under the cranium to escape, and blood, if you will, compressing the brain; 2, to remove splinters of bone in cases of compound fracture; 3, in order to relieve the symptoms of oppressed brain when a portion of bone is lying much beneath its proper level and causing deep coma and other serious symptoms of compression; 4, to remove foreign bodies. But of all this we shall treat more fully at our next meeting.

ON THE SPECIFIC GRAVITY OF THE URINE IN HEALTH AND DISEASE,

ESPECIALLY
IN DIABETES

AND

GRANULAR DEGENERATION OF THE KIDNEYS.

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THE principal object of this communication is to exhibit the incorrectness of a table which is given by Becquerel in his "Semeiotique des Urines," and which appears to have found its way into nearly all our scientific periodicals, and into all the works on animal chemistry (German, French, and English) which have appeared since the publication of Becquerel's treatise. The professed object of this table is to give the amount of the solid residue in one thousand parts of urine, from the simple knowledge of the specific gravity; and it is almost needless to observe that, if this object were really attained, the physiologist would have little difficulty in calculating the amount of the solid materials daily excreted by the kidneys, while the analyst would be able to avoid one of the most tedious steps in the chemical investigation of the urine, viz., the accurate determination of the water.

If all the various constituents of the urine possessed the same specific gravity, or even if, without possessing the same specific gravity, the different constituents of the solid residue were always associated in the same relative proportions to each other,—and if, further, no abnormal constituents (albumen, sugar, pus, &c.) ever presented themselves,—we should experience no difficulty in the establishment of a formula which would express a constant relationship between the specific gravity and the amount of solid residue in a known quantity of urine: As, however, these conditions do not occur in the urine; it is clearly impossible to construct a formula which will give mathematically-accurate results.

We shall endeavour to ascertain, in the course of this paper, whether a formula or table could be deduced from a large number of analyses, which would give results of sufficient accuracy for practical purposes.

Becquerel's table is stated to have been deduced from the results of twenty-five analyses of urine of persons in health and in different states of disease. It may be briefly expressed by the formula,—

Solid residue in 1000 parts of urine = $\Delta \times 1.65$, when Δ represents the excess of the density of the urine above that of water (which = 1000).

In several experiments, made in 1842, it so happened that I obtained results which approximated very closely with those given in Becquerel's table, and hence I was led to attribute to it a degree of accuracy which I have since found that it hardly deserved. In certain analyses which I was conducting about a year ago, on Becquerel's principle, I found an amount of error that could not well pass unnoticed. I may premise that the method to which I allude is to observe the density, and hence to calculate the solid residue, then to ascertain, individually, the urea, uric acid, and fixed salts; the sum of these three constituents deducted from the whole amount of solid residue gives the "organic matters" of Becquerel.

In the cases to which I allude I found that the sum of the urea, uric acid, and fixed salts, amounted *very nearly*

to the whole quantity of solid residue, as assigned by Becquerel's table, whereas there ought to have been a considerable difference between them, corresponding to the amount of organic matters, which, I had reason to know, from other experiments, was present in rather a large proportion.

For instance, in analysing a specimen of urine of specific gravity 1020, I found that 1000 parts were composed, according to Becquerel, of water, 967.00; solid residue, 33.00.

I found, by analysis, in the same quantity of urine, 16.42 parts of urea, 0.71 of uric acid, and 12.96 of fixed salts, amounting, in all, to 30.09; hence there was left only 33.00 — 30.09, or 2.91, to express the organic matters, which, in reality, amounted to nearly four times that amount.

Several cases of a similar nature led me to renounce the use of Becquerel's table, and to have recourse to actual experiment for the determination of the true proportions of water and solid residue. The following directions are given by Simon on this subject, and are well worthy of attention. A small quantity of fresh urine, whose specific gravity, at a temperature of 60° F., has been taken, must be placed in a light porcelain evaporating basin, weighed, and submitted to the action of the water-bath, until it begins to assume the appearance of an extract. The quantity of urine should not exceed twenty-five grains, and the basin should be as light as possible, and if not level at the edges, should be ground down, so as to admit of being perfectly closed when covered by a piece of thin glass.

