

THE ISLANDS OF LANGERHANS AND CARBOHYDRATE METABOLISM.

The first observed to suggest a relationship between the pancreas and carbohydrate metabolism was Thomas Cawley, who, in 1788, found calculi in the pancreatic duct and marked atrophy of the gland in a fatal case of diabetes. This clinical relationship has since been amply confirmed. It remained for Minkowski and von Mering, whose brilliant experiments were published in 1889, to demonstrate in animals that an intact pancreas was absolutely essential to normal carbohydrate metabolism. They showed that complete extirpation of the gland in dogs and other animals was invariably followed by the development of a typical diabetes mellitus, with all its characteristic symptoms as seen in man, including a fatal acidosis. If one-tenth of the gland were left intact, diabetes did not develop. They were not aware at the time of the true explanation for the occurrence of diabetes in the pancreatectomized animals, nor of the reason why it did not occur if sufficient of the gland were left behind. In 1892 Lépine of Lyons, was the first to suggest that the pancreas produced an internal secretion containing a "glycolytic ferment," which was necessary for the proper burning up of the glucose in the tissues.

The year 1900 marks a new era in our knowledge of the etiology of diabetes. In that year Opie published from Welch's laboratory a pathological study on interstitial pancreatitis, in which he, for the first time, demonstrated a connection between the islands of Langerhans and diabetes. These groups of cells were first described by Langerhans in 1869, but little or no attention had been paid to them. They were composed of columns of cells, having no communication with the ducts of the gland, but being in intimate relationship with a rich capillary network. They are about the size of a kidney glomerulus, measuring 0.2 mm. in diameter. The islands are situated for the most part in centres of the ordinary gland acini, and are quite distinct, structurally and functionally, from them. They are distributed throughout the whole gland, but are more numerous in the tail than in the body or head. In tissues treated with Müller's fluid they appear, under low magnification, as conspicuous points of a bright yellow color. With high magnification they are found to be composed of small polygonal cells, having a round nucleus and homogeneous protoplasm. These islands, therefore, are really ductless glands imbedded in the substance of the pancreas.

Without going into details, it may be briefly stated that Opie found that in a certain percentage of the cases of interstitial pancreatitis diabetes was an accompaniment of the disease. He showed that the diabetes occurred, especially in the interacinar form of pancreatitis, in which the interstitial tissue grows in and surrounds the individual acini, rather than in the interlobular type of the disease. What was of most