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Clinical Experiences with a Test for Bile Salts in Urine.

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In a previous preliminary report[1] a test for bile salts in urine was given. The method consisted in the nephelometric determination of the cloudiness produced in bile salt containing urine by acid precipitation. Further experience with this test brought to light certain defects in the original technique. At first the urine was decolorized by the addition of charcoal. This had the obvious advantage of giving a test fluid relatively free of pigment. However it was found after repeated trials that even if the charcoal was extracted with boiling alcohol it was impossible to prevent some loss of bile salts due to adsorption on the charcoal. A further loss (probably by hydrolysis) occurred in boiling the acid alcohol urine mixture for the precipitation of albumin as described in the original technique. It was noted, however, that urine containing albumin could be acidified directly without the production of a cloud, provided it is not heated. A cloud will be produced in urine at room temperature if bile salts are present. Precipitation of urochrome by salts of various metals was also attempted and found to be impracticable as some loss of bile salts occurred in all methods tried.

Since attempts at decolorization and removal of albumin all resulted in considerable loss of bile salts, we tried to determine the clinical value of a method which would not involve loss of bile salts, although open to certain other sources of error. The following simple procedure was used. The urine to be tested is filtered. To a 5.0 cc. portion is added 5.0 cc. of normal sulfuric acid. To a second 5.0 cc. is added 5.0 cc. of distilled water. Both tubes are then compared in the nephelometer against a standard prepared as follows: A urine is secured from a normal individual which does not show a nephelometric cloud when acidified. To 4.9 cc. of this normal urine is added 5.0 cc. of normal sulfuric acid and 0.1 cc. of 1% sodium glycocholate solution. A reading for opacity is obtained both for the water and the acid mixtures of the urine under test. A difference of turbidity in favor of the acid tube was considered to indicate the presence of bile salts. Occasionally a slight negative value was obtained. Such tests were considered negative. Positive readings indicating a concentration of less than 2 mg. bile salts per

[1] BROUN, G. O., PROC. SOC. EXP. BIOL. AND MED., 1926, xxiii, 596.

100 cc. urine were not considered significant. This method is open to criticism in that substances such as uric acid and urates may be precipitated in the presence of acid. This would sometimes give a false positive test. The clinical results do not indicate that this interference was encountered very frequently.

A series of tests were made on a number of cases of liver disease and also on cases in which there was no evidence of liver pathology. The results of these experiments may be summarized as follows: Bile salts can be demonstrated in urine where a frank clinical jaundice exists. The results are negative in most cases of liver pathology without jaundice. This robs the method of any advantage over the various tests of liver function now in use. The conditions where physical examination might leave hepatic pathology in doubt, for example cases of early cirrhosis, gall bladder disease and metastatic carcinoma, do not show any well marked increases in the concentration of bile salts in the urine. The threshold of elimination of bile salts by the kidneys seems to approximate closely that bilirubin. The clinical significance of the occurrence of both substances would therefore seem identical. The quantitation of urinary bilirubin is not difficult, so that it would be preferable as a clinical test. These facts relegate the determination of bile salts in urine to a secondary place among the tests of hepatic function.

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Tetany and Blood Calcium After Thyro-Parathyroidectomy in the Goat.

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Though it is a well-known fact that tetany does not often follow parathyroidectomy in herbivorous animals, no adequate explanation has been offered. Of the 2 interpretations offered, the more common is that the decomposition products of the food of herbivorous animals are less toxic than those of the food of carnivorous animals. The other is that aberrant parathyroids are sometimes found in the thymus gland of herbivorous animals. Parathyroid tetany in the goat following the removal of the thyroid and the parathyroids has not occurred as frequently as in the dog. MacCallum *et al*[1] who oper-

[1] MacCallum, W. G., Thomson, H. S., and Murphy, J. B., *Johns Hop. Hosp. Bull.*, 1907, xviii, 333.