# Effect of Choline as a Lipotropic Agent in the Treatment of Human Coronary Atherosclerosis.*† (17566)

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Evidence is continually accumulating that lipotropic agents such as choline, a member of the vitamin B complex, are effective in the prevention of experimental and clinical fatty infiltration and degeneration of the liver,(1,2) and in experimentally induced atherosclerosis. (3-4) Numerous observers(4-7) have described evidence from which it was concluded that a disorder in lipoid or cholesterol metabolism is a significant factor in the development of human atherosclerosis. In view of the encouraging lipotropic action of choline on atherosclerosis in experimental animals, the authors inaugurated a study of the lipotropic action of choline in proven human atherosclerosis over a 3-year period.

*Method of Study.* A group of 230 patients were studied who were admitted in consecutive order to the Los Angeles County General Hospital medical wards and were proven to have acute coronary thrombosis with myocardial infarction, as demonstrated by typical serial electrocardiograms, history, laboratory tests and physical findings. These patients were thereupon accepted as proven cases of coronary atherosclerosis. One hundred and fifteen of the patients served as "controls"; these were discharged from the hospital on recovery after an average of 6 weeks, and were then followed over a 3-year time period. They were not given choline; some were given whatever medication may have been indicated for symptoms; in cases that were symptom-free no medication was prescribed but the patients' progress was followed periodically. The other group of 115 patients represented those who were admitted in alternate order to the Los Angeles County General Hospital for their first acute myocardial infarction. After they were discharged from the hospital they were placed on choline treatment over a 3-year period, and followed in the Research Clinic of the Hospital. Fifty-two patients were given choline for 1 year, 35 patients took choline for 2 years, and 28 patients were given choline for 3 years. The dose of choline varied from 6 to 32 g daily per individual depending on their tolerance for the drug and the degree of hypercholesterolemia present. Choline bicarbonate was used in this study. The diet remained the same as that taken by the patients prior to their infarction; patients with their first known infarction only were studied. The ages for both controls and choline treated cases ranged from 30 to 70 years, and from 28 to 70 years respectively; most patients were of the white race and were males.

*Results.* Of the 115 control patients 35 patients or 30% had died after 3 years. Death in this series was due similarly either to recurrent coronary thrombosis with myocardial infarction (19 cases), congestive heart failure (10 cases), or extracardiac causes (6 cases). In the choline-treated series of 115 patients, 14 patients or 12% had died after 3 years.

* Study supported by grants from the Council on Pharmacy and Chemistry, Committee on Therapeutic Research, American Medical Association, Los Angeles County General Hospital Research Association, and Commercial Solvents Corporation.

† Appreciation is hereby expressed to Dr. Lawrence W. Smith, for the supply of choline bicarbonate, and to Albert L. Chaney, Lillian Hall, and Perla Berlin, for their assistance.

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Death in this series was due similarly either to recurrent coronary thrombosis with myocardial infarction (6 cases), congestive heart (5 cases), or to extracardiac causes (3 cases). Upon comparison the mortality rate mainly from cardiac cause in the control series was 30% as against 12% for the choline treated patients.

*Discussion.* Previous clinical and experimental observations on the action of choline in preventing or mitigating experimental atherosclerosis have suggested that this lipotropic agent like that of its fellow members of the vitamin B complex inositol,(5) pyridoxine, (8) and methionine,(5) appears to prevent arterial atheromatous deposition or to exert a decholesterolizing effect on the atheromatous deposits in the vascular walls of experimental animals,(3,4,5) and in man.(6)

*Summary.* Over a 3-year period the lipotropic agent choline was effective in significantly reducing the mortality rate due to recurrent coronary thrombosis with myocardial infarction in a series of 115 patients with proven coronary atherosclerosis.

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Received November 7, 1949. P.S.E.B.M., 1950, v73.

## Portal Blood in Collateral Veins of Patients with Cirrhosis. Acetylation by the Intestine. (17567)

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Few direct studies on absorption from the gastro-intestinal tract have been carried out in humans because of the inaccessibility of the portal vein. The use of the London angiostomy technique(1) for obtaining portal vein blood shed considerable light on the absorption process in animals, but due to the difficulty of the procedure the studies were limited. Furthermore, the applicability of these studies to humans is uncertain. Sherlock and Walsh(2) made the interesting observation that a large superficial collateral vein over the abdomen of a patient with cirrhosis of the liver could be shown to contain portal blood. Their observations were restricted, however, because the vessel became thrombosed after the injection of radio-opaque dye. Three other patients with cirrhosis failed to show evidence of portal blood in their abdominal veins. The present investigation was undertaken to ascertain the incidence of superficial abdominal veins carrying portal blood in patients with cirrhosis of the liver and to devise a simple method for detecting such channels. A large proportion of patients with cirrhosis were found to show abdominal portal collaterals. Two simple techniques for their detection are described, together with preliminary physiological studies using the proven portal collaterals. After this work was completed, Billings and DePree(3) reported observations on glucose absorption in abdominal veins of patients with cirrhosis. They also found a high incidence of portal collaterals.

The dynamics of the absorption process as revealed in portal (abdominal collateral vein) and peripheral (antecubital vein) blood are illustrated in Fig. 1. A patient with cirrhosis and ascites was given 2.5 g of sulfadiazine orally and the concentration of the total drug in the blood was determined by the method of Bratton and Marshall.(4) The level in the

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