

XXXIV. *Second Appendix to a paper on the Variations of the Acidity of the Urine in the state of Health.*

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*On the Influence of Tartrate of Ammonia and of Carbonate of Ammonia on the Acidity of the Urine.*

IN a previous paper and appendix on the acidity of the urine, published in the Philosophical Transactions for 1849, I have shown the effect of different diets, of sulphuric acid, of tartaric acid, of caustic potash and of tartrate of potash on the acidity of the urine; in this Appendix I purpose tracing the effect of tartrate of ammonia and of carbonate of ammonia.

III. (e.) The effect of tartrate of potash having been so remarkable, it was thought, that by observing the effect of tartrate of ammonia, some conclusion might most rapidly and decidedly be obtained, as to the comparative effect of fixed and volatile alkalies on the acidity of the urine.

Mr. MORSON prepared for me some beautifully crystalline tartrate of ammonia: one portion was dried by pressure on blotting paper; another portion was dried in a water bath. When dissolved in water no acid reaction was perceptible.

(36.) The first day for comparison no tartrate of ammonia was taken. Breakfast at 8<sup>h</sup> 40<sup>m</sup> A.M. Dinner at 6<sup>h</sup> P.M. On mixed diet.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	7 25 A.M.	was thrown away.		
Water passed at	8 40	1015·3	+ 4·93 measures.	Clear.
Water passed at	9 45	1021·7	— 2·93	Clear.
Water passed at	10 50	1018·5	— 7·85	Clear.
Water passed at	1 0 P.M.	1025·8	+10·72	Thick from urates.
Water passed at	3 25	1024·2	+19·52	Thick from urates.
Water passed at	6 0	1023·5	+26·38	Clear.
Water passed at	8 15	1029·4	+25·26	Thick from urates.
Water passed at	10 15	1031·7	+15·50	Thick from urates.
Water passed at	7 10 A.M.	1022·3	+10·76	Clear.

(37.) For the following days tartrate of ammonia was taken. The first day two drachms of imperfectly dry tartrate of ammonia were taken, in two ounces of distilled water, at a few minutes after one o'clock P.M.

Water passed at	8 35 A.M.	1025·1	+13·65 measures.	Thick appearance from urates.
Water passed at	10 5	1023·9	+11·72	Thick from urates.
Water passed at	11 30	1027·2	— 7·78	Clear.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	1 5 P.M.	1027·0	+ 5·84 measures.	Thick from urates.
Water passed at	2 10	1025·2	+11·70	Thick from urates.
Water passed at	2 50	1025·6	+18·52	Thick from urates.
Water passed at	4 30	1025·9	+20·47	Cloudy.
Water passed at	6 30	1024·6	+18·54	Clear.
Water passed at	11 45	1031·0	+12·62	Thick from urates.
Water passed at	6 55 A.M.	1021·1	+16·64	Clear.

(38.) The following day 180 grains of tartrate of ammonia, dried at 100, were taken soon after twelve o'clock; and at three o'clock 108 grains more were taken. In all then, 288 grains. Breakfast at 8<sup>h</sup> 24<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 30<sup>m</sup> P.M. The salt caused severe griping pain of the bowels, which lasted until the night, but the bowels were not relaxed.

Water passed at	8 24 A.M.	1026·0	+17·54 measures.	Thick from urates.
Water passed at	10 10	1027·0	+13·63	Thick from urates.
Water passed at	12 5	1027·4	+11·68	Thick from urates.
Water passed at	1 0 P.M.	1024·8	+17·56	Thick from urates.
Water passed at	3 0	1027·4	+23·36	Thick from urates.
Water passed at	5 0	1025·5	+25·35	Clear.
Water passed at	6 20	1026·0	+27·29	Clear.
Water passed at	11 15	1029·2	+15·54	Thick from urates.
Water passed at	6 40 A.M.	1022·9	+17·59	Clear.

(39.) The following day a single dose of tartrate of ammonia was taken. At twelve o'clock 177 grains of imperfectly dry tartrate of ammonia were taken. Breakfast at 8<sup>h</sup> 10<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 30<sup>m</sup> P.M. as before.

Water passed at	8 10 A.M.	1027·0	+19·47 measures.	Thick from urates.
Water passed at	9 45	1024·8	+17·56	Thick from urates.
Water passed at	12 0	1026·9	+14·60	Thick from urates.
Water passed at	1 30 P.M.	1026·0	+16·57	Thick from urates.
Water passed at	3 20	1027·3	+25·30	Thick from urates.
Water passed at	4 50	1027·9	+27·24	Thick from urates.
Water passed at	6 30	1027·7	+28·21	Thick from urates.
Water passed at	11 40	1027·2	- 8·75	Clear.
Water passed at	7 0 A.M.	1017·5	+17·69	Thick from urates.

The medicine caused slight uneasiness of the bowels, which lasted until the evening.

(40.) The following day no tartrate of ammonia was taken. Breakfast at 8<sup>h</sup> 30<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 50<sup>m</sup> P.M., as before.

Water passed at	8 30 A.M.	1024·8	+21·46 measures.	Thick from urates.
Water passed at	10 10	1020·6	+11·75	Thick from urates.
Water passed at	11 20	1023·0	0	Clear.
Water passed at	1 0 P.M.	1027·0	+ 5·84	Thick from urates.
Water passed at	2 30	1027·1	+14·60	Thick from urates.
Water passed at	5 5	1025·0	+26·34	Cloudy from urates.
Water passed at	6 50	1026·6	+29·22	Clear.
Water passed at	11 0	1032·1	+ 8·72	Thick from urates.

