LXXIV. THE "AMMONIA COEFFICIENT" OF PREGNANCY.

BY WINIFRED CLARA CULLIS AND EVELYN E. HEWER.

*From the Physiological Laboratory, London (Royal Free Hospital)
School of Medicine for Women.*

(Received September 21st, 1920.)

A STUDY of the nitrogen distribution in the urine during pregnancy has led to the view that the "ammonia coefficient¹," although it shows a tendency to rise above the normal, should not differ from it very markedly. Indeed it has been claimed by some obstetricians that a value of 15 means a serious departure from a normal pregnancy, and that a value of over 30 is a sign that the pregnancy should be terminated.

The following case is given as a contribution to the study of nitrogen metabolism in pregnancy because it showed a high ammonia coefficient and yet had a successful termination. It is to be regretted that other observations on respiratory values and blood reactions were not made at the same time, as they would have added considerably to the value of the observations. Further, no attempt was in this case made to differentiate between the ammonia and the amino-acids, the "ammonia" being determined by the Folin method. Nevertheless, the figures obtained from the urinary analysis are sufficiently striking to be worth recording².

The subject, Mrs W., was a primipara aged 22, who was admitted to the Royal Free Hospital for prolonged vomiting. She was found to be pregnant, retroversion was corrected, and then as the vomiting continued in spite of dieting she was transferred to the Marlborough Maternity Hospital, Endsleigh Street, under charge of Lady Barrett, with a view to induction. Lady Barrett's resident medical officer was Dr Dorothy Chick, to whose keenness and interest we are indebted for the collection of the specimens over the long period before parturition, during which we were enabled to make the analyses at the school laboratories. This was only one of the cases in which Dr Chick's interest in the scientific aspect of her work was manifested, but it was the last before her untimely death in the influenza epidemic of 1919. In publishing these

¹ By the "ammonia coefficient" is meant the ratio between the ammonia and the nitrogen excreted in the urine, taking the nitrogen as 100. The usual way of determining is to estimate the percentage of ammonia and of nitrogen in a 24-hours' specimen of urine: this will give an average coefficient of from 4 to 8, most often about 5 or 6.

² All the analyses in this investigation were done by one of us (E.E.H.).

results it is only fitting to record once again our keen sense of the loss that all her colleagues sustained in the death of this particularly able young medical woman, with her scientific attitude towards the problems of work, an attitude strengthened and made valuable by her previous training at Cambridge.

The first specimen of urine in which the ammonia coefficient was determined gave the extraordinarily high value of 70. For other reasons immediate induction was not considered essential, and therefore in view of the urinary analysis we suggested that possibly the high value was in part due to an acidosis of starvation, and particularly to protein deficiency. That the high coefficient could not be explained only by fasting is shown by the fact that in fasting the ratio may rise up to 35, but probably not higher. However, as a trial, the patient was put on to a diet containing much more protein, and almost at once she began to improve.

The volume of urine passed increased (see accompanying charts), and the ammonia coefficient dropped rapidly (although still high). Intermittent vomiting continued for some time, but the patient looked and felt much better. Two months after admission to the Maternity Hospital she was discharged, with instructions to report at out-patients, and to bring fortnightly twenty-four-hourly samples of urine.

Two months later she was readmitted for vomiting, and a trace of albumin in the urine, but was discharged a week later much improved.

Six weeks later she was readmitted for confinement. The baby was born slightly jaundiced, and weighed $5\frac{3}{4}$ lb. ♀. The patient was discharged doing well, and feeding the baby.

In view of the interest of the case, she was instructed to report periodically, and to bring samples of urine with her. From these we have been able to draw up a chart showing her urinary excretion when not pregnant; the analyses give a normal ammonia coefficient, a very high urea average, and a small volume of urine.

At the present time she is again pregnant, and the urine is being systematically analysed: up till the present nothing abnormal has been detected.

A study of the accompanying tables and charts will show the way in which the ammonia coefficient varied with the condition of the patient. It is particularly unfortunate that no urinary analyses were made just before and after confinement: this was due to the serious outbreak of influenza at the Hospital, during which Dr Chick herself died.

The following points appear from the charts:

1. The patient has no inherent abnormality of metabolism, the coefficient being of the average physiological value, *i.e.* from 4 to 8.
2. The high ammonia percentage was not due to concentration of the urine.
3. There was a very definite retention of nitrogen.
4. There was a definite parallelism between the daily total NH_3 and daily

Table I. *Urinary Analysis (Mrs W., Non-pregnant condition)*

Date	Quantity oz.	S.G.	Titration acidity %	NH ₃ %	N %	Urea %	NH ₃ Coeff.	Total NH ₃	Total N	Total Urea
Mar. 16-17	—	1023	71.1	0.1	1.6	2.75	6.2	—	—	—
Sept. 7-8	—	1030	58	0.15	1.81	3.2	8.3	—	—	—
Sept. 21-22	30	1030	55.1	0.12	1.78	3.85	6.7	1.02	15.1	32.8
Sept. 29-30	—	1030	53.8	0.12	1.73	3.8	6.9	—	—	—
Nov. 21-22	36	1021	24.8	0.074	1.26	2.2	5.9	0.76	12.8	22.5
Dec. 2-3	22	1027	12	0.064	1.13	1.92	5.6	0.4	7.1	11.98

In this table and in Table II

Titration acidity Expressed as number of cc. of N/10 NaOH required for 100 cc. urine using phenolphthalein as indicator.

