

## **On the urine of the insane : a contribution to urology / by Adam Addison.**

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ON THE URINE OF THE INSANE :

*A Contribution to Urology.*

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## ON THE URINE OF THE INSANE.

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MOST of our knowledge of the chemistry of the urine in insanity appears to be derived from a paper on this subject published by Dr. Sutherland in the 'Medico-Chirurgical Transactions of 1855.' The conclusions arrived at by the author of that essay were the following:

1. A plus quantity of phosphates exist in the urine in the paroxysms of acute mania.

2. A minus quantity exists in the stage of exhaustion of mania, in acute dementia, and in the third stage of general paralysis of the insane.

3. The plus and minus quantities of the phosphates in the urine correspond with the quantitative analysis of the brain and of the blood, for a plus quantity of phosphorus is found in the brain, and a slight excess of albumen in the blood of maniacal patients, and minus quantities of phosphorus and albumen are found in the brain of idiots, and a minus quantity of albumen in the blood of paralysis of the insane.

4. The plus quantity of phosphates in the urine of acute mania denotes the expenditure of nervous force, and is not a proof of the existence of acute inflammation in this disease.

Unfortunately, the method of investigation adopted by Dr. Sutherland was not such as to give reliable results. It was the old and now obsolete one of determining only the per-centage amounts of the urinary constituents without reference to the quantity of urine passed in a given time. No doubt it is true that, as Dr. Sutherland expresses it, there is a plus quantity of phosphates in one thousand grains of the urine of a maniacal patient as compared with the amount found in the same measure of urine passed in the normal state; but then the patient in acute mania may be voiding from ten to twenty ounces only in the twenty-four hours, whilst in health he excretes from fifty to eighty; consequently it may happen that, after recovery, with a greatly diminished per centage of phosphates, he actually excretes a larger quantity than during the maniacal paroxysm. I think, therefore, that the whole subject stands in need of revision.

The mode I have adopted has been to collect the whole urine passed in twenty-four hours for three or more successive days, and to ascertain by analysis the absolute amounts of certain of its constituents excreted during that time. Dr. Sutherland refers to the impossibility of collecting all the urine during mania; but it is my experience that there are many cases where this can be done.

By careful attention on the part of the night attendant, and by placing a special nurse with the patient during day, I have perfectly succeeded in obtaining all that has been passed; and I can confidently declare that the quantities I have given are correct. In acute cases which have recovered, I have always compared the urine of the abnormal state with that of the normal, because the individual healthy standard must always be more correct than the average of a number of cases. In dementia and melancholia, where such a comparison has been impossible, I have adopted two methods. Firstly, I have compared the quantities voided under such conditions with those passed by healthy men and women, irrespective of age and weight; and, secondly, I have found the amounts excreted by 1 lb. avoirdupois of body weight in twenty-four hours, and contrasted them with the normal standard ascertained in the same way.

In order to facilitate this comparison, I will give in the following table, made up from Dr. Parkes's book, 'On the Urine,' the amounts of those constituents which I have made the subject of examination; first, as they are excreted in health (age and weight indifferent); and, second, according to a definite weight of body:

Constituent.	MALES.				FEMALES.			
	Minimum.	Mean.	Maximum.	1 lb. excretes in 24 hours in grs.	Minimum.	Mean.	Maximum.	1 lb. excretes in 24 hours in grs.
Chloride of sodium . . . . .	...	177·0	...	...	...	...	...	...
Urea . . . . .	286·1	512·4	688·4	3·53	...	390·0	...	2·96
Phosphoric acid . . . . .	24·70	48·80	79·80	0·336	...	56·2	...	0·464
Sulphuric acid . . . . .	17·34	31·11	41·14	0·214	...	30·2	...	0·25

Dr. Parkes points out that in the women the phosphoric acid is probably set down as too great in consequence of the small number of cases taken for the average. In seven women, after recovery, I found the minimum of phosphoric acid to be 22 grs., the mean 35·66 grs., and the maximum 61·90 grs. The range above and below the mean of the chloride of sodium is very great, from 30 to 60 per cent. Parkes observes that "the limits of variation above and below the mean excretion, according to weight, are certainly considerable. If we compare two persons we find that one may excrete in twenty-four hours only 0·390 grammes (Beneke in one series), and another 0·529 grammes of urea to each kilogramme; and variations as great occur in the other ingredients. Also, in the same person the amount of urea excreted by each pound weight of the body at different times varies rather largely (even occasionally as much as 20 per cent.), so

that certainly we must allow a wide range of mean, maximum, and minimum excretion above and below the mean recorded in the table. In the other ingredients the maximum and minimum excretion of each pound weight is even greater than in the case of the urea."

The mode of chemical analysis adopted was the volumetric. The chloride of sodium and the urea were found by Liebig's method with solution of pernitrate of mercury, the phosphoric acid by a graduated solution of uranium, and the sulphuric acid by ascertaining the neutral point after precipitation with baryta. The results are expressed in English ounces and grains, as being more easy of comparison than the French measures.

*Cases of Mania.*—The urine was collected in the following cases as they were admitted, and generally when the maniacal paroxysm had become fully developed. A special attendant was placed with the patients, otherwise they were subjected to no restraint, and were allowed the freedom of the ward. The cases are mostly women, because I found that the female attendants were more careful than the male in attending to the proper collection of the urine. In young cases, and at the commencement of a maniacal attack, it is generally not difficult to obtain the whole urine passed; and it is only after the system has lost its tone that dirty habits set in. None of the cases required to be artificially fed. As regards diet, it was good, and in sufficient quantity, and was the same for all. It is not, however, an easy matter to determine with certainty the connexion between the dietary and the urine in insanity, for it is seldom that the full quantity is taken by maniacal patients:

I. Ann F., aged twenty-two. Feb. 5-8, 1864.—Is maniacal, sleepless, and violent in her conduct; shouts, gesticulates, and talks incoherently; bodily condition fair; pulse 100, small; takes food moderately well.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	14·0 oz.	1030	28·58	216·41	22·94	13·62
2	20·5	1026	50·82	251·12	24·75	13·19
3	17·5	1026	40·83	193·95	18·09	12·57
Total	52·0	1027	119·23	661·48	65·78	39·38

March 25-20, 1864.—Has quite recovered; works regularly; health fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	55·25 oz.	1016	54·78	483·43	26·72	29·77
2	43·50	1017	41·86	475·78	25·69	23·44
3	55·50	1017	61·51	663·68	27·77	33·23
Total	154·25	1016	188·15	1622·79	80·18	86·44

In this case the urine was collected during a fully developed relapse

of acute mania. It will be seen that the urinary constituents excreted after recovery are greater than those voided during the maniacal paroxysm. In the totals the average specific gravity is given, and the same will be continued throughout these cases.