The basin must now be removed from the water-bath and placed *in vacuo* over strong sulphuric acid. In the course of from thirty-six to forty-eight hours we may safely conclude that all the water is removed. On removing the evaporating basin from the air-pump it must be immediately covered with the piece of glass, in order to prevent, as far as possible, the absorption of moisture from the atmosphere, and weighed. The excess of the weight above the *known* weight of the basin and glass gives the solid residue, and then, by a simple rule of proportion, we can estimate the quantity of solid residue in one thousand parts.

It is of great importance, in all investigations of this nature, that the temperature should be carefully noted. Simon* observes that a specimen of urine, whose specific gravity, at 59° F., was 1020.75, gave, at 64°, a specific gravity of only 1019.85, while at 53° the specific gravity rose to 1021.46.

Important, however, as is the due observation of the temperature, of still greater consequence is the thorough removal of all traces of humidity from the residue of the urine. A single illustration will show the necessity of attention to this point. If 25 grains of urine leave a solid residue of 1 grain, the solid residue in 1000 grains (or parts) will amount to 40. If, however, only one-tenth of a grain of water should escape expulsion, the solid residue in 1000 parts would amount to 44.

With respect to Table I., which embraces the results of upwards of *two hundred analyses*, I may observe that when the urine of the same person is frequently referred to, the same initial letter is made use of, thus A, D, and L, always refer to the same individuals. The analyses A, are taken from Simon's papers, and L from Lehmann's "Essay on the Effect of Diet on the Urine." The experiments were made upon himself; L refers to the urine which he passed while living on his ordinary diet, L|| and L† indicate the circumstance of his living, at the period at which the analysis was made, in the first case, on a purely vegetable, in the second, on a purely animal diet. During the whole time that these experiments were going on he only took a sufficient quantity of drink to satisfy thirst. I have not thought it requisite to notice the colour, acidity, &c., except in those cases which presented any peculiar deviations from the normal characters of the urine.

* Simon's "Beitrag," &c., Nos. 1 and 3. I have freely availed myself of these papers in this communication; in fact, a very large proportion of the cases in my table are taken from that source.

