REMARKS

ON

PEPSINE,

BY

J. S. HAWLEY, A.M., M.D.,

MEMBER OF THE MEDICAL SOCIETY OF THE COUNTY OF KINGS, EX-DELEGATE TO THE MEDICAL SOCIETY OF THE STATE OF NEW YORK, MEMBER OF THE AMERICAN MEDICAL ASSOCIATION.

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1880.

DIABETIC FLOUR.

PUT UP IN ONE AND FIVE POUND PACKAGES.

The ascertained fact that persons suffering from diabetes, cannot be successfully treated so long as they are permitted to use either amylaceous or saccharine articles of diet, has directed the attention of physicians to such modifications of their food as to avoid the use of such articles. This was at first accomplished by the exclusive use of flesh, fish, and green vegetables. This exclusion of bread and all other articles prepared from the cereal grains, together with esculent fruits and vegetables, was so wide a departure from the customary diet as to impair the appetite and produce a loathing towards so restricted a regimen.

The use of prepared bran as a substitute for ordinary flour in the dietary of diabetes appears to have been first effectually carried out by Dr. Camplin, in the treatment of the disease in his own person.

This preparation, so important in the treatment of diabetes, is made with all possible care and faithfulness, and is believed to be equal to any similar preparation. The principal points to be attained in the manufacture of Diabetic Flour, are freedom from starch and fineness of grinding; the former to free the patient's diet from sugar-producing elements, the latter to avoid irritation of the alimentary canal. In these respects this preparation is unsurpassed, being practically *free from starch*, and of extraordinary fineness.

LIEBIG'S FOOD FOR INFANTS.

PUT UP IN SIX OUNCE AND TWELVE OUNCE BOTTLES.

This food is prepared upon the principle proposed by Baron Von Liebig, and is adapted to the period of life preceding dentition, and affords to the infant all the elements of a normal diet in an assimilable form.

The indorsement of so distinguished a chemist and physiologist as Liebig is sufficient to warrant its universal adoption.

The circumstance which led Liebig to propose this form of food for infants, was the well demonstrated fact, that an infant of a few weeks or months was incapable of digesting starch, and the consequent fact that many infants perished from being fed upon arrow-root, farina, and various preparations of wheaten flour. By the addition of malted barley to wheaten flour, the diastase contained in the malt acts upon the starch in the same manner as the digestive fluids of the adult, and thus prepared it for assimilation. This preparation is made strictly after the method of Liebig.

Dr. Eustace Smith, in his "Wasting Diseases of Infants and Children," after mentioning several more common articles of infant diet, says: "When none of these agree, Liebig's Food for Infants, is extremely useful." The same author, speaking of "some infants with whom, in spite of all possible precautions, cows' milk causes indigestion and flatulence," says: "such children will often do well upon Liebig's Food, mixed with milk, although the milk by itself causes derangement." "One of the best substitutes for the milk of the mother, or a healthy nurse, is Liebig's soup, (food.) *It comes certainly the nearest in its nutritive properties to the breast milk of the mother.*"—(*Condie on Diseases of Children, page* 31.)

"This soup, (Liebig's Food, when ready for use,) according to my own experience, and that of many German physicians, *is the best substitute for mothers' milk, and has visibly saved the lives of many totally atrophied children.*"—(*Vogel on Diseases of Children. Translated by H. Raphael, page* 46.)

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PEPSIN.

The fact that food taken into the stomach was reduced to a pultaceous condition by a solvent fluid poured out from the walls of the organ, was demonstrated by the experiments of Reaumer and Spalanzani in the latter part of the eighteenth century. Previous to that time the food was supposed to be triturated by the contractile movements of that viscus. This discovery gave a new direction to investigation. It was at length ascertained that the gastric fluid performed the office of digestion only for a portion of the aliment, viz., the albuminoids. This fluid, although the principal, not the only digester, has been found to be a compound, the most important elements of which are a peculiar organic substance called Pepsin, and an acid secretion. The acid is now believed, by recent physiologists, to be the hydrochloric.

The organic body or ferment is in itself destitute of digestive power, its activity being developed only by the addition of an acid. Besides hydrochloric, the lactic and tartaric acids notably impart activity, but of the latter much larger quantities are required to accomplish the same amount of digestion. To the presence of the acid in the gastric juice, is due its incompatibility with the

saliva and pancreatic juice. The proportion of pepsin in the gastric juice is very small (17 parts in 1,000); in other words, a small amount of pepsin gives digestive activity to a large quantity of acidulated fluid. It is completely soluble in water, and is precipitated from its solution by alcohol, the salts of lead, and chloride of sodium, without materially impairing its activity.

Temperature has a remarkable influence over the activity of pepsin. Low temperatures suspend its action ; at the average temperature of the atmosphere it acts feebly; at about 100° Fahr., or the heat of the body, it acts vigorously; at higher temperatures its activity is temporarily increased, but finally extinguished at about 120° or higher. In artificial digestion "a difference of only a few degrees materially affects the activity of the ferment."* Certain substances suspend its digestive power ; among these are alcohol, concentrated acids, alkalies, oxide of zinc, and bile. This latter substance completely and permanently destroys its activity. This action of the bile upon pepsin as it reaches the duodenum, enables the pancreatic juice to perform its triple function, viz., to emulsify the fat, transform the starch, and complete the digestion of albumenoids.

The antiseptic property formerly attributed to pepsin is now found to reside in the hydrochloric acid contained in the gastric secretion. The manner in which acidulated pepsin effects the solution of the albumenoids is not definitely known. That it is not a chemical process is evident from the fact that albumenose or peptone does not differ in chemical composition from albumen, and that the pepsine remains after the act of digestion has been completed ;

* Dowdeswell; Practitioner, March, 1880, page 192.

that is, neither substance is destroyed, and no new substance is formed, which is always the result of a chemical combination. "The known digestive ferments all belong to the class of soluble or unorganized ferments. They are sharply distinguished from the insoluble or organized ferments, of which the type is yeast, in not having the power of self-nutrition or self-multiplication. *They are quite unknown in the domain of ordinary chemistry. Their mode of action bears no resemblance to that of ordinary chemical affinity, and has a distinctly physiological character.*"*

Dr. Brinton believes the change effected in albumen by the action of pepsin to be of the nature of hydration—not a simple solution, but an intimate alliance between the albumen and the water, which the presence of pepsin alone is able to produce. On the other hand, our eminent countryman, Prof. J. C. Dalton, regards the process as a catalysis; the contact of the pepsin with the food inducing a change of quality, by rearrangement of particles, but not a change of composition.