II. Christiana M., aged thirty-four. March 15-18, 1864.—Is maniacal, restless, sleepless, and destructive to her clothing; talks incoherently; pulse 90; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	14.0 oz.	1026	28.58	245.00	19.11	5.03
2	21.5	1022	54.55	344.89	16.85	7.40
3	19.5	1015	20.97	204.08	10.73	5.83
Total	55.0	1021	104.10	793.97	46.69	18.53

April 5-8, 1864.—Recovered; no change as to bodily health.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	74.0 oz.	1015	53.55	453.25	35.79	28.80
2	64.5	1013	56.43	357.43	24.82	14.48
3	59.5	1015	78.09	503.27	35.72	21.38
Total	198.0	1014	188.07	1313.95	96.33	64.66

This was a case of puerperal mania. Its most remarkable feature is the small amount of sulphuric acid excreted in the maniacal state; otherwise it agrees with the first case.

III. Agnes S., aged forty-five. Feb. 23-26, 1864.—Very excited; dancing, singing, and talking incoherently; bodily condition rather emaciated; pulse 96.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	21.0 oz.	1030	61.25	312.37	26.61	19.33
2	14.5	1031	16.91	215.68	16.91	8.79
3	36.5	1022	29.62	412.58	24.68	21.17
Total	72.0	1027	107.78	940.63	68.20	49.29

May 2-5, 1864.—Quite recovered; bodily condition much improved; works regularly.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	40.5 oz.	1020	43.62	395.71	35.12	21.82
2	28.0	1020	40.41	277.66	23.30	14.66
3	49.5	1015	56.09	389.81	30.55	16.30
Total	118.0	1018	140.12	1063.18	88.97	52.78

Urine was collected under the same conditions as in the foregoing cases, and with the same result.

IV. Jane C., aged seventeen. March 26–29, 1864.—She is maniacal, violent, and unmanageable; talks incoherently; bodily condition fair; pulse 108.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	18·5 oz.	1029	29·69	377·70	20·41	23·26
2	9·5	1031	27·70	192·98	9·21	11·23
3	18·5	1030	21·58	294·06	17·56	15·51
4	13·0	1030	15·16	193·37	16·26	7·39
Total	59·5	1030	94·11	1058·11	63·44	57·39

Sept. 10–13, 1864.—Recovered; has grown very stout.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	44·0 oz.	1017	38·50	385·00	28·60	14·48
2	72·5	1011	63·43	507·50	31·41	25·04
3	26·0	1017	30·33	182·00	15·60	11·67
4	86·0	1016	75·25	677·25	43·00	28·31
Total	228·5	1015	207·51	1751·75	118·61	79·50

In this case the difference is still more striking, apparently owing to the increased weight and improved condition of body.

V. Isabella M., aged twenty. March 26–29, 1864.—Conversation is incoherent; she is very confused, restless, sleepless, and untidy; pulse 90; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	6·5 oz.	1032	15·32	120·69	8·10	7·30
2	9·5	1032	27·70	182·66	12·53	9·95
3	13·0	1032	37·91	246·45	15·60	10·24
Total	29·0	1032	80·93	549·80	36·23	27·49

Oct. 1–4, 1864.—Bodily condition improved; conversation correct; behaves quietly, but almost daily has hysterical fits of laughing and crying.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	30·5 oz.	1023	33·36	320·18	21·07	15·97
2	41·0	1021	47·83	465·85	23·71	19·02
3	68·5	1015	59·93	499·47	24·21	13·32
Total	140·0	1019	141·12	1285·50	68·99	48·31



Though this case can scarcely be said to have recovered, it shows that the amounts of the urinary constituents passed are less during mania than after quiescence.

VI. Janet D., aged fifty-seven. Feb. 5-7, 1864.—Noisy; shouting and talking incoherently; pulse 97; bodily condition emaciated.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	22.5 oz.	1019	16.39	183.75	15.75	12.67
2	24.0	1013	9.10	188.33	11.18	6.40
Total	46.5	1016	25.49	372.08	26.93	19.07

Aug. 29-Sept. 1, 1864.—Recovered. Bodily condition improved, but she is still thin.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	62 oz.	1016	36.16	379.75	28.93	15.77
2	71	1015	31.06	414.16	26.03	26.56
Total	133	1015	67.22	793.91	54.96	42.33

The days here are too few, but the case points to the same result as in the others.

VII. Margaret B., aged fifteen. Feb. 8-11, 1864.—Maniacal, sleepless, noisy, and violent; bodily condition good; pulse strong, 98.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	6.0 oz.	1035	19.25	110.25	13.00	7.54
2	25.5	1030	74.37	375.59	39.16	27.48
3	20.5	1030	59.79	370.70	26.33	9.72
Total	52.0	1031	153.41	856.54	78.49	44.74

Patient recovered, and had a relapse.

March 15-23, 1864.—Very violent, noisy, and destructive.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	61.5 oz.	1020	89.68	574.00	62.57	47.88
2	19.5	1032	51.18	355.46	35.77	33.57
3	8.5	1032	8.03	192.90	20.83	12.44
4	17.0	1030	19.83	304.93	27.79	27.99
5 } 6 }	25.5	1030	29.75	531.78	38.27	32.45
7	15.5	1030	18.08	235.08	28.43	13.69
8	11.0	1021	9.62	137.95	13.57	5.59
Total	158.5	1027	226.17	2331.10	227.23	173.61

Aug. 10-18, 1864.—Recovered; grown very stout; works regularly.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	68·0 oz.	1022	69·41	714·00	51·00	23·58
2	44·5	1020	45·43	427·57	34·11	16·62
3	73·0	1019	63·87	851·66	65·55	28·27
4	48·0	1014	35·00	434·00	30·40	16·47
5	73·5	1019	53·59	664·56	46·54	30·80
6	69·5	1018	70·94	587·85	54·48	29·75
7	66·5	1018	58·19	533·38	47·67	34·84
8	74·0	1017	53·95	602·46	43·19	36·56
Total	517·0	1018	450·38	4815·48	372·94	216·89

In all the foregoing cases the urine was collected after the mania had become fully developed, but in this case I had an opportunity of watching the relapse from its commencement; and I believe it affords a very fair illustration of the changes which take place in the urine at the beginning of a maniacal attack, and onwards throughout its course. It will be noticed that during the first twenty-four hours the quantity of the urine was not diminished, and the amounts of the constituents under investigation were larger than the daily average after recovery; but on the second day the quantity of the urine and its constituents fell greatly, in an inverse ratio to the development and intensity of the mania; and this relation was continued throughout the course of the attack. As regards the phosphoric acid, it will be seen that, though the amount passed on the first day is large, still it is not equal to the quantity excreted on the third day in the normal state; and that even with its addition the absolute amount excreted during the mania is still very far below the excretion in health.