NORMAL URINE.		Specific gravity.	Solid residue per 1000, by actual analysis.	Solid residue by Becquerel's table.	Difference.
1	Urine of B., aged thirty-eight years	1003.7	9.604	6.105	+ 3.499
2	A, aged thirty-five years.....	1005.5	10.770	9.075	+ 1.695
3	A child, aged six years	1006.6	14.000	10.890	+ 3.110
4	A	1007.2	13.740	11.880	+ 1.860
5	A man, aged twenty-one years	1008.0	19.000	13.200	+ 5.800
6	Another man, of the same age	1008.2	16.200	13.530	+ 2.670
7	A	1009.05	18.670	14.932	+ 3.738
8	A	1009.5	19.270	15.675	+ 3.595
9	D, aged thirty years	1010.0	27.400	16.500	+ 10.900
10	D	1011.0	36.800	18.150	+ 18.650
11	A	1011.1	21.290	18.315	+ 2.975
12	D	1012.0	44.000	19.800	+ 24.200
13	A pregnant woman	1012.2	24.530	20.130	+ 4.400
14	D	1014.0	42.400	23.100	+ 19.300
15	A	1014.4	28.360	23.670	+ 4.690
16	L	1015.6	53.923	25.740	+ 28.183
17	L 	1016.4	50.010	27.060	+ 22.950
18	L	1016.7	56.264	27.555	+ 28.609
19	A	1017.4	30.565	28.710	+ 10.855
20	L	1017.4	56.264	28.710	+ 27.554
21	A	1017.9	37.310	29.535	+ 7.775
22	D	1018.0	39.140	29.700	+ 9.440
23	A	1018.22	37.800	30.063	+ 7.737
24	D	1018.3	31.420	30.195	+ 1.225
25	A	1018.3	35.580	30.195	+ 5.385
26	L†	1018.7	59.210	30.855	+ 28.355
27	L	1019.1	61.948	31.515	+ 30.469
28	L	1019.2	62.318	31.680	+ 30.638
29	A	1019.4	39.590	32.010	+ 7.580
30	A	1019.8	46.950	32.670	+ 14.280
31	A	1019.86	39.600	32.769	+ 6.831
32	A	1019.9	41.950	32.835	+ 9.115
33	D	1020.0	40.091	33.000	+ 7.091
34	A	1020.0	41.090	33.000	+ 8.090
35	L 	1020.1	55.850	33.165	+ 22.685
36	L	1020.2	65.008	33.330	+ 31.678
37	A	1020.42	42.860	33.693	+ 9.167
38	A	1020.5	42.320	33.825	+ 9.495
39	A man, aged twenty-five years.....	1021.0	40.910	34.650	+ 6.260
40	A	1021.5	43.050	35.475	+ 7.575
41	D	1021.6	45.130	35.640	+ 9.490
42	L†	1021.9	66.120	36.135	+ 29.985
43	D	1022.0	40.100	36.300	+ 3.800
44	A	1022.03	45.870	36.394	+ 9.476
45	L	1022.2	65.998	36.630	+ 29.368
46	L	1022.5	66.423	37.125	+ 29.298
47	B	1023.05	46.640	38.032	+ 8.608
48	A	1023.5	44.440	38.775	+ 5.665
49	L 	1023.8	58.090	39.270	+ 18.820
50	D	1024.0	42.670	39.600	+ 3.070
51	L†	1024.3	66.730	40.095	+ 26.735
52	L	1024.7	66.744	40.755	+ 25.989
53	L	1025.1	67.842	41.415	+ 26.427
54	L	1025.2	67.881	41.580	+ 26.301
55	A	1025.3	53.670	41.745	+ 11.925
56	L 	1025.7	60.130	42.405	+ 17.725
57	L†	1026.3	72.380	43.395	+ 28.985
58	L†	1026.4	72.300	43.560	+ 28.740
59	A pregnant woman	1026.7	54.500	44.055	+ 10.445
60	L 	1026.8	63.090	44.220	+ 18.870
61	D	1027.0	49.140	44.550	+ 4.590
62	B	1027.3	58.420	45.045	+ 13.375
63	L†	1027.8	77.720	45.870	+ 31.850
64	L 	1027.9	65.080	46.035	+ 19.045
65	L†	1028.5	78.150	47.025	+ 31.125
66	L 	1028.6	67.110	47.190	+ 19.820
67	L 	1028.9	67.600	47.685	+ 19.915
68	L†	1028.9	79.040	47.685	+ 31.355
69	L†	1029.0	78.380	47.850	+ 30.530
70	L	1029.2	79.932	48.180	+ 31.752
71	L†	1029.3	80.870	48.345	+ 32.525
72	L	1029.4	80.807	48.510	+ 32.297
73	L 	1029.8	70.900	49.170	+ 21.730
74	L†	1030.7	84.230	50.555	+ 33.675
75	L 	1032.3	75.680	53.295	+ 22.385
76	A woman, aged twenty-seven years.....	1032.7	71.320	53.995	+ 17.325