After an acidulated solution has become saturated by peptone, or in other words, has digested all the albumen it is capable of, the peptone may be separated by dialysis, and the same pepsin will digest another amount of albumen, and so on indefinitely. This is supposed to be measurably the case in the stomach. The peptone produced by the digestive process is absorbed to some extent by the walls of the organ, thereby setting free the pepsin to be reacidulated and to enter anew upon the digestive process.

Pepsine for medicinal purposes was first made by Boudault, of Paris, under the direction of Dr. Lucien Corvi-

* Dr. Roberts, Lemelian Lectures.

sart, about the year 1850. His method consisted in obtaining a solution, by maceration of the stomachs in water, precipitation by salts of lead, separation of the lead by sulphuretted hydrogen gas, evaporation of the liquid and combination with starch as an excipient. From that time its use rapidly extended, and its production was largely undertaken in England and Germany. The principal supply for this country, however, continued to be derived from France, up to 1866, when the writer of this article commenced its manufacture in the United States. Subsequently Mr. E. Scheffer, of Louisville, Ky., proposed a simpler method of preparation, by precipitation by chloride of sodium and combination with milk-sugar. This method had obvious advantages, and soon became universal in this country. The number of makers have recently increased to a formidable list, including pharmacists and physicians, wholesale and retail druggists, porters, and servants, embracing persons possessing the highest qualifications for their duties, down to those who are entirely destitute of them. Some English manufacturers, on the suggestion of Dr. Beals, of London, have prepared it by scraping the mucous membrane of the stomach, in such manner as to press out the gastric juice from the tubules, drying upon glass, and reducing to powder. This method is open to the objection that a large portion of mucus and epithelium is also scraped from the membrane, which undergoes putrifactive decomposition, and gives an unpleasant odor to the preparation.

Pepsine, being unofficinal in this country, no standard of strength has been established, which, with the operation of other causes, has produced a great diversity of quality. This circumstance doubtless accounts in part for the variable results obtained in prescribing the remedy.

Speaking of this subject in a paper read before the Medical Society, County of Kings, April, 1880, Dr. E. R. Squibb, of Brooklyn, says, "In this connection the *want of care and want of knowledge** in the great mass of the medical profession may be illustrated. To the digestion of 100 parts of coagulated white of egg, they (the pepsines) require by their labels, and by actual test applied, 1.6, 1.6, 5.6, 6.6, and 8.3 parts of pepsine. It is thus seen that the prominent makers all vary very much, the pepsine of some being from three to five times weaker than others, and yet they all sell in enormous quantities at about the same price, and physicians go on and prescribe them in about the same doses."

Dr. Dowdeswell, in the Practitioner, March, 1880, says, "The different preparations of medicinal pepsin are numerous, and very extensively employed; but although previous experiments have shown that there exists great difference in activity between the various brands, nothing is known certainly as to the relative power of each, *nor is there any guide to the selection of the most effective.*"

J. R. James, Am. Jour. Pharmacy, April, 1880, in an article entitled "Ostrich and other Pepsines," says, "I would suggest that we pay more attention to the testing of substances purporting to be remedial agents, which from time to time find their way into our pharmacies and are prominently brought before the notice of practitioners; for it is a matter of considerable importance that the accuracy of the facts be well sustained before they are given to the profession, *many of whom have no facilities for verifying them.*"

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* Italics mine.

"Very imposing statements are sometimes made as to the absolute digestive capacity of this or that preparation; with such I have nothing to do. Under slightly different circumstances as to temperature, the degree of acidity, dilution of liquid, frequency of agitation, &c., different results are sure to be obtained, but that will not affect the question of relative activity of the different preparations under the same conditions."—*Dr. Dowdeswell, Practitioner, March*, 1880.

What is known as the digestive test is the method most in use for the purpose of determining the relative activity of different pepsines. The procedure is as follows: In a suitable bottle put one grain of pepsine, 100 grains coagulated white of egg, two ounces of water, and two per cent. of hydrochloric acid. Digest with frequent agitation at a temperature of 100° F. in a water or an air bath for six hours. Strain off the residue and carefully absorb the water from it and weigh. The loss of weight represents the amount digested. The samples to be compared should be treated at the same time, in the same bath, and in all respects alike. The principal objections to this method are the number of appliances, not usually in the possession of a physician, which are required, and the time and labor necessary for its performance. The writer's large experience in the use of this test enables him to say that not less than ten consecutive hours of labor and attention are necessary for its proper performance.

Dr. Kretzschmar, in his "Note on Pepsin," gives the time devoted to watching the water-bath alone, at 36 hours. Dr. Squibb, in his "Note on Pepsin," gives the greatest length of time devoted to the digestive process as six hours, which, together with the other labor to be

performed before and after digestion, would extend the time to eight or ten hours.*

Besides its tediousness, contrary to the prevailing idea, it is subject to many uncertainties and irregularities, among which may be mentioned: 1st. Unavoidable variations of the temperature of the bath. 2nd. Necessary differences in the size and consistency of the particles of the coagulated albumen in the different bottles. 3rd. The fact that a sharp elevation of temperature at the beginning of the process would temporarily increase digestion, but would also greatly impair it for the remainder of the time, and consequently diminish the result, while the same elevation of temperature at or near the end of the process would greatly increase the amount of digestion, but could not impair subsequent action. These irregularities can be overcome only by averaging a considerable number of results. Dr. Dowdeswell, in his observations on the digestive activity of different pepsines, mentions that no fact is stated which depends upon a single observation, and that as many as twenty-three series of observations were made to determine his results. 4th. In making a test of several pepsines of variable strength, the condition of the albumen remaining in the different bottles at the conclusion of the process, will differ widely. The residue left by the weaker pepsine will remain white and opaque, and sometimes even angular, while that left by the stronger samples will be translucent and fully hydrated. Now in the former case the albumen may be washed free from adhering peptone, and the remainder easily dried by bibulous paper and weighed; while in the latter the separation is one of great difficulty, because the state of hy-