VIII. Margaret P., aged twenty-four. Aug. 27-30, 1864.—She is very violent and incoherent in her talk, sleepless, and noisy; bodily condition fair; pulse 86.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	12 oz.	1028	14·00	262·50	17·23	13·65
2	20	1026	20·41	425·83	21·46	27·53
3	15	1025	15·31	299·37	19·25	8·30
Total	47	1026	49·72	987·70	57·94	49·48

Oct. 12-15, 1864.—Excitement is passing away; she is quiet, and works a little, but her manner is excitable and forward; bodily condition not so good as on admission.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	75.0 oz.	1014	54.86	415.62	22.89	17.96
2	45.5	1015	33.17	265.41	17.13	13.61
3	48.5	1015	49.51	268.77	20.62	12.34
Total	169.0	1014	137.54	949.80	60.64	43.91

The second examination in this case was made just as the patient began to convalesce, and at a time when the system had been considerably deteriorated by the previous excitement. It will be seen that the urea and sulphuric acid are less after quiescence than during the paroxysm, but that the chloride of sodium and phosphoric acid are higher. This case presents a comparison of the amounts excreted during mania and during the depression immediately following, and it will be seen that the quantity of phosphoric acid is greater in the latter condition. I cannot doubt that, after the system has recovered its tone, the excretion of all the elements will be much increased.

IX. Elizabeth A., aged forty. June 15-18, 1864.—She is maniacal, sleepless, violent, and incoherent in her talk; bodily condition fair; pulse 93.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	23.5 oz.	1032	34.27	562.41	41.15	32.36
2	14.0	1034	20.41	306.25	25.45	22.00
3	14.5	1032	21.14	351.02	23.70	23.88
Average	17.3	1032	25.27	406.56	30.10	26.08

This case has not recovered; but a comparison of the results with the average healthy excretion in women will show that the quantity of urea is higher, the sulphuric acid about normal, and the chloride of sodium and phosphoric acid below the mean.

As all the foregoing cases were marked by symptoms of great violence and intensity, I shall now give some instances of a milder form.

X. George E., aged forty-three. Feb. 20-23, 1864.—Talks incoherently; is fidgety, restless, and sleepless; bodily condition fair; pulse 91.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	39 oz.	1027	52.32	534.62	29.35	31.81
2	60	1018	61.24	833.33	40.00	33.81
3	51	1024	74.37	639.62	39.95	36.29
Total	150	1023	187.93	2007.57	109.30	101.91

Sept. 13-16, 1864.—Is quiet and well behaved; conversation correct; works regularly; bodily condition improved.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	62.0 oz.	1023	90.41	741.41	49.16	38.97
2	73.0	1018	127.75	702.62	46.23	33.71
3	51.5	1019	92.23	469.58	30.90	23.78
Total	186.5	1026	310.39	1913.61	126.29	96.46

In this case the amounts of urea and sulphuric acid excreted during the mental excitement are greater than after quiescence, while those of the chloride of sodium and the phosphoric acid are larger in the latter condition.

XI. William R., aged thirty-two. June 22–25, 1863.—Is restless and sleepless; makes ridiculous gestures with his features and hands, and caresses fellow-patients; does not speak; bodily condition fair; pulse 96.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	28.5 oz.	1027	20.78	336.62	36.57	19.86
2	32.0	1026	35.44	335.76	33.60	17.07
3	48.0	1024	41.66	575.00	36.00	27.75
4	34.0	1021	29.75	257.83	36.50	17.64
Total	140.5	1024	127.63	1505.21	142.67	82.32

Aug. 25–30, 1864.—Has a lucid interval at present; bodily condition is not improved; does not work.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	58.5 oz.	1020	76.78	494.81	33.15	23.63
2	38.0	1028	49.87	550.83	41.16	34.12
3	44.5	1021	45.43	480.23	27.48	21.31
4	24.5	1030	50.02	350.14	26.13	19.06
Total	165.5	1024	222.10	1876.01	127.92	98.12

In this case the amounts of the urinary constituents excreted during the lucid interval are greater than those passed during mania, with the exception of the phosphoric acid. The cause of this diminution of the phosphoric acid may have been accidental; but, at the same time, it ought to be recollected that a considerable time intervened between the examinations, that the patient had had several maniacal attacks in the interval, that his system had lost tone, and that he was not working.

XII. Ann R., aged sixteen. Sept. 6–9, 1864.—Looks drowsy, complains of pain in head; behaves quietly; laughs and mutters incoherently to herself; pulse 80; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	36.0 oz.	1019	42.00	252.00	14.54	14.54
2	28.5	1020	41.56	224.43	16.20	16.20
3	66.0	1020	96.25	442.75	31.61	31.61
Total	130.5	1019	179.81	919.18	62.35	60.35

Oct. 10-13, 1864.—Sleeps well, works regularly; habits active; has given over muttering and laughing to herself.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	89.25 oz.	1016	78.09	637.76	41.58	40.50
2	73.50	1015	53.59	428.75	22.43	22.00
3	61.00	1015	53.37	382.52	21.56	17.34
Total	223.75	1015	185.05	1449.03	85.57	79.84

This was a very mild case, and it is possible that the symptoms had been subsiding when she was admitted. The excreta are all increased during the convalescent stage.

XIII. Margaret P., aged sixteen. Sept. 5-8, 1864.—Is excited and restless; laughs and giggles when spoken to, and speaks in an excited manner; noisy at night; pulse 73; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	46.0 oz.	1014	46.95	320.18	23.00	11.69
2	22.5	1021	59.06	465.85	15.37	10.10
3	34.0	1017	29.75	499.47	30.80	18.44
Total	102.5	1017	135.76	285.50	69.17	40.23

Oct. 10-13, 1864.—Excitement has disappeared; she is quiet, sleeps well, and works in the sewing-room.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	42.5 oz.	1014	30.89	272.70	16.38	16.53
2	65.0	1011	28.43	341.25	19.84	15.56
3	85.0	1015	49.80	623.43	39.01	28.15
Total	192.5	1013	109.12	1537.38	75.23	60.24

This, like the previous, was a very mild case, and possibly some of the most severe symptoms may have disappeared before it came under my observation. It is a fair inference from these cases that in certain mild forms of mania, when the quantity of urine is not so greatly lessened as in the severer types, the amount of phosphates excreted is not greater than in the normal state.