NORMAL URINE.		Specific gravity.	Solid residue per 1000, by actual analysis.	Solid residue by Becquerel's table.	Difference.
77	A child, aged five years	1033.62	72.710	55.473	+ 17.237
78	L†	1033.8	90.680	55.770	+ 34.910
79	L 	1034.2	80.760	56.430	+ 24.330
80	L 	1036.1	82.760	59.565	+ 23.195
URINE IN DISEASE.					
81	Urine of a young person, aged fifteen years, suffering under diabetes insipidus; limpid, perfectly neutral, and containing no traces of sugar	1002.7	4.870	4.455	+ 0.415
82	A case of a similar nature, in which the urine was slightly acid	1004.0	13.000	6.600	+ 6.400
82*	A case of granular degeneration of the kidneys	1005.0	11.700	8.250	+ 3.450
83	A child, aged three years, with rachitis	1006.0	12.850	9.900	+ 2.950
83*	A case of granular degeneration of the kidneys	1006.0	12.400	9.900	+ 2.500
84	A man, aged fifty. Diabetes	1007.0	18.000	11.550	+ 6.450
84*	A case of low typhoid fever	1007.0	16.500	11.550	+ 4.950
85	A man, suffering from hydrorachis	1007.6	15.900	12.540	+ 3.360
86	A child, aged eight years. Œdema of the lower extremities and of the face, intermittent fever, &c.	1008.	17.246	13.200	+ 4.040
87	A man, aged forty-eight years. General œdema.	1008.7	20.070	14.355	+ 5.715
88	A case of albuminuria, with, in all probability, granular degeneration of the kidneys	1009.0	20.000	14.850	+ 5.150
88*	A case of granular degeneration of the kidneys	1009.0	20.500	14.850	+ 5.650
89	A case of typhus. Extreme prostration of strength; urine pale, and very soon becoming alkaline	1009.0	25.000	14.850	+ 10.150
90	A case of diabetes insipidus	1009.42	6.400	15.543	— 9.143
90*	A case of granular degeneration of the kidneys	1009.5	23.900	15.675	+ 8.225
91	A case of severe dysentery	1009.9	21.040	16.335	+ 4.705
92	A case of typhus	1010.0	29.000	16.500	+ 12.500
93	An inflammatory affection of the lungs, and œdema of the feet. As much as 130 ounces of urine passed in the course of 24 hours; slightly albuminous.	1010.04	19.130	16.566	+ 2.464
94	A woman. Sporadic cholera	1011.0	24.100	18.150	+ 5.950
94*	A case of low typhoid fever	1011.0	34.700	18.150	+ 16.550
95	A woman. Arthritis	1011.65	21.620	19.222	+ 2.398
96	Case 87	1011.7	21.230	19.311	+ 1.919
97	A case of typhus, one day before death	1011.86	25.210	19.569	+ 5.641
98	A young man, with an affection of the spinal cord. The urine was pale and ammoniacal, and there was a precipitate of the earthy phosphates	1012.15	23.450	20.047	+ 3.403
99	A man, aged thirty-five years, containing a considerable quantity of blood	1013.4	26.230	22.115	+ 4.115
99*	A case of granular degeneration of the kidneys	1013.4	29.800	22.155	+ 7.685
100	A case of typhus	1013.4	42.300	22.275	+ 20.025
101	Case 95	1013.85	23.270	22.852	+ 0.418
102	A woman, suffering under osteomalacia. The phosphatic salts, instead of being increased, were diminished	1013.9	23.410	22.935	+ 0.475
103	A man, suffering from incontinence of urine, consequent upon affection of the spinal cord. Urine turbid, slightly alkaline.	1014.0	29.580	23.100	+ 6.480
103*	A case of granular degeneration of the kidneys	1014.0	33.900	23.100	+ 10.800
104	A case of icterus	1014.0	37.200	23.100	+ 14.100
105	A man, with acute hepatitis	1014.03	42.970	23.149	+ 19.821
106	A case of phthisis	1014.6	29.620	24.090	+ 5.430
107	A case of pneumonia	1014.7	31.040	24.255	+ 6.785
108	A case of granular degeneration of the kidney	1015.0	35.000	24.750	+ 10.250
109	A case of typhus	1015.0	41.600	24.750	+ 16.850
110	A case of scurvy	1015.05	33.100	24.832	+ 8.268
111	In the third stage of pneumonia	1015.20	20.015	25.080	— 5.065
112	In the early stage of convalescence after variola	1015.32	21.785	25.278	— 3.493
113	A child, aged three years, suffering from rachitis	1015.5	27.270	25.575	+ 1.695
114	A case of arthritis	1015.5	33.710	25.575	+ 8.135
114*	A case of granular degeneration	1016.0	35.080	26.400	+ 8.680
115	A man, with diabetes mellitus	1016.0	39.060	26.400	+ 12.660
116	A case of typhus	1016.0	40.000	26.400	+ 13.600
117	A similar case	1016.0	46.500	26.400	+ 20.100
118	A similar case	1016.0	47.200	26.400	+ 20.800
119	A case of diabetes mellitus	1016.0	40.000	26.400	+ 13.600
120	During the remission of tertian ague	1016.3	32.370	26.895	+ 5.474
121	A man, aged forty years. Pneumonia	1017.0	40.400	28.050	+ 12.350
122	A case of typhus	1017.0	50.000	28.050	+ 21.950
123	A case of granular degeneration of the kidneys	1017.0	51.880	28.050	+ 23.730
124	A rather severe case of pneumonia	1017.3	41.330	28.545	+ 12.785
125	In the cold stage of intermittent fever	1017.33	32.480	28.594	+ 3.886
126	A man, aged thirty-eight years, suffering from scurvy	1017.36	39.840	28.644	+ 11.196
127	A man, with arthritis	1017.5	37.610	28.875	+ 8.735
128	In a case of icterus without any febrile symptoms	1017.98	27.225	29.667	— 2.442