# The Variations of the Acidity of

1<sup>ST</sup> DAY

2<sup>ND</sup> DAY

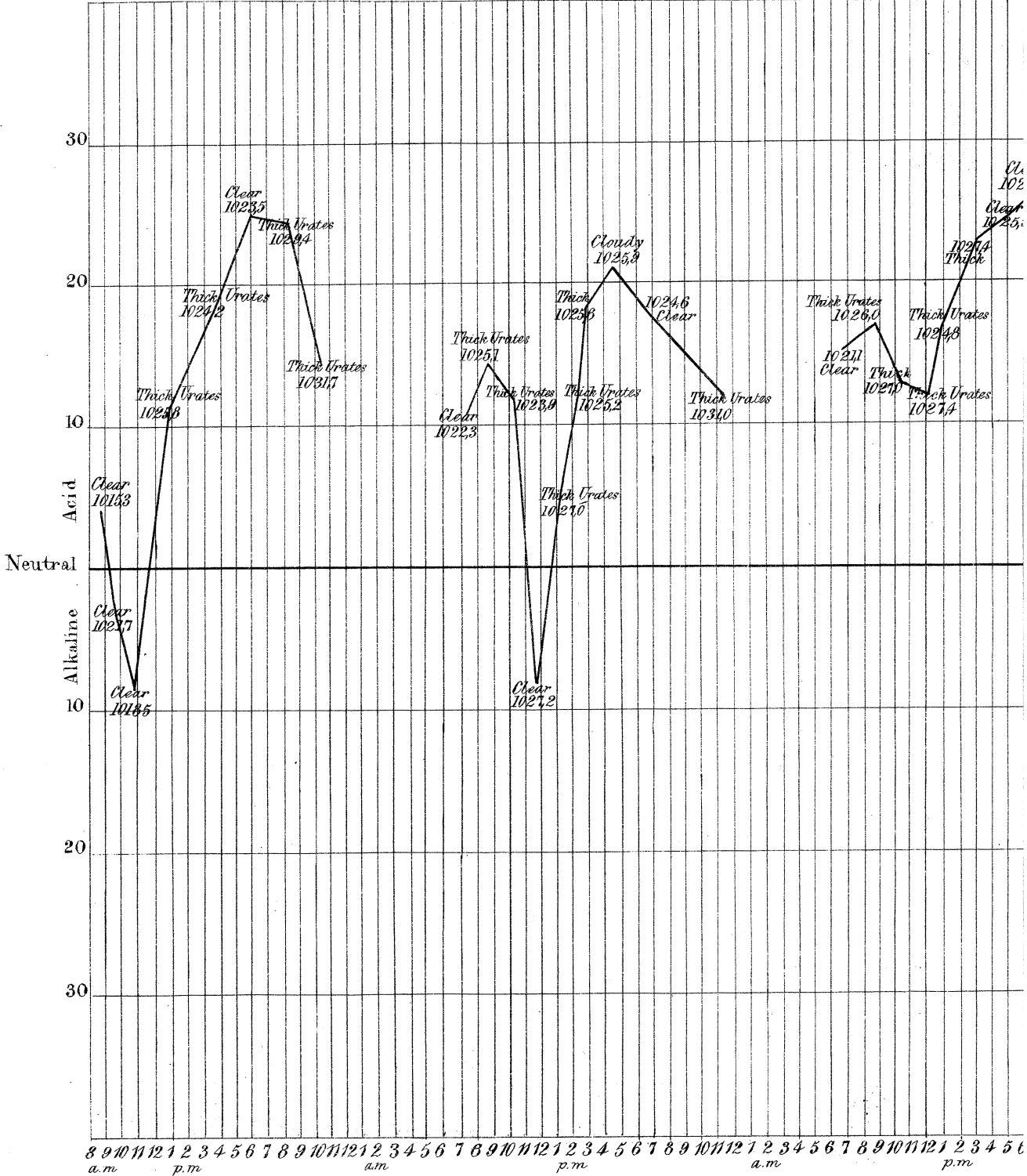
no Tartrate of Ammonia was taken

2 Drachms of Tartrate of Ammonia

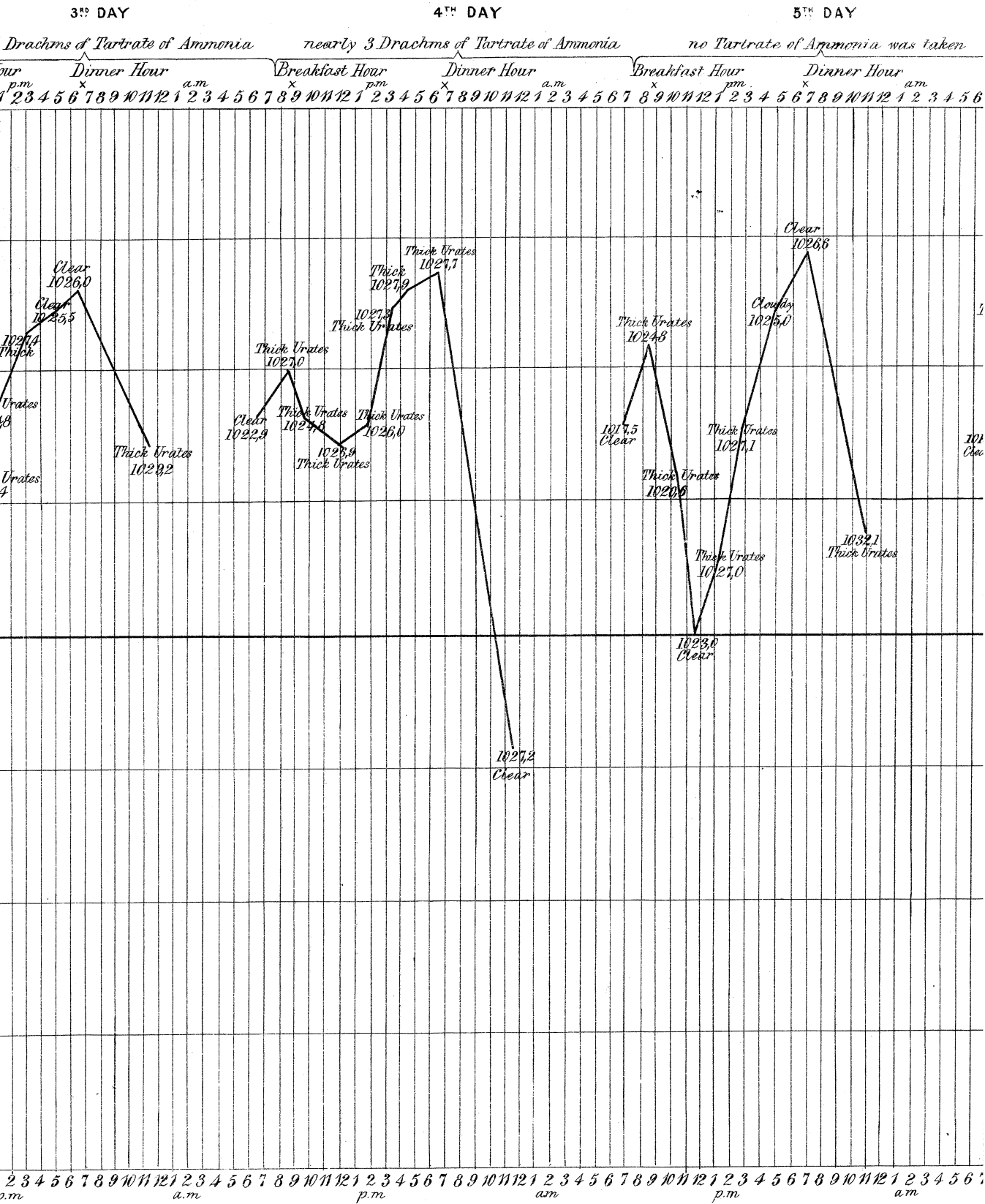
nearly 5 Drachms

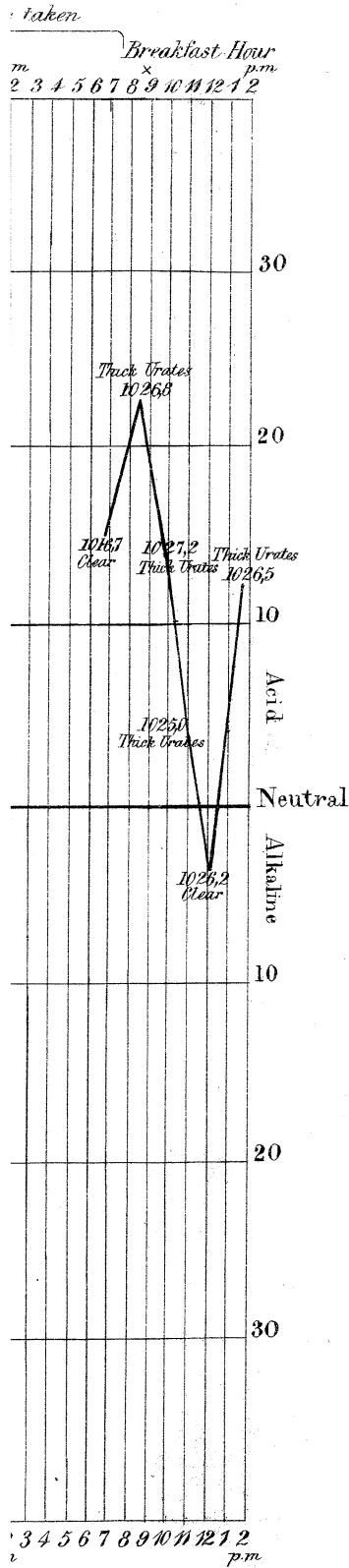
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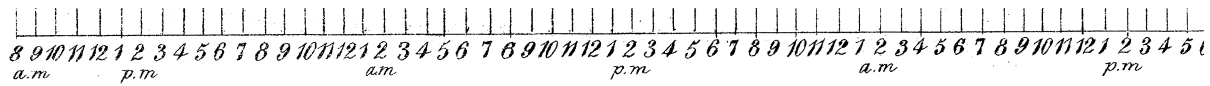
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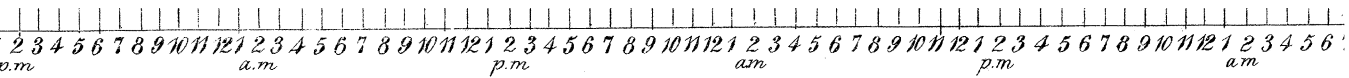


Quality of the Urine when Tartrate of Ammonia was taken.









3 4 5 6 7 8 9 10 11 12  
p.m.

J. Basire, Lith.



	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	6 45 A.M.	1016·7	+15·73 measures.	Clear.
Water passed at	8 30	1026·8	+23·37	Thick from urates.
Water passed at	9 45	1027·2	+15·56	Thick from urates.
Water passed at	10 40	1025·0	+ 5·85	Thick from urates.
Water passed at	12 0	1026·2	- 3·89	Clear.
Water passed at	1 30 P.M.	1026·5	+11·69	Thick from urates.

It follows from these experiments, which are best seen in Plate LI., that the influence of tartrate of ammonia in lessening the acidity of the urine is not perceptible.

By comparing this Plate with Plate XXIII. 1849, the remarkable difference between the action of volatile alkali and fixed alkali is very apparent. When two drachms of tartrate of potash were taken, the effect was perceptible in thirty-five minutes. When three drachms of tartrate of ammonia were taken, no diminution of the acidity of the urine was observed.

In three days, one ounce, one drachm, two scruplés and five grains of tartrate of ammonia were taken without any apparent effect in diminishing the acidity of the urine.

III. (*f.*) The effect of carbonate of ammonia on the acidity of the urine was then examined; and for this purpose Mr. MORSON gave me some of the so-called sesquicarbonate of pharmacy. Each dose was reduced to powder immediately before it was taken, in distilled water.

(41.) The first day for comparison no carbonate of ammonia was taken. Breakfast at 8<sup>h</sup> 20<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 40<sup>m</sup> P.M. As before.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	8 20 A.M.	1028·4	lost.	Thick from urates.
Water passed at	11 5	1025·2	+ 4·87 measures.	Cloudy.
Water passed at	12 50	1024·4	+ 6·83	Clear.
Water passed at	3 5 P.M.	1026·0	+16·57	Clear.
Water passed at	5 15	1016·7	+18·68	Clear.
Water passed at	6 40	1023·6	+25·40	Clear.
Water passed at	11 5	1031·4	0	Clear.
Water passed at	6 55 A.M.	1021·1	+12·73	Clear.

