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Research Article

ON THE RELATION BETWEEN CONDUCTIVITY AND CHLORIDES IN THE URINE

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Previous papers by Gram and Norgaard (1) and Gram (2) and also by Atchley, Loeb, Benedict and Palmer (3) have shown in both normal and most pathological human sera a marked constancy in the ratio of NaCl concentration to the NaCl equivalent of conductivity. This is expressed as the ratio $\frac{[NaCl]}{NaCl\ eq.}$. A recent study by Pepper (4) has shown that in nephritis the relative proportion of non-chloride, non-urea constituents in the urine is increased.

It would seem that a determination of the ratio $\frac{[NaCl]}{NaCl\ eq.}$ in such urines would serve to throw light on whether this relative increase is due to non-chloride electrolytes or not.

In tables 1 and 2 we give the results of an examination of 11 normal and 11 nephritic urines respectively. All specimens were freshly voided and no ammoniacal decomposition had taken place. The ratio in normal urines of course is not nearly as fixed as in normal sera, but still has remained within the limits 0.84 and 0.63 in all cases, with an average of 0.726.

In nephritic urines on the other hand the ratio $\frac{[NaCl]}{NaCl\ eq.}$ was with one exception lower than in any of the normal urines, varying between 0.67 and 0.34 with an average of 0.524.

This marked discrepancy in the ratio cannot be attributed to the presence of albumin in the nephritic urines since the quantities of

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TABLE 1

Eleven normal urines

Name	Date	NaCl eq. of conduct.	[NaCl]	Ratio $\frac{[NaCl]}{NaCl\ eq.}$
	1923	*per cent*	*per cent*	
H. C. G.	April 13	1.85	1.43	0.72
G. E. C.	April 14	0.59	0.39	0.66
J.	April 14	2.16	1.81	0.84
J. H. A.	April 21	1.89	1.31	0.69
D. H. M.	April 21	1.73	1.09	0.63
L. J.	April 23	1.91	1.51	0.79
P.	April 23	1.91	1.35	0.71
K.	April 23	1.185	0.91	0.77
L.	June 4	1.54	1.10	0.71
P. P.	June 18	1.56	1.02	0.65
C.	September 10	1.96	1.61	0.82
Maximum				0.84
Minimum				0.63
Average				0.726

TABLE 2

Eleven nephritic urines

Name	Diagnosis	Date	NaCl eq. of conduct.	[NaCl]	Ratio $\frac{[NaCl]}{NaCl\ eq.}$
		1923	*per cent*	*per cent*	
N. B.	Glomerulo-nephritis	April 26	0.49	0.27	0.55
G. B.	Nephritis	May 21	0.53	0.23	0.43
P.	Chronic nephritis	June 2	0.44	0.15	0.34
L. G.	Nephritis	June 6	0.36	0.20	0.56
J. N.	Nephritis	June 7	0.67	0.35	0.52
W. V.	Chronic nephritis	June 8	0.67	0.41	0.61
M.	Nephritis	June 20	0.91	0.42	0.46
M. T.	Nephritis	June 20	0.845	0.47	0.56
S.	Acute nephritis	June 20	0.73	0.43	0.59
A. T.	Chronic nephritis	September 5	0.51	0.34	0.67
S. M.	Chronic nephritis	September 5	0.425	0.20	0.47
Maximum					0.67
Minimum					0.34
Average					0.524

albumin are too small to affect materially the ratio; besides any such influence would cause an increased, not a decreased ratio.

A lower concentration of non-electrolyte crystalloids, principally urea, would depress the ratio in nephritis but could not cause the difference observed, even if the urea decreased from 5 to 0 per cent.[1]

Only a few of these patients were placed on a diet poor in salts, so that this will not explain the decreased ratio $\frac{[NaCl].}{NaCl\ eq.}$

No exact classification was attempted in diagnosis, but the material included both acute and chronic nephritis and sclerotic kidneys in different stages of severity.

SUMMARY

In nephritic urine the non-chloride electrolyte fraction is increased relative to the chloride fraction.

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[1] To correct conductivity observed for urea we use the formula:

$$C_c = C_o \cdot \frac{100}{100 - dx}$$

C_c = corrected conductivity, C_o = observed conductivity, d = constant, which is 1.1 for urea, x = the percentage of urea.