receiver which must be large; cover the surface with its Dome and make a gentle Fire under it for two hours, in which time the greatest part of the Phlegm will come over; then increase the Fire to the second degree for two hours more, which will raise its Spirit and Volatile Salt; increase it still to the third, which will fill the Recipient with Clouds; Keep up that degree

till the Clouds lessen in the Receiver; continue the increase of the Fire still to the Fourth degree, and keep it there till all be come over, and the Receiver grows cool; then cease the Fire and there will be a Phlegm, Spirit, Salt, and Oil which must be rectify'd."

The compound tincture consists of the distillate from 1 lb. of Flowers of Sulphur and 4 oz. of crude antimony saturated with oil of sulphur or oil of vitriol, 4 ozs., to which has been added gradually 1 lb. of sweet spirit of nitre. To 1 lb. of this distillate is added 2 ozs. of dried vipers cut into small pieces; the mixture is digested in a matrass for 48 hours, strained, and has added to it cochineal, saffron and (with a proper appreciation of the doctrine of signatures) Virginia Snake root *ana* 2 ozs. The clear tincture is decanted off after 48 hours. This is said to be an excellent Diaphoretick—which we can well believe—its dose from 10 to 50 or 60 drops of Canary or phlegm water.

But, we repeat, the celestial tincture appears from the description given to be the more elegant preparation, particularly if Lum Kan, launderer, can contemplate making away with three carboys, and our opinion, we venture, will be confirmed by any chemist who tries to distil together those first ingredients.

To conclude, we would urge that it is the part of the man of broad mind and serene to survey compassionately therapeutic vagaries, ancient as well as modern, oriental equally with occidental.

The *British Medical Journal*, with the first number of 1906, appears in a new dress, with a tinted cover and a medallion of the founder. The paper is of a much better quality and the colour photographs are admirable. This journal holds a strong place in the affection of the profession, and it is likely to be stimulated by the approaching meeting in Toronto.

The Canadian Medical Protective Association has sent out the last call for subscriptions. The fee is now three dollars, instead of two-and-a-half, which, the council thinks, is more convenient to remit than the smaller amount. At the Halifax meeting it was ruled that the membership be made permanent, and that collections may be made through the banks if remittances are not sent.

Reviews and Notices of Books.

MANUAL OF PHYSIOLOGY, WITH PRACTICAL EXERCISES. By G. N. STEWART, M.A., D.Sc., Professor of Physiology, University of Chicago. London: Ballière, Tindall & Cox, 1906; Toronto: J. A. Carveth Co.

The present is the 5th edition of this book since the year 1906; a fact which alone testifies to its popularity, and though the latter does not in all cases correspond with real value in a text-book for students it may be considered to do so in this case. The whole ground of physiology has been covered within somewhat less than 900 pages of readable print; in which one recognizes the use of a larger and a smaller type, the more elaborate discussions and those on points somewhat unsettled being especially dealt with in the smaller print. The author makes use of italics in the main body of the text with which to set forth the principal conclusions of important discussions, a plan which is excellent and too little followed in text-books, though coming more and more into vogue in original papers in various departments of science. The work is illustrated by 400 cuts in the text and a few coloured plates, the one which appears opposite the title page being of especial excellence. Dr. Stewart has also followed a course which is unusual in that he has introduced directions for laboratory exercises into the body of his work. These do not occupy a great deal of space, they are all founded on actual experience and have been well tested by the author. They will undoubtedly serve a good purpose for teachers, may be very valuable to the private student and at least prove suggestive for the ordinary reader. That they will in their entirety be followed by many classes is more doubtful. This work does not pretend to teach or specially illustrate the minute structure of tissues. As to whether so complete an omission of the histological is wise in a work intended for the average medical student, seems a little doubtful. However, there is more division of labour and specialization in medical teaching now than at any previous time and much can be said for Professor Stewart's course. Something must be omitted in every work, and it certainly was wiser to leave out histology altogether than to make the physiological treatment superficial or inadequate in any respect.

The author informs us that in this edition in the chapters on Blood, Digestion, and the Central Nervous System, there has been considerable addition to the matter of previous ones; still the bulk of the volume has not been materially increased owing to the adoption of the different

forms of type referred to above. The whole work impresses one with the conviction that the author was unusually well fitted not only by an adequate knowledge of physiology but by experience in teaching and writing, to construct a text-book for students, and indeed for all who wish a sound and thorough knowledge of modern physiology. It certainly is not a book for babes and sucklings, for in this more than in many works have the technique and experimental been brought to the front, and this will not make easy reading to a great many who wish to get some knowledge of physiology; but to the student who has the opportunity of doing laboratory work, as indeed this book presupposes, these will not seem such difficulties or bugbears as they were to a large proportion of students of medicine at the date of the appearance of the first edition of this book. Nevertheless, we cannot but believe that the work might have been possibly more useful, certainly accessible to a larger number, if the technical had been a little less prominent. The medical student is rather one who must be provided with physiology in such form as he can comprehend clearly and apply readily than with that technical and extensive knowledge demanded of the specialist in physiology, or of one pursuing a purely scientific career. But there is room for many kinds of books and about the value of Dr. Stewart's there can be no question. All who can read it, digest it, and apply it will have a good hold upon the science of physiology. The practitioner, or more advanced student, who was perhaps furnished with a less nutritious diet in his undergraduate days may, by means of this book of moderate size, ascertain sufficiently well what is the present *status* of physiological knowledge in any department. It is an exceedingly well balanced book. It does not represent the physiology of any one school or laboratory or the fads of any individual writer, and so far as we have observed it has no peculiar defects or weaknesses of any importance, though it has many and great merits. We sincerely wish it the success it deserves.

W. M.

PARK'S PATHOGENIC MICRO-ORGANISMS. By WILLIAM HALLOCK PARK, M.D., Professor of Bacteriology and Hygiene, Bellevue Hospital Medical College, Director of Research Laboratory, Department of Health, New York. New (2nd) edition, enlarged and thoroughly revised. 556 pages, with 165 engravings and 4 full page plates. Cloth, \$3.75, net. Lea Brothers & Co., Philadelphia and New York.

We congratulate Dr. Park upon the fact that in this new edition

he has determined not to be a slave of the word and has made his text-book of Bacteriology for medical students not one description of pathogenic bacteria only, but has widened its scope so that pathogenic microbes in general are included, whether of vegetable or animal nature. However much we may lament the misuse of terms in one science—and such misuse is painfully widespread—utility must dominate correct usage. Already for long years the works on bacteriology have contained chapters upon the pathogenic moulds and yeasts, which assuredly are not bacteria. Their study forms no separate science. So it is with the protozoan microparasites; they have to be studied by the student by the same methods, the problems they introduce are identical; to leave them out of the text-books is pedantic. We have always liked this work of Dr. Park's. We like it still better in this improved form. With no particular grace of style it is nevertheless direct and practical, as might be expected from the author's position in connection with the New York Board of Health and his valuable series of studies upon the infections and anti-toxines, it is more particularly authoritative whenever it touches upon practical methods of applying bacteriology to diagnosis and treatment of infectious diseases. The newly introduced chapters upon the pathogenic protozoa are singularly clear and concise.