* Proceedings Kings Co. Med. Soc., May, 1880.

dration is nearly allied to a chemical union. This circumstance greatly increases the difficulty of estimating the residual albumen. In any case, the determination of the remaining albumen is a matter of the roughest estimation, because it is impossible to determine when any residuum is brought to the same state of moisture as before digestion. 5th. The impossibility of adjusting the amount of coagulated albumen and acidulated water to the variable digestive powers of the several samples. It was long ago demonstrated by Kuhnè that when a certain amount of peptone had accumulated in a digestive fluid, the process of digestion ceased. This, for convenience, may be called the point of saturation. As the point of saturation was approached, the digestive act diminished in proportion as the amount of peptone increased. But if at the end of the process the peptone was dyalyzed away, the digestion was immediately resumed. It follows, therefore, that if the stronger and weaker pepsine be provided with the same amount of albumen and acidulated water, the stronger pepsine will sooner reach the point of saturation and its activity cease, while the weaker is still proceeding, and may in the end overtake and outstrip the stronger. It is the race of the fox and tortoise over again.

The impracticability of the digestive test for busy physicians and pharmacists, induced Dr. John Merritt, of Brooklyn, to propose a test by re-solution and re-precipitation by chloride of sodium, or in other words, a repetition of Scheffer's process of manufacture of saccharated pepsine. Nothing is plainer than that this process would reproduce the same pepsin which originally entered into the preparation. Merritt's method of procedure is substantially as follows:

"For the estimation of the amount of pepsin present, put ten grains of the sample in a test tube, (or bottle,) not less than 1¼ inches in diameter, and add about one ounce of water; agitate frequently. When solution has occurred, add an equal amount of a saturated solution of table salt, (sodic chloride,) allow to stand 24 hours; the pepsin will be found floating on the upper part of the fluid. The quantity may be conveniently marked by a slip of paper with the name or initial of the manufacturer thereon, cut to the same depth as the floating stratum, and pasted on the tube." The following cut illustrates the method.

It is better to dissolve the pepsine in a two per cent. solution of hydrochloric acid. In some samples this is necessary in order to insure a complete solution.

The principal objection to this method appears to be the circumstance that the precipitate obtained from the stronger pepsine, on account of its greater volume, adheres to the sides of the tube or bottle more strongly than those from the weaker pepsines, which retards its rising and diminishes its compactness, thereby giving to it an undue appearance of superiority. This objection disappears, practically, when we reflect that the object of the test is to determine the *comparative quality* of the different samples under examination, and not the *quantity* of pepsine contained; that is, it may be deemed qualitative and not quantitative. Indeed, that is all that can be claimed for the digestive test. Neither gives more than an approximate result, and both

sufficiently determine the *relative value* of the preparations for all practical purposes.

The great advantage of the test by precipitation is its great readiness, the *actual* time required for labor and attention not exceeding ten minutes, of course not including waiting for the precipitate to rise. The apparatus consists of a single bottle or test tube of suitable size. As the value of this test has been called in question, it may be well to see how its results compare with those of the digestive test.

In quoting tests made by careful and skillful experimenters, I shall omit from the lists such pepsines as are unknown in this country, and some others little known, but retain all such as are common to all, or a portion, the tests for the purpose of making a comparison of results.

TABLE I.

Showing the least quantities of various preparations capable of digesting 100 grs. coagulated albumen in four hours. By Dr. Dowdeswell, Practitioner, (English,) March, 1880.

	Preparation.	Quantity.	Result.
3	Pepsina Porci, (Bullock & Reynolds).....	gr. ½	all digested.
7	Pepsina Porci, (Morson).....	grs. iv.	"
8	Starch Pepsine, (Boudault).....	grs. vi.	"
10	Lactopeptine.....	grs. xv.	not digested.
11	Ingluvin.....	grs. xx.	"
12	John Wyeth & Bros.....	grs. x.	"

TABLE II.

Digestive test by P. H. Kretzschmar, M.D.—*Proceedings Kings Co. Med. Soc.*, May, 1880.

	Name of Manufacturer.	Amount dissolved in grammes.	Percentage of pepsine.	Price of pepsine.
2	Bullock & Reynolds, (Beale's).....	9.1	91 per cent.	$4 00
3	J. S. Hawley, Sacch. Pepsine.....	9.0	90 "	45
6	Boudault, Starch Pepsine.....	8.5	85 "	85
7	E. Scheffer, Sacch. Pepsine.....	7.7	77 "	60
8	Smith & Pitkin.....	6.7	67 "	50
10	W. H. Schieffelin & Co.....	6.2	62 "	45
15	Lactopeptine	4.9	49 "	70
20	Ingluven..	1.7	17 "	1 00
21	John Wyeth & Bros.....	1.5	15 "	66

TABLE III.

Digestive test made by E. R. Squibb, M.D.—*Proceedings Kings Co. Med. Soc., May*, 1880.

No. of sample.	Test given on the label, powder to boiled white of egg at 100 degrees Fahr.	Quantity taken for test as equivalent to 3.25 grammes=50 grs. albumen.	Time required for complete solution.
1	10 grs. to 120 grs. No time or temperature given.	4.17 grs.=0.27 gram.	3 hours.
2	12 to 15 times its weight. No time or temperature given.	3.33 " =0.216 "	5 hours.
3	10 grs. to 150 to 180 grs. in 4 to 6 hours.	2.8 " =0.181 "	3, 5 hours.
4	1 gr. to 60 in 6 hours.	0.804 " =0.052 "	4 hours.
5	1 gr. to 60 in 4 to 5 hours.	0.804 " =0.052 "	6 hours.

In order to compare this test with the foregoing, it becomes necessary to supply the names of the makers and to reduce the quantities of pepsines used to an equality. This will be done on the supposition that the quantity of albumen digested, bears a constant relation to the amount of pepsine used, other things being equal. For greater readiness of comparison the samples will be arranged in the order of digestive strength.

TABLE IV.

