

in the diet. This was probably so because dietary cortisone intake of the latter animals declined as they ate less, whereas the daily dose of cortisone for injected animals remained constant.

Summary. 1. Caloric requirements, water intake, and organ weights were determined for rats whose weights had been kept constant by restricted feeding of diets low in Na, K, and Cl with and without cortisone acetate. 2. Whereas ordinarily requirements for weight maintenance decline sharply during the first 5 weeks and become constant thereafter, little if any decrease was noted without Na and K salts. With cortisone, requirements for all diets except those containing CaCl_2 or NH_4Cl were initially much higher than without cortisone but went down rapidly. However, with NaCl and cortisone, the requirements were higher than with K salts or NaHCO_3 and cortisone. On CaCl_2 , the requirements were reduced by cortisone. 3. The water intake

of animals receiving neither Na nor K was very high. Cortisone reduced the intake of the CaCl_2 -supplemented rats. The opposite effect was noted with NaCl. 4. Organ weight determination reaffirmed that the increase in kidney weight noticed on NaCl-containing, K salt-low diets could be avoided by replacement of NaCl by NaHCO_3 . The renal changes were therefore not the consequence of simple K deficiency. Cortisone enhanced renal enlargement in animals on K salt-low, NaCl-containing diets. 5. Cortisone acetate and NaCl reinforce, under certain conditions, some of each other's actions.

1. Kaunitz, H., *Laboratory Invest.*, 1956, v5, 132.
2. Kaunitz, H., Slanetz, C. A., Johnson, R. E., and Guilmain, J., *J. Nutrition*, in press.
3. Quimby, F. H., *ibid.*, 1948, v36, 177.
4. Winter, C. A., Silber, R. H., and Stoerk, H. C., *Endocrinology*, 1950, v47, 60.
5. Meyer, J. H., *J. Nutrition*, 1954, v52, 137.

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Blood Gases in Cholera Patients and in Normal Subjects. (22504)

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Acute purging and vomiting in cholera produce marked reduction in plasma volume with concomitant increase in cell volume. This hemoconcentration affects the hemodynamics of circulation leading to alteration in the normal physiology of blood circulation. The only form of therapy which has stood the test of time as postulated by Rogers(1) is administration of solutions of sodium chloride to maintain the normal physiology of circulation. This form of treatment has been effective in many cases though some die in spite of the treatment, due to kidney failure, resulting in uremia. A reduction in alkalinity of blood was also reported(1,2). The cause of death in cholera is not definitely known. It might be due to acidosis. It might also be due to inadequate supply of oxygen to the

tissues. In the present study, therefore, oxygen and carbon dioxide contents of the whole blood and the bicarbonate content of plasma in patients suffering from cholera and in normal persons were compared.

Methods. Patients admitted into the Nilratan Sircar Medical College Hospitals, Calcutta, with typical symptoms of cholera namely passage of rice-water stool, vomiting and collapse were selected. As a routine procedure stool was cultured and the cases whose stool showed the presence of cholera vibrio were included in the present report. Upon admission and before any treatment was rendered, blood was drawn from the antecubital vein with a dry syringe and delivered in a centrifuge tube under liquid paraffin. The tube was constricted in the middle forming a nar-

TABLE I. Oxygen and Carbon Dioxide Content of Whole Blood and Bicarbonate Content of Plasma of Normal Subjects and of Patients Suffering from Cholera.

Subjects	Whole blood		R.B.C.	Plasma bicarbonate	Packed cell vol
	O ₂ vol, %	CO ₂ vol, %	O ₂ vol, %	vol, %	
Cholera (30)	11.3 ± .8	33.5 ± .9	24.2 ± 1.4	34.9 ± .4	57 ± 2
Normal (10)	10.2 ± .4	55.8 ± 1.5	22.2 ± .8	60.0 ± 1.5	46 ± 1
Difference of means	1.1	22.3	2.0	25.1	11
Stand. error of difference	.897	1.719	1.667	1.5	2.423
<i>t</i>	1.3	13.0*	1.2	16.7*	4.5*

* These values of *t* are highly significant.

Figures in parentheses indicate No. of subjects.

row neck so that the needle of the syringe could just pass through it. The centrifuge tube contained crystals of a mixture of ammonium and potassium oxalates so that when mixed with blood it was isotonic. As soon as the blood was collected a portion was taken in a syringe under liquid paraffin and analysed for oxygen and carbon dioxide contents by Van Slyke's manometric method(3). Packed cell volume was determined by centrifuging the blood in a Wintrobe tube. The rest of the blood was centrifuged, plasma separated and bicarbonate in plasma was determined by the method of Van Slyke *et al.*(4). The normal persons selected were post graduate and research students of the department of physiology of the Presidency College, Calcutta. The results are given in Table I.

Results. The oxygen content of the whole blood was 11.3% in cholera cases and 10.2% in normal subjects. The carbon dioxide content of the whole blood was 32.5 volume % in cholera cases and 55.8% in normal subjects. The plasma bicarbonate contents of cholera patients and normal subjects were respectively 34.9 and 60.0 volume %. The packed cell volume was 57% in cholera cases as compared to 46% in normal subjects.

Discussion. The packed cell volume increased significantly in cases of cholera due mainly to the loss of plasma. The carbon dioxide contents of the whole blood diminished to a marked degree in cholera cases. Plasma bicarbonate level also decreased sig-

nificantly in patients suffering from cholera. The diminished alkali reserve of blood indicates a condition of acidemia in cholera. This is in confirmation of the findings of other workers. The oxygen content of the whole blood and also of the red blood cells, in patients suffering from cholera, did not differ from the corresponding values in normal persons. This indicated that cholera patients did not suffer from deficient oxygenation of the tissues and as such death in cholera is not due to anoxemia.

Summary. Packed cell volume, oxygen and carbon dioxide content of the whole blood and bicarbonate of the plasma were determined in 30 cholera patients and in 10 normal subjects. While there was no change in the oxygen content of the whole blood in patients suffering from cholera, the patients had a low plasma level of bicarbonate. Cholera patients suffer from acidemia and not from anoxemia.

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1. Rogers, L., *Ann. Trop. Med. and Parasitol.*, 1916, v10, 139.
2. Tsurumi, M., and Toyoda, T., *Arch. Int. Med.*, 1922, v30, 797.
3. Van Slyke, D. D., and Neill, J. M., *J. Biol. Chem.*, 1924, v61, 523.
4. Van Slyke, D. D., Stillman, E., and Cullen, G. E., *ibid.*, 1919, v38, 167.

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