J. G. A.

LEFEVRE'S DIAGNOSIS. By **EGBERT LEFEVRE, M.D.**, Professor of Clinical Medicine and Therapeutics in the University and Bellevue Hospital Medical College, New York. New (2nd) edition, revised and enlarged. In 479 pages, with 102 engravings and 6 full page plates. Cloth, \$2.25, net. Lea Brothers & Co., Philadelphia and New York.

The second edition of this book introduces a number of changes and emendations; the illustrations are in many cases very useful, and there is a fairly representative lot of radiographs shown chiefly with regard to diseases of the lungs. A good point about the whole book is the stress that is laid upon observations by eye and hand, and the skin-pencil is used throughout very effectively; all this means that the student is learning his science from the patient and not from the text-book.

QUIZ COMPENDS; Blakiston's: Medical Chemistry, Inorganic and Organic, Urinalysis. By **HENRY LEFFMAN, A.M., M.D.** 5th edition.

This book of 200 pages contains much information attractively presented.

BLAKISTON'S QUIZ COMPENDS; A Compend of Diseases of the Skin. By JAY F. SCHAMBERG, A.B., M.D., Professor of Diseases of the Skin, Philadelphia Polyclinic. Pages, 298; illust., 108. 4th edition. P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia, 1905.

The fourth edition of this little hand-book does not appear to differ radically from its predecessors. Some additions on X-ray treatment are made.

CLINICAL AND PATHOLOGICAL PAPERS, from the Lakeside Hospital, Cleveland. Series II., 1905.

This consists of 40 papers, clinical, experimental and pathological, which have been published elsewhere, but are here collected to give evidence of the scientific activity of the hospital.

A MANUAL OF DISEASES OF INFANTS AND CHILDREN. By JOHN RUHRÄH, M.D., Clinical Professor of Diseases of Children, College of Physicians and Surgeons, Baltimore. 404 pages, fully illustrated. Philadelphia and London: W. B. Saunders & Company, 1905. Flexible leather, \$2.00, net. Canadian Agents: J. A. Carveth & Co., Toronto.

Dr. Ruhräh's book is a compact volume which appears to be a well conducted and sifted product of one of the large text-books upon the subject, and this is exactly what the author has set himself to do. It is essentially a student's book, for each individual subject is so briefly considered that it can scarcely be more than an outline. A useful chapter is one devoted entirely to therapeutics and prescriptions, with some general common sense rules about the treatment of children by medicines.

SAUNDER'S QUESTION COMPENDS; Essentials of Materia Medica and Therapeutics. By HENRY MORRIS, M.D. Seventh revised edition, adapted to the new (1905) pharmacopeia.

This work is no exception to all the other numbers of this excellent series of compends. Dr. Bastedo, in revising the book for this seventh edition, has brought it in accord with the new (1905) Pharmacopeia, introducing all the new remedies and carefully indicating their therapeutic doses and uses.

DOSE-BOOK AND MANUAL OF PRESCRIPTION-WRITING. By E. Q. THORNTON, M.D., Jefferson Medical College. Third Edition, revised and enlarged; 392 pages, illustrated. Philadelphia and London: W. B. Saunders & Company, 1905. J. A. Carveth & Co., Toronto. \$2.00 net.

For the saving remnant of the profession which still writes prescriptions this book is invaluable. It contains all which is known of the too-much despised art of prescription-writing. The metric system receives equal prominence with the established usage. The book is intended primarily for students, but there are many graduates who would be improved by consulting its pages.

MAN AND HIS POISONS. By ALBERT ABRAMS, A.M., M.D., Consulting Physician, Denver National Hospital. Illustrated. E. B. Treat & Company, New York. Price, \$1.50.

Dr. Abrams will be remembered as the author of "The Blues," a book about which we were not over enthusiastic when it appeared. Too much stress need not be laid upon the scientific quality of this book either, though it is difficult to avoid comparison with Bouchard's "Auto-intoxication." Yet it is full of character, wise saws, and acute reflections.

LECTURES ON ANTI-INTOXICATION IN DISEASE. By CH. BOUCHARD, Professor of Pathology and Therapeutics, Paris. Translated, with a preface and new chapters added, by THOMAS OLIVER, M.A., M.D., F.R.C.P., Professor of Physiology, University of Durham. Second revised edition. Price, \$2.00, net. F. A. Davis Company, Publishers, 1914-16 Cherry Street, Philadelphia.

The first edition of this book appeared in 1894, and the present reviewer still remembers the pleasure with which he read it a dozen years ago. Such books were rarer then than now. The text remains practically the same, but Dr. Oliver, by his additions and scholarly preface, has brought the book up to date. This book remains one of the most fascinating monographs in modern medicine.

The new Asylum for epileptics at Woodstock has been formally handed over to the government by the contractors. The asylum consists of two cottages and an administration building with accommodation for seventy patients. Dr. J. J. Williams, of Lisle, is to be superintendent.

Medical News.

MONTREAL MEDICO-CHIRURGICAL SOCIETY.

The Montreal Medico-Chirurgical Society has arranged the following programme for the remainder of the Session:

February 2nd: Pancreatitis from a surgical point of view, with reports of some cases. J. M. Elder.

February 16th: A cure for tuberculosis. Geo. A. Brown.

March 2nd: Osteomyelitis, with special reference to treatment. A. E. Garrow. Subacute blepharo—conjunctivitis. F. J. Tooke.

March 16th: Two years' travel and medical research on the Congo. J. L. Todd (Liverpool School of Tropical Medicine).

April 6th: Pulmonary gangrene and abscess. Ridley MacKenzie, Geo. E. Armstrong.

April 20th: Latent organic disease of the stomach. C. F. Martin.

May 4th: An epitome of one year's work in the Neurological Department, Montreal General Hospital. D. A. Shirres.

May 18th: Remarks on the weak foot, commonly known as flat foot, with especial reference to the principles of curative treatment. Royal Whitman (Medical Department, Columbia University, New York).

June 1st: The outdoor treatment of tuberculosis, illustrated by lantern slides. A. J. Richer.

June 15th: Skin lesions of tertiary syphilis. G. Gordon Campbell.

ROYAL VICTORIA HOSPITAL.

The annual meeting of the Royal Victoria Hospital was held on the 16th January, 1906. During the year 3,093 patients were treated, an increase of 39 over the previous year.