No	Name of Maker.	Computation.	Quantity digested by 1 gr.	Time.
4	J. S. Hawley	50 grs. ÷ 0.804	62.18 grs.	4 hours.
5	W. H. Schieffelin & Co.	50 grs. ÷ 0.804	62.18 grs.	6 "
3	E. Scheffer	50 grs. ÷ 2.8	17.85 grs.	3, 5 "
2	Lazell, Marsh & Gardiner	50 grs. ÷ 3.33	15.01 grs.	5 "
1	Smith & Pitkin	50 grs. ÷ 4.17	11.99 grs.	3 "

Showing comparison of the three digestive tests with test by Dr. Merritt's method; the different tests being arranged in the order of digestive strength of the samples as shown by each test respectively.

No.	Dr. E. R. Squibb's digestive test.	No.	Dr. P. H. Kretzschman's digestive test.	No.	Dr. Dowdeswell's digestive test.	No.	Dr. John Merritt's test by precipitation.
1	J. S. Hawley.	1	Bullock & Reynolds.	1	Bullock & Reynolds	1	Bullock & Reynolds.
2	W. H. Schieffelin & Co.	2	J. S. Hawley.	2	Morson.	2	J. S. Hawley.
3	E. Scheffer.	3	Boudault.	3	Boudault.	3	W. H. Schieffelin & Co.
4	Lazell, Marsh & Co.	4	E. Scheffer.			4	E. Scheffer.
5	Smith & Pitkin.	5	Smith & Pitkin.			5	Smith & Pitkin.
		6	W. H. Schieffelin & Co.			6	Lazell, Marsh & Co.
		7	Lactopeptine.	4	Lactopeptine.	7	John Wyeth & Bros.
		8	Ingluvin.	5	Ingluvin.		
		9	John Wyeth & Bros.	6	John Wyeth & Bros.		

A considerable number of names of makers were left out of both Dr. Dowdeswell's and Dr. Kretzschmar's tables, because they were not contained in the other tables, and could be of no value in making the comparison which is the object of this exhibit.

An examination of the above tables shows the usual and unavoidable diversity in the results by digestive tests, and a somewhat striking conformity of Dr. Merritt's test with the main results of the other tests.

TABLE VI.

Showing four observations by Dr. Merritt's test, giving thickness of floating precipitates in sixteenths of an inch, and the weights in twentieths of a grain of the same after dessication. Ten grains of each sample were used.

	I.	II.	III.	IV.
Measure..... 1st series.	27	6	7	6
Weight,.....	10/20	1/20	2/20	1/20
Measure..... 2nd series.	27	5	8	7
Weight.....	8/20	1/20	2/20	1/20
Measure ..... 3rd series.	27	5	6	6
Weight.....	10/20	1/20	2/20	1/20
Measure..... 4th series.	27	5	8	6 +
Weight.....	12/20	1/20 +	3/20	1/20

The correspondence between the weights and measures in this table is greater than the correspondence would be between the results of an equal number of digestive tests made with the same samples, performed by the same person. To further confirm the practical value of this test, the dried residues in Series i. and ii. were employed in making a digestive test to determine if the digestive

power sustained any constant relation to the weights and measures. As this digestion was performed on a different principle from the one in common use, it is proper to state that principle before giving the results.

Recalling the well demonstrated and universally admitted fact mentioned on page 8, the reason for adjusting the coagulated albumen and acidulated water to the strength of the pepsine will be clearly understood. In the present case, for the purpose of making a crucial test, we may assume these dried residues to be the pepsin obtained from each of the several samples, and apportion the albumen and acidulated water in proportion to their several weights. This will give to each sample a fair field according to its *supposed* strength, and the result will confirm or disprove our supposition.

Table showing the result of a digestive test made with the dried precipitates obtained by Dr. Merritt's test. In this case the bottles were removed from the bath when one sample had dissolved all the albumen in the bottle. The liquid used was a 2 per cent. sol. hydrochloric acid.

		No. I.	No. II.	No. III.	No. IV.
1st Series.	Albumen.....	200 grs.	20 grs.	40 grs.	20 grs.
	Liquid.....	20 drch.	2 drch.	4 drch.	2 drch.
	Precipitate.....	$\frac{10}{20}$ grs.	$\frac{1}{20}$ grs.	$\frac{2}{20}$ grs.	$\frac{1}{20}$ grs.
	Amount digested	191½ grs.	20 grs.	40 grs.	20 grs.
2nd Series.	Albumen.....	200 grs.	20 grs.	40 grs.	20 grs.
	Liquid.....	20 drch.	2 drch.	4 drch.	2 drch.
	Precipitate.....	$\frac{8}{20}$ grs.	$\frac{1}{20}$ grs.	$\frac{2}{20}$ grs.	$\frac{1}{20}$ grs.
	Amount digested	192½ grs.	20 grs.	40 grs.	20 grs.

The results obtained by the above digestions present a greater degree of agreement than occurs in the same number of digestions in the tables before quoted.

It remains to call attention to another cause for the variable results obtained in the use of either method of test, that is the variable size of the particles of pepsine in the same sample of any given preparation. It must be borne in mind that pepsine is a mechanical mixture of the active principle and milk sugar, therefore in distributing the pepsine through the sugar, some particles will be larger and some smaller, unavoidably. It might well happen that in weighing a portion for a test it would contain several of these larger particles, and the next portion from the same bottle might contain none of them.

This circumstance sufficiently accounts for the different digestive action of different samples taken from the same bottle, and also accounts for considerable difference in the precipitates obtained by Dr. Merritt's method.

THE SOURCE FROM WHICH PEPSINE IS DERIVED

has by some been considered important; much emphasis being laid upon the superiority of "Pepsina Porci," or the pepsine of the swine. This claim to superiority rests entirely upon theoretical grounds, based upon the resemblance of the digestive organs of the pig to those of the human being, and upon the fact that the pig, like man, is omniverous. But neither of these circumstances proves the superior digestive power of pig pepsine, but on the contrary their is *prima facie* evidence of the greater strength of the pepsine of the ruminant animals. The multiplication of stomachs, the act of rumination, and the greater length of intestine in them, clearly indicate the

greater indigestibility of their food. It seems then a fair inference, that if pepsine differs in different animals, it would be of greater strength in those whose food is more difficult of digestion. It is a matter of physiological proof that the gastric juice of the carnivora will digest vegetable food, and that of the gramnivora will digest animal food, the pepsine in both cases being the same; but the form and arrangement of the organs differing according to the food upon which the animal subsists. Superiority has also been theoretically attributed to the pepsin of birds, especially the ostrich. Recent observations have not sustained this view. The following test by J. R. James, in the Am. Jour. Pharmacy, April, 1880, illustrates the point. It was made with 50 grs. coagulated white of egg in five drachms, 1 per cent. solution of water and muriatic acid.

