great that it will be impossible to do more than name a few classes or individual drugs, the action of which is most directly connected with the best-known digestive functions, leaving out of consideration such as, *e.g.*, the drastics and hydragogues. True, so practical a writer as Fothergill tells of a pill of the following composition given to a man twice daily for two months with benefit to his digestion, viz.: Ol. croton., ♏i.; gamboge, gr. iss.; pulv. capsici, gr. i.; strychnia, gr. $\frac{1}{60}$; Ext. aloes aquos., q. s.; but most patients are more helped by milder doses. He also quotes Lauder Brunton to this effect: "Purgatives prove useful in many ways. They hurry the food out of the alimentary canal, and thus lessen the injurious effects of over-eating. By expelling irritating substances from the intestine they arrest diarrhœa and remove headaches and other pains, caused either by the abdominal irritation or by the absorption of poisonous matters produced by imperfect digestion and decomposition of food." Thus it is enforced that cathartics are important aids to digestion alike when the disturbance is evidenced by constipation and by diarrhœa. Another condition in which the cathartic aids digestion is when the walls of the atonic or dilated stomach are covered by a coating of thick tenacious mucus, which also covers the bolus of food. The familiar morning draught of hot water, or the hot saline draught before breakfast, helps to liquefy and sweep away this mucus and leave the way unobstructed for the gastric secretions to reach the food. The natural saline mineral waters in all countries are immensely popular both with the profession and with people at large, and are perhaps the most largely used of all cathartics, whether taken habitually to secure a daily movement of the bowels or as a principal feature of occasional or periodic visits to the spas. No doubt, on the latter occasions the mineral waters themselves receive more credit than they deserve for the improved digestion, much being undoubtedly due to the influence of change of air, to regulated exercise and diet, to rest from customary labors or indulgences, and in some degree to the various external applications of the waters. Salines, other than as ingredients of the natural mineral waters, belong among the purges. The most important of them are sulphate and citrate of magnesia and sulphate and phosphate of sodium and, like castor oil, rhubarb, mercury, aloes, and senna, they promptly unload the bowel. The less active remedies, the effects of which are chiefly manifested on the lower bowel, include such as manna, sulphur, and cascara, and are classed as laxatives (Wood). It would be in vain to enter on a discussion of the many other cathartics, for the theories both of their many desirable combinations and of the ways in which they do good in the digestive system alone would fill volumes. One other method of treatment deserves attention at this point and that is *lavage*. Although it is essentially an evacuant, yet so good an authority as Hemmeter says: "Lavage, with solutions of sodium chloride, or of 0.04 per thousand of HCl, is most effective in starting the sensation of hunger." He specifies the following indications for its use: "(*a*) When the exit of the chyme from the stomach is hindered by a mechanical obstruction giving rise to decomposition, as in most forms of dilatation of the stomach; (*b*) where foreign or irritating collections are mixed with the gastric contents which sooner or later interfere with digestion. These may be of mucus or bile or abnormally increased gastric juice." For these purposes he uses warm alkaline and saline solutions, and subsequently solutions of bismuth or silver nitrate. Careful details for carrying out this mode of treatment, the introduction of the tube, etc., may be found in Hemmeter's treatise or in Foster's "Reference Book of Practical Therapeutics," *sub verbo*. In the treatment of acute indigestion lavage is often to be preferred to the administration of an emetic. The *stomach douche* is a more recent addition to the armamentum medicum of the same class.

Disinfectants include drugs of which the following are among those best known and which have been found most efficacious, viz.: Naphthalene, the sulpho-carbolates, the salts of bismuth, carbon finely divided, salol and its congeners, and probably the bichloride of mercury. They are believed to prevent putrefaction and abnormal fermentative processes in the contents of the bowels. As a result they often relieve pain, check diarrhœa, and prevent such auto-intoxication as may lead to irregular and persistent fever and to acute rheumatic affections of the joints. Salol, creosotal, and their kind have the recommendation that they pass through the stomach unchanged, to be dissolved only by the intestinal secretions, where they become active. The search for the ideal disinfectant for internal administration has not yet been crowned with success, owing to the difficulty of finding a drug which is sufficiently soluble and which will retain its disinfectant properties after meeting the intestinal fluids and yet not develop irritating or poisonous properties.