(42.) The following day. Breakfast at 8<sup>h</sup> 15<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 50<sup>m</sup> P.M., as before. Eighteen grains of carbonate of ammonia were taken at 12<sup>h</sup> 50<sup>m</sup>.

Water passed at	8 15 A.M.	1021·7	+15·66 measures.	Clear.
Water passed at	9 50	1012·6	+ 7·90	Clear.
Water passed at	11 35	1020·3	0	Clear.
Water passed at	12 50	1022·5	+11·63	Clear.
Water passed at	3 0 P.M.	1022·1	+17·61	Clear.
Water passed at	4 30	1021·1	+20·56	Clear.
Water passed at	6 50	1023·7	+24·42	Clear.
Water passed at	11 0	1031·1	+19·39	Thick from urates.
Water passed at	6 50 A.M.	1023·4	+15·63	Clear.

(43.) The following day. Breakfast at 8<sup>h</sup> 12<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 35<sup>m</sup> P.M. Twenty

grains of carbonate of ammonia were taken at 1<sup>m</sup> P.M.; and the same quantity at 3<sup>h</sup> 30<sup>m</sup> P.M.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	8 12 A.M.	1024·6	+22·49 measures.	Clear.
Water passed at	9 45	1021·0	+16·65	Thick from urates.
Water passed at	11 0	1025·0	+11·70	Thick from urates.
Water passed at	1 0 P.M.	1027·5	+15·57	Thick from urates.
Water passed at	2 35	1029·6	+21·36	Thick from urates.
Water passed at	4 25	1027·2	+29·20	Thick from urates.
Water passed at	6 35	1026·2	+29·23	Clear.
Water passed at	9 25	1033·4	+27·09	Thick from urates.
Water passed at	11 25	1029·3	+ 2·91	Clear.
Water passed at	6 50 A.M.	1026·4	+29·23	Clear.

(44.) The following day. Breakfast at 8<sup>h</sup> 10<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 40<sup>m</sup> P.M., as before. Twenty grains of carbonate of ammonia at 11<sup>h</sup> 15<sup>m</sup> A.M. The same quantity at 12<sup>h</sup> 45<sup>m</sup> noon. Repeated at 2<sup>h</sup> 15<sup>m</sup> P.M.; and again repeated at 4<sup>h</sup> P.M. In all, eighty grains of carbonate of ammonia in the day.

Water passed at	8 10 A.M.	1030·6	+32·99 measures.	Thick from urates.
Water passed at	9 45	1025·1	+22·34	Thick from urates.
Water passed at	11 15	1027·4	+13·62	Thick from urates.
Water passed at	12 45	1029·0	+19·43	Thick from urates.
Water passed at	2 15 P.M.	1028·4	+24·31	Thick from urates.
Water passed at	4 0	1026·2	+27·28	Clear.
Water passed at	6 40	1027·7	+30·16	Clear.
Water passed at	10 45	1031·1	+29·09	Thick from urates.
Water passed at	6 10 A.M.	1022·6	+25·42	Clear.

(45.) The following day. Breakfast at 8<sup>h</sup> 15<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 45<sup>m</sup> P.M., as before. For comparison no carbonate of ammonia was taken.