Of the total number, 1,729 were Protestants, 1,118 Roman Catholics, 211 Hebrews, and 35 of other faiths. The free patients numbered 1,631. The total days of hospital treatment aggregated 71,194, as against 74,777 in the preceding year, a decrease of 3,583 days.

On January 1, 1905, there were 174 patients in the hospital remaining from 1904, and during the year 3,085 were discharged, of whom 1,348 were well, 1,098 improved, 184 not improved, 278 not treated, and 182 died. There remained in hospital on December 31, 1905, 180 patients. Of the 182 deaths, 57 took place within 48 hours of admission. The

death rate for the year was 5.89 per cent., or, deducting those dying within 48 hours of admission, 4.05 per cent.

The highest number of patients in the hospital on any one day was 219, on February 24, and the lowest was 166, on July 18. The highest monthly average was 212, in February; and the lowest 178, in July. The daily average for the year was 195, as against 205 for the previous year.

During the twelve years that the hospital has been in existence 29,682 patients have been admitted to the wards for treatment.

In the out-patient department the total number treated last year was 3,830. The number of visits of these patients aggregated 24,872; Medical, 8,587; surgical, 4,988; eye and ear, 4,524; nose and throat, 5,633; disease of women, 1,140.

The income for the year was \$160,591, while the ordinary expenditure amounted to \$124,547, the balance of \$36,043 being applied in reduction of the indebtedness incurred by the new buildings and other additions.

The total cost per day patient was \$1.74; the cost per day of maintaining each person in the hospital—staff, servants, all employees and patients—being 82 cents, and the daily cost of provisions for each person, 23 cents.

Dr. J. W. Stirling was appointed ophthalmologist to the hospital, in succession to the late Dr. Buller.

The following appointments were made to the medical staff:

Associates in medicine—Drs. Fry, Cushing and McCrae.

Clinical assistants in medicine—Drs. Burnett, McAuley and Russell.

Clinical assistants in neurology—Drs. Robinson, Robins and Russell.

Clinical assistant in ophthalmology—Dr. Tooke.

Clinical assistant in gynæcology—Dr. Goodall.

Clinical assistant in laryngology—Dr. Hamilton White.

Registrar—Dr. Cushing.

Assistant registrar—Dr. McAuley.

House pathologist—Dr. Klotz.

Assistant in X-ray department—Dr. Cram.

WESTERN HOSPITAL.

The thirty-third annual meeting of the Western Hospital was held January 16th, 1906. The number of patients treated during the year was 524; and the number of consultations in the out-door department was 6,698. In order to provide urgently needed accommodation, the

Board of Governors had decided to proceed at once with the erection of one wing of the new building, sufficient to accommodate 100 beds.

The treasurer reported total receipts of \$21,405.58. The payments—including \$2,752, outstanding accounts for 1904, the previous year—totalled \$15,541.50.

The lady-superintendent reported that the number of nurses was 16. Ninety-six applications for admission to the training school had been received; 15 probationers had been admitted; and 5 had finally been selected to act as pupil nurses. Eleven nurses had passed the necessary examinations, and been awarded diplomas and medals.

The Medical Board reported the following resignations from the staff: Dr. Andrew Macphail pathologist; Dr. Grace Ritchie-England, assistant gynaecologist; Dr. J. Leslie Foley, dermatologist.

Dr. A. G. Nichols was appointed to succeed Dr. Macphail as pathologist, Dr. C. C. Gurd and Dr. L. Gilday were appointed assistant gynaecologists.

In regard to the new wing, the chairman said that the subscriptions up to December 31st last, amounted to \$13,395; to which had since been added \$500. The sum of \$8,745—increased by interest account to \$8,769—had been paid in; \$8,502 had been paid out; and \$267 remained on hand. The total subscription account at the present time amounted to \$13,895. He estimated that the new building, with complete equipment would cost about \$65,000.

The following officers were elected:

Honorary president, R. Hersey; president, Mr. Charles F. Smith; 1st vice-president, Mr. Peter Lyall; 2nd vice-president, Mr. D. K. McLaren; treasurer, Mr. H. A. Hodgson; secretary, Dr. George T. Ross.

Committee of management—Messrs. Stearns, J. Pitblado, B. A. Boas, P. W. McLaren, Thos. Gilday, A. P. Willis, C. W. Davis, James A. Ogilvy, Jr., W. H. Trenholme, F. Robertson, J. C. King, J. T. McCall, Robert Bickerdike, Charles Gurd and John Murphy.

The sixth annual meeting of the Canadian Association for the Prevention of Consumption and Other Forms of Tuberculosis will be held in the Railway Committee room of the House of Commons on the 28th of March, 1906. In the evening a public lecture will be delivered in the lecture hall of the Normal School by Dr. Arthur J. Richer, of Montreal, which will be illustrated with stereopticon plates, showing the stages of consumption and some of the appliances now in use to check and cure the disease. The chair will be taken in the evening by His Excellency Earl Grey.

At the annual meeting of the Toronto Free Hospital for Consumptives, it was stated that 136 patients in the advanced stages of tuberculosis had been cared for, during the year. An addition has been built at a cost of \$20,000, which will soon be ready for occupation; a further sum of \$15,000 is on hand to build a hospital for paying patients in the advanced stages of the disease.

Dr. Orlando S. Strange died in Kingston on January 2nd. He was the oldest physician in Kingston and had practiced for fifty years, retiring some years ago.

Dr. Joseph Carbert died in Toronto, on January 2nd, in his 80th year. He had practiced in Orangeville for many years.

Dr. Silas P. Emes, a graduate of Victoria College, Cobourg, died at Niagara Falls, on December 25th, aged 67. He had been in practice at Drayton, Ont. He was a surgeon of the Grand Trunk Railway, and was coroner of Welland County.

Dr. Robert Mitchell, of Amherst, N.S., died on December 27th, of pneumonia. He was a graduate of Edinburgh. He practiced in Wallace, N.S., Dorchester, N.B., and finally at Amherst, N.S.

Dr. A. H. Cooke, who formerly practiced at Mt. Pleasant, Ont., died on January 10th, at Chicago.

Dr. Fred. Lapsley, a graduate of Toronto University, died on January 6th, at Chicago, aged 37 years.

Dr. Wm. Armstrong died in Toronto, on January 11th, in his 79th year. He lived in Orangeville, and afterwards in Toronto.

Dr. W. A. Comfort, of Beamsville, Ont., died on December 20th, at Campden, Ont., aged 83 years.

Dr. W. J. Arnott, of Berlin, died on December 12th, of meningitis. He was a graduate of Trinity College, Toronto, and was 43 years of age.

Dr. A. L. Jukes died on December 3rd, at Vancouver, in his 85th year. He was born in India, was at one time senior surgeon of the North-west Mounted Police, and since 1894 has lived in retirement. He was a Fellow of the Royal Obstetrical Society of England.