The Digestive Ferments are interesting physiologically as well as therapeutically, though when we confine ourselves to "remedies that aid digestion" there are but few of them that come within our purview. Thus the saliva contains an enzyme, *ptyalin*, the function of which is to change starch to sugar and to the products intermediate between starch and sugar. Its direct bearing upon our subject is to show the importance of *mastication* in salivary digestion, for it breaks open the starch-cellulose envelopes and thus exposes a larger surface to the action of the enzyme; but ptyalin itself is little used as a medicinal remedy. The most important of the amylolytic or starch-digesting class is *diastase*, which is obtained from germinating grain, and is familiar under the names of malt extract, Maltine, or Maltzyme, and with it belongs *taka diastase*, which is obtained from a fungus called Eurotium oryzæ, and is much more powerful than the malt extracts. Like the other digestive ferments diastase is much used to strengthen the weakened digestive secretions, but its province is less well defined than in the case of some others, for the existence of a condition deserving the name of "amylaceous dyspepsia" is certainly questionable. According to Osler, "Ptyalin and diastase are particularly indicated when the acid is excessive, and the malt diastase is often very serviceable when given with alkalies." Many of the preparations of malt diastase contain some percentage of alcohol, making them equivalent to a mild stout or beer (Cushny). Coming now to the proteolytic digestive ferments the most familiar one is *pepsin*. This is usually obtained from the stomach of the pig. It acts in an acid solution only, preferably one containing 0.2 per cent. of hydrochloric acid, which is nearly the same as the proportion of that acid in the gastric juice. Ewald is quoted to the effect that "the use of pepsin may be limited to the cases of advanced mucous catarrh and the instances of atrophy of the stomach." It has, however, been largely used with the view of reinforcing the digestive capacity of the stomach for proteids in other conditions, and doubtless its administration has often been superfluous, for it is found that "the gastric juice is almost always capable of digesting proteids if it is acid in reaction" (Cushny). Pepsin is best administered in powder or in solution with acid. *Pancreatin* is an extract of the pancreatic gland of the pig and should represent the various enzymes found in the pancreatic juice. These are *amylopsin*, which is amylolytic; *trypsin*, proteolytic, but requires an alkaline medium for its action; *steapsin*, which causes emulsification of fats in the alkaline solution (Hall). It is thus apparent that an efficient digestive aid can be expected from this preparation only when it can be brought to act upon the intestinal contents where their reaction is alkaline. It is therefore customary to combine it in tablets with bicarbonate of soda, to neutralize the destructive acidity of the gastric juice, or to enclose the drug in a coating of keratin to protect it from the gastric juice while passing through the stomach. Among the proteolytic ferments should also be mentioned *papain* or *papoid*, derived from the carica papaya or pawpaw. It is used to some extent as a substitute for pepsin or pancreatin, but has the peculiarity of acting either in warm or cold, in moderately acid, alkaline, or neutral solutions.

Upon milk it exerts the double action of curdling and then peptonizing. In this connection the following quotation from Hemmeter may not be inappropriate. "Predigested foods, such as somatose, Mosquera's beef meat and such others as are tasteless, when mixed with food so as not to be detected, are useful when the digestion of albumen in the food becomes insufficient, or when as in some cases of carcinoma or tuberculosis there is inadequate absorption of nitrogenous food."

The indication for *alkalies* as digestants is the presence or secretion of an excess of hydrochloric acid in the stomach. For this purpose they are used as ingredients of the fluid of lavage, as well as to liquefy tenacious mucus. While there is no doubt of the value of alkalies given half an hour to an hour after meals in cases of excessive acidity, on the other hand the most contradictory views are held by good authors as to the result upon the secretion of acid from giving alkalies before eating. Magnesia, carbonate of magnesia, and lime are commonly classed as *antacids*. They also are used in excessive acidity of the stomach and in acid putrefaction in the bowels, and it is believed that the magnesia salts produced in the intestinal canal under these conditions are less irritating than the lime salts and may have the additional advantage of acting as mild purgatives. Of *acids* by far the most important as an aid to digestion is *hydrochloric*, as the ingredient in which the gastric juice is most often lacking. *Nitric* acid is also used by itself and in combination with hydrochloric, and so is to some extent *phosphoric* acid. A consideration of the physiology of stomach digestion as already referred to in this article furnishes the explanation of their use. They are often given with the bitters, as strychnine or gentian, with pepsin and with carminatives such as cardamom, one enhancing the effect of the other in the combination. Dilute hydrochloric acid may be given in doses of ♏xv. to xx. after eating, although as much as a drachm or a drachm and a half has been recommended by some of the best authorities.

