

activated may again be activated. This the authors interpret as contributing further to the analogies already existing between phage and enzymes. While this still does not prove that phage is an enzyme, it should be emphasized that there no longer exist valid philosophical objections to entertaining such a consideration. Stanley's¹⁵ isolation of a crystalline protein possessing all the properties of tobacco-mosaic virus is proof that there exist inanimate substances which though lethal for certain cells may yet possess the capacity for being propagated by contact with these cells. It is not altogether illogical to speak of phage in such terms.

8643 P

Comparative Effects of Pancreas and Choline on Blood Cholesterol of Depancreatized Dog Maintained with Insulin.*

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It was shown¹ that the completely depancreatized dog can survive for well over 4 years when maintained with insulin and a diet containing meat, sucrose, bone ash and vitamin supplements, B (in the form of a rice bran concentrate), and A and D (as cod liver oil). No other accessory substances were found essential. Despite their survival, however, such dogs are not normal in all respects. The appearance of cataracts was first observed in this laboratory as early as one year after pancreatectomy.² A striking change also takes place in the lipid metabolism. When the animals are maintained on the dietary constituents listed above, there occurs a fall in all blood lipid constituents and a rise in the lipid content of the liver.^{3, 4} It was then shown that the addition of raw pancreas to the diet not only decreased the lipid content of the

¹⁵ Stanley, W. M., *Science*, 1935, **81**, 644.

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¹ Chaikoff, I. L., *Proc. Soc. Exp. Biol. and Med.*, 1935, **33**, 211.

² Chaikoff, I. L., and Lachman, G. S., *Proc. Soc. Exp. Biol. and Med.*, 1933, **31**, 237.

³ Chaikoff, I. L., and Kaplan, A., *J. Biol. Chem.*, 1934, **106**, 267.

⁴ Kaplan, A., and Chaikoff, I. L., *J. Biol. Chem.*, 1935, **108**, 201.

liver to the normal level but also effected a rise in the blood lipids to values far in excess of the preoperative or normal level.⁵ The maintenance of a high blood lipid level was observed only so long as raw pancreas was being ingested, the exclusion of the glandular tissue from the diet resulting in a precipitous fall in the lipid level, which finally reached a value below the normal. The ability of raw pancreas, when administered *per os*, to cause these fluctuations in the blood lipids, as well as its effect on the lipid metabolism of the liver, suggested that *this glandular tissue contained a substance—entirely apart from insulin—capable of influencing lipid metabolism.* Since choline has been claimed to effect a cure of the fatty livers

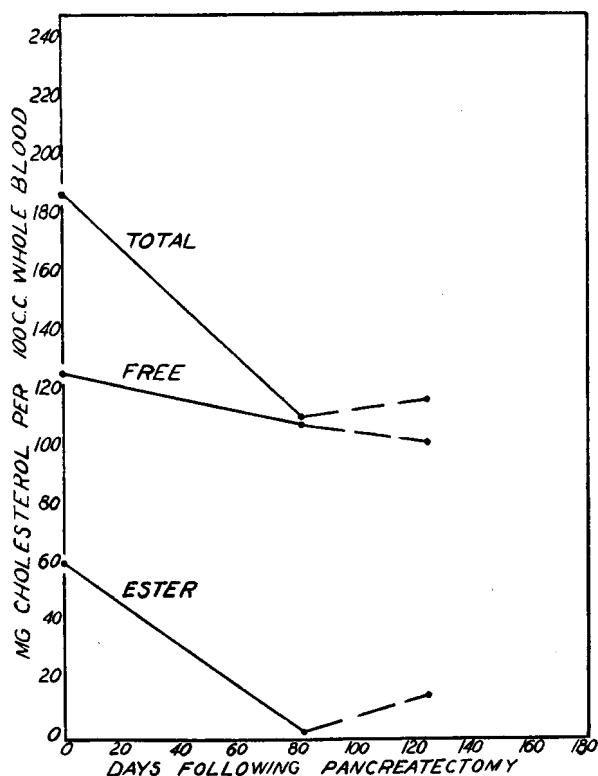


CHART 1.

Effect of choline on blood cholesterol of Dog D23. Solid line represents blood cholesterol during period in which the dog ingested meat, sucrose, bone ash and vitamin supplements. Broken line shows cholesterol level during period in which 2 gm. of choline hydrochloride was ingested daily along with the above dietary constituents.