Urea ... Expressed as grams. Estimated by hypobromite method.

Nitrogen ... Expressed as grams. Estimated by Kjeldahl method.

Ammonia ... Expressed as grams. Estimated by Folin's formaldehyde method.

Table II. *Urinary Analysis (Mrs W., Pregnant condition)*

Date	Quantity oz.	S.G.	Titration acidity %	NH ₃ %	N %	Urea %	NH ₃ Coeff.	Total NH ₃	Total N	Total Urea
Sept. 3-4	8½	1022	33.3	0.67	0.86	—	77.9	1.66	2.1	—
4-5	9	1017	48	0.7	1.03	—	67.9	1.79	2.6	—
5-6	9	1019	78.5	0.54	1.08	—	50	1.38	2.8	—
8-9	16	1016	30	0.23	0.76	—	30.25	1.04	3.45	—
9-10	20	1015	24.7	0.22	0.74	—	29.7	1.25	4.2	—
10-11	20	1016	21.4	0.17	0.61	—	27.8	0.96	3.46	—
11-12	44	1012	17.6	0.12	0.57	0.9	21	1.5	7.1	11.23
12-13	23	1012	26.6	0.12	0.62	1.1	19.35	0.78	4.04	7.2
13-14	30	1016	28.1	0.13	0.77	1.2	16.8	1.11	6.55	10.2
15-16	30	1005	12.85	0.05	0.38	0.5	13.2	0.43	3.2	4.3
16-17	45	1009	30.9	0.07	0.5	0.8	14	0.89	6.4	10.3
17-18	25	1012	34.3	0.09	0.62	0.8	14.5	0.64	4.4	5.7
18-19	25	1010	50	0.1	0.5	0.8	20	0.71	3.5	5.7
19-20	30	1007	22.85	0.08	0.54	0.8	14.8	0.68	4.6	6.8
20-21	36	1011	37.6	0.1	0.54	0.75	18.5	1.02	5.5	7.7
22-23	40	1008	17.1	0.08	0.54	0.7	14.8	0.91	6.12	7.9
23-24	39	1010	41.9	0.11	0.54	0.65	20.3	1.22	5.97	7.2
24-25	28	1011	34.2	0.11	0.61	0.8	18	0.87	4.84	6.3
25-26	29	1008	9.1	0.06	0.43	0.52	13.95	0.49	3.54	4.3
27-28	7	1018	49.5	0.21	0.82	1.45	25.6	0.42	1.63	2.9
29-30	+	1009	13.8	0.09	0.4	0.55	22.5	—	—	—
Oct. -1	27	1015	61.4	0.2	0.8	1.3	25	1.53	6.13	10
6-7	15	1016	37.1	0.14	0.73	1.2	19.18	0.6	3.1	5.1
8-9	27	1012	52.8	0.15	0.63	1	23.8	1.15	4.8	7.7
10-11	25	1014	59	0.19	0.8	1.37	23.75	1.35	5.7	9.7
14-15	30	1013	2	0.07	0.5	0.62	14	0.6	4.25	5.3
29-30	—	—	9.5	0.23	0.8	0.8	28.7	—	—	—
Nov. 26-27	—	—	17.5	0.07	0.66	0.85	10.6	—	—	—
Feb. 9-10	—	1016	18.5	0.07	0.71	1.25	9.8	—	—	—
15	Patient confined									
Mar. 16-17	—	1023	71.1	0.1	1.6	2.75	6.2	—	—	—

Chart 1

Chart 2

total urea: comparison with a normal chart shows that increased NH_3 in the usual way means decrease of urea (on a constant diet): in this case, increase of NH_3 went with increase of urea.

5. There appeared to be no relationship between the vomiting and the coefficient: the latter was much more dependent on the diet. (It is, of course, well known that starvation raises the coefficient.)

Chart 3

6. There was no relationship between the total NH_3 excreted and the NH_3 coefficient.

Quite recently another case of abnormally high ammonia coefficient has been met with, in connection with an investigation that is being carried out at the London (R.F.H.) School of Medicine for Women, on the metabolism of pregnancy under the Medical Research Council's Scheme of Child Life Investigation.

We should like to thank Lady Barrett for permission to publish this case.