Time	Normal Dog	Kidneys Removed	Normal Rabbit	Kidneys Removed
minutes	per cent	per cent	per cent	per cent
5	10	44	46	54
15	3	35	23	45
30	0-trace	28	13	36
60	0	24	4 to 5	33

It is thus seen that immediately after injection, the sulfonephthalein is quickly concentrated in the kidney of the dog while this does not occur in the rabbit. This suggests the possibility of normally existing physiological differences in the renal mechanism of these animals.

Tests were carried out upon dogs with complete urinary obstruction, produced by ligating both ureters. The first day after operation the concentrations reached in the serum by the sulfonephthalein were only slightly higher than normal, becoming successively higher in tests performed each following day up to the time of death, so that in urinary obstruction where excretion tests could not be made, a study of the sulfonephthalein in the blood serum gave an index as to the conditions of the kidneys.

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A new method of testing liver function with phenoltetrachlorphthalein. IV.

By SANFORD M. ROSENTHAL* (by invitation.)

[*From the Pharmacological Laboratory, Johns Hopkins University, Baltimore, Md.*]

A. FUNCTIONAL CHANGES AFTER REMOVAL OF LIVER TISSUE

The author's method of testing liver function, by determining the rate of removal of phenoltetrachlorphthalein from the blood stream was carried out in a series of 11 normal rabbits and repeated immediately after the removal of varying amounts of hepatic tissue. The relation between the degree of retention of

* Fellow National Research Council.

tetrachlorphthalein in the blood and the quantity of liver substance removed was strikingly uniform. Slight deviations that fell within the range of normal variations first appeared when one tenth to one eighth of the liver was removed. The curve of disappearance of tetrachlorphthalein from the serum after 20 per cent of the liver was removed was 3.14 times as high as the average normal curve. Following removal of 81 per cent of the liver the curve was 7.37 times normal, and with the entire liver out it was 12.78 times higher than normal. (The surface area method of comparison of these curves, originated by P. D. Lamson, was employed.) These experiments establish the sensitiveness of the test and show that these results bear a quantitative relation to the amount of liver tissue in normal animals. In any application of these findings it must be borne in mind that these experiments dealt with normal liver tissues, and that the tests were carried out immediately after the removal of liver tissue.

B. LIVER FUNCTION IN SYPHILIS AND IN ARSPHENAMINE JAUNDICE

Hepatic function tests with phenoltetrachlorphthalein were carried out in 22 cases of untreated syphilis in various stages, and in 11 cases of jaundice following arsphenamine therapy. In 14 cases of untreated tertiary syphilis with no manifestations except positive Wasserman reaction, liver function tests with tetrachlorphthalein were normal. In one case of primary syphilis a normal test was obtained. In 6 cases of secondary syphilis with skin eruptions, slight impairment of hepatic function was present in all.

Twenty-one tests were performed on 11 cases of arsphenamine jaundice. In 4 tests performed within 10 days after the onset of jaundice, 25 to 30 per cent of the dye was present in the serum one hour after injection, when normally it is practically absent. This degree of retention is amongst the highest that the author has so far obtained in any type of liver disease. Tests performed later than 2 weeks after the onset of jaundice showed a gradual return to normal or almost normal function within 3 to 4 months. This severe early functional impairment with gradual return to normal speaks in favor of a destructive process with repair rather than a simple obstructive lesion.

C. PERMANENT STANDARDS

Advantage has been taken of the "compensator" method of comparison introduced by Walpole for the colorimetric determination of hydrogen ion concentration. With the aid of Dr. Dunning of Hynson, Westcott and Dunning, the "compensator" principle has been applied to the present purpose, and I have found it satisfactory in the estimation of phenolsulfonephthalein and phenoltetrachlorphthalein in the blood serum, urine, feces, and duodenal contents, as it obviates the necessity of chemical extraction. To determine quantitatively the phthaleins, or any indicator dye, in the blood serum, the serum is placed into two small test tubes. One tube is allowed to remain clear, or if necessary clarified, by the addition of 3 per cent hydrochloric acid. This clear serum is placed in a compensator box in front of a tube of the aqueous standard of the dye, and by looking through both tubes simultaneously, they are compared with the tube of alkalinized (colored) serum, behind which may be placed a tube of clear water. Aqueous standards of phenoltetrachlorphthalein, of strengths previously described, may be sealed in hard glass ampules.[1] This procedure does away with the necessity of preparing fresh standards for each tetrachlorphthalein hepatic function test. It was independently employed for this purpose by G. O. Broun of Boston.

[1] Standards for phenoltetrachlorphthalein and comparator box may be obtained from Hynson, Westcott and Dunning of Baltimore. Artificial color standard tubes prepared from commercial dyes to exactly match the color values of the phenoltetrachlorphthalein dilutions have recently been made by H., W. & D. The artificial colors have the advantage of withstanding exposure to light and are indefinitely stable.