The following cases show that in epileptic mania the urine is affected by the same law.

XIV. John M., aged fifty.—An epileptic; fits occur every month, several in succession, for one or two days, and he becomes very morose, vicious, and dangerous.

PAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	14·5 oz.	1033	21·14	325·64	14·44	28·61
2	17·0	1031	44·62	374·35	18·16	24·68
3	16·5	1034	43·41	375·37	26·27	43·67
Total	48·0	1032	109·17	1075·36	58·87	93·96

INTERPAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	93·5 oz.	1016	54·54	572·68	29·60	29·38
2	99·5	1014	35·11	418·70	31·50	29·78
3	89·0	1013	64·89	414·00	31·15	26·64
Total	282·0	1014	154·54	1405·48	92·25	85·80

Here is also a second analysis of the urine during the paroxysmal period in the same case; this time he made water so sparingly and irregularly, that it was only obtained every forty-eight hours.

PAROXYSMAL PERIOD.						
Hours.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>5</sub> .
48	32·5 oz.	1032	94·79	687·23	42·25	49·30
48	36·0	1031	52·50	645·75	48·00	59·26
24	32·5	1023	18·95	398·12	29·79	27·72
Total	101·0	1028	166·24	1731·10	120·04	136·28

The average of these five days is less than the average of the three interparoxysmal days.

XV. Peter H., aged twenty-four.—An epileptic; fits occur monthly, and he becomes excited, maniacal, and violent.

PAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	31·0 oz.	1021	67·81	379·75	22·74	21·76
2	26·5	1030	54·10	456·02	26·07	23·80
3	40·5	1025	59·06	472·50	10·70	26·68
Total	98·0	1025	189·97	1308·27	59·51	72·44

INTERPAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	95.0 oz.	1017	152.39	881.19	60.59	45.51
2	91.5	1014	226.84	800.62	32.58	27.39
3	85.0	1015	111.53	614.83	40.40	34.36
Total	271.5	1015	2296.64	2296.64	133.57	107.26

There is a second analysis in this case, also with the same result.

PAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	21.25 oz.	1031	46.48	570.20	33.10	20.67
2	20.75	1030	39.33	502.18	14.07	19.30
3	33.00	1029	33.68	596.75	20.40	31.60
Total	75.00	1026	119.49	1669.13	67.57	71.57

XVI. Helen C., aged twenty-six.—An epileptic ; fits occur every three weeks ; she becomes very excited and violent, and talks incoherently.

PAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	22 oz.	1030	77.00	385.00	31.18	23.00
2	7	1034	21.41	136.79	8.17	11.00
3	7	1030	20.41	147.00	5.37	7.85
Total	36	1031	117.82	368.79	44.72	41.85

INTERPAROXYSMAL PERIOD.						
Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	35.0 oz.	1012	20.41	240.20	22.60	7.85
2	73.5	1006	42.87	192.93	16.21	9.80
3	51.0	1012	29.48	267.75	21.25	15.87
Total	159.5	1010	92.76	700.88	59.46	33.52

In this case, again, we observe a comparatively large excretion of salts, phosphates included, on the first day ; then an extreme fall in the quantity of the urine and its constituents on the succeeding day, which reduces the amount of the urea and phosphoric acid of the paroxysmal period below that of the inter-paroxysmal.

The first fact observed on examining these tables is the remarkable diminution of the quantity of the urine which takes place during the

course of a severe maniacal attack. This decrease appears to have an inverse relation to the rapidity of development and the intensity of the paroxysm, for in the milder cases it is not nearly so great. Nor is this wonderful when we consider how much of the watery elements of the blood must find an outlet through the skin as a consequence of the muscular exertions which accompany the restlessness, violence, and gesticulation of mania. The specific gravity of the urine in such attacks is also high; there is an excess of solids, and, on standing, a considerable quantity of sediment, especially of urates, is deposited. Owing to the want of a volumetric test for uric acid, I have been unable to subject this element to examination. The per-centage amounts of all the organic and inorganic constituents are raised very far above the normal. In all my cases the urine was acid—very intensely so in the more severe forms—and in this my experience agrees with that of Sutherland.

Out of 16 cases the quantity of chloride of sodium was found less during mania than after convalescence in 14; nor is it inconsistent with dietetic and physiological principles that it should be so, for maniacal patients do not show much solicitude respecting condiments, whilst a considerable amount must find its way out of the body in other directions. The excretion of urea was diminished during the maniacal paroxysm in all the cases. The quantity of phosphoric acid excreted in states of mental excitement was less than after convalescence in all the cases except one (No. XI.), in which the analysis was made during a lucid interval and under unfavourable conditions. This, perhaps, is the most important fact elicited by the investigation, for a greater than the average excretion of the phosphates has come to be regarded as a pathognomonic phenomenon of maniacal excitement. In two cases where I had an opportunity of examining the urine immediately after the appearance of maniacal symptoms, I found that the quantity of phosphoric acid excreted on the first day was larger than the average daily excretion after convalescence; and from other observations I am disposed to believe that this often, though not always, occurs, for when the quantity of the urine is greatly diminished by a rapidly developed and severe mania, the amount of phosphoric acid is also lessened. I have known patients in whom there seemed to be a sort of suppression of urine, and from whom I could obtain no water for twenty-four or thirty-six hours. When it did appear, it was loaded with solids, but in quantity greatly below the normal. These facts would seem to suggest that the quantities of the urinary constituents excreted under such conditions are not to be regarded as anything like an absolute measure of tissue change; that, in fact, large amounts may be retained in the blood from the want of water to dissolve and wash them out. This, however, is but a suggestion, and does not interfere with the actual excretion by the kidneys, which is the question at issue.

Again, though the amount of phosphoric acid excreted on the first day is higher than the normal daily average, the period of this increased excretion is so short, and, as I have said, so inconstant, and the



fall in the quantity of the urine on the succeeding days so extreme, that it would be unphilosophical to regard it as an isolated fact. The better method, then, is to ascertain the absolute amount of phosphoric acid excreted during part of the course of a maniacal paroxysm greater than twenty-four hours, and to compare it with the quantity passed during an equal time after convalescence. This I have done, and the daily results I have given of the parts of a course of mania correspond exactly with the daily results of the whole course, as I have ascertained at different times; consequently I consider it sufficiently proved that the quantity of phosphoric acid excreted during the course of a maniacal attack is less than that voided in an equal time after recovery. In 11 cases the amount of sulphuric acid excreted during convalescence was greater than during mania; in 5 cases it was larger in the latter condition.

