Locke's solution remained alive at room temperature for 6 to 7 days; in gelatin-salt for 2 days. Series of plates made at frequent intervals failed to reveal any growth in solutions containing this small concentration of gelatin. The beneficial effect of gelatin was found to lie largely in its protection of the pneumococci against mechanical injury, which occurs during the process of dilution in crystalloid solutions or water. Gelatin has in addition a well marked preservative action, the nature of which is uncertain.

ABSTRACT OF COMMUNICATIONS.

Western New York Branch.

Eighth meeting.

Clifton Springs, New York, October 13, 1923.

19 (2251)

Some experiments on the excretion of ammonia.

By ROGER S. HUBBARD and ELLERY G. ALLEN.

[*From the Laboratories of the Clifton Springs Sanitarium, Clifton Springs, New York.*]

In a previous article Hubbard and Munford[1] published the results of a study of the ammonia excretion in a series of cases; in the present article a similar study of a number of determinations upon a single subject is given. Determinations of the reaction and ammonia content were made upon samples of urine collected at hourly intervals through the morning from a normal man (one of the authors, E. G. A.). Experiments were carried out on thirteen days during a period of two and a half months

1 Hubbard, R. S., and Munford, S. A., The excretion of acid and ammonia. *J. Biol. Chem.*, 1922, liv, 465.

during the summer of 1923. The food eaten for breakfast varied on the different days, but otherwise there was no noteworthy difference between the various experiments. Analyses were carried out as described in the previous paper.[1]

TABLE I.

Independent Variable			Dependent Variable		
Kind	Variation	Pairs	Volume	Ammonia Nitrogen	
			per cent	milligrams per cc. per cent	milligrams per hr. per cent
Reaction	any	1743	69	82	64
"	more than 0.2 pH	1422	75	87	67
"	" " 0.5 pH	1019	80	93	71
"	" " 1.0 pH	536	89	98.5	80
Volume	any	1768		75	51
"	more than 5 cc.	1342		81	49
"	" " 10 cc.	995		86	49
"	" " 20 cc.	491		89	53

Ammonia concentration and rate of excretion increase as degree of acidity increases. Volume decreases as degree of acidity increases. Rate of ammonia excretion increases and concentration of ammonia decreases as volume increases.

In the first table the results of the experiments have been summarized as were those in the paper by Hubbard and Munford. All the results were listed in the order of the differences in reaction and volume, all the pairs of values of amounts of ammonia excreted and of concentrations of ammonia which varied in the same direction as the independent variable were counted, and the result expressed as per cent of the total pairs. Similar calculations have been given for specimens which varied from each other by more than 0.2 pH, by more than 5 cc., etc. The table shows that the volume and the concentration and rate of excretion of ammonia varied with the reactions of the specimens, and that the ammonia concentration varied much more closely with it than did the rate at which ammonia was excreted. These results agree with the findings given in the first article. Ammonia excretion did not vary with the volume as it did in the earlier series. Specimens with large volumes were usually excreted in the middle of the forenoon when the degree of acidity was low, and this fact may partially explain the lack of agreement. The ammonia concentration varied with the volume, but

no more closely than the volume itself varied with the reaction, and not as closely as the ammonia concentration varied with the reaction.

TABLE II.
Reaction varies 0.2 pH or less.

Volume varies	Pairs	Ammonia per hour varies with volume
	Number	
more than 1 cc.	410	71 per cent
" " 5 cc.	273	76 "
" " 10 cc.	166	77 "
" " 20 cc.	67	91 "

In Table II the relationship between volume and ammonia excretion of all pairs of specimens whose reactions did not differ from each other by more than 0.2 pH is given. The rate of ammonia excretion did vary with the volume in these specimens, but not as closely as it did in the series previously reported. Most of the specimens with constant reactions in that series were found in cases of gastric anacidity in which the reaction did not vary during the whole experiment; it seems possible that the difference in the agreement in the series now presented arises from changes in reaction which took place during the periods of collection.

TABLE III.
Average values of each experiment.

Reaction	Volume	Ammonia Nitrogen	
		per 100 cc.	per hour
pH	cc.	mg.	mg.
5.2	20.5	69	14
5.2	28	70	20
5.5	23	66	14
5.8	37	48	17.5
5.9	27	58.5	16
6.0	36	61	8
6.0	38	35	13
6.1	40	40	14
6.15	46	40.5	16.5
6.15	41	54	22
6.5	35	32	11
6.7	36.5	32	10
6.85	47	28	12.5

The average of the results of each day, arranged in order of differences in reaction, are given in Table III. The ammonia concentration varied with the reaction (there was only one pair of experiments which differed from each other by more than 0.2 pH which is not in its proper sequence) but the agreement is not quantitative. This failure of quantitative agreement was also shown in the tables from which Table I was compiled. The rate of ammonia excretion did not correspond with the reaction as it did when separate specimens were compared with each other.

TABLE IV.

Experiments with small variations in reactions of specimens.

Reactions of specimens		Volume	Ammonia Nitrogen
Difference pH	Average pH	Average cc. per hour	Average mg. per hour
0.2	5.2	20.5	14
0.4	5.5	23	14
0.2	5.2	28	22
0.4	5.65	18	13.5
0.4	5.45	34	22
0.5	4.9	36	14
0.3	4.8	39	15

In the first part of Table IV the average of those experiments in which the reactions of the different specimens was fairly constant and the average reactions of different experiments agreed well is given. Since only three experiments in the series fulfilled these conditions, results on two other subjects are also given. In these experiments the average rate of ammonia excretion varied with the volume.

The results show that in this series the ammonia concentration varied with the reaction, and that when the reaction was constant the rate of ammonia excretion varied fairly closely with the volume. It is possible that variations in the rate of ammonia excretion may depend on some factor which varies approximately with the volume and that this may explain why better agreement between volume and ammonia excretion was not found.