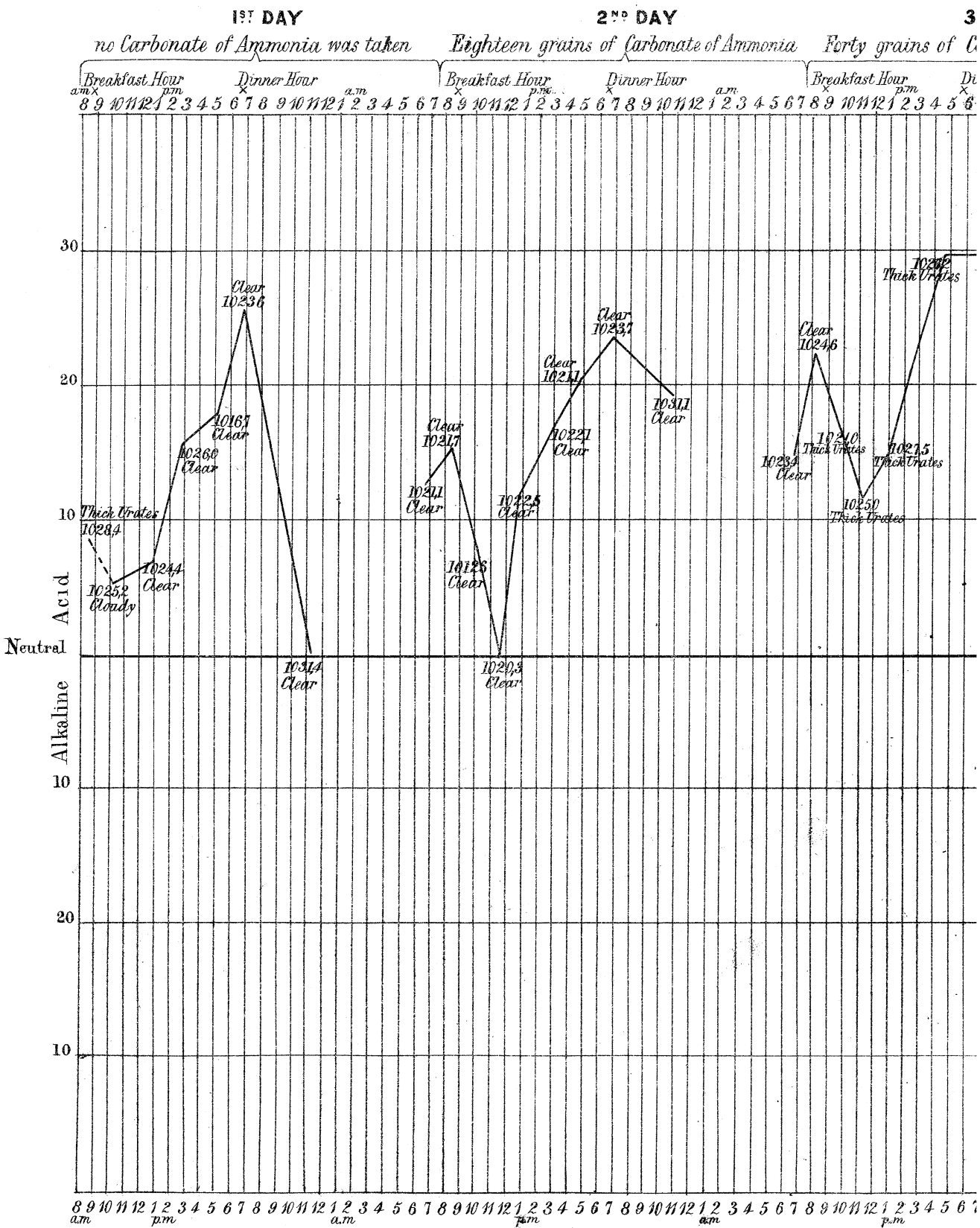
Water passed at	8 15 A.M.	1023·6	+26·37 measures.	Clear.
Water passed at	10 0	1023·5	+23·44	Thick from urates.
Water passed at	12 45	1027·2	+21·41	Thick from urates.
Water passed at	3 20 P.M.	1029·0	+34·02	Thick from urates.
Water passed at	5 35	1028·3	+35·00	Clear.
Water passed at	6 45	1030·8	+36·86	Thick from urates.
Water passed at	9 20	1032·9	+37·75	Thick from urates.
Water passed at	11 45	1031·4	+ 7·75	Cloudy.
Water passed at	7 25 A.M.	1029·8	+22·33	Thick from urates.

(46.) Breakfast at 8<sup>h</sup> 30<sup>m</sup> A.M.

Water passed at	8 30	1028·6	+27·22	Thick from urates.
Water passed at	9 35	1025·4	+17·55	Clear.
Water passed at	11 0	1027·7	+ 8·75	Clear.
Water passed at	1 0 P.M.	1030·3	+17·47	Thick from urates.
Water passed at	3 0	1029·3	+25·26	Thick from urates.
Water passed at	5 45	1029·0	+27·21	Thick from urates.

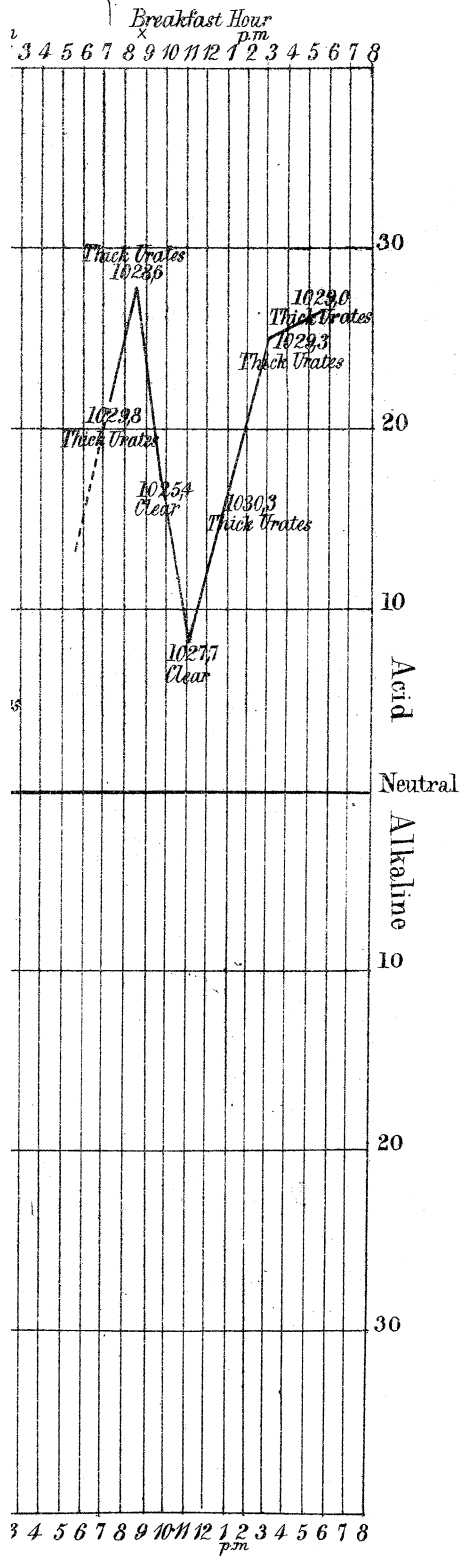
The result of these experiments is very evident in Plate LII.