Dr. J. H. McFaul died at Toronto, on December 23rd, of angina pectoris. He was a native of Ontario, a graduate of Trinity College, and practiced medicine in Toronto since 1888. He was 66 years of age.

Retrospect of Current Literature.

SURGERY.

UNDER THE CHARGE OF GEORGE E. ARMSTRONG.

J. HOGARTH PRINGLE, M.B., Edin., F.R.C.S., Eng. "Bier's Osteoplastic Amputation." *Lancet*, November 18th, 1905.

The evolution of this operation, which is quite a different procedure from that of Pirogoff and Gritti, has been a gradual one. The first step was the idea of forming an artificial foot for the purpose of taking the weight. Having amputated the limb, he took out a wedge higher up, involving the whole thickness of the bone, and turned up the distal segment of bone which was then fixed at right angles to the remainder and projected forwards beyond it, so as to form a support something like a miniature foot. Latterly he shortened the piece of bone to be turned up so it merely covered the end of the proximal segment. The present modified operation first appeared in 1897. A flap of skin and subcutaneous tissue is cut from the antero-internal aspect of the limb and reflected with care that there is no damage to the periosteum covering the skin surface of the tibia. Next, three sides of a rectangular flap of periosteum are cut on the skin surface of the tibia, the two lateral incisions being made just beyond the margins of this surface of the bone, and the transverse incision about one and a half inches down from the base of the skin flap. With an elevator the periosteum is raised for about one-third of an inch upwards from the transverse incision, and then a fine saw is applied and a thin flap of bone, still adherent to the periosteum, is cut from the compact bone of the shin surface. It may consist of the whole thickness of the compact layer. Its length must be equal to the transverse diameter of the tibia, and may be made long enough to cover the fibula end as well. The base of the bone flap is then snapped through, but the periosteal bridge connecting it to the bone of the stump must be most carefully preserved. After the bones are sawn across, the bone flap is sutured by the margin of its periosteal covering to the edge of the periosteum of the bone of the stump and to the muscles of the stump also, so that it is held closely to the sawn end of the tibia. The results are illustrated by accompanying skiograms. The writer has performed this amputation 15 times on the bones of the leg, 6 times on the femur, on the humerus twice, and once through the forearm. In the leg and femur and humerus the results have been very good, in the forearm

pronation and supination were quite arrested. This result is not so disadvantageous as would at first appear because rotation takes place, so freely at the shoulder that the patient found no inconvenience. The reasons set forth for this method of amputating in children as being conducive against the development of conical stump are given and are worthy of consideration. The advantages claimed for this operation are that it allows the patient to bear his full weight upon the end of the stump, that by so doing better power of locomotion is secured, and that this renders atrophy of the muscles less likely to occur. In the writer's opinion, it ought to be the operation of choice in all cases when there is a reasonable chance of avoiding infection.

G. LENTHAL CHEATLE, C.B., F.R.C.S. "The Spread of Cancer in the Tongue, and its Influence on Treatment." *The Practitioner*, November, 1905.

The paper deals only with the extension of the disease in the tongue itself, not with the deposits in the lymphatic glands and elsewhere.

For active surgical purposes, cases of cancer of the tongue can be divided into three classes, the early case in which there is little disease, the advanced case but presumably operable, and the inoperable case. In all, 19 cases were operated upon, and examination of the tissues removed and post-mortem findings in three of the cases form the basis for the conclusions drawn. Whitehead's operation was performed on all the cases, they all belonged to the second class of case, and the cancer process began on the side or centre of the tongue, in its anterior two-thirds in all of them, except one, where it began on the under surface of the tip, at the junction of the frænum linguæ with the tongue, and early spread to the floor of the mouth. Regarding the superficial spread of cancer in the tongue, the writer believes that mechanical, lymphatic and vascular areas play quite a secondary part in the spread and limitation of the disease, and that the primary growth spreads in the muscles rather than in fascial planes which separate them. Ulceration is regarded as being due to simple atrophy caused by the pressure of the growing tumour beneath the mucous membrane rather than to actual extension of the disease. The limitation of the disease to the median line, which is frequently observed, is explained in the same way as the limitation of growth in rodent ulcer, that it becomes at least temporarily, arrested at neighbouring nerve areas and in denervated areas, which also explains the escape of the tip in these cases. This limitation, however, may be only apparent, for with it we may have deep infiltration of the apparently unaffected side, as is shown in one illustra-

tion. Regarding the deep spread, it takes place in the muscles and fascial planes. These points are well illustrated by 13 sections with explanatory notes. The point of chief practical importance, which these data teach, is that the tongue, for surgical purposes, must include its extrinsic muscles, and not merely these parts of them covered by mucous membrane in the mouth. This point is shown by the finding of secondary deposits in the stumps of the hyoglossus muscle, the inferior lingualis muscle, and the fascia covering the genio-hyoid muscle. It would appear, therefore, that Whitehead's method of excision is quite inadequate for the presumably operable class of cases.

When the disease has spread to the dorsal surface, at, or near the centre in its anterior two-thirds, the hyoglossus, the geniohyoglossus muscles, particularly its genio-glossal fibres and the inferior lingualis muscle, are cancer-bearing on both sides, and their total removal is the best chance of success. When the disease has begun, and is still undoubtedly quite at one side, and does not approach the middle line, then excision of half the tongue and of its muscles should be attempted, but the writer believes these cases to be very uncommon in the class of case under consideration. He supports Mr. Butlin's view that the glands in the anterior triangles of both sides must be removed where one complete half, or both sides of the tongue have been removed. Dr. Wright's method of producing pre-operative artificial immunity, and of operating when the degree of opsonic power is high, was carried out in two cases with most gratifying results. He believes this is the line to be followed in the future, and suggests a wide field of research on these lines. Attention is drawn to a lymphatic gland, a secondary deposit in which occurs in the earlier stages of cancer on the side of the tongue, and in one case was the only gland involved. This gland lies on, or near, the posterior inferior angle of the hyoglossus muscle just above the hyoid bone.

Where the disease involves the under surface of the tip and floor of the mouth, the whole tongue and the genio-hyoid muscles and their fasciæ must be removed.

A description of the writer's method of operation is given, and though much more radical than those generally pursued, the pathological findings would seem to indicate the necessity for such extensive removal of tissues.

