

weeks it became active. In this respect, the curdling ferment shows parallel behaviour with trypsin, and the explanation is probably the same in both cases, namely, that the pancreatic cells do not contain either ferment in a perfect state, but rather in the condition of zymogen or mother-of-ferment. It may be assumed that, in the living animal, the zymogens are converted into active ferments during the process of secretion. In the artificially made extracts, the change takes place more gradually, and is probably of the nature of a slow oxidation.

*Pancreatic Diastase.*—The pancreas is exceedingly rich in diastase. An aqueous extract of the gland (of which seven ounces represented one ounce of gland-tissue) was found to have about tenfold the starch-converting power of the best malt-extracts. We therefore possess, in pancreatic extracts, an efficient medicinal substitute for saliva in the digestion of starch.

The emulsifying properties of pancreatic juice have long been known; and Bernard demonstrated that this power depended not simply on the free alkali of the secretion, but on the presence of a special ferment.

*Medicinal Equivalents of Pancreatic Juice.*—There are two pancreatic preparations which have long been before the profession, namely, pancreatic emulsion and pancreatine, both sent out by Savory and Moore. I found that pancreatic emulsion contained no active ferments; they had probably been destroyed by the heat used in the manufacture; but it was the most perfect possible emulsion, and when mixed with water, the milk-like fluid showed no tendency to separate after several days.

The single specimen of pancreatine which I was able to examine was found to have an energetic proteolytic activity, and it also curdled milk; but it had no action on starch, a fact which supplied an unexpected confirmation of the opinion that the four pancreatic ferments are perfectly distinct bodies.

The most complete, active, and convenient medicinal equivalents of pancreatic juice are, however, the liquid extracts of the gland. These may be prepared from the pancreas of the pig, with glycerine, with water, or with brine. The glycerine extract leaves nothing to desire on the score of activity, and it keeps perfectly; but

the taste of glycerine is to some people objectionable, and it seems sometimes to provoke nausea, and even vomiting.

The aqueous extract, as prepared for me by Mr. Bengier, will, I think, prove a valuable preparation. It is simply an extract of the gland in water, with enough spirits added to keep it from decomposition. I propose to call it liquor pancreaticus. A sample of it is on the table before you. It is a limpid, straw-coloured fluid, with very little taste or smell of its own, and of nearly neutral reaction. But though so pale and bland, it is an elixir of really remarkable powers; it curdles milk like rennet; it changes starch into sugar with unrivalled energy; with the aid of a little alkali, it transforms albuminous substances into peptones; finally, it emulsifies fats more perfectly than any other known agent. Extracts of pancreas are destined, if I am not mistaken, to play a considerable part in the dietetic therapeutics of the future. Whether the full powers of these preparations can be made available when administered by the mouth, must be regarded as uncertain. As an aid to the digestion of starch, the propriety of giving them by the mouth cannot of course be doubted; but the propriety of giving them by the mouth as proteolytic agents is a less simple question, seeing that it requires the addition of an alkali to bring the trypsin into activity; and the addition of an alkali is an interference with gastric digestion which may, or may not, be advantageous in a particular case. I commenced to employ pancreatic extract by the mouth about two years ago, and have now had considerable experience of its use. Guided by theoretical considerations, I have usually directed the dose (a teaspoonful) to be given, with twelve or fifteen grains of bicarbonate of soda, one and a-half or two hours after a meal, when gastric digestion might be supposed to be approaching its termination, and the later portions of the meal to be passing into the duodenum. There is at this late period of digestion a tendency to excess of acid in the stomach, and the alkali alone is undoubtedly of service; but I have had, in several instances, striking results from the combination of the extract with the alkali, which I had previously failed