Kind of Pepsine used.	Weight of Pepsine used.	Result.
Pig Pepsine	½ grain.	Digested.
Ostrich "	2½ grains.	Not digested.
" "	5 "	"
" "	10 "	"
" "	20 "	"
Ingluvin.....	2½ "	"
"	5 "	"
"	10 "	"

WINE OF PEPSINE

was one of the earliest forms in which pepsine was prepared for medicinal use. But high authority has declared against its therapeutical value, on account of the incompatibility between alcohol and pepsin. But these objectors have overlooked the important fact that alcohol is

incompatible *only* as a precipitant of pepsin and not as a destroyer of its digestive power. In fact alcohol has been a favorite agent with physiologists for the separation of pepsin for experimental purposes. Alcohol of a certain dilution will not precipitate pepsin, and wine of low alcoholic strength may be made to hold in solution a given amount of it, especially if it be previously dissolved in acidulated water. The fact that alcohol is a precipitant of pepsin is a sufficient reason why dilute alcohol or wine cannot be a good solvent, and therefore the production of wine of pepsine by macerating stomachs in wine must produce an inferior or negative result. We may therefore conclude that if wine may be made to hold pepsin in solution, and its digestive power is not thereby impaired, if taken into the stomach it may fulfill its office there. It is obvious that the digestive strength of pepsine wine will be limited by its power of holding pepsin in solution; that is by its point of saturation, and therefore cannot be increased in strength above a certain point, as is the case with powdered pepsine. Wine of pepsine may be tested by Dr. Merritt's method by filling a test tube or bottle half full of the wine and then adding an equal amount of sat. salt solution. The pepsin present will soon rise to the surface.

INCOMPATIBILITIES

between pepsine and other remedies with which it may be desirable to administer it, is a matter which has deservedly occupied the attention of observers.

In order to intelligently consider the subject, it is necessary to make a clear distinction between the incompatibility of solutions, one of which precipitates the other

and thereby prevents their combination in the same mixture, and that incompatibility in which one substance *destroys* the potency of the other without regard to their remaining in solution in the same fluid. Alkalies of all kinds are incompatible in so far as they neutralize the acid upon which the activity of the pepsine depends. Prof. Edes of Boston says, "Carbonate of soda permanently modifies the digestive properties of pepsine and destroys its action on freshly coagulated albumen."

Borax is said by Dumas and Schutzenburger, to destroy the activity of all soluble ferments. These facts are sufficient to exclude all alkalies from prescriptions containing pepsine, although it may not be true that all alkalies destroy it. Pepsine should not be combined with alcoholic tinctures, they being *pharmaceutically* incompatible.

Dr. Dowdeswell says, "I have found that neither one per cent. of Salicylic acid nor sulphate of quinine appreciably interferes with the proteolytic action of pepsine."

Some observations made by the writer show that the following drugs but slightly diminished its digestive activity. Salicine, Ext. Nux Vomica, Acetate of Lead, Sulph. Quiniæ, Sub. Carb. Bismuth, Sub. Nit. Bismuth, Tannic Acid. The test was made with 60 grs. coagulated albumen, one ounce 2 per cent. solution of muriatic acid in water, one grain of pepsine, and one grain of each drug in each bottle respectively.

THE MODE OF ADMINISTRATION

recommended by Prof. Edes, is that it should be given alone or with as few drugs as possible. Dr. Ketzchsmar very sensibly advises that it be given by itself in acidulated water.

THE DEPRECIATION OF PEPSINE BY TIME

is very generally accepted as true, and may often be a reason why any particular brand may show an inferior test.

To determine the fact of such deterioration by actual observation, the writer selected a bottle of pepsine, and tested it by precipitation as follows: the depth of the floating precipitate is given in sixteenths of an inch.

PEPSINE MADE NOVEMBER, 1879

1st Test, Dec. 24, 1879.....	Precipitate,	$\frac{12}{16}$
2nd " March 29, 1880.....	"	$\frac{10}{16}$
3rd " July 14, 1880.....	"	$\frac{8}{16}$

In this case the depreciation as shown by the test appears to have been uniform, and the sample to have lost one-third of its pepsine in eight months. Further observations are necessary to verify these results.

THE THERAPEUTIC USE OF PEPSINE

preceded the physiological knowledge of its existence. Infusions of stomachs were in use in the time of Galen, and were used by himself for indigestion. The coagula found in the stomachs of sucking animals had a place in the pharmacopœas of the eighteenth century, and the lining membrane of the chicken's gizzard remained official up to 1746, and is even now extensively used as a domestic remedy for dyspepsia. This latter substance, in a powdered form, is at present on the market as a substitute for pepsine under the name of Ingluvin. The medical profession is indebted to the sagacity and enterprise of Dr. Lucian Corvisart, for conceiving and developing

the happy thought of aiding nature in her embarrassments by the use of her own agents.

It having been established that aliment is converted into nutriment principally by the agency of a certain substance produced in the stomach, Corvisart conceived the idea of extracting that substance from the healthy stomachs of animals, and using it to aid the digestion of those in whom this function had become impaired or destroyed.

As a foundation upon which to base his clinical observations, he lays down the following propositions.

1st. That aliment is an inanimate substance, without nutritive power of itself, which would allow one to starve who could not digest it ; that it is digestion which gives it vital fitness, and by virtue of which it thereafter imparts life.

2d. That the principal thing necessary to perform this transformation of aliments into nutriments is acidified pepsin.

3d. That under the influence of this physiological agent, nitrogenous aliments undergo the same physical, chemical and organic modifications as they would under the influence of the gastric juice in the stomach itself.