W. S. THAYER, M.D. "Observations on Several Cases of Acute Pancreatitis." *Johns Hopkins Bulletin*, November, 1905.

Five cases are reported, four of suppurative pancreatitis with abscess

formation, and one of gangrenous pancreatitis. Of the four abscess cases three recovered, and one died. The gangrenous case was also fatal. The principal features of the cases are as follows: *Case I.*—That of a woman, aged 51, with a personal history of previous attacks of biliary colic. The onset of the present illness came on with an attack of biliary colic and jaundice, followed by fever, nausea, vomiting, and pain on the left side of the abdomen. A deep-seated tumour mass was found occupying the epigastrium and left side of the abdomen, extending well outward and backward into the flank. Operation was performed thirty-seven days from onset and a parapancreatic abscess with fat necrosis was found. The patient stood the operation well, but was in a very critical state for ten days following with frequent vomiting, but made a complete recovery. *Case II.*—Was in a man, aged 34, with a previous history of cramp-like pains over the epigastric area for a year and a half. The present attack came on with severe epigastric pain, vomiting and fever. Examination showed a tumour mass in the epigastrium, and a diagnosis of acute pancreatitis with parapancreatic abscess was made and confirmed on operation twelve days after onset. The patient made an uninterrupted recovery. The third case was in a man, aged 47, who gave a history of biliary colic with jaundice six months before his present illness. The present attack came on with sudden intense cramp-like abdominal pain, associated with nausea, vomiting, collapse, abdominal distention and constipation. Physical examination revealed a tender, painful tumour in right half of epigastrium and hypochondrium. Operation was performed on the twenty-first day from onset. On opening the peritoneal cavity numerous areas of fat necrosis were visible, and the omentum was matted together. On making an opening through the omentum a large amount of dark, brownish-black fluid escaped. The patient's condition was so bad that a drainage tube was inserted and the wound closed without further investigation. The autopsy showed necrosis of the pancreas, with parapancreatic abscess and a stone lodged in Vater's diverticulum.

The fourth case was that of a woman, aged 49, with a previous history of biliary attacks. The present attack was attended with sudden severe epigastric pain requiring morphia. There was persistent dull epigastric pain with nausea and vomiting. Examination revealed a tender tumour in the right umbilical, epigastric and lateral abdominal regions. A diagnosis of pancreatitis was made. At operation an abscess was found which was shut off from the general abdominal cavity by intestinal adhesions. The abscess contained masses of necrotic omental fat, a considerable quantity of which was evacuated, the cavity afterwards being

wiped out and packed with iodoform gauze. The case made a good recovery. The fifth case was in a man, aged 37, who, seven months previously, had an attack of intense epigastric pain with vomiting and purging. He recovered from the attack in two months time. Three weeks before admission he had another attack of epigastric pain with vomiting. These symptoms persisted in a milder degree up to entry. A diagnosis of acute pancreatitis was made from the history and clinical findings, chief of which were the presence of an indefinite mass midway between the umbilicus and ensiform cartilage, which was tender, a little fulness in the upper half and more on the left side of the abdomen, and marked increase in resistance over this area combined with the rather collapsed general condition. Operation showed fat necrosis at tip of the omentum which was adherent to gall-bladder, with some similar spots on the mesentery of the transverse colon. The case was thought to be either acute pancreatitis or possibly carcinoma of the tail of the pancreas, this latter view being held on account of the general thickening of the organ which was most marked at the tail. Two days after operation the patient developed pulmonary symptoms, and on the third day there were three profuse discharges of fresh bright blood from the bowels, and death ensued shortly afterwards. Autopsy showed acute gangrenous pancreatitis with necrosis of the greater part of the pancreas, formation of fat necrosis and perforation of the stomach, duodenum and transverse colon, erosion of the splenic artery with hæmorrhage into pancreas and transverse colon, and cholelithiasis. The causes of pancreatitis are considered, and also the aids to diagnosis afforded by examination of the excreta and urine. Unfortunately, the careful feeding necessary for thoroughly satisfactory observations on the fæces is usually impossible in acute pancreatitis, but the list suggested by Opie should be employed in every case. Glycosuria is rare and of little diagnostic importance. Those cases of acute pancreatitis, which go on to suppuration, the subacute form of Robson and Moynihan, have especial interest in that they alone are regarded as amenable to surgical treatment. The symptoms of this class are sudden, intense, abdominal pain, localized, as a rule in the epigastrium, but often more or less general and associated with obstinate vomiting and collapse. The fever is not, as a rule, excessive. In some instances the attack may be followed by or associated with jaundice. In the course of a few days the acute symptoms subside, but there remains epigastric tenderness with fever, possibly chills, sweating and evidence of deep abscess. Vomiting is often obstinate. The deep-seated mass sometimes to be felt may extend on either side into regions far distant from the normal limits of the pan-

creas, as was so in the cases here reported. The importance of the relationship between cholelithiasis and pancreatitis, and of early operation and drainage are the writer's conclusions.

W. L. B.

JOHN B. ROBERTS, M.D. "A Case of Excision of the Head of the Humerus for Congenital Subacromial Dislocation of the Humerus." *American Journal of the Medical Sciences*, December, 1905.

This deformity is a very unusual one, the writer being able to find only twenty cases previously reported. Although allowing for cases of this form of dislocation being caused by traumatism at time of birth, he believes a large proportion of them are really the result of intra-uterine conditions. Subspinous or subacromial dislocations are so rare in adults and children that it seems reasonable to regard them, when found immediately after birth, as true congenital conditions. This view is further backed up by the fact that this condition has been found present in both shoulders of the same infant, and also by the fact of its occurrence in more than one child of the same family. The case presented the usual picture of the dislocation, as is very well shown by the skiagrams. A posterior and an anterior incision were made and reduction attempted but without success. Owing to the rotation of the humerus the bicipital groove with the long head of the biceps tendon was much displaced and in excising the head the tendon was divided in the depth of the wound and unfortunately not recognized at the time. Seen two years after operation, there is three-quarters of an inch shortening, some rotation persists, the belly of the biceps stands out prominently in the middle of the arm, and there is some atrophy of the forearm, and the hand is smaller than its fellow. The scapular muscles appear as well developed as in the other side, and there was marked improvement functionally.

CHARLES GREEN CUMSTON, M.D. "Remarks on Renal Traumatism." *The Practitioner*, December, 1905.

The considerable increase in recent years of renal traumatism is to be explained by the greater number of accidents resulting from the development of modern industry, and by the advance during the last ten years in our knowledge of renal surgery. In consequence of the well protected position of the kidney, traumatism forms a comparatively small percentage of renal diseases, but at the thirty-second German Surgical Congress, Riese was able to tabulate 491 cases. The most common