# The Variations of the Acidity





taken



8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7  
a.m. p.m. a.m. p.m. a.m. p.m.

3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7  
*a.m.* *p.m.* *a.m.* *p.m.* *a.m.*

3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8  
*p.m.*

J. Basire Lith.



It follows therefrom, that carbonate of ammonia, taken in large doses, does not diminish the acidity of the urine. On the contrary, the third day (experiment 44.), when most carbonate of ammonia was taken, the acidity was higher than it had been any previous day. By experiment (45.) it appears that the acidity of the urine was still high on the following day. The effect of the eighty grains of carbonate of ammonia was very evident twenty-four hours after it was taken.

The comparison between Plate XXII. Philosophical Transactions, 1849, representing the acidity when tartaric acid was taken, and this Plate, which shows the effect of carbonate of ammonia, is worthy of observation. The urine was more acid when carbonate of ammonia was taken than when tartaric acid was taken. It is possible that there was some difference in the irritability of the stomach when the two series of observations were made. But the gradual increase of the acidity, as the quantity of carbonate of ammonia taken was increased, shows that the difference of the state of the stomach was not the cause of the state of the acidity of the urine. When no carbonate of ammonia was taken, the acidity of the urine, after food was taken, was diminished to a greater degree than it was when the volatile alkali was taken.

The comparison between Plate XXI. Philosophical Transactions, 1849, which represents the acidity of the urine when liquor potassæ was taken, and this Plate, which shows the acidity when carbonate of ammonia was taken, is also very interesting, as it establishes the important difference of the effect of volatile and fixed alkali on the acidity of the urine.

That 138 grains of carbonate of ammonia, taken in three consecutive days, should not diminish the acidity of the urine is very remarkable. It is still more worthy of attention that it actually increases the acidity. It appeared very desirable to test these facts by further experiments.

(47.) The experiment with large doses of carbonate of ammonia was therefore repeated. For comparison, the day previous to that on which the carbonate of ammonia was taken, the variations in the acidity of the urine were determined. Breakfast at 8<sup>h</sup> 30<sup>m</sup> A.M. Dinner at 7 P.M.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	7 20 A.M.	thrown away.		
Water passed at	8 30	1028·8	+19·44 measures.	Thick from urates.
Water passed at	9 40	1026·0	+14·62	Thick from urates.
Water passed at	10 35	1025·2	+ 5·85	Clear.
Water passed at	11 55	1027·6	-14·59	Cloudy from phosphates.
Water passed at	1 0 P.M.	1027·9	+12·64	Cloudy from urates.
Water passed at	2 55	1026·8	+18·50	Thick from urates.
Water passed at	5 10	1025·4	+24·38	Thick from urates.
Water passed at	7 0	1027·9	+31·13	Thick from urates.
Water passed at	11 0	1031·8	+ 7·75	Thick from urates.
Water passed at	6 45 A.M.	1024·7	+ 9·76	Clear.

(48.) The following day. Breakfast at 8<sup>h</sup> 15<sup>m</sup> A.M. Dinner at 7 P.M. Twenty

grains of carbonate of ammonia were taken at 11<sup>h</sup> 40<sup>m</sup> A.M. The same quantity at 1<sup>h</sup> 15<sup>m</sup> P.M. It was repeated at 2<sup>h</sup> 25<sup>m</sup>, and again repeated at 3<sup>h</sup> 55<sup>m</sup>. In all, eighty grains dissolved in about eight ounces of distilled water.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	8 15 A.M.	1026·2	+ 17·54 measures.	Clear.
Water passed at	9 30	1025·0	+ 12·68	Thick from urates.
Water passed at	10 25	1023·8	+ 6·83	Clear.
Water passed at	11 40	1027·0	+ 2·92	Clear.
Water passed at	1 15 P.M.	1026·7	+ 11·69	Clear.
Water passed at	2 25	1027·3	+ 19·47	Thick from urates.
Water passed at	3 55	1023·9	+ 23·44	Clear.
Water passed at	5 30	1022·8	+ 25·42	Clear.
Water passed at	7 0	1025·2	+ 29·26	Clear.
Water passed at	10 55	1028·9	+ 3·94	Clear.
Water passed at	5 10 A.M.	1024·6	+ 2·94	Clear.

Plate LIII. gives the means of comparing the acidity of the urine on these days. Here also it is evident that the acidity is not so much diminished after food when carbonate of ammonia is taken, but the increase in the acidity after the volatile alkali is taken is not so evident as in the previous Plate LII.: this probably arose from the very considerable increase in the quantity of water made on the day the carbonate of ammonia was last taken. The volatile alkali acted as a diuretic. This is seen by the lower specific gravity of the urine the second day. The actual quantity of water passed was one-third more than it was on the previous day.

Still this experiment shows that eighty grains of carbonate of ammonia do not lessen the acidity of the urine.

(49.) The following day no carbonate of ammonia was taken. Breakfast at 8<sup>h</sup> 20<sup>m</sup> A.M. Dinner at 7<sup>h</sup> 15<sup>m</sup> P.M. An increased quantity of urine was secreted during this day also.

	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	8 20 A.M.	1017·2	+ 13·76	Clear.
Water passed at	9 30	1014·5	+ 8·87	Clear.
Water passed at	10 15	1014·5	+ 7·88	Clear.
Water passed at	11 25	1021·3	+ 12·72	Clear.
Water passed at	1 10 P.M.	1023·8	+ 17·58	Clear.
Water passed at	2 30	1023·5	+ 20·51	Clear.
Water passed at	3 50	1021·5	+ 19·58	Clear.
Water passed at	5 20	1022·2	+ 21·42	Clear.
Water passed at	7 15	1025·9	+ 23·39	Clear.
Water passed at	10 30	1023·3	0	Clear.
Water passed at	6 25 A.M.	1026·4	+ 11·69	Clear.

(50.) The next day eighty grains of carbonate of ammonia were taken in divided doses: twenty grains at 11<sup>h</sup> 45<sup>m</sup> A.M.; the same quantity at 1<sup>h</sup> 15<sup>m</sup> P.M., at 2<sup>h</sup> 30<sup>m</sup> P.M., and at 3<sup>h</sup> 45<sup>m</sup> P.M. Breakfast was at 8<sup>h</sup> 20<sup>m</sup> A.M., and dinner at 7<sup>h</sup> 30<sup>m</sup> P.M.

The quantity of urine was much less than on the two previous days.