⁵ Chaikoff, I. L., and Kaplan, A., *J. Biol. Chem.*, 1935, **112**, 155.

of the depancreatized dog,⁶ it became necessary, in the process of identifying the pancreatic lipid factor, to study the effects of choline on the blood lipids of the completely depancreatized dog maintained with insulin.

The dietary treatment of the depancreatized dogs maintained in this laboratory has been described elsewhere.^{3, 5} Blood studies were made on 5 dogs receiving choline in their diets and on 10 dogs receiving raw pancreas. A typical result of each is recorded. Dog D23 was depancreatized on September 26, 1934, and D24 on September 27, 1934. Both animals were fed a diet containing none of the glandular tissue for a period sufficient to produce a marked lowering of the blood lipids. In the case of D23, a marked de-

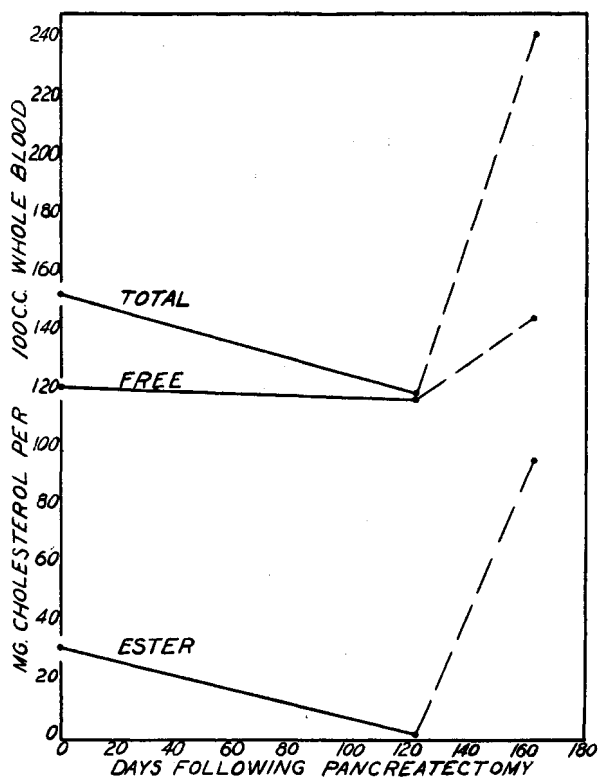


CHART 2.

Effect of raw pancreas on blood cholesterol of Dog D24. Solid line represents blood cholesterol during period in which the dog ingested meat, sucrose, bone ash and vitamin supplements. Broken line shows level of blood cholesterol during period in which 250 gm. of raw pancreas was ingested daily along with the above dietary constituents.

⁶ Best, C. H., Ferguson, G. C., and Hershey, J. M., *J. Physiol.*, 1933, **79**, 94.

crease in the cholesterol content of the blood was observed on December 17, 1934, and for a period of 6 weeks after this date 2 gm. of choline hydrochloride were added daily to the diet. In D24 a lowered cholesterol content of the blood was established on January 27, 1935, and for a period of 6 weeks thereafter the diet of this animal was supplemented with 250 gm. of raw pancreas daily.

The results obtained are shown in Charts 1 and 2. The addition of raw pancreas to the diet of D24 produced a rise in the cholesterol esters from 2 to 97 mg. and in the total cholesterol a rise from 120 to 243 mg.% in the space of 40 days. The administration of choline to D23 produced very little change in the cholesterol level of the blood. It has been emphasized by us previously⁵ that a notable effect of the pancreatic lipid factor is its ability to raise and maintain a cholesterol level in the blood, both total and esterified, far above the normal. The addition of choline to the diet of D23, in amounts far greater than the choline contained in the lecithin content of raw pancreas fed D24, failed to raise the total and esterified cholesterol content of the blood of D23 from a lowered level to a level above the preoperative or normal.

8644 C

Pancreatic Diabetes and Hypophysectomy in the Rat.

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The laboratory mammals used for pancreatectomy are the dog and the cat. The complete extirpation of the pancreas of the rat and related rodents is considered an impossibility because of the diffuse nature of this organ and the inaccessibility of certain branches of tissue. Nonetheless it seemed a matter of some interest and usefulness to investigate the effects of as complete an extirpation as is possible.

The rat pancreas consists roughly of 3 portions: (1) the head, or duodenal division located on the right of a line following the portal vein from the junction of the splenic and superior mesenteric veins to the point at which it passes behind the first part of the duodenum; (2) the tail, or splenic, division located on the left of a line passing from the junction of the splenic and superior mesen-