causes of renal traumatism are blows, squeezing between carriages, etc., and run-over accidents. Muscular tension, as in strong reflex movement to prevent falling, may also give rise to trauma. It is pointed out how trauma may occur from a relatively slight accident. By animal experimentation, as well as in the cadaver, it has been shown that the mechanism of the development of rupture of the kidney depends principally upon a sudden jerking adduction of the lower limbs, pressing the kidney against the spinal column, or by hydraulic pressure acting upon a distended renal pelvis, or an extremely vascular renal parenchyma. In order to produce rupture of the renal pelvis or parenchyma, the ribs must press upon the organ. It is interesting to note that fracture of a single rib is a very rare associated condition, generally two or more ribs are fractured. Subcutaneous traumatism of the kidney gives evidence of general manifestations particularly referable to the central nervous system, and then come the local symptoms arising directly from the renal injury. The general symptoms are apathy immediately after the accident followed or not by unconsciousness, vomiting, a small frequent pulse, subnormal temperature, and in most cases, an extreme pallor of the integuments. These general symptoms cannot be relied upon as of absolute diagnostic value for kidney contusion, nor for estimating the gravity of a given case, because they may arise in any accident, frequently in contusion of the abdomen, and frequently do not correspond in any way with the real gravity of the accident. The local symptoms are more constant and are pain, generally of a colicky character, tumefaction of overlying parts with dulness on percussion, and blood in the urine, with rigidity of the affected side. Should there be involvement of the peritoneum, either by a retroperitoneal hæmorrhage or escape of urine, or by rupture of the peritoneum, visceral or parietal, we have added a well marked distension. It is interesting to note that a septic peritonitis does not necessarily follow from the presence of urine in the peritoneal cavity. Petroff collected 14 cases where such conditions pertained, and only one resulted in a fatal septic peritonitis. As regards treatment, the writer believes that many kidney injuries may recover without surgical interference, and prefers to carefully watch his cases, using palliative measures. If the symptoms of severe hæmorrhage become marked, or if signs of pus formation show themselves a nephrotomy or nephrectomy is indicated, but the activity of the other kidney should always be previously ascertained.

Three cases are reported, all of which recovered.

CHARLES P. CHILDE, B.A., F.R.C.S. "Wandering Spleen; Hæmorrhage within the Capsule; Splenectomy; Recovery." *British Medical Journal*, December 23rd, 1905.

This interesting case occurred in a woman, aged 54 years, who had had nine children. Her confinements were normal and her general health always good. The present illness came on with sudden pain in the abdomen, retching and faintness. These acute symptoms subsided quickly and had not recurred two months later when she was seen by the writer. At this time there was a smooth, rounded fluctuating tumour occupying the left false pelvis and extending up to level of umbilicus on same side, dull on percussion, could be moved a little from side to side but not upward, and not apparently attached to the uterus. The very justifiable diagnosis of an ovarian cyst, the acute attack being attributed to torsion of the pedicle with hæmorrhage into its cavity, followed by peritonitis which had caused adhesion and fixation of the tumour was made. Operation revealed a cystic tumour with omentum adherent everywhere over its anterior surface. Further investigation showed this mass to be a wandering spleen, with a large blood cyst attached to it. The lower pole was firmly adherent to the left iliac fossa the spleen lying obliquely across the pelvis with the pedicle twisted on itself, and the lower part very tense. The upper pole was lowermost and turned towards the right. Considerable difficulty was experienced on account of the adhesions, the readiness with which the capsule tore, the thickness of the pedicle, and great tension in its lower part. The writer admits that splenectomy is not the ideal treatment for wandering spleen, but we quite agree with him that in this case it was the only procedure warranted. The case made an uneventful recovery, and one year later showed no enlargement of the lymphatic glands, a condition observed in the after history of three cases of splenectomy reported by Messrs. Ballance and Pitts in 1896, and was in apparent perfect health.

JOHN L. YATES, Ph.B., M.D. "An Experimental Study of the Local Effects of Peritoneal Drainage." *Surgery, Gynecology, and Obstetrics*, December, 1905.

The writer has gone very thoroughly into the literature of this subject from the time when Celsus drained the peritoneal cavity for ascites up to the present time. He reviews the reported clinical and experimental observations of many writers, and gives a brief description of his own findings in 31 operations upon dogs. From all of which ma-

terial he arrives at the following conclusions. Drainage of the general peritoneal cavity is physically and physiologically impossible. The relative encapsulation of the drain is immediate. The absolute encapsulation occurs early (less than 6 hours in dogs) and can be retarded, but not prevented. The serous external discharge is an exudate due to irritation of contiguous peritoneum by the drain. There is a similar inward current from the potential into the general cavity. This external exudate diminishes remarkably with the formation of encapsulating adhesions. These conditions, under approximately normal conditions, form about any foreign body, and their extent and density depend on the degree and duration of the irritation of this body. Primarily fibrinous, these adhesions become organized in a few days (three days in dogs). If the irritation persists, they become progressively more mature fibrous tissue. After irritation ceases, their disappearance depends principally upon a mechanical factor, the ability of the involved surfaces to pull themselves or to be pulled loose. Drains should be the least irritating, and should be gradually and finally removed as soon as possible. Irrigation through drains is futile to prevent adhesions, and dangerous. After a drain is inserted all intra-abdominal movements should be reduced to a minimum. As soon as the drain is removed intra-abdominal movements should be stimulated, to aid in the disappearance of the remaining adhesions. Peritonitis, if not too severe, probably aids in the rapidity of the encapsulation of the drain. A drain in the presence of infection is deleterious to peritoneal resistance and should only be introduced to exclude most malign influences. Postural methods, unless destined to facilitate encapsulation, are both futile and harmful, as far as drainage is concerned. Peritoneal drainage must be local, and unless there is something to be gained by rendering an area extraperitoneal, or by making from such an area a safe path of least resistance leading outside the body, there is, aside from hemostasis, no justification for its use. The clinical significance of these conclusions is that drainage is to be used only when we are dealing with dangerous areas or areas likely to become dangerous. The writer holds that the best way to render such areas extraperitoneal is by enveloping a gauze drain constructed on the principle of Mikulicz's tampon, as completely as is practical, with the thinnest gutta-percha tissue, which should entirely surround the whole distal portion and project beyond the skin.

JOHN G. PARDOE, M.B., Aber., F.R.C.S., Eng. "The Treatment of Tuberculosis of the Urinary System by Tuberculin." *Lancet* December 16th, 1905.

The writer's attention has been called more particularly to this sub-

ject during the past seven or eight years by two observations, that tuberculosis of the urinary system is of far more frequent occurrence than is generally supposed, more particularly primary diseases of the bladder; and the disappointing results of operative treatment of all kinds. The tuberculin used in this treatment is that known as Koch's tuberculin rüickstand (T. R.) heated to 60° C. for an hour. It is administered hypodermically, the initial dose being 1-500 milligramme and is increased every other day until a definite reaction is obtained. The dose is then reduced to that amount which apparently causes no reaction and is given once a week for long periods. Should a reaction occur at any time the dose is further reduced either in amount or frequency or both. Owing to the long periods of latency which frequently obtain in tuberculosis of the urinary system, those cases apparently cured must be regarded with caution. In his results no case is reported which has not been under observation for more than one year. Out of 21 cases so reported, six died, six showed no improvement, four were much improved, while five were apparently cured. Compared with surgical results this series is encouraging. The writer believes that in tuberculosis of the bladder this tuberculin treatment is the best at our disposal.

