Embden that the sugar destruction was due to the effect of bacterial contamination seems to have been amply disproved. Rahel-Hirsch has confirmed Cohnheim's research. His observations would seem to show that tissues other than the muscles—for example, the liver—yield a substance which can be rendered active by the pancreas juice and then cause rapid destruction of glucose.

Cohnheim's researches undoubtedly have gone a long way toward solving the problem of the ultimate disposal of the carbohydrates in the normal individual. In combination with Opie's investigations they seem to afford a satisfactory explanation for the occurrence of the hyperglycaemia in diabetes. There seems little doubt but that the activating agent produced in the pancreas is a product of the islands of Langerhans. When these are destroyed, as they are in such a large percentage of diabetic patients, the substance produced by the muscles, and possibly other tissues, is not converted into the form which is necessary for it to be capable of burning up the glucose in the muscular tissues. Consequently a hyperglycaemia, with more than 0.2 per cent. of glucose in the circulating blood occurs, and a transitory or permanent glycosuria ensues.

Although these investigations have thrown a flood of light on normal carbohydrate metabolism, as we shall later see, the problem is not a simple one, as the other ductless glands have been shown to have a marked influence on the warehousing of the carbohydrates in the system.

The Thyroid and Carbohydrate Metabolism.

Every observer who has had a wide experience with diseases of the thyroid gland has been impressed by the fact that in hyperthyroidism and hypothyroidism there is marked disturbance in the carbohydrate metabolism in many of the cases. F. Kraus, Ludwig. Chvostock, and others have observed that spontaneous glycosuria is not uncommon in exophthalmic goitre. Moreover, it has been shown that the administration of small amounts of carbohydrates in this condition often cause an alimentary glycosuria. In other words, in over-activity of the gland the tolerance for carbohydrates is reduced. Glycosuria in animals is not uncommon as a sequel to ether administration. Gray and De Sautelle have shown that when the thyroid is removed the amount of glucose put out in the urine, under the above conditions, is strikingly less, demonstrating that when the restraining influence of the thyroid is thus removed the pancreas is more efficient for carbohydrate metabolism.

On the other hand, in hypothyroidism, myxedema, the occurrence of spontaneous glycosuria is so rare as practically never to occur. Hirschl found that in an outspoken case of myxedema the administration of 200 to 500 grams of grape sugar did not produce alimentary glycosuria.