4th. That artificial pepsin, aside from a different degree of force, has the same power of transforming aliment into nutriment as the gastric juice in the stomach of either carnivorous or herbivorous animals ; that is to say, its digestive power is always similar; a demonstration of the highest order of interest, and upon which there rests no doubt, whether tested by physiological experiments or therapeutical results. Further, that if digestion by the aid of pepsin can be successfully carried on in an inert bottle or pouch, so much the more in the living stomach,

which imparts the natural motion and heat, although it may not secrete the digestive principle. He closes his arguments by this general proposition : " If these physiological experiments, infinitely varied, demonstrate that there is but one agent for producing digestion ; that under its influence aliment always becomes assimilable; and that by the vital power which pepsin contains, we can transform anywhere aliment into nutriment, one ought, then, by the use of the same agent, to cause those to digest and be nourished whose stomachs, by a vice of secretion, are deprived of this agent, this vital force which is indispensable." " If each paroxysm of intermittent fever interrupted by quinine, is proof of its antiperiodic power, then is each difficult or impossible digestion made easy and complete by pepsin—a proof that it is a true digester."

In support of these conclusions, the following cases of common

CHRONIC DYSPEPSIA,

due to impaired tone of the stomach and consequent vitiated or diminished secretion of gastric fluid, are recited:

Case I.—Mad. M., aged fifty years, for many years troubled with a gastralgia ; sense of weight and fulness in the epigastrium after meals ; a severe pain in that region ; acid and acrid regurgitations, and finally obstinate constipation. This lady was long treated for gastritis by free blood-letting, as well as leeches to the epigastrium. Since I have had the care of her, I have employed bitter and iron tonics, as well as anti-spasmodics, without much success. On the 22d of August I ordered two doses of pepsin during the day, at the beginning of each meal.

On the 23d, revisited the patient. She had suffered less indigestion ; was easier ; and the sense of weight diminished.

Ordered to continue the pepsin every four hours, wishing to assure myself that the improvement was due to the pepsin.

From the 23d to the 26th, Mad. M. had taken four doses a day, and during this time her digestion was easy, and she suffered neither sense of weight nor acid eructations. From the 26th to September 5th, she took no pepsin. Revisited her September 2d. She said she was suffering again ; the digestion was not good, and the epigastric pain had reappeared, and she demanded again the remedy before prescribed. On the 6th of September, Mad. M. resumed the use of pepsin, and continued it six successive days. September 13, her sufferings had ceased. She digested well, and visited the closet without inconvenience. From this time her digestion was always good ; her sufferings never returned, and her health was perfectly restored.

The following case, reported by Dr. Landry, may be condensed into few words :

Case II.—A young country girl, twenty years of age, had suffered from a gastro-intestinal fever, whereby her digestion became much impaired. She suffered after each meal from epigastric swelling, sensation of suffocation, eructations and gastralgia; her appetite failed, and symptoms of chlorosis appeared.

The administration of calcined magnesia after each meal, and of ferruginous preparations, produced little effect. At length I tried pepsin. Twelve doses were given, one after each meal. After the first the digestion

was without pain, and the administration of the remaining eleven was followed by the same result.

The appetite was restored, and the digestion being good, the remedy was discontinued.

The following case is kindly furnished by Dr. W. F. Sanford, of the City of Brooklyn.

Case III.—Mr. S——, aged thirty-five years, called on me August 1st, 1868. He complained of most severe pain after meals, lasting sometimes for hours, a feeling as if "lead food was in his stomach," as he expressed it, and other symptoms of severe dyspepsia.

He had some five months before been laid up for three months with a wound in his ankle, which, with his indigestion, had reduced him greatly. His surgeon had prescribed various tonics, etc., with little avail as regarded the old disease, which he said had troubled him for years. He did not regain the flesh lost during his confinement from the injury, since he was again at his business. He was to return in a day or two to the country, where he had been engaged. I ordered two ounces of American pepsin to be taken with him, and a twenty-grain powder to be taken before each meal. Knowing him to be a most temperate and careful man in his manner of living, I gave him no directions in regard to his diet, but only to follow his own judgment. He was to report to me after he finished the two bottles, unless better. I heard nothing of him until December 1st, when I met him looking like a new man and joyfully expressing himself as well. I could attribute the wonderful result to pepsin alone, since there had been no change in diet or manner of life, and no other remedy had been taken.

Corvisart early called attention to the fact that pepsin exerted a favorable influence over

VOMITING IN PREGNANCY,

and which so often leads to disastrous effects.

Case I.—A very remarkable case was related in 1856, by M. Teisier, Professor of Clinical Medicine at Lyons, showing the immediately beneficial effect of a dose of pepsin in a case of vomiting during pregnancy. In this case the symptoms resisted all the ordinary methods which were employed, and the patient was unable to retain in her stomach any substance whatever. Under these circumstances the patient was brought to M. Teisier, who found her in the following condition : The vomiting had continued for two months, and she was at the end of the fourth month of pregnancy; she presented all the appearance of a skeleton, having the aspect and the cough of a phthisical subject; the pulse was 140, and M. T. thought at first that the case was one of pulmonary tubercle ; finding that all treatment had hitherto been inefficacious, and that the lady was actually dying of inanition, he was seriously meditating the propriety of procuring abortion as a means of saving her life ; but at last he determined to employ pepsin. He accordingly prescribed one gramme, to be divided into two doses, and taken every day in a spoonful of broth. At the first dose the broth was retained, and from that moment the vomiting never returned. On the third day the lady ate some chicken, and then some beefsteak. She was continued in the same manner for three weeks, and at the end of that time the cure was complete, the emaciation was replaced by embonpoint, the fever and the cough ceased with the vomiting, and at the end of the ninth month the lady was safely delivered.

Dr. Gross relates six other cases in which pepsin was employed with the same success, and thinks himself warranted in concluding that pepsin doubtless produces good effects in the vomiting which attends pregnancy.

Case II.—Dr. J —— des Saintes writes, March 3d, 1859, that his own wife was reduced to the last degree of weakness by the sympathetic vomiting of pregnancy. May 12th, he writes : "the pepsin which you sent produced the happiest results. The first dose entirely removed the vomiting."