URINE IN DISEASE.		Specific gravity.	Solid residue per 1000, by actual analysis.	Solid residue by Becquerel's table.	Difference.
129	A case of pericarditis after full depletion	1018.0	39.900	29.700	+ 10.200
130	A case of diabetes mellitus	1018.0	43.000	29.700	+ 13.300
131	A case of typhus	1018.0	58.500	29.700	+ 28.800
131*	A case of icterus	1018.0	43.000	29.700	+ 13.300
132	A woman, with hypertrophy of the right side of the heart	1018.38	32.550	30.327	+ 2.223
133	Case 120, immediately after a paroxysm	1018.85	42.270	31.002	+ 11.168
134	A case of lithiasis	1018.9	41.160	31.185	+ 9.975
135	A man, aged twenty-eight years of age, with acute hepatitis ..	1019.28	59.530	31.812	+ 27.718
136	A man, with scarlatina (at the height of the disease).....	1019.8	46.000	32.670	+ 13.330
137	During the febrile period of variola	1019.83	31.690	32.719	- 1.029
138	A man, with pleuro-pneumonia	1019.85	38.900	32.752	+ 26.148
139	A case of icterus	1020.0	45.500	33.000	+ 12.500
140	In puerperal peritonitis	1020.0	48.200	33.000	+ 15.200
141	In pneumonia	1020.0	52.100	33.000	+ 19.100
141*	A case of granular degeneration of the kidneys	1020.	53.180	33.000	+ 20.180
142	In the hot stage of intermittent fever	1020.3	35.320	33.495	+ 1.825
143	A case of icterus, with considerable fever	1020.99	34.272	34.633	- 0.361
144	A case of diabetes mellitus	1021.0	52.800	34.650	+ 19.150
145	A man, aged forty years, with scurvy.....	1021.32	47.360	35.178	+ 12.182
146	A man, with diabetes mellitus	1021.5	50.000	35.475	+ 14.525
147	In variola, at the period of suppuration	1021.98	33.530	36.262	- 2.732
147*	A case of hæmaturia	1022.0	33.800	36.300	- 2.500
148	A case of pleuro-pneumonia	1022.0	49.900	36.300	+ 12.600
149	A child; with scarlatina	1022.0	56.400	36.300	+ 20.100
150	Case 86	1022.26	54.260	36.729	+ 17.531
151	A case of typhus, shortly before death; alkaline	1022.3	39.620	36.795	+ 2.825
152	At the early febrile period in variola	1022.35	34.380	36.877	- 2.497
153	During the eruption of variola in the same case	1022.47	34.690	37.075	- 2.385
154	In the sweating stage of intermittent fever	1022.82	38.155	37.653	+ 0.502
155	During a rheumatic affection of the kidneys	1023.02	39.770	37.983	+ 1.787
156	During the height of pneumonia.....	1023.47	37.220	38.725	+ 1.505
157	A case of pericarditis	1023.50	62.500	38.775	+ 23.725
158	A case of icterus	1023.8	60.500	39.270	+ 21.230
159	In angina pectoris	1023.99	36.898	39.583	- 2.685
160	Case 85	1024.2	54.500	39.930	+ 14.570
161	A case of typhus. The patient was labouring under diarrhœa and in a comatose state.....	1024.52	52.610	40.458	+ 12.152
162	A case of acute rheumatism	1024.6	55.460	40.590	+ 14.870
163	A patient suffering under pulmonary emphysema, &c.	1024.8	53.540	40.920	+ 12.620
164	Case 132, the symptoms being much more urgent	1024.8	42.525	40.920	+ 1.605
164*	A case of morbus cordis	1025.0	55.200	41.250	+ 13.950
165	A case of hydrothorax	1025.0	63.460	41.250	+ 22.210
166	A case of acute articular rheumatism	1025.15	65.800	41.497	+ 24.303
167	A very severe case of pleuro-pneumonia	1025.2	64.690	41.580	+ 23.110
168	A man, with abscess of the lungs	1025.7	55.080	42.405	+ 12.675
169	A case of pleuro-pneumonia.....	1025.85	60.350	42.652	+ 17.698
170	A case of ascites	1026.0	64.590	42.900	+ 21.690
171	A case of typhus	1026.0	70.000	42.900	+ 27.100
172	A case of phthisis	1026.6	64.080	43.890	+ 20.190
173	A case of granular degeneration of the kidneys	1027.0	64.200	44.550	+ 19.650
174	A woman, with phthisis	1027.1	68.710	44.715	+ 23.995
175	A case of pleuro-pneumonia; stage of resolution	1027.14	63.160	44.781	+ 18.379
176	A man, aged thirty-five years, with pleuritis	1027.2	65.600	44.880	+ 20.720
176*	A case of urticaria tuberculosa	1028.0	68.420	45.200	+ 22.220
177	A man, aged forty-one years, with pneumonia	1028.3	64.400	46.695	+ 17.705
178	A case of diabetes mellitus	1028.5	52.240	47.025	+ 5.215
179	A similar case	1029.5	62.050	48.675	+ 13.375
180	A similar case	1029.7	70.200	49.005	+ 21.195
181	A similar case	1030.218	71.530	49.846	+ 21.684
182	A man, aged thirty-nine years, suffering from a very severe attack of articular rheumatism	1030.38	79.315	50.125	+ 29.190
183	A case of diabetes mellitus	1030.44	72.100	50.226	+ 21.874
184	A similar case	1032.0	78.150	52.800	+ 25.350
185	A similar case	1032.37	80.410	53.410	+ 27.000
186	A similar case	1032.5	76.570	53.625	+ 22.945
187	A similar case	1032.97	80.170	54.400	+ 25.770
188	A similar case	1035.0	81.500	57.750	+ 23.750
189	A similar case	1035.3	87.000	58.245	+ 28.755
190	A similar case	1036.0	90.400	59.400	+ 31.000
191	A similar case	1037.1	89.520	61.215	+ 28.305
192	A similar case	1038.0	84.740	62.700	+ 22.040
193	A similar case	1038.9	94.110	64.185	+ 29.925
194	A similar case	1039.0	93.450	64.350	+ 29.100
195	A case of very acute rheumatism	1039.6	102.130	65.340	+ 36.790
196	A case of diabetes mellitus	1039.8	96.200	65.650	+ 30.550
197	A similar case	1040.0	103.260	66.000	+ 37.260