Availing ourselves of the anæsthetic action of *cocaine*, we may sometimes employ that drug to check vomiting when threatened in irritation of the stomach. *Arsenic* has a specific action in causing fatty degeneration of the epithelium of the stomach and intestines, and the effects attributed to it of increasing appetite and promoting digestion may perhaps be due to a mild degree of the same action on the epithelium (Cushny). Be that as it may, we often see nutrition improve under the use of the drug, especially when given with iron. The sedative action of the *bromides* is also made use of to diminish the irritability of the stomach which prevents the retention of an adequate quantity of food. *J. Haven Emerson.*

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DIGESTION.—The purpose of digestion is to prepare the food for absorption and assimilation, so that it may form a suitable nutriment for the tissues of the body.

During the process of digestion the food lies within the alimentary canal, along which it is gradually moved by appropriate contractions of the muscular walls.

Here the food-stuffs, through the agency of the digestive juices, undergo chemical and physical modifications which render the various constituents in the end more soluble and capable of easy absorption by the columnar cells of the intestine.

A complete account of digestion would accordingly deal with the movements of the various parts of the alimentary canal and with the mode of secretion and chemical properties of the digestive fluids, in addition to describing the action of these digestive secretions upon the food-stuffs.

It is, however, more appropriate, for facility of reference, to treat of the mechanics of digestion under the various headings of mastication, deglutition, intestinal movements, and defecation; while the properties of the various digestive juices will be found under their names and those of the ferments which they contain.

In this article we shall, therefore, chiefly consider the action of the digestive juices upon the food in the different parts of the alimentary canal.

Buccal Digestion.—The chief function of the saliva undoubtedly is that of facilitating the swallowing of solid food. This is shown by the fact that *mucin*, the most important of the organic constituents and one which is invariably present, has no chemical action whatever on any of the food-stuffs. On the other hand, *ptyalin*, which is the only chemically active substance, is absent in certain classes of animals, such as all the typical carnivora. The water of the saliva, which is intimately mixed with the food in the process of mastication, makes the mass of much softer consistence, while the mucin at the same time coats it over with a slippery envelope, so that the subsequent passage along the œsophagus is for both these reasons rendered easier.

The more important effects exerted upon the food in the mouth are hence physical in character, viz., a comminution by the teeth, a softening by imbibition and mixing with the water of the food, and a slippery surface conferred by the mucin of the saliva. In addition to these, however, a chemical action is initiated in man and most mammals upon any starches present in the food, which is of some importance because of the rapidity of the action, and of the fact that the activity is continued for a considerable time after the food passes into the stomach.

This action on the starches is due to a diastatic enzyme, which has been named *ptyalin;* although like all other enzymes it has not yet been isolated as a chemical individual. The chemical action is typical of that of the entire class of diastatic enzymes, such as malt diastase or amylopsin of the pancreatic juice, and hence merits a short description.

In the reaction, the ptyalin is not itself chemically involved, but it sets up a catalytic change in which the elements of water are taken up by the complex starch molecule, which at the same time becomes resolved into simpler bodies. The first evidence of this *hydrolysis* and accompanying degradation of the starch molecule is physical in character and consists in the formation of soluble starch, or *amidulin*. Starch paste to which saliva has been added loses at this stage its viscid character, the common property of colloidal solutions containing giant molecules, and becomes limpid and more like a true solution. The solution still retains, however, the chemical properties of starch, as is shown by its giving the usual deep blue coloration on the addition of iodine. This first stage of the action of ptyalin upon starch takes place very rapidly, especially when the starch granules have been burst by previous cooking, as short a time as thirty seconds being sufficient to render a stiff starch paste completely fluid, when a few drops of saliva are added at body temperature. This first action is hence of considerable importance, for under proper conditions of mastication practically all the boiled starch of the food ought to enter the stomach as *soluble starch*. When the starch has not been previously boiled the action is infinitely slower, since there is a thin membrane of *starch cellulose* surrounding each starch granule, and this membrane retards the action of the ptyalin upon the enclosed *starch granulose*.

The further stages in the action of ptyalin upon starch consist in a gradual advance of the process of hydrolysis. As a result there is formed a variable mixture of maltose and iso-maltose, with dextrins, of which the constituent individuals have never been satisfactorily isolated. The