# The Variations of the Acidity

6<sup>TH</sup> DAY

7<sup>TH</sup> DAY

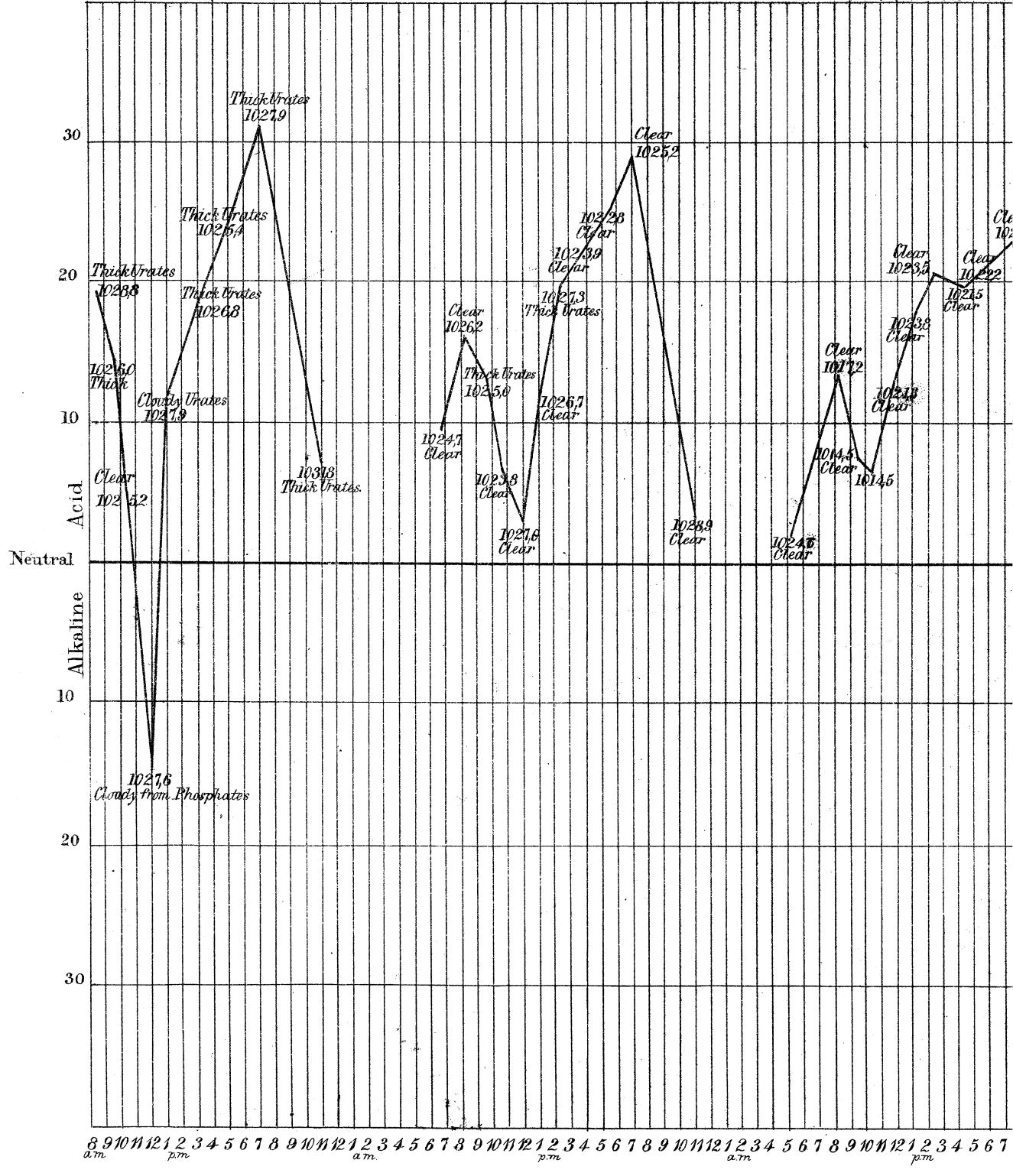
8

no Carbonate of Ammonia

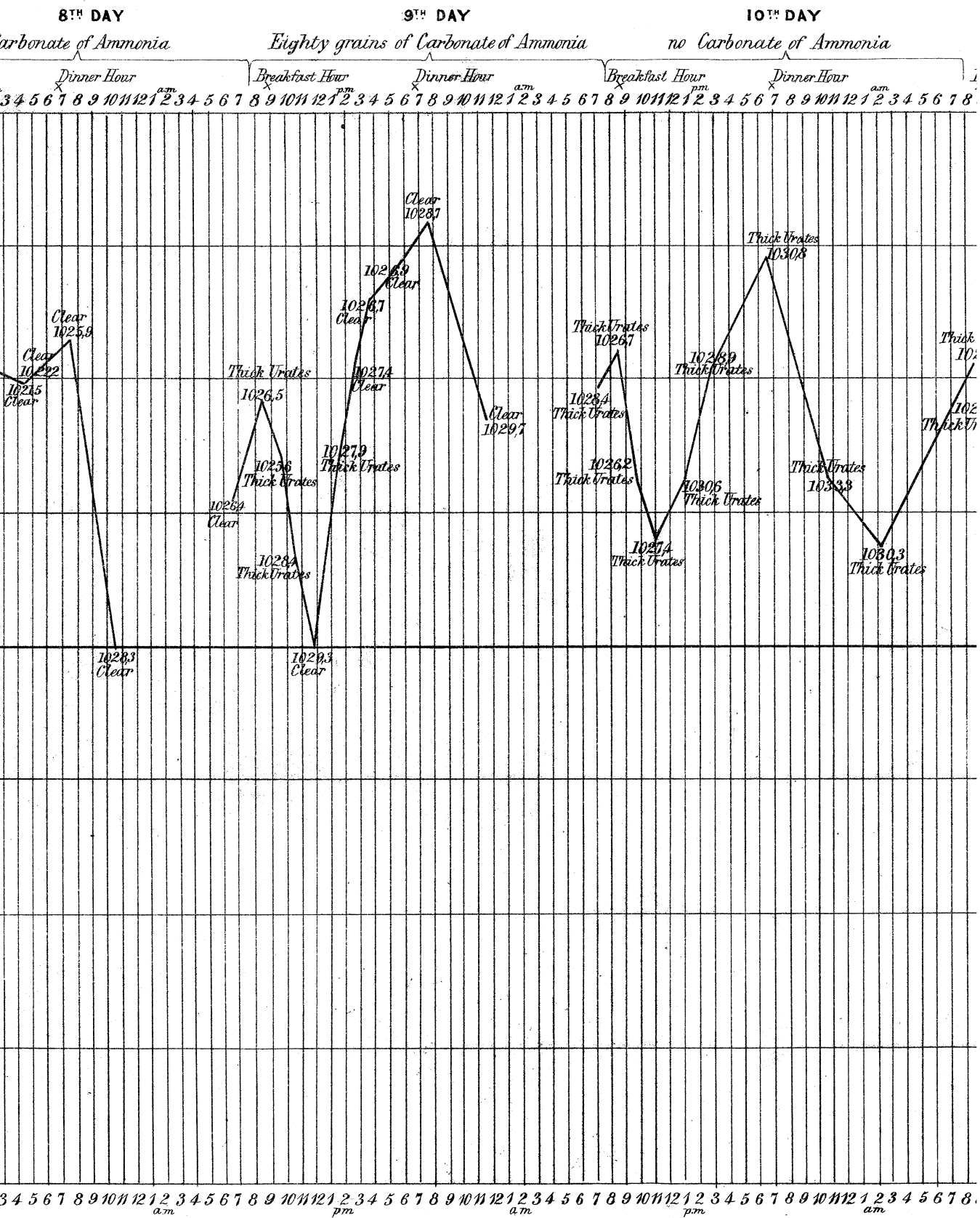
Eighty grains of Carbonate of Ammonia

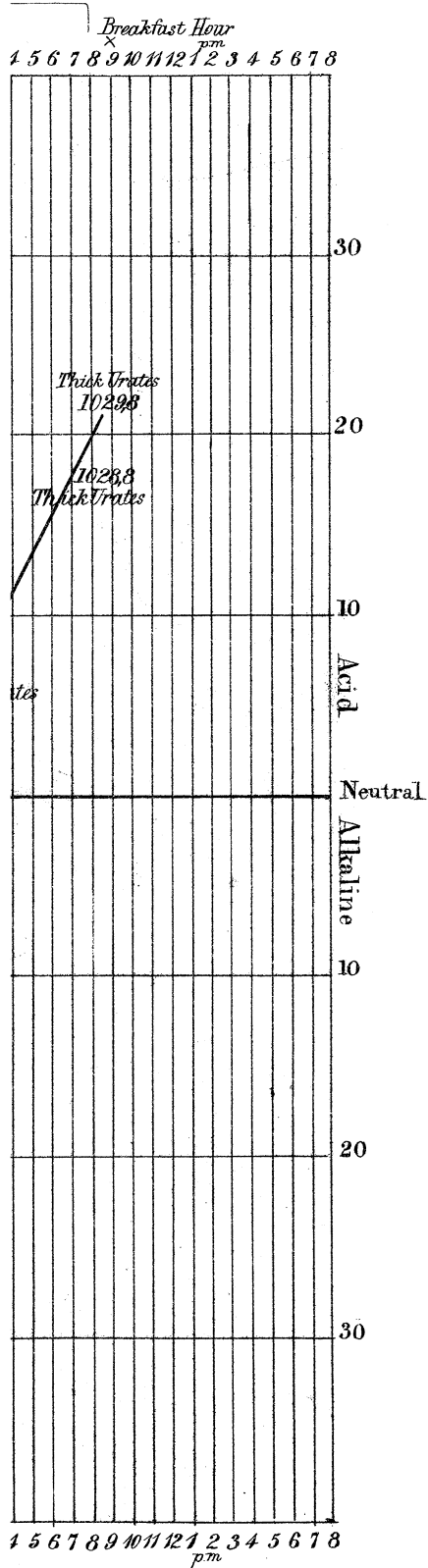
no Carbonate

Breakfast Hour Dinner Hour Breakfast Hour Dinner Hour Breakfast Hour Dinner Hour  
 a.m. x p.m. x a.m. p.m. x a.m. p.m. x a.m. p.m. x



Acidity of the Urine when Carbonate of Ammonia was taken





8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7  
*a.m.* *p.m.* *a.m.* *p.m.* *a.m.* *p.m.*



1 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8  
*p<sup>m</sup>*

J. Basire, Lith.



	h m	Spec. gr.	Acidity per 1000 grs. of urine.	Appearance.
Water passed at	8 20 A.M.	1026·5	+18·50 measures.	Thick from urates.
Water passed at	9 30	1025·6	+14·62	Thick from urates.
Water passed at	10 35	1028·4	+ 7·78	Thick from urates.
Water passed at	11 45	1029·3	0	Clear.
Water passed at	1 15 P.M.	1027·9	+14·59	Thick from urates.
Water passed at	2 30	1027·4	+21·41	Clear.
Water passed at	3 45	1026·7	+26·29	Clear.
Water passed at	5 20	1026·9	+28·24	Clear.
Water passed at	7 30	1028·7	+32·08	Clear.
Water passed at	11 15	1029·7	+17·48	Clear.
Water passed at	6 55 A.M.	1028·4	+19·44	Thick from urates.

Here again there is decided evidence of an increase in the acidity of the urine after a large dose of carbonate of ammonia. There was no diuretic action, but during the night a most profuse and unusual perspiration took place. The following morning no carbonate of ammonia was taken.