Case III.—Dr. P—, of Paris, says : "Thanks to pepsin, my pregnant patient, advanced one month and a half, and who found nothing to relieve her extreme and continued pains of gastralgia, was immediately cured. You remember I came to see you December 7th, P.M. An hour after that my patient was greatly relieved, and on the following morning even cured."

Geo. Selwin Morris, Esq., Guisbro, says : "I have used oxalate of cerium in six cases lately, where sickness and retching were most urgent in pregnancy. I cannot say that I am at all satisfied with its results. It is true, three of the cases were relieved by it ; but in order effectually to stay the urgent vomiting, I *was obliged to have recourse to my favorite drug* (*pepsin*) in ten-grain doses.

In my own practice recently, a case occurred favorably illustrating this part of my subject.

Case IV.—Mrs. C——, in the early stage of her first pregnancy, found herself entirely unable to retain food, even the blandest. I prescribed Am. pepsin, ten grains three times a day. Visited her on the following day, and learned that the vomiting had ceased from the time of taking the first powder. So far as I know, the vomiting never returned.

The next use of pepsin to which I call your attention, is in

DIARRHŒA OF INFANTS.

Premising that the great predisposing cause of infantile diarrhœa, is the state of evolution which the digestive system and its dependencies are undergoing during the period of dentition, the question of therapeutics becomes one of comparative simplicity, and the evident duty of the physician is to allay the irritation of the organs which is exhibited in vomiting and purging ; first, by the removal of all extraneous sources of disturbance, such as food improper in quantity and quality ; by protecting the skin from too sudden and frequent changes of temperature. Secondly, by sedatives to subdue the excitement which the foregoing causes may have induced, and which, in the enfeebled condition produced by the transition state, are self-propagating ; and lastly, to impart to the struggling and overwhelmed digestive apparatus that assistance which will enable it to convert food from the character of a foreign, and therefore irritant material, into nutriment which will reinvigorate the natural forces, and enable them to accomplish successfully the great and necessary evolution through which they are passing.

As sedatives to the over-excited mucous membranes and glandular system of the stomach and bowels, the preparations of opium and the salts of bismuth stand pre-eminent. When irritation without pain exists, bismuth most promptly and satisfactorily allays it, but when accompanied with pain, the addition of a minute portion of opium becomes a necessary complement to its effectiveness.

We have now briefly noticed, in outline, the first two

conditions of treatment, viz.: the removal of external causes of irritation and allaying the morbid excitement which has sprung from their agency; and it may be asked, if the natural functions will not now resume their offices and the health of the patient be restored? Doubtless such would be the case did not the system labor under the combined effects of the transition state of dentition, and the impairment of strength due to the morbid causes above enumerated.

The *ingesta* themselves become, for want of digestive and assimilative power, irritants to the sensitive and debilitated organs. Instead of affording nutriment to fortify the system against the dangers of the crisis through which it is passing, the food going through the intestinal canal in an undigested form becomes itself an irritant, and adds another morbid cause to those already existing. This is not all; the food does not always remain a simple, foreign substance, inducing irritation, but undergoes putrefactive decomposition, adding new and more active sources of disease.

Here the happy thought of Corvisart comes to our relief. The very function which is crippled we can replace; the very strength which is exhausted, we can supply. By the administration of pepsin, we at once convert the ingesta into nutriment. They not only cease to be irritants to the digestive organs, but are absorbed into the circulation and become sources of power instead of weakness.

Case I.—Alexander Lang, born on the 2nd of August, was seized on the 25th of October with diarrhœa after a very obstinate attack of erythema and eczema. This diarrhœa was accompanied with frequent hiccough and vomiting. On the 3d of November 8 grs. of pepsin were

given night and morning. On the 4th the same treatment was continued, and now the vomiting and purging have disappeared; the stools have become natural. Pepsin discontinued.

Nov. 22. The vomiting and purging have returned. Recourse was again had to pepsin.

Nov. 23. The vomiting and purging have ceased, and the stools are natural. From this time the little patient went on well.

Case II.—July 19, 1868. Thomas Kennedy, aged 15 months, has had diarrhœa a week; is fed; passages watery and contain undigested food.

℞. Am. pulv. pepsin, subnit. bismuth, aa. grs. v. every three or four hours. The single prescription terminated the disease.

Case III.—July 20, 1868. John Kniester, aged 18 months, is teething; diarrhœa has existed ten days; passages very watery and frequent, and contain undigested milk.

℞. Am. pepsin, and subnit. bismuth, aa. grs. v. every four hours.

This case was also relieved by a single prescription of ten powders.

THE WASTING DISEASES

Which frequently follow protracted diarrhœa, and scarcely to be distinguished from true marasmus, are frequently due to impaired functions of the stomach, upon which tonics and stimulants have but little influence. In such cases pepsine frequently acts in a remarkably prompt manner. The following cases very well illustrate this point:

Robert Phelan, aged two years, born Aug. 25th, 1876. Had severe diarrhœa in the summers of 1876, 77 and 78, together with numerous abscesses. His present condition is as follows: Appetite insatiable, sleepless at night, abdomen very protuberant, has never walked. At the age of five months emaciation began, which has progressed up to the present date, Oct. 8, 1878, when his face exhibits the bony outline peculiar to this state. At this time he began to take pepsine in quarter teaspoonful doses. Nov. 25th, at this date, appetite normal and is satisfied after meals; protuberance of bowels disappeared; very much improved in flesh; the appearance of *extreme emaciation* is absent; walks well and sleeps at night. Continue pepsine. Jan. 1, 1879—in full flesh, color normal, perfectly restored to health.

July 28, 1868.—D. N——, an infant, two weeks old, said to have been born in a plump and healthy condition. Its present state is one directly opposite. Its face is thin and skinny, exhibiting, painfully, the bony outline. It has thin, muddy, but not frequent alvine discharges, and vomits whatever it swallows, even to half a teaspoonful of its mother's milk. It lies stupid, with its eyes closed, and refuses the breast. It has also an intense muguet. In this extremity, I ordered three grains of American pepsin to be given every three hours, and half a teaspoonful of its mother's milk to be administered with great frequency. The following morning I found the mother, through utter hopelessness, had greatly neglected my directions. It was only through much persuasion and the co-operation of a friendly neighbor that she was induced to pursue the treatment. During that day the vomiting ceased, and on the following day the child took the breast, and retained and digested its nourishment. From this

day it steadily improved in condition, and its diarrhœa and muguet disappeared.