It is worthy of remark that in *every one* of the eighty analyses of normal urine Becquerel's table gives an error of deficiency, and the error seems to increase with the increasing specific gravity. Moreover, the utter absence of any approach to regularity in the column of differences clearly indicates the impossibility of deducing a formula, or making a table, which would give sufficiently accurate results for chemical purposes. If, then, in a state of health, such an attempt is hopeless, the utter impossibility of forming a table which would give accurate results, when many additional disturbing forces are called into play, and where various abnormal ingredients occur, must at once be obvious.

It has been suggested by Simon that formula of this nature might be deduced for particular diseases, or classes of disease, which might be sufficiently accurate to be of service to the pathologist, although not to be trusted by the chemist. Thus he proposes that one table should be exclusively devoted to *albuminuria*, another to those diseases in which there is a *deficiency of fibrine in the blood*, another to *inflammatory diseases*, and a fourth to *diabetes*.

Although the scheme is far more rational than Becquerel's, yet it is to be feared that if we cannot form a tolerably accurate estimate of the solid residue from the specific gravity of healthy urine, we shall not be more successful when that secretion is deranged.

We shall attempt to carry out Simon's idea for two diseases, viz., albuminuria and diabetes :—

No.	Specific gravity.	Residue in 1000 parts, from actual analysis.	Residue in 1000 parts, by Becquerel's table.	Difference.
1	1005.0	11.7	8.25	3.45
2	1006.0	12.4	9.90	2.50
3	1006.9	15.0	11.38	3.62
4	1009.0	20.5	14.85	5.65
5	1009.5	23.9	15.67	8.23
6	1013.4	29.8	22.11	7.69
7	1014.0	33.9	23.10	10.80
8	1015.0	35.0	24.75	10.25
9	1016.0	35.08	26.40	8.68
10	1016.3	38.6	26.89	11.71
11	1016.3	39.3	26.89	14.41
12	1016.4	36.9	27.06	9.84
13	1017.0	51.88	28.05	23.83
14	1019.1	46.5	31.51	14.99
15	1020	53.18	33.00	20.18
16	1022	66.50	36.30	30.20
17	1027	64.20	44.55	19.65
		614.34	420.66	

It is easily shown from these data that Becquerel's table gives a *mean* error in deficiency of nearly 11.4 in 1000 parts, the greatest error being 30.2, and the least 2.5.