(51.) Breakfast was at 8<sup>h</sup> 35<sup>m</sup> A.M. Dinner at 6<sup>h</sup> 15<sup>m</sup> P.M. The same as on the previous days.

Water passed at	8 35 A.M.	1026·7	+22·40	Thick from urates.
Water passed at	9 40	1026·2	+13·64	Thick from urates.
Water passed at	11 0	1027·4	+ 8·76	Thick from urates.
Water passed at	1 0 P.M.	1030·6	+11·64	Thick from urates.
Water passed at	3 0	1028·9	+21·38	Thick from urates.
Water passed at	6 15	1030·8	+29·10	Thick from urates.
Water passed at	10 30	1033·3	+13·55	Thick from urates.
Water passed at	2 0 A.M.	1030·3	+ 8·73	Thick from urates.
Water passed at	7 20	1028·8	+18·47	Thick from urates.
Water passed at	8 20	1029·8	+20·39	Thick from urates.

Perhaps the acidity did not rise higher on account of the perspiration, which must have removed much acid from the system. The effect of the carbonate of ammonia may be traced in a smaller fall than usual in the acidity after breakfast and dinner.

These experiments, well seen in Plate LII., then tend to the confirmation of the results previously obtained:—first, that there is a very great difference between the effects of volatile and fixed alkalis on the acidity of the urine; secondly, that carbonate of ammonia, in large doses, does not diminish the acidity of the urine; thirdly, that carbonate of ammonia, in large doses, actually increases the acidity of the urine; and this was evident, not only in the acidity not falling so low as it did after food when no carbonate of ammonia was taken, but in an actual rise before food to a higher degree than was reached when no carbonate of ammonia was administered.

