servations must be its influence on catabolic reactions. Thus the organ-specific effects of cortisone can be explained on the basis of increased catabolism in diaphragm but not in liver.

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Effect of Serotonin on Renal Excretion of Sodium; Possible Relation to Rauwolfia Action.* (22311)

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The administration of reserpine has been found to be associated with a decrease in the concentration of serotonin in brain, platelets and intestines(1). It has also been demonstrated that rauwolfia alkaloids can produce occasional salt and water retention even to the point of congestive failure(2). The present study was undertaken to investigate the possibility that this effect of rauwolfia might be mediated through serotonin.

Materials and methods. Forty convalescent patients free of cardiovascular, renal, metabolic or endocrine disease were selected for the study. All but 3 were bed patients, and all were afebrile and on a regular diet. All were given an infusion of 250 ml of 5% glucose and water. One or 2 mg of serotonin base‡ were added to the infusion of 18 subjects, the remaining 22 serving as controls. Those receiving serotonin were unaware that any drug had been added to their infusion, and did not experience any blood pressure change or discernible local or systemic reaction. Comparable conditions and identical procedures were employed in both groups. Each subject emptied his bladder as completely as possible in the sitting or standing position. One hour after breakfast the patients voided and then drank 200 ml of water. Exactly one hour later, they again voided and were immediately given the infusion which was administered at a constant rate to require one hour for its completion. Urine specimens were obtained at the close of the infusion and at exactly hourly intervals for 2 additional hours. All hourly urine specimens, beginning with those obtained at the start of the infusion, were measured and analyzed for sodium, potassium (by flame photometer), and chloride. For the purposes of this study, the excretion rates in the hour's specimen obtained at the end of the infusion were compared with excretion rates per hour in the combined 2 hourly specimens subsequently collected.

Results. The mean excretion of sodium in mEq/hr in the control group was 7.7 at the start of the infusion, rose to 9.4 at its close, with a further increase to 9.6 in the 2-hour period after the infusion. In the serotonin group the initial value was 5.9, rose to 7.2 at

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‡ Serotonin creatinine sulfate was supplied by Dr. E. W. Young of Upjohn Co., Kalamazoo, Mich.

TABLE I. Changes in Urine Volume and Electrolyte Excretion Rates following Infusion with and without Addition of Serotonin.

	Control group					Serotonin group				
		Na	K	Cl			Na	K	Cl	
	Vol, ml/hr	mEq/hr				Vol, ml/hr	mEq/hr			
1.	57 - 68†	4.4 - 5.7	3.4 - 3.4	5.6 - 5.7	1.*	189 - 75	13.6 - 3.2	7.8 - 3.4	19.6 - 6.3	
2.	168 - 145	2.6 - 4.9	4.9 - 6.8	4.9 - 6.6	2.*	109 - 144	12.7 - 11.1	5.3 - 4.4	14.3 - 13.4	
3.	110 - 30	3.3 - 1.4	1.3 - 1.3	3.4 - 1.7	3.*	186 - 96	4.3 - 1.8	2.8 - 1.5	5.9 - 2.7	
4.	100 - 118	1.9 - 8.9	.7 - 1.8	1.8 - 7.3	4.*	62 - 155	9.1 - 6.8	1.8 - 3.6	8.8 - 8.5	
5.	78 - 76	3.0 - 3.3	3.4 - 2.9	4.7 - 3.8	5.*	59 - 102	3.5 - 3.4	2.7 - 3.7	5.5 - 5.9	
6.	40 - 28	3.2 - 1.9	2.1 - 1.6	3.8 - 2.3	6.	47 - 31	5.2 - 2.6	3.7 - 3.3	9.6 - 5.8	
7.	23 - 34	1.5 - 4.2	2.0 - 3.3	3.8 - 7.0	7.	36 - 45	5.8 - 5.4	2.2 - 3.5	6.1 - 6.5	
8.	59 - 40	11.3 - 6.8	6.0 - 2.6	11.0 - 6.1	8.	77 - 114	5.8 - 4.6	2.0 - 1.9	5.1 - 3.7	
9.	86 - 136	9.7 - 9.7	3.0 - 3.5	9.7 - 10.5	9.	57 - 89	2.4 - 3.6	1.3 - 1.5	3.0 - 4.3	
10.	129 - 134	4.4 - 5.4	2.9 - 2.7	5.4 - 5.4	10.	83 - 73	6.3 - 10.2	5.3 - 4.2	9.5 - 9.2	
11.	94 - 205	9.6 - 9.4	4.0 - 3.8	10.8 - 9.5	11.	208 - 185	6.2 - 4.4	5.6 - 9.4	6.2 - 3.9	
12.	184 - 108	4.5 - 3.3	2.7 - 4.2	3.4 - 3.7	12.	120 - 106	4.3 - 3.6	2.4 - 3.9	4.3 - 6.0	
13.	53 - 48	7.5 - 6.7	4.3 - 4.4	9.5 - 8.5	13.	540 - 75	11.6 - 1.9	3.6 - 2.6	4.9 - 2.2	
14.	150 - 140	10.6 - 12.6	4.6 - 5.7	14.1 - 16.7	14.	136 - 93	7.8 - 7.3	4.5 - 6.2	9.7 - 10.4	
15.	181 - 111	10.2 - 10.6	8.2 - 5.5	13.0 - 12.9	15.	144 - 134	19.5 - 13.5	6.8 - 6.7	23.2 - 17.1	
16.	89 - 174	6.3 - 15.5	.9 - 2.9	6.3 - 16.9	16.	47 - 58	5.8 - 3.9	5.3 - 4.9	9.1 - 6.8	
17.	60 - 46	11.1 - 8.1	5.5 - 4.7	15.0 - 11.7	17.	41 - 134	.9 - 5.7	.7 - 5.5	.9 - 7.2	
18.	414 - 129	17.5 - 15.2	3.7 - 3.2	15.9 - 17.0	18.	178 - 175	4.7 - 2.7	8.6 - 2.6	8.3 - 2.4	
19.	144 - 146	2.9 - 1.2	2.8 - 3.1	3.2 - .8						
20.	216 - 181	.8 - 1.1	4.6 - 4.6	2.3 - 2.7						
21.	154 - 105	41.0 - 29.7	5.9 - 5.7	42.3 - 32.0						
22.	270 - 310	40.0 - 45.8	6.5 - 7.6	39.5 - 45.0						
Avg	130 - 114	9.4 - 9.6	3.8 - 3.9	10.8 - 10.6	Avg	129 - 105	7.2 - 5.3	4.0 - 4.0	8.6 - 6.8	