The following table shows the mean of the average daily quantities of the urine and its constituents excreted by all the cases during mania and convalescence:—

	During mania.	...	During convalescence.
Quantity of urine . . . . .	23·9 oz.	...	58·4 oz.
Specific gravity . . . . .	1025	...	1016
Cl Na . . . . .	35·94 grs.	...	59·98 grs.
Urea . . . . .	328·14	...	475·70
PO <sub>5</sub> . . . . .	22·14	...	30·54
SO <sub>3</sub> . . . . .	21·42	...	23·07

#### CASES OF MELANCHOLIA.

XVII. Agnes E., aged forty-four; weighs 99 lbs.—Bodily condition feeble; suffers from amenorrhœa; is melancholy, desponding, and discontented; does no work, and never moves off her seat. In addition to ordinary diet, has a pint of porter daily.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. avoirdupois excretes in grs.	
							Cl Na	Urea
1	32·0 oz.	1018	46·66	238·00	21·33	11·49	0·288	
2	13·00	1018	15·16	87·20	7·80	6·03	1·856	
3	26·00	1022	18·95	219·91	14·73	14·39	0·153	
4	21·50	1024	28·21	188·12	15·05	15·12	0·115	
5	21·25	1021	27·89	167·38	12·39	7·31		
6	24·00	1020	34·66	208·00	19·60	14·36		
Aver.	23·12	1020	28·58	184·76	15·15	11·45		

XVIII. Elizabeth R., aged forty-three; weighs 115 lbs.—Suffers from slowly progressing phthisis; fancies she is a great sinner, and that she will be damned; much depressed, and shows great apathy.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
							Cl Na	Urea
1	38.0 oz.	1023	38.79	443.33	31.46	16.49	Cl Na	0.409
2	24.5	1026	42.87	357.29	24.90	17.96	Urea	4.074
3	35.5	1020	36.23	372.74	26.95	19.01	PO <sub>5</sub>	0.289
Aver.	32.6	1023	39.29	391.15	27.77	17.82	SO <sub>3</sub>	0.185

XIX. Eliza G., aged sixty-four; weighs 96 lbs.—A case of acute melancholia. Bodily condition fair; is restless and miserable, continually running hither and thither, expressing her sense of misery, her wretchedness, and impending damnation.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
							Cl Na	Urea
1	38.0 oz.	1023	38.79	443.33	31.46	16.49	Cl Na	0.409
2	24.5	1026	42.87	357.29	24.90	17.96	Urea	4.074
3	35.5	1020	36.23	372.74	26.95	19.01	PO <sub>5</sub>	0.209
Aver.	32.6	1023	39.29	391.15	27.77	17.82	SO <sub>3</sub>	0.185

XX. Jane B., aged fifty-nine; weighs 126 lbs.—Bodily condition good; is depressed in spirits; fancies she is a great sinner, that she will be damned, and that all are doomed to hell-fire; she is suicidally inclined, and frequently secretes pieces of string in her bed.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
							Cl Na	Urea
1	54.0 oz.	1008	31.48	141.74	15.30	8.89	Cl Na	0.294
2	49.5	1011	28.87	303.18	12.17	13.33	Urea	2.014
3	70.0	1011	51.04	316.45	20.57	9.43	PO <sub>5</sub>	0.127
Aver.	57.8	1010	37.13	253.79	16.01	10.55	SO <sub>3</sub>	0.083

XXI. Jane G., aged forty-two; weighs 149 lbs.—A mild case of melancholia, with doubts of her soul's salvation. Is quiet, somewhat depressed; works regularly.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
							Cl Na	Urea
1	32.5 oz.	1020	37.91	246.45	23.83	12.64	Cl Na	0.343
2	35.5	1019	31.06	232.90	20.40	25.50	Urea	1.972
3	44.5	1023	84.36	402.35	36.34	19.33	PO <sub>5</sub>	0.180
Aver.	37.5	1020	51.11	293.90	26.85	19.15	SO <sub>3</sub>	0.128

XXII. George R., aged forty-six; weighs 122½ lbs.—Bodily condition fair; is melancholy and depressed, and manifests a morbid anxiety respecting his health.

Days.	Quantity.	Sp. gr.	ClNa.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	47.0 oz.	1021	82.25	390.68	29.76	21.10	Cl Na	0.522
2	72.0	1015	73.50	483.00	34.94	21.55	Urea	3.170
3	50.0	1015	36.45	291.66	18.05	8.98	PO <sub>5</sub>	0.225
							SO <sub>3</sub>	0.140
Aver.	56.3	1017	64.06	388.44	27.58	17.21		

XXIII. James N., aged sixty-three; weighs 149½ lbs.—Is melancholy, apathetic, hypochondriacal, and fancies he is to be hanged for his crimes; takes very little food.

Days.	Quantity.	Sp. gr.	ClNa.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	16.5 oz.	1014	12.03	110.68	6.87	5.88	Cl Na	0.0915
2	20.	1013	14.58	58.33	4.41	2.39	Urea	0.5690
3	16.5	1011	14.43	86.62	7.42	6.17	PO <sub>5</sub>	0.0408
							SO <sub>3</sub>	0.0322
Aver.	18.6	1012	13.68	85.21	6.11	4.81		

In this case all the amounts are very far below even the minimum of health, and they can have but an exceptional relation to the weight of the body.

When acute melancholia is accompanied by paroxysms of maniacal excitement, the urinary secretion is regulated by the same law as in acute mania—that is, the quantity of urine and its constituents is less than in the normal state, as will be seen in the following cases:—

XXIV. Helen F., aged twenty-nine. April 7, 1864.—Is much excited and agitated, crying, “Hang me, hang me!” Noisy, sleepless, expresses great sense of misery, and says she has a desire to commit suicide; bodily condition fair.

