

they may stimulate not only the circulation and the nervous system, but also nutrition, and may, by stimulating the digestive secretions, aid the digestion of other foods. Hence, the kidneys being sufficient, while we should not depend on beef-tea as a food or real nutriment, it may be of marked benefit in serious illness. Also, a cup of bouillon or consommé before dinner may have a physiologic use.

DIGESTANTS

The value of gastro-intestinal digestants has long been misunderstood, and such preparations have consequently been much misused. Acids and pancreatin, soda and pepsin, and pancreatin and pepsin have been so hopelessly mixed in prescriptions and in the patient's stomach that the only saving factor has been in their harmlessness.

Those who understand the subject of digestion have realized that it is comparatively futile to expect aid in intestinal digestion from pancreatic extract administered by way of the stomach. Even if it were temporarily protected by an alkali, as sodium bicarbonate, its activity would be more or less impeded by the hydrochloric acid of the stomach before entering the alkaline intestine, though its amylolytic ferment might act in the stomach, protected by the alkali, until free hydrochloric acid was present or a certain amount of acid peptones had formed.

For predigesting such protein foods as milk, pancreatin and a sufficient amount of alkali as combined in various powders or liquids on the market may be of value, but in the stomach pancreatin is practically useless. Pepsin is rarely needed, and generally is of value only when combined with dilute hydrochloric acid. If pepsin is indicated, the dose generally given is small when the size of a meal is considered. Also, pepsin is rarely absent from the stomach. Dilute hydrochloric acid is a valuable aid in correcting the imperfect digestion in the stomach which frequently occurs. It should be remembered that when given directly after meals this acid will inhibit the starch digestion of the ptyalin, though this may often be negligible.

Because the value and action of these digestants are misunderstood, a report of experiments made in an effort to clarify this subject is welcome, and one is offered by J. H. Long and G. W. Muhleman¹ of Chicago. They state that ptyalin is so sensitive to acid that even traces of hydrochloric acid will render it inert. Consequently, any acid administered after a meal would inhibit salivary starch digestion.

They also state that the pancreatin marketed is "often not much more than fat-free ground pancreas," while, theoretically, pancreatin should be a precipitated and concentrated extract of the pancreas. Such a preparation would, of course, be much more expensive than the substance now sold as pancreatin. Long and Muhleman find that in fat-splitting power, these pancreatic powders are very deficient. They contain little of the lipase enzyme. Therefore they are valuable only as a digestant of protein and of starch.

The experiments also show that very small amounts of acid destroy the amylopsin of pancreatin; therefore, its activity is destroyed when pancreatin is administered by way of the stomach. Pepsin also seems to

delay or interfere with pancreatic starch conversion. It has not been demonstrated that pepsin alone can interfere with trypsin action; that is, with the proteolytic power of pancreatin. Moderate amounts of sodium carbonate (which perhaps is true also of sodium bicarbonate, though it is not stated) do not interfere with the action of trypsin.

These experiments seem to show that hydrochloric acid in a 0.2 per cent. solution—the normal strength of this acid in the stomach—neither destroys nor essentially retards the action of trypsin when the solution has been neutralized by an alkali. It is shown, however, that the proteolytic ferment of trypsin when subjected to the action of pepsin is partially destroyed and that it may become inert if subjected to the action of acid and pepsin during the length of time that is required in ordinary digestion. Therefore, no justification seems to exist for administering pancreatin either for its proteolytic action in the intestine or for its amylolytic action in the stomach.

These investigators examined a number of pancreatins purchased on the American market. Although these may be obtained from many firms the sources of supply are few. Some of these products showed, under proper conditions, a fair amount of amylolytic action, but their tryptic power was usually low. In the strength required by the United States Pharmacopœia, pancreatin is of but little value, except in predigesting certain articles of food. It also commonly loses its digestive power with age. Certainly, old preparations of pancreatin should not be used even for predigesting purposes.

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W. A. PUCKNER, SECRETARY.

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1. Long, J. H., and Muhleman, G. W.: The Mutual Action of Certain Digestive Ferments, *Arch. Int. Med.*, February, 1914, p. 314.