* These received 1 mg serotonin base, the remainder 2 mg.

† First figure of each column denotes values obtained at end of infusion; second figure indicates values of the combined subsequent two hourly specimens.

the close of the infusion, then fell to 5.3 in the 2-hour subsequent period. The urine volumes and the rates of excretion of sodium, potassium and chloride as affected by the infusion are shown in Table I. Whereas the urine sodium excretion rate diminished in 10 of the 22 control subjects following the infusion, it decreased in 15 of the 18 patients after the infusion with serotonin. In general, the chloride excretion rate was similar to that of sodium. No consistent trends were noted in either water excretion or urine potassium values.

The concentrations of electrolytes can be calculated readily from these data. The urine sodium concentration rose in 15 of the 22 control subjects after the infusion, but decreased in 15 of the 18 patients after serotonin. The average urine sodium concentration of the control group was 82 mEq/L. in the specimens obtained at the end of the infusion, and rose to 90 mEq/L. in those collected during the subsequent 2-hour period. In contrast, the average values of the serotonin group fell from 74 to 56 mEq/L.

These differences, employing averages as well as geometric means, were determined to be statistically significant ($p = <0.02$).

Discussion. These data indicate that the administration of small doses of serotonin creatinine sulfate may be associated with decreases in renal sodium excretion, occurring principally after an hour's infusion with this chemical. The conditions of the study were such that the changes noted could not be explained by variation in activity, diet or in the adequacy of urine collections as these were comparable for both groups. The mechanism, significance, and the effects of high dosage and prolonged administration remain to be determined. These observations support the view that electrolyte changes following rauwolfia administration may be related to serotonin activity. They also raise the question that serotonin may play a role in the physiologic regulation of sodium metabolism.

Summary. The administration of 1-2 mg of serotonin creatinine sulfate may be associated with significant sodium retention. Electrolyte changes following rauwolfia ad-

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Separation of Antibodies in Syphilitic Rabbit Sera by Electrophoresis-Convection.* (22312)

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The method of electrophoresis-convection has been used by Cann *et al.*(1-3) to obtain separations of a number of different types of antibodies. Their work suggested that it might be possible to separate the Wassermann reagin antibody from the antibody producing immobilization of spirochetes in the *Treponema pallidum* immobilization (TPI) test(4) and to relate these antibodies to electrophoretic serum components.

In this study a pool of syphilitic rabbit sera was fractionated by electrophoresis-convection and the resulting materials tested for the Wassermann reagin antibody by the VDRL flocculation test(5), tested for immobilizing antibodies in the TPI test and also tested for agglutinating activity(6). The fractions obtained were characterized by electrophoretic analysis.

Methods. The electrophoresis-convection apparatus used was that described by Raymond(7)‡. The operation of the apparatus was carried out in a coldroom at ca. 4°C. A 4 l bottle filled with buffer was placed in the buffer circulating system to increase the volume of circulating buffer to ca. 8 l. The increased buffer volume seemed desirable to minimize pH changes in the buffer during the course of the run. Protein concentrations were estimated by semimicro Kjeldahl nitrogen determinations and the factor 6.25 was used to convert nitrogen to protein. The relative composition of the serum fractions was determined by paper electrophoresis using the method developed by Grassmann and Hannig(8)§. The mobilities were determined by moving boundary electrophoresis using the Perkin-Elmer Model 38 Electrophoresis Apparatus. The determinations were carried out at a protein concentration of 0.3% in barbital buffer (pH 8.6, $\mu = 0.1$). The samples were simultaneously dialyzed for 48 to 72 hours against the same 2 l volume of barbital buffer. The specific conductance of the buffer after dialysis was used in the mobility calculations. The mobilities reported are the average of those calculated from photographs of the descending boundaries taken by the Longsworth scanning procedure, at 1, 1.5 and 2.0 hours. The VDRL slide flocculation test was used to measure the relative Wassermann reagin antibody content of the fractions. The serum fractions were not heat inactivated prior to testing. The TPI test with modifications(6) was carried out on serum fractions that had been diluted with normal rabbit serum (Pool I) to a final concentration of 2.0% of serum fraction protein and then heat inactivated at 56°C for 30 minutes. The samples tested were of the order of half serum

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‡ Manufactured by E. C. Apparatus Co., New York City.

§ The paper electrophoresis apparatus and densitometer were obtained from E. Miltenberg Inc., New York City.