Days.	Quantity.	Sp. gr.	ClNa.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	23 oz.	1030	86.89	315.29	21.55	19.62
2	30	1032	48.12	476.87	43.86	26.50
3	24	1030	31.50	367.50	35.20	18.68
Total	77	1030	116.51	1159.66	100.61	64.80

Aug. 15, 1864.—Appears to have quite recovered; has become much stouter, and works regularly.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	66.0 oz.	1024	67.37	789.25	59.40	39.51
2	72.0	1024	84.00	861.00	64.80	50.64
3	61.5	1025	59.94	807.18	61.50	43.52
Total	199.5	1024	211.31	2457.43	185.70	133.67

Here is another case of the same nature, but I have not yet had an opportunity of examining the urine after recovery :—

XXV. Anne H., aged thirty-eight. Sept. 20–25.—Is much excited and agitated, crying, wringing her hands, and walking restlessly up and down the corridors. She is a woman of large size, bodily condition fair; pulse 103. Attempted to steal a knife, and has scratched her throat with a needle.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	50·0 oz.	1030	80·20	926·00	70·00	62·86
2	15·5	1033	31·64	334·54	26·09	11·59
3	16·0	1033	25·66	331·33	21·00	14·96
4	37·5	1030	54·68	612·50	53·12	29·06
5	28·5	1025	37·46	324·12	29·15	12·79
Aver.	29·5	1030	45·92	505·69	39·93	26·25

It will be seen that in this case, on the first day, all the constituents of the urine are in large quantity. The phosphoric acid in particular is large; but, as in the other cases where I have had occasion to notice this, on the succeeding day it falls to less than half the amount. Judging from the woman's size, I am satisfied that in the normal state and in robust health she will excrete more than an average of 39 grains of phosphoric acid.

The following cases of monomania of fear may also be grouped with the melancholic :—

XXVI. Isabella C., aged fifty-four; weighs 147 lbs.—Perpetually in low spirits, crying, and pricking her hands; expresses a dread of being killed.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
							Cl Na	
1	41·5 oz.	1013	18·15	254·18	20·06	12·42	Cl Na	0·184
2	39·5	1015	34·56	334·10	23·70	17·73	Urea	1·949
3	49·0	1012	28·58	271·54	15·26	8·80	PO <sub>5</sub>	0·133
							SO <sub>3</sub>	0·090
Aver.	43·3	1013	27·09	286·60	19·67	12·98		

The next case presents a comparison of the paroxysmal and chronic conditions of monomania of fear.

XXVII. Catherine M., aged twenty-eight. March 17–20.—Restless and agitated; trembling from dread of being put to death; skin cold, pulse 94; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	23 oz.	1020	20·12	207·95	23·38	11·56
2	10	1030	10·79	212·91	15·66	8·23
3	18	1033	18·37	273·00	28·80	15·85
Total	51	1027	49·28	693·86	67·84	35·64

Sept. 15, 1864.—Bodily condition improved; is very obstinate and idle; often refuses her food, apparently out of dread.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	42·5 oz.	1020	43·38	347·87	26·63	16·37
2	32·5	1015	18·95	255·93	21·93	12·16
3	39·5	1015	23·04	334·10	24·11	15·96
Total	114·5	1016	85·37	937·90	72·67	44·49

All these cases of chronic melancholia and monomania of fear give results very far below the mean in healthy men and women. In two cases (Nos. XVIII. and XIX.), the amount of urea is about normal. The following table gives the mean of the daily average excretion in nine cases. I have included the male and female cases in the same group, but the amounts do not differ so much as to affect the result:—

Cl Na	. . . . .	36·67 grs.
Urea	. . . . .	270·44
PO <sub>5</sub>	. . . . .	20·04
SO <sub>3</sub>	. . . . .	13·08

Mean excretion according to weight, in eight cases:—

1 lb. excretes in grs. in 24 hours.	
Cl Na	. . . . . 0·267
Urea	. . . . . 1·961
PO <sub>5</sub>	. . . . . 0·139
SO <sub>3</sub>	. . . . . 0·090

A reference to the table made from Dr. Parkes' book will show that the results as to weight are remarkably below the mean in health.

The small amounts of urinary constituents excreted by melancholics may be accounted for from their indifference to their food, their apathy, bodily torpor, languor, and inactivity. According to the prevalent theory, one would have expected a large excretion of phosphoric acid as the consequence of mental anxiety, but such does not appear to be the case.

#### CASES OF GENERAL PARALYSIS.

XXVIII. Alexander M'W., aged thirty-nine.—Bodily condition good; has extravagant delusions as to his wealth, and sits counting millions of money on his fingers.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	80·5 oz.	1018	93·91	727·85	46·60	36·14
2	68·5	1018	89·90	579·39	44·32	28·70
3	81·5	1017	107·63	570·50	40·75	23·76
Aver.	76·8	1017	97·14	625·91	43·89	29·33

XXIX.—John F., aged thirty-seven.—Bodily condition good; manifests a general silliness of mind and manner, with exaltation.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	41·0 oz.	1015	29·89	310·91	23·23	11·04
2	70·0	1016	61·25	428·75	32·66	30·16
3	66·5	1015	58·18	465·49	26·40	27·86
Aver.	59·1	1015	49·10	401·71	27·43	23·02

XXX. David B., aged forty-five.—Weighs 162½ lbs.; bodily condition, very stout; mind is extremely silly and facile.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	88·5 oz.	1020	90·34	903·43	44·07	49·00	Cl Na	0·549
2	74·5	1020	86·91	651·87	41·89	27·87	Urea	4·395
3	77·5	1019	90·41	587·70	44·82	30·15	PO <sub>5</sub>	0·268
							SO <sub>3</sub>	0·219
Aver.	80·1	1019	89·22	714·33	43·59	35·67		

XXXI. James M., aged thirty-six.—Weighs 167½ lbs.; has had several attacks of acute mania, attended with extravagant delusions; is now demented, and rarely speaks; bodily health very good.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	69 oz.	1012	80·60	527·27	64·51	47·52	Cl Na	0·591
2	64	1016	93·30	479·70	37·30	25·45	Urea	3·119
3	71	1015	103·54	560·60	50·84	39·70	PO <sub>5</sub>	0·303
							SO <sub>3</sub>	0·244
Aver.	68	1014	99·11	522·52	50·88	40·89		

XXXII. Elizabeth M. M., aged thirty-five.—Labours under a mild form of dementia; bodily condition good.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	55 oz.	1014	88·22	397·83	32·56	18·11
2	65	1019	47·39	564·97	43·36	24·32
3	69	1015	70·40	579·60	29·95	11·41
Aver.	63	1016	68·67	514·13	35·29	17·94

During the acute maniacal attacks to which general paralytics are liable it is extremely difficult, more so than in any other form of insanity, to collect the urine; but I have some facts which point to the conclusion that the urinary excretion under such conditions is regulated by the same law as in acute mania.