If we reject cases 13 and 16, in which the solid residue is unaccountably high, the most accurate empirical formula we can obtain is—

Solid residue in 1000 parts of urine = $\Delta \times 2.33$, which is, as we shall presently see, precisely the same number as Christison has deduced for diabetic urine.

Diabetes.—There is no disease in which we are so likely to find a tolerably constant relation between the density and the solid residue as in this disease, in consequence of the peculiar attention that is usually paid to the *quantity of the ingesta* in this class of patients. It also happens that there is no disease in which it is so requisite to obtain, with considerable accuracy, a knowledge of the quantity of solid matter excreted by the kidneys. With a view to the determination of this point, Dr. Henry performed a series of experiments, upon the results of which he subsequently founded a table, which has been copied into almost every work on urinary pathology in our language. This table, or, at least, the formula upon which it is based, has recently received an important modification from the hands of Dr. Christison. "The late Dr. Henry determined the fact that the quantity of solid matter in 1000 parts of diabetic urine is equal to the

excess of its density over that of water multiplied by the number 2.58. According to the writer, however, the correct number, deduced from many experiments, is 2.33."*

We shall now compare the results of experiment with those of the formulæ of Becquerel, Henry, and Christison. From this table it may be shown, by a very simple arithmetical process, that the average error which would occur from the use of Christison's formula is only .47 in 1000 parts, while the mean errors of Becquerel's and Henry's formulæ are 21.92 and 7.71 respectively.

No.	Specific gravity.	Solid residue per 1000.	Solid residue by Becquerel's table.	Solid residue by Henry's formula.	Solid residue by Christison's formula.
1	1016.	39.36	26.40	44.28	37.28
2	1016.	43.00	26.40	41.28	37.28
3	1018.	43.00	29.70	46.44	41.94
4	1021.	52.20	34.65	54.18	48.93
5	1021.5	50.00	37.47	55.47	50.09
6	1028.5	52.24	47.02	73.53	66.40
7	1029.5	60.05	48.67	76.11	68.73
8	1029.7	70.20	49.00	76.63	69.20
9	1030.22	71.53	49.94	77.97	70.40
10	1030.44	72.10	50.22	78.53	70.42
11	1032.	70.15	52.00	82.56	74.56
12	1032.37	80.41	53.41	83.51	75.42
13	1432.5	76.57	53.62	83.85	75.72
14	1032.27	80.17	54.40	85.06	76.82
15	1035.	81.50	57.75	90.30	81.55
16	1035.3	80.00	58.24	91.07	82.25
17	1036.0	90.40	59.40	92.88	83.88
18	1037.1	80.52	61.21	95.72	86.44
19	1038.0	94.70	62.70	93.04	88.54
20	1038.9	94.11	64.18	100.36	90.72
21	1039.	93.45	64.35	100.62	90.87
22	1039.8	96.20	65.65	102.68	92.73
23	1040.	103.26	66.00	103.22	93.20
24	1042.	68.80	69.30	108.36	97.87
25	1043.5	100.80	71.40	112.23	101.35
		1859.06	1310.82	2051.86	1847.19

Although, from my knowledge of Dr. Christison's accuracy of observation, I was led to expect that his formula would give more correct results than those of Becquerel or Henry, yet I must confess that the extreme minuteness of the error is much more striking than I had anticipated. There can be no doubt that although formulæ of this nature cannot be legitimately used by the chemist in the manner that Becquerel has done throughout his "*Semeiotique des Urines*," still, if they even approximate to the accuracy of Christison's diabetic formula, they will be instruments of no mean importance in the hands of the practical physician who may not have time or opportunity for delicate chemical investigation.

Southwick-street, Hyde Park-square.

ON THE TREATMENT OF ACUTE RHEUMATISM

LARGE DOSES OF NITRATE OF POTASS AND SULPHATE OF QUININE.

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AMONG the various subjects which have the privilege of occupying, at the present time, the attention of the medical profession, the treatment of acute rheumatism stands prominent. The rules laid down by Sydenham have long since lost their "prestige," and a dozen different plans of treatment are urging their claims to notice and adoption. There can be no doubt but that the researches which many talented physicians are now prosecuting will tend to establish, on a more firm and rational basis, the therapeutics of rheumatism; and, in order to

* Dr. Christison in the "Library of Medicine," vol. iv., p. 248.