that in the first experimental period). The desoxycholic acid percentage, however, rose to a surprisingly high figure, the maximum concentration of total bile acids reaching 2.83%. During that day the liver excreted 11.78 gm. of bile acids. The conjugated bile acids did not increase proportionately with the increase in total bile acids. The volume of bile rose from 390 cc. to a maximum of 690 cc. The bile acid output returned to the control level 5 days after the cessation of cholic acid administration.

Summary. In the patient studied the oral administration of cholic acid was more effective than that of desoxycholic acid in raising the concentration and total output of bile acids in the hepatic bile.

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An Excretory Test for Vitamin C Deficiency and Subnutrition.

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The excretion of vitamin C in the urine after an intravenous injection of 100 mg. of ascorbic acid was followed in a group of 12 normal subjects on diets adequate in vitamin C, in 3 normal subjects on diets low in vitamin C and in 13 cases of scurvy. The age of the normal subjects varied from 20 to 25 years. The subjects on the diet low in vitamin C were of the same age group. In the patients with scurvy 5 were under 40 years of age and 5 over 60 years of age. The symptoms of scurvy in these patients consisted in changes in the gums, present in all the patients and evidenced by ulceration, hemorrhage into the gums and piling up of the gums. Massive subcutaneous hemorrhage was present in 3 cases and petechiae over the legs and arms in 6 cases. The duration of the deficient diet was 3 months in 4 cases, 12 months in 5 cases and over 12 months in the rest of the patients.

The procedure for the test was as follows: In each group the excretion of vitamin C was determined for a 3-hour period and also for the following 21-hour period, prior to the administration of any vitamin C. The following day, after emptying the bladder, an injection of 100 mg. of ascorbic acid (Merck and Company) was given intravenously to the subject and the urine was again collected for 3 hours and for the following 21 hours. Vitamin C was deter-

TABLE I.

Mg. of Vitamin C Excreted in 3 and 21 Hours on Diet and Following Injection of 100 mg. of Ascorbic Acid in Normal, Subnutrition and Scorbutic Subjects.

Normals				Subnutrition Cases				Cases with Scurvy			
Mg. Excreted on Diet —Hr.—		Mg. Excreted After Test Dose —Hr.—		Mg. Excreted on Diet —Hr.—		Mg. Excreted After Test Dose —Hr.—		Mg. Excreted on Admission —Hr.—		Mg. Excreted After Test Dose —Hr.—	
3	21	3	21	3	21	3	21	3	21	3	21
25.4	180.7	52.7	125.8	1.4	9.5	11.5	4.8	3.3	—	3.6	—
9.0	53.2	24.2	87.1	2.2	11.7	5.6	1.6	2.2	—	1.3	4.7
16.8	81.6	81.8	73.8	2.3	9.5	14.2	9.1	Not done		7.9*	—
21.2	44.7	67.0	89.3					2.1	8.2	3.9	12.9
8.5	109.0	40.5	104.0					No Vitamin C Titrable			
6.4	31.1	32.0	34.6					2.0	6.2	Tr.	0
10.9	36.1	57.8	65.7					0.7	1.5	0.3	2.8
12.9	30.1	44.6	49.3					0.3	0	1.0	0
4.9	39.7	43.5	25.1					0.2	20.9†	9.7†	23.9
4.5	58.9	47.8	53.5					2.0	17.2‡	4.7	14.1
12.1	51.9	37.6	47.9					0	0.75	1.8	21.5
10.9	86.9	34.4	80.9					0	0	0.4	1.5
								0.69	5.2	2.3	6.6

*Clinic patient had been taking some orange juice for week prior to test.
†Clinic patient had been taking orange juice for one week.
‡Patient received 100 mg. Cevitamic Acid after the 3-hour excretion.

mined by the method of Birch, Harris and Ray,[1] which consists of titrating the urine against a standardized solution of 2:6 dichlorophenolindophenol. Precautions were taken for the preservation of the vitamin by adding glacial acetic acid, 10% by volume to the specimens. The overnight specimens were kept in dark bottles in the icebox. All the urines passed during the day were titrated immediately.

Table I shows the results in the normal, sub-nutrition and scurvy subjects. In the normal group, on diet alone the urinary excretion of vitamin C in 3 hours varied from 4.5 to 25 mg., in 21 hours from 31 to 180 mg., with an average excretion of 12 mg. for 3 hours and 67 mg. for the following 21 hours. Following the intravenous injection of 100 mg. of ascorbic acid, the excretion rose in all the normal subjects. The variations were from 25 to 82 mg. in 3 hours, and in the following 21 hours from 25 to 126 mg. The averages were 47 mg. for 3 hours and 69 mg. for 21 hours.

In the subnutrition group on diet alone the 3-hour excretion averaged 2 mg., the 21-hour excretion 10 mg. Following an intravenous test dose of 100 mg. of ascorbic acid the average 3-hour excretion was 11 mg. The average 21-hour excretion was 5 mg.

In the patients with scurvy the excretion in 3 hours on diet alone averaged 1.5 mg. and the excretion in 3 hours following an intravenous test dose of 100 mg. of ascorbic acid averaged 2.6 mg. In some cases no vitamin C was titratable in the urine and in 2 cases (22 and 28) the excretion rose to 8 and 9 mg. in 3 hours, but both of these cases had been taking orange juice for one week on the advice of a physician.

Summary. 1. The 3-hour urinary excretion of vitamin C before and after an intravenous test dose of 100 mg. of ascorbic acid was studied in a group of 12 normal adults on their usual diet which was adequate in vitamin C, in 3 normal adults on diets low in vitamin C and in 13 cases of scurvy. 2. The 3-hour and 21-hour excretion was studied in the same group after an intravenous test dose of 100 mg. of ascorbic acid. 3. Following the test dose the normal subjects excreted an average of more than 40% of the injected vitamin within 3 hours; the subnutrition cases an average of 11% and the scurvy group an average of 2.6%. 4. These observations support the fact that the 3-hour urinary excretion of vitamin C following an intravenous dose of 100 mg. of ascorbic acid will serve as an index of vitamin C deficiency or subnutrition.

[1] Birch, T. W., Harris, L. J., and Ray, S. N., *Biochem. J.*, 1933, **27**1, 590.