W. L. B.

MEDICINE.

UNDER THE CHARGE OF JAMES STEWART, F. G. FINLEY, H. A. LAFLEUR AND
W. F. HAMILTON.

A STUDY OF BRACHIAL BIRTH PALSY.

L. P. CLARK, M.D.; A. S. TAYLOR, M.D.; J. P. PROUT, M.D. *American Journal of Medical Sciences*, November, 1905.

This article deals exhaustively with brachial birth palsies. As the result of dissection of a number of new-born infants, it was found that the only condition which could cause injury or rupture to the brachial plexus was tension on the nerves. When sufficiently great, tension invariably produced lesions of the nerves at the same point, and the only position causing stretching of the plexus was on increasing the distance between the head and neck and the shoulder. In living infants it was found that pushing the head and shoulders apart causes the upper nerves of the plexus to stand out just like fiddle strings. In vertex presentations this attitude occurs when the shoulder is obstructed, either at the

brim of the pelvis or by the symphysis pubis and the head is pulled upon by the *accoucheur*. If rotation or oscillation of the head and neck be added the strain is increased and more damage is apt to occur. A very few cases of temporary paralysis have occurred in normal vertex cases without traction. In breech presentations the lesion occurs from traction on the shoulders in delivery of the head.

In the cadaver, traction invariably caused the fifth root to give way first, then the sixth, and so on regularly down if the force used was sufficient. From the position of the plexus this result was to be expected. The same fact is borne out clinically, as the mildest cases show paralysis only of muscles belonging to the fifth root and progresses from that to cases involving rupture of the entire plexus. The nerves do not give way in a limited transverse section, but fray out over a considerable area, just like an overstrained rope. The site of rupture of the fifth and sixth nerves is above their junction in over 50 per cent. of cases.

A number of figures illustrate the pathology of the condition. The sequence of events appears to be rupture of the perineural sheath and the formation of a small hæmatoma. According to the extent of the lesion some of the adjacent nerve fibres are ruptured or, in extensive cases, the whole nerve. In the process of regeneration organization of the blood clot interferes with the regeneration of the nerve fibres, and, consequently, recovery may be incomplete even in partial ruptures.

The symptoms of "laceration palsy" are very characteristic. The arm hangs powerless by the side and cannot be abducted because of palsy of the deltoid and supra-spinatus muscles; the forearm is extended and cannot be flexed owing to paralysis of the biceps, brachialis anticus and supinator longus; the hand is in extreme pronation caused by palsy of the supinator brevis and biceps; and the entire arm is rotated in so that the palm looks backward and outward. The humerus is rotated in as a result of paralysis of the supra and infra spinati and teres minor.

A fact of very great importance is the presence or absence of neuritis. When an infant remains peevish and fretful for a considerable period, and when handling of the extremity greatly aggravates the pain and irritability, there is present a traumatic neuritis, aggravated by pressure incident to the organization of the blood clot and repair of the rent in the perineural sheath. In cases that do not present this symptom there is a more or less spontaneous recovery, while in those cases presenting evidences of neuritis a considerable palsy will follow.

The degree and extent of lesion cannot be determined immediately after its occurrence. Electrical tests are unsatisfactory and even misleading, and sensory disturbances are not apparent. In the course of

a few months thickening may be detected at Erb's point, the junction of the fifth and sixth nerves.

In the milder cases recovery may occur spontaneously in six to nine months. Even in these cases there may be retarded development and persistent atrophy. In more decided lacerations the outcome depends on the amount of cicatricial contraction in and about the nerves. The occurrence of traumatic neuritis renders the outlook relatively bad from the outset.

Treatment: As the degree of spontaneous recovery cannot be determined for many months, treatment should be directed to maintaining the nutrition of the muscles, to preventing contractures and deformity, and to assist in repair by massage, passive movements, douches, electricity and such apparatus as is necessary to overcome a tendency to deformity.

In cases showing marked evidence of neuritis immobilisation is necessary for two to four months.

The length of time through which palliative treatment should be continued is still a matter for discussion. If complete recovery has not occurred by the end of a year, a prognosis of permanent lesion and a diagnosis of a cicatricial lesion, preventing nerve regeneration, may be confidently made. The only rational treatment is, therefore, excision of the cicatricial areas and nerve suture.

The results of operation in seven cases are recorded: Two died, and the others showed definite improvement, although two cases were aged eight and ten years.

Society Proceedings.

MONTREAL MEDICO-CHIRURGICAL SOCIETY.

The eighth regular meeting of the Society was held Friday evening, January 19th, Dr. F. R. England, President, in the Chair.

LIVING CASE FOR DIAGNOSIS.

E. W. ARCHIBALD, M.D.—The patient is a woman, aged 32, nine years married; she came to the hospital September 13th, 1905, with what was presumably carbolic acid gangrene of the right hand. The history was that she had suffered for some time with numbness and tingling in the hand with occasional pain, and had consulted a doctor, who prescribed a dessertspoonful of pure carbolic acid in a pint of water, into which she should place her hand for a short time. She states that she simply poured the acid into the water without stirring,

and kept her hand in it for a half-hour at a time; and it is evident that in this way the gangrene occurred. On September 13th, when she was first seen (the applications of the carbolic acid had been carried out daily for one week in August), there was beginning gangrene in the tips of the ring and little fingers, with swelling of the other fingers. She was advised to go into the ward, but she refused and was not seen again until some time in October, when she turned up at the Out-door Clinic. The gangrene now was quite definite, though it had not advanced to any extent, and the rest of the fingers and part of the body of the hand were swollen. There was considerable pain in the fingers and hand, not continuous, but rather of an intermittent cramp-like nature. Towards the end of December she was admitted to the ward with a well defined line of demarcation cutting of the tips of the two fingers mentioned. The rest of the fingers and the hand were dry, glazed and scaly. The question of Raynaud's disease coming up, the patient was closely questioned, and it was found that she had suffered from indefinite pains and numbness and tingling in the other hand as well and also in both feet. She admitted that two of the left hand fingers occasionally became blue, or at times white. These symptoms were indefinite, and had not left any objective signs. It now seemed to us that this was not a case of carbolic acid gangrene purely, and Raynaud's disease suggested itself as a probability. On December 29th the tips of the ring and little fingers were amputated beyond the line of demarcation. Gangrene of the stumps immediately occurred; and pain remained severe and persistent, so that on January 9th the whole of the fingers were removed; what was remarkable was that at the operation there was no arterial bleeding, and but little capillary or venous oozing, though the tissues looked sound. At this time the tip of the index finger too was amputated, and here also there was no bleeding. The middle finger was slightly reddish and swollen, but otherwise there was no sign of gangrene. The amputated fingers were dissected, and no gross arterial disease could be found. It was now noticed that the radial could not be felt at the wrist, and that the brachial was much smaller on the right side than on the left. It was also noticed in the neck that the subclavians ran about an inch above the clavicle on either side. However, physical and X-ray examination showed that there was no aneurysm, nor cervical rib which might cause a local obstruction. There was demonstrated, however, a very low position of the clavicles; that is, they ran apparently in the skiagram below the third rib instead of through the second. This was controlled by comparison with the normal. During the past ten

days there has been a progressive increase in the gangrene which has involved considerably the thumb and middle fingers. With this there has been also a diminution in the brachial pulse, so that now no pulsation is felt at the elbow, and not until one reaches the middle of the upper arm. The artery to the feet seems harder than on the left side, and can be traced as a cord from elbow to axilla. The axillary pulsation is, perhaps, a little weaker than on left side.

