

dose of MnCl_2 and 24 hours following the first dose of CCl_4 . The main component of the blood and lymph bilirubin was the 1' or prompt reacting type.^{9,10} Fig. 1, from one of the MnCl_2 dogs is a typical example. The alkaline phosphatase increased as early as 12 hours following the first dose of MnCl_2 in both lymph and blood, and a definite increase was noted in all of the dogs 24 hours following the administration of either of the toxic substances. Fig. 2 compares the typical results from MnCl_2 and CCl_4 (one dog for each).

The total cholesterol changed very little in any of the experiments, either in blood or lymph, if anything showing a slight tendency to decrease. The same might be said for the cholesterol esters. The bile acid concentrations in blood and lymph showed no significant alterations in the experiments with either of the 2 toxic substances. The behavior of the intravenously-injected bromsulfalein was similar in all 6 of the dogs in which it was administered (3 MnCl_2 and 3 CCl_4 dogs). As noted in Fig. 3, the bromsulfalein was retained in the blood at relative high concentration, a delayed increase appearing in the thoracic duct lymph similar to that previously described for the 32-hour stage following common duct ligation.

Discussion. The present results differ in a number of respects from those previously described for experimental obstructive jaundice.⁷ The increase of serum bilirubin in

the lymph was not as early nor as marked, and the same was true for bromsulfalein, although, as noted above, there was a delayed increase in the lymph, similar to that seen 32 hours following common duct ligation. The behavior of the bile acids was quite different in that, in the present experiments, no increase was noted, while in the experimental obstructive jaundice, the bile acids rose rapidly and to a marked degree in the lymph. The alkaline phosphatase behaved quite similarly in the 2 groups of experiments. While no attempt will be made to explain these observations, the possibility is considered that the differences are due to a relatively greater hepatocellular and lesser cholangiolar injury in the present experiments than in the experimental obstructive jaundice.

Summary. A method is described that allows collection of thoracic duct lymph over a period of days, the lymph circulating through its natural channel during the intervals in which it is not being collected. Liver injury caused by either CCl_4 or MnCl_2 were qualitatively comparable in dogs, the changes being more marked with the latter. An elevation of the alkaline phosphatase activity and bilirubin content of both blood and thoracic duct lymph were noted. The main component of the bilirubin was the 1' or prompt reacting type.^{9,10} The behavior of the injected bromsulfalein was comparable to that of the 32-hour stage, following common bile duct ligation.⁶ No significant changes were observed as regards the bile acids, total cholesterol or cholesterol esters.

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Effect of Meals on the Electrocardiogram of Cardiac Patients.*

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In a previous communication,¹ we reported, for 12 normal men, the effect of meals on

electrocardiograms recorded 30 and 60 minutes later. Most of the electrocardiographic functions, especially the T-wave, showed sta-

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1 Simonson, E., Alexander, H., Henschel, A., and Keys, A., *Am. Heart J.*, 1946, **32**, 202.

tistically significant changes, although the electrocardiograms remained within clinically normal limits. In 20 cardiac patients, mostly definite or suspected coronary disease, we recorded the standard limb leads, 3 chest leads (CF_1 , CF_2 , CF_4) and the heart sounds before and at 30 and 60 minutes after a 1000-calorie meal. In 2 patients additional chest leads were taken. The location for the chest leads was marked on the chest by means of a colored pencil.

Out of 10 patients with some symptoms of angina pectoris but with normal electrocardiogram before the meal and without any signs of decompensation, the electrocardiogram became abnormal after the meal. The abnormality involved inversion of the T-wave in lead CF_2 or CF_4 or increase in the size of a Q-wave in lead III. These patients felt no discomfort after the meal.

In 5 patients with coronary disease and abnormal electrocardiogram before the meal, the electrocardiogram became more abnormal with inversion of the T-wave in leads I, 2 or CF_4 . Slight changes of the QRS-contour were also observed. In one patient, a transitory *pulsus trigeminus* appeared after the meal.

In 2 patients with abnormal electrocardiograms before the meal the chest leads ap-

peared to be more normal after the meal; previously inverted T-waves in CF_2 and CF_4 became positive. Similar changes have been observed after exercise in coronary patients and cannot be interpreted as a sign of improvement.

In 2 patients with coronary disease and abnormal electrocardiograms, the meal produced violent discomfort, associated with a pronounced ST-depression, especially in lead II. The discomfort as well as the ST-depression was instantaneously removed by nitroglycerine. In normal subjects the ST-segment does not change after the meal. It seems probable that the ST-depression is due to a transitory coronary insufficiency, produced by an abnormal reflex coronary constriction. In only one patient with an abnormal ECG were the changes after the meal comparable to those observed in normal subjects.

The present series is only of an exploratory nature, and no attempt is made to correlate the effect of meals on the electrocardiogram to the nature of the existing pathological changes. However, the series appears to show that the effect of meals is of importance for the clinical interpretation of electrocardiograms and for the standardization of procedure.

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Radiosodium Tracer Studies in Congestive Heart Failure.*

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Extensive studies in this laboratory on the distribution and turnover of sodium in cardiovascular states with Na^{24} (14.8 hour $\frac{1}{2}$ life) as a tracer led to the possible investigation of long-term phenomena associated with congestive heart failure and edema. For such studies a long life isotope is necessary. Ra-

dioactive sodium 22 (3 year $\frac{1}{2}$ life) is listed in the isotope tables but has not been reported as used in biological studies. Through the cooperation of Professors M. D. Kamen and A. L. Hughes of the Washington University Cyclotron, an experimental supply was made available for investigation. The details of preparation, standardization, determination and safety will be described later. In view of the significant results as well as for the introduction of this technic in the

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