XXXIII. Helen C., aged fifty.—Demented.

Condition.	Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
Quiet .	1	96·0 oz.	1010	224·00	358·40	30·05	22·99
Quiet .	2	61·0	1011	106·75	323·80	20·35	13·69
Excited	3	25·0	1023	54·08	262·50	22·93	16·43
	Aver.	60·3	1014	128·47	314·90	24·44	17·71

XXXIV. Thomas A., aged fifty-two.—Is excited, and has very extravagant delusions as to his wealth and powers; on the third day he became much more maniacal and destructive.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1	46·0 oz.	1014	26·83	241·50	19·16	11·01
2	42·0	1015	30·60	244·86	19·20	12·66
3	16·5	1024	21·65	170·84	10·31	8·39
Aver.	34·8	1017	26·69	219·06	16·35	10·68

XXXV. William G., aged fifty-one.—Very maniacal and destructive; urine was collected one day only.

Day.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
1 ... 18 ...	1023 ...	18·04 ...	231·0 ...	17·41 ...	13·47	

These tables show that in states of excitement the quantities of chloride of sodium, urea, phosphoric and sulphuric acids are less than in the quiescent state. In the demented cases quantities are about normal—some slightly above, and some below, the mean. In two cases (Nos. XXX. and XXXI.), the excretion, according to weight, was also very near the mean healthy standard, and in No. XXXI. the phosphoric acid was above it when compared without reference to weight. In the last stage of general paralysis it is impossible to obtain the twenty-four hours' urine, but I have no reason to suppose that the result would differ much.

CASES OF DEMENTIA AND IDIOCY.

XXXVI. Robert C., aged forty-nine; weighs 133½ lbs.—A congenital imbecile; works on farm; bodily condition good.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	73.0 oz.	1021	117.10	585.52	45.01	33.86	Cl Na	0.670
2	67.5	1016	68.66	490.52	33.75	28.28	Urea	4.036
3	51.5	1025	82.61	540.75	37.76	34.68	PO <sub>5</sub>	0.290
							SO <sub>3</sub>	0.241
Aver.	64.0	1020	89.45	538.93	38.84	32.27		

XXXVII. David C., aged forty-four; weighs 142 lbs.—Is demented, and has been seventeen years insane; works on farm; bodily condition good.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	50.00 oz.	1020	51.04	408.12	26.51	21.70	Cl Na	0.402
2	34.25	1029	64.93	532.81	23.51	24.08	Urea	3.500
3	56.00	1020	57.16	555.55	26.51	29.33	PO <sub>5</sub>	0.180
							SO <sub>3</sub>	0.176
Aver.	46.75	1023	57.37	498.82	25.76	21.70		

XXXVIII. George E., aged thirty-three; weighs 125½ lbs.—Has been twenty-five years insane, and is demented; bodily condition good; works on farm.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	56.5 oz.	1022	65.91	659.16	36.31	35.51	Cl Na	0.573
2	42.5	1028	86.77	582.60	30.72	27.98	Urea	4.679
3	31.0	1030	63.29	519.89	28.88	26.91	PO <sub>5</sub>	0.276
							SO <sub>3</sub>	0.240
Aver.	43.3	1026	71.99	587.21	31.97	30.13		

XXXIX. John T., aged twenty-two; weighs 127½ lbs.—A case of so-called acute dementia; never speaks, requires to be fed, and is quite apathetic; bodily condition fair.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	72.0 oz.	1021	84.00	609.00	54.00	31.25	Cl Na	0.558
2	65.5	1016	76.41	468.05	40.39	18.62	Urea	3.792
3	51.5	1025	53.37	373.62	17.15	18.25	PO <sub>5</sub>	0.291
							SO <sub>3</sub>	0.178
Aver.	64.0	1020	71.26	483.55	37.18	22.70		

XL. William A., aged twenty-six; weighs 98½ lbs.—A case of so-called acute dementia; sits the whole day in apathy without speaking; bodily condition feeble; ulcers on feet.



Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	75 oz.	1020	83.12	546.87	40.84	27.79	Cl Na	0.850
2	71	1016	122.12	387.24	36.33	28.70	Urea	4.467
3	64	1016	46.60	386.40	39.64	22.99	PO <sub>5</sub>	0.395
							SO <sub>3</sub>	0.266
Aver.	70	1017	83.76	440.05	38.97	26.28		

XLI. Susan S., aged fifty-four; weighs 93 lbs.—Bodily condition feeble; is demented.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	24 oz.	1016	63.00	238.00	11.36	10.87	Cl Na	0.726
2	37	1017	87.50	344.53	21.89	16.28	Urea	3.049
3	20	1022	52.50	268.34	13.00	10.78	PO <sub>5</sub>	0.165
							SO <sub>3</sub>	0.135
Aver.	27	1018	67.60	283.62	15.51	12.64		

XLII. Alexander C., aged thirty-one; weighs 148½ lbs.—Is demented, and never speaks; bodily condition good; works on farm.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	65.0 oz.	1020	75.83	616.14	41.77	29.18	Cl Na	0.357
2	38.5	1020	44.91	449.16	26.59	23.63	Urea	3.319
3	52.5	1015	38.28	413.43	21.08	12.57	PO <sub>5</sub>	0.196
							SO <sub>3</sub>	0.146
Aver.	52.0	1018	53.00	492.91	29.14	21.79		

XLIII.—John W., aged forty-one years; weighs 139½ lbs.—A congenital idiot; can speak but a few words; works on the farm.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	109.5 oz.	1012	63.87	606.81	58.40	31.13	Cl Na	0.469
2	85.0	1015	74.37	842.91	41.08	30.53	Urea	4.857
3	100.0	1014	58.33	583.33	42.04	29.93	PO <sub>5</sub>	0.338
							SO <sub>3</sub>	0.218
Aver.	98.1	1013	65.52	677.68	47.17	30.53		

XLIV. William M.K., aged eighteen; weighs 70½ lbs.—A congenital idiot; bodily condition good; stature small; cannot speak; sometimes eats his excrement.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	33.0 oz.	1035	57.75	481.24	31.35	16.76	Cl Na	0.754
2	29.0	1027	50.75	380.62	25.61	17.79	Urea	6.172
3	39.0	1024	51.18	443.62	31.20	17.51	PO <sub>5</sub>	0.421
							SO <sub>3</sub>	0.247
Aver.	33.3	1028	53.22	435.16	29.72	17.35		