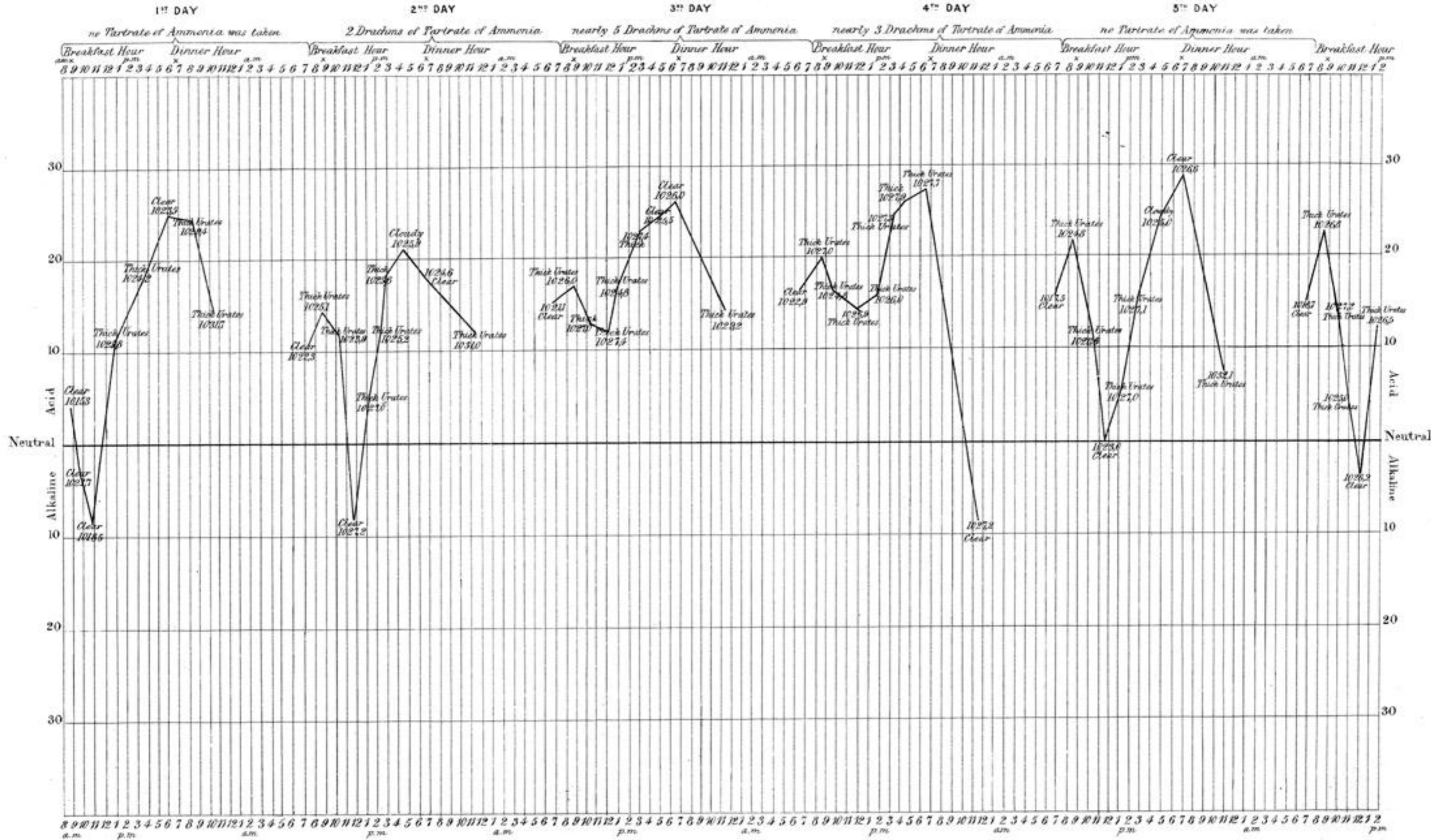
The conclusions from these experiments with tartrate and carbonate of ammonia may be shortly stated thus—

(e.) That tartrate of ammonia in large doses produces no effect on the alkalescence of the urine. It differs entirely in this respect from tartrate of potash.

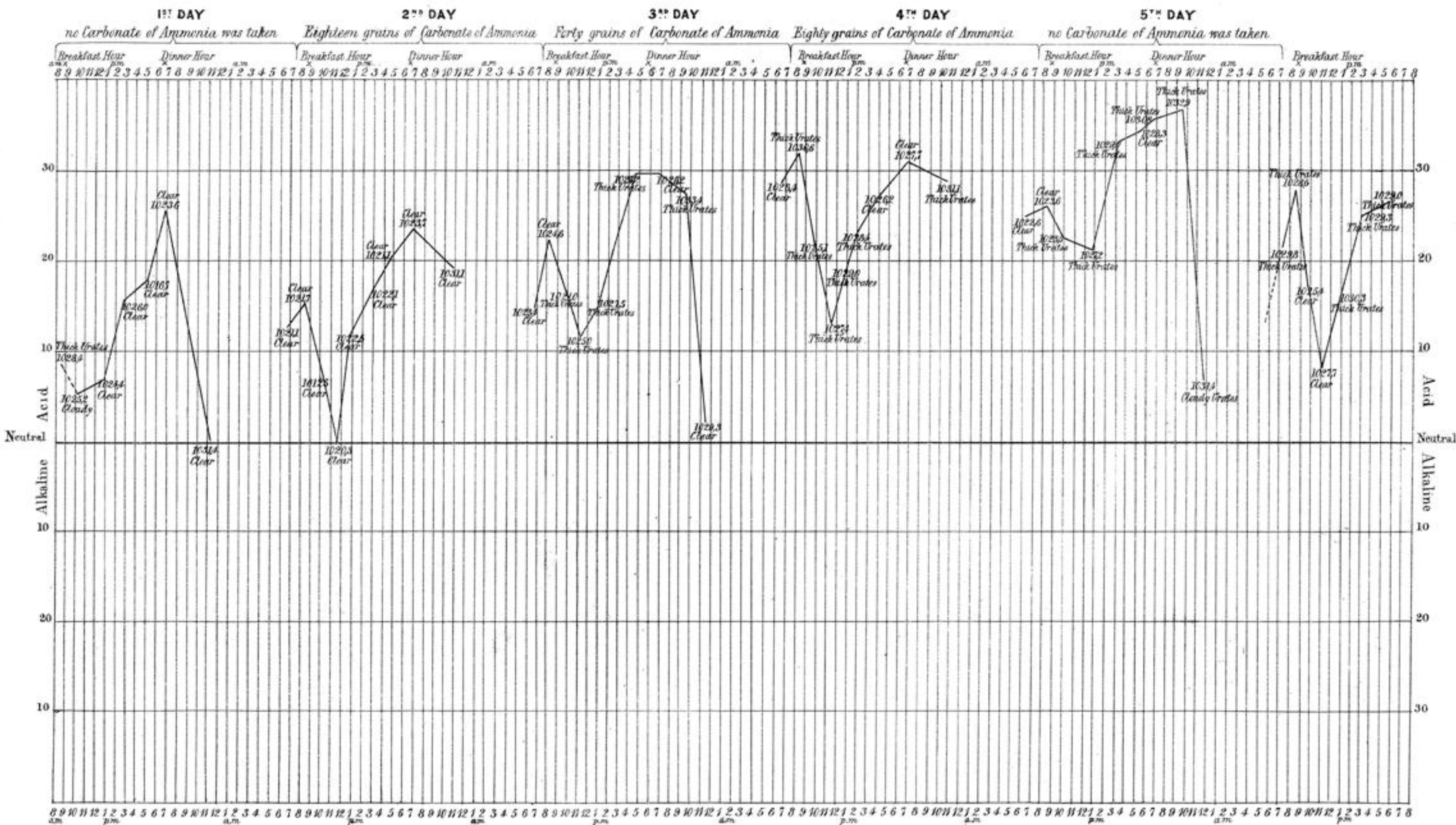
(f.) That carbonate of ammonia in large doses increases the acidity of the urine.

I hope to determine the cause of this in a future paper on the variations of the nitrates in the urine.

The Variations of the Acidity of the Urine when Tartrate of Ammonia was taken.



The Variations of the Acidity of the Urine when Carbonate of Ammonia was taken.



The Variations of the Acidity of the Urine when Carbonate of Ammonia was taken