It seems to me that the carbolic acid could not have developed all this trouble; Raynaud's disease alone can hardly be held accountable for the whole of the trouble; and besides the fact that the advanced gangrene is on one side only rather disturbs this diagnosis. The crux of the differential diagnosis seems to lie in the point:—Can Raynaud's disease cause a continuous spastic obstruction of large arteries? Or must we assume an organic arterial disease, a sort of severe senile gangrene occurring at an early age? Of advanced arterial sclerosis at an early age I find no mention in American literature; but it is described in certain German surgical works as purely a sclerotic change, in the early stages of which the pulse, *e.g.*, in the foot or wrist, is very small or absent. Another question suggested is as to whether in some cases Raynaud's disease and arterio-sclerosis overlap each other? What is the exact pathology of each?

F. G. FINLEY, M.D.—This is a case of very unusual interest, and it seems to me the condition is one of arterial obstruction rather than of genuine Raynaud's disease. The gangrene, marked and advanced in the right hand and completely absent in the left, is against Raynaud's disease, which is always symmetrical. I would like to ask if the condition in the neck is likely to cut off the vascular supply. As to premature arterio-sclerosis I remember many years ago seeing in Mr. Treves' ward a young man about 26, who had thickened arteries all over his body and gangrene, and Mr. Treves referred to the case as one of premature senility.

WESLEY MILLS, M.D.—It seems to me that this case is one of absorbing interest from a scientific point of view. From the fact that there were some symptoms pointing to Raynaud's disease before the carbolic acid accident it might be worth while to consider whether the injury might not have acted in a reflex way; and yet from the fact that the condition is almost wholly unilateral one might make such a diagnosis as Dr. Finley suggests; nevertheless, the explanation by reflex vaso-motor action would seem to satisfy a good many requirements.

J. B. McCONNELL, M.D.—It seems to be more than a coincidence that the gangrene should be only in one hand, and that, the one exposed

to the carbolic lotion. There does not seem to be any arterio-sclerosis anywhere that one can make out and it is usually a symmetrical disease, and it is a question if one needs to appeal to the presence of Raynaud's disease to explain the condition. The fact of the abnormal condition in the shoulders might mean a certain amount of compression of nerves and vessels, and explain the tingling which she is said to have felt previously, and which is the only evidence given of the presence of Raynaud's disease. If Raynaud's disease was present, would not the gangrene process have been accelerated rather than unusually slow and prolonged, as in this case. We know that gangrene will follow the persistent exposure of a finger to dilute solution of carbolic acid. Here the whole hand was soaked in it, and to this extent has become gangrenous. I think we do not need to look beyond its action for the results seen in this case.

F. R. ENGLAND, M.D.—Are there any other glandular enlargements? As to the rib being the cause of the condition—it seems to me that if this is the case, it should have appeared earlier. The rib has evidently always been there, and does not seem to have been the cause of any trouble before this accident.

J. A. HUTCHISON, M.D.—I would like to ask Dr. Archibald whether there has been at any time a superficial blood supply change in any of the other limbs. Cases of Raynaud's disease generally have more than one limb affected and long before there is any definite gangrene there is this marked blueness and swelling perceptible for at least several months, and in one case I noticed several years.

E. W. ARCHIBALD, M.D.—No certain changes have been observed by us in the other extremities, though at one time I thought I could see a slight blueness in two fingers; but nothing definite enough for the diagnosis of Raynaud's disease. At the same time it is to be noted that when the patient consulted her doctor first, she described the condition as one of numbness and pain, coming on at intervals, with either blueness or whiteness of the tips of the fingers. As to the suggestion of obstruction in the neck, I came to the conclusion, after careful examination, that there was no tumour there, nor a cervical rib; but that there seemed to be an abnormally low stand of the clavicle, which might possibly allow the subclavian to run at an abnormal angle over the first rib and in that sense the first rib itself might cause pressure on that side; but I do not know that one could presume much on that observation. Cases of cervical rib reported usually give nervous symptoms and not arterial. As to the rib first causing disturbance late in life, that is a matter of not infrequent clinical observation,

the reason of which escapes us. I was not able to find any enlarged glands. Dr. Mills' suggestion is a very interesting one; as I understand, it means that, while there was previously a condition of angio-spasm of the vascular periphery, that is, Raynaud's disease, the application of the carbolic produced reflexly a more or less continuous spasm which spread upwards and involved the large arteries. This idea occurred to me, but it seemed hardly possible that the spasms should be so continued as to produce gangrene. I came to the conclusion that there was not enough evidence to show definite obstruction in the neck, and made a provisional diagnosis of premature arterio-sclerosis, which, as a result of the fortuitous carbolic application, led rapidly to a pre-senile gangrene; the gangrene, therefore, being partly carbolic, partly sclerotic.

PHYSIOLOGY AND HYGIENE OF THE VOCAL ORGANS.

WESLEY MILLS, M.D.—Dr. Mills addressed the Society on this subject, illustrating his remarks with various appliances to indicate tension, pitch, resonance, etc., of tones produced by the singer or speaker.

H. S. BIRKETT, M.D.—The ideas which Dr. Mills has brought before us this evening have more than a special interest to those of who are engaged in the treatment of affections of this portion of the respiratory tract which he has specially dealt with. It is quite evident from the study brought before us to-night that the practical application of the ideas which Dr. Mills has enumerated might be put into use in one's own work. It is a very common occurrence to have pupils come for treatment of conditions which they think are largely due to some local cause and which, upon examination, are not the result of disease itself or local conditions, but really produced by faulty vocal production. A striking example is the condition of the vocal cords characterized by a definite localized thickening on the edges about the middle third of each cord, and known amongst the Germans as "Saenger's Knotin," and in England, Board School Laryngitis. In the case of the singer the local trouble is produced by faulty production, and in the board school the teachers are using their voice not only in unhygienic surroundings but with faulty production, and it is to be noted that this condition is improved simply by change in the form of the vocal production without any local treatment whatever.

G. P. GIRDWOOD, M.D.—I should like to add my voice in favour of Dr. Mills' statement that I certainly condemn the use of corsets.