XLV. John R., aged forty-five; weighs 100½ lbs.—A congenital imbecile; bodily condition fair; works on farm.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	50.5 oz.	1017	44.18	441.87	22.71	21.91	Cl Na	0.451
2	59.0	1018	51.62	499.04	28.43	23.83	Urea	4.570
3	55.5	1015	40.46	437.03	22.29	19.93	PO <sub>5</sub>	0.243
							SO <sub>3</sub>	0.218
Aver.	55.0	1016	45.42	459.31	24.27	21.89		

XLVI. David C., aged fifty-six; weighs 165½ lbs.—A congenital imbecile; bodily condition good; does not work.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	98.0 oz.	1017	85.75	743.16	42.43	39.60	Cl Na	0.456
2	55.5	1018	57.98	469.43	29.42	24.91	Urea	3.725
3	47.5	1029	83.12	637.29	41.21	37.68	PO <sub>5</sub>	0.227
							SO <sub>3</sub>	0.202
Aver.	67.0	1021	75.61	616.62	37.68	34.06		

XLVII. William T., aged twenty; weighs 128½ lbs.—Has been two years demented after a maniacal attack; bodily condition good; works on farm.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	67.5 oz.	1019	59.06	472.50	37.95	28.28	Cl Na	0.499
2	80.0	1013	46.66	536.66	37.87	28.73	Urea	4.309
3	64.0	1022	84.00	700.01	60.50	37.35	PO <sub>5</sub>	0.352
							SO <sub>3</sub>	0.244
Aver.	70.5	1018	63.24	569.72	45.24	31.45		

XLVIII. Christina H., aged forty; weighs 101 lbs.—Bodily condition spare; is demented, and seldom speaks.

Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .	In 24 hours 1 lb. excretes in grs.	
1	47.5 oz.	1017	41.56	415.55	28.23	17.77	Cl Na	0.251
2	32.5	1013	14.21	208.54	14.09	9.72	Urea	2.932
3	49.0	1012	21.43	264.39	18.10	13.20	PO <sub>5</sub>	0.190
							SO <sub>3</sub>	0.134
Aver.	43.0	1014	25.40	296.16	20.14	13.56		

The next case shows that the urine in paroxysms of excitement, in idiocy, is regulated by the same law as in acute mania.

XLIX. Peter M.D., aged eighteen.—A congenital idiot; cannot speak; is subject to fits of fury, during which he strikes and bites every one near him.

Condition.	Days.	Quantity.	Sp. gr.	Cl Na.	Urea.	PO <sub>5</sub> .	SO <sub>3</sub> .
Excited	1	52.0 oz.	1021	40.95	470.16	37.29	43.35
Quiet	2	61.5	1015	38.87	412.56	40.18	55.22
Excited	3	41.5	1021	48.41	338.91	30.45	17.39
Quiet	4	78.5	1024	68.68	336.33	37.45	21.14
	Aver.	58.4	1017	49.22	396.99	36.27	34.27

The only points kept in view in the selection of the demented cases were, that they should not be of such dirty habits as to make it impossible to collect their urine, and that they should be observed under such conditions as to make a fair comparison with healthy persons—viz., that they should take their food moderately well, and be in the habit of enjoying a certain degree of exercise in the shape of work. Of course, during the collection of the urine, the latter condition ceased to operate when they were confined to the house. As regards mind, several are congenital idiots, several have been many years demented, and two are cases of acute dementia. As I have only two female cases, and their conditions of life are different from those of the males, I will dismiss them from consideration with the statement that the quantities of all their urinary excreta are considerably below the healthy mean. In the twelve male cases the chloride of sodium was present in moderate quantity, though not equal to the mean put down in Dr. Parkes' book. In five the urea was above the mean (age and weight indifferent) given by the same author, whilst the quantity excreted by a definite weight of body was greater than the mean in nine cases. The amount of phosphoric acid was less than the mean in all cases, but in none was it below the minimum; and in four cases the excretion by one pound of body weight was greater than the healthy mean. This is a very necessary distinction, because some of the cases were lads. Two, who passed a larger than average quantity of phosphoric acid according to weight, were congenital idiots who could not speak, another a case of so-called acute dementia, and the fourth had been two years demented. With such facts as these in view, and considering that in

none of the twelve cases was the average daily excretion of phosphoric acid below what has been found by several observers in healthy adult men, I cannot altogether endorse Dr. Sutherland's statement that there is a minus quantity of phosphates in the urine of dementia. Indeed, I believe that the excretion of phosphoric acid is regulated more by the condition and weight of the body than by the action of the brain. No doubt, in an ill-conditioned dement, who does not take his full quantity of food, the absolute amount of phosphoric acid excreted will be small compared with the healthy mean, but less so when contrasted with the mean healthy excretion by 1 lb. of body weight.

The following table gives a comparison of the mean daily excretion of 12 cases, with the mean amounts in health :—

Constituents.	In dementia.	In health.
Cl Na ...	64·92 grs.	177·00 grs.
Urea ...	517·24	512·40
PO <sub>5</sub> ...	35·20	48·80
SO <sub>5</sub> ...	27·03	31·11

The next shows the mean excretion in 11 cases by 1 lb. of body weight in twenty-four hours, compared with the normal mean found in the same way :—

In dementia 1 lb. excretes in grs. in 24 hours.			In health 1 lb. excretes in 24 hours.		
Cl Na	...	0·557	Urea	...	3·53
Urea	...	4·311	PO <sub>5</sub>	...	0·336
PO <sub>5</sub>	...	0·291	SO <sub>5</sub>	...	0·214
SO <sub>5</sub>	...	0·216			

It will be seen from these tables that the differences between the quantities in dementia and in health are not greater than occur in individual healthy cases.

The conclusions which I deduce from the whole foregoing observations are :—

1. That the quantities of the urine, of the chloride of sodium, urea, phosphoric and sulphuric acids, excreted during the course of a maniacal paroxysm, occurring in acute mania, epilepsy, general paralysis, melancholia, or dementia, are less than the amounts excreted in an equal time during health.

2. That in chronic melancholia the quantities of the chloride of sodium, urea, phosphoric and sulphuric acids are reduced below the mean, and sometimes the minimum, of health.

3. That in idiocy, dementia (paralytic and common), the urea, chloride of sodium, and sulphuric acid range above and below the normal mean of health ; that in some cases the amount of phosphoric acid is greater than the mean according to weight, but in the majority of cases it ranges between the minimum and mean found in healthy adult men.

I shall be satisfied if these observations serve no other purpose than to point out the foundation upon which an exact pathology of the urine of the insane must be built. My thanks are due to my chief, Dr. Howden, for facilities given to make this inquiry.

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