On the 8th, one week after my last visit, I was called to see its mother, and hardly could have recognized the infant which so lately had seemed in the last stage of inanition. Its face had acquired a comparative fullness, its color was restored; it nursed well and freely, and seemed as likely to live and thrive as any infant.

This child was simply starving to death. What led to its condition of inanition I could not satisfactorily learn, but its state seemed most hopeless. This case illustrates, in a remarkable manner, how little assistance will restore the digestive faculty to its normal activity, and enable it to perform its functions unassisted.

Case furnished by Dr. P. B. Mish, Lebanon, N. Y.

Child 9 months old; owing the inability of its mother to nurse, it was fed from the bottle, had constant vomiting and diarrhœa, large pimples and boils on its head and body, and was reduced to a state of great emaciation.

Gave it small doses of pepsine after each feeding, and in a few weeks the child improved, and from a delicate, puny sufferer, became a large and healthy child.

ALIMENTATION IN DISEASE, AND CONVALESCENCE.

The following quotation from a lecture by Prof. Austin Flint, Sr., sets forth forcibly the importance of alimentation in disease: "The importance of this subject in the treatment of individual cases of disease is to be estimated by the amount of impending danger from starvation as an incidental element. If to die by slow asthenia be often virtually to starve to death, then, no matter what the

disease may be, *it is an object of fundamental importance to promote, as far as practicable, the assimilation of food.*"

"In acute disease the failure of the vital powers is forestalled in proportion as nutritive supplies are assimilated. This is simply saying that the *assimilation of nourishment is indispensable for the preservation of the powers of life.*"

"No matter what may be the seat or nature of the chronic affection, a diet fully up to the capacity of the organism for nutrition promotes recovery, if recovery be possible; and if recovery be not possible, by increasing the ability of the system to endure the affection, contributes to prolong life. The limitations to alimentation, therefore, relate wholly to the *physiological processes* which are *preliminary to nutrition*, namely, *digestion*, and the other processes by which aliment is converted into food."

To whatever degree starvation may be a cause of death in disease—to whatever extent disease may overwhelm the power of life in *consequence* of *insufficient nutrition*—to that degree and to that extent is artificial digestion important. The only question remaining to be answered, is this: Can artificial digestion be successfully accomplished by the administration of pepsin? Undoubtedly it can. This is now a matter of recorded experience, sufficiently extensive to remove all doubt.

This use of pepsin is the *most important of all*, and affords the largest *field for its use.* Cases for this application of the remedy are of daily occurrence in every physician's practice.

The following cases reported by Dr. Longet, and quoted by Corvisart, are to the point:

Case I. Typhoid Fever.—On the twenty-fourth day, *the patient could not support any food, even the lightest.*

The administration of pepsin produced immediately

easy digestion. On suspending the remedy as a test, the old symptoms re-appeared with violent pain in the stomach and diarrhœa. The treatment was continued for ten days, when the patient digested without any help.

CASE II.—Miss ——, aged fifteen years, on the twenty-fourth day of a serious typhoid affection, although convalescent, was in an alarming state of debility, because she *could not bear any food, not even the lightest.* I ordered her pepsin in powders. The first half dose, which was administered in tapioca broth, acted so well that a second was given to the patient three hours after the first, and was digested without difficulty. The second day, the same result was obtained with three broths and a raw egg. The third day the dose was intentionally omitted from the broth in the morning, and this caused violent pains in the stomach and intestines, and a watery stool. The two others, however, which were administered the same day, and contained each half a dose of pepsin, resulted in a complete and easy digestion. The fourth day of the administration of pepsin, the patient ate soups and chicken. After this a more and more substantial food could be given, but every time the dose was suppressed for a meal, the digestion was more or less painful. This state lasted ten days, when the digestion became normal.

The following case, kindly furnished by Dr. Sanford, of Brooklyn, very well illustrates this point.

CASE III.—Fannie R. had capillary bronchitis, following scarlatina, which reduced her greatly. Thursday and Friday, February 12 and 13, vomiting set in, which grew more and more severe, in spite of my remedies. Having taken but little food before, she was growing rapidly weak, and I knew that she would be able to endure but a short time, unless her stomach could be quieted. Liquid

bismuth seemed to produce a good effect, but would not enable food to be retained, except at very long intervals and in very small quantities. Saturday I prescribed as follows : ℞ Pepsin (Am.) ʒ j., bismuthi subnit. grs. xv., in six powders.—Mix one powder in a tablespoonful of beef essence, and give a teaspoonful every half hour.

The food thus mixed with the powder was retained from the first, and given every half hour all Saturday night.

Sunday I found her much stronger. During the night she had taken four ounces of beef essence.

I then ordered the food without the pepsin, which I found at my visit in the evening had been retained several hours, but then vomiting had returned, but in a much lighter form. I ordered the pepsin powders as before, and found, Monday morning, that the food was retained immediately on their use.

Monday Evening.—Still continue the powders, and give quinine every three hours.

Tuesday.—Discontinued the pepsin.

Wednesday.—Food and tonics acting perfectly ; has a little appetite ; other food taken this morning was digested without the least trouble.

Thursday.—Child improving very rapidly ; no further trouble with the stomach.

Attention has recently been called to the value of pepsin in

DEFICIENT LACTATION.

Where the deficiency either in quantity or quality is suspected to be due to imperfect nutrition of the mother, especially if she consciously suffers from indigestion, pepsine may reasonably be prescribed.

The following case illustrating this has been kindly furnished by Dr. John Merritt, of Brooklyn.

Mrs. E.— Am. Œt. 30.

Has had one child, which she was unable to nurse on account of deficiency of milk. Not so much in quantity, as in quality.

Was called to attend her when her second child was three months old ; child had been well nourished at time of birth, but was thin and very fretful when I saw her. Various galactogogues had been employed, but the milk was deficient in quantity and the child was not thriving.

Analysis of milk showed very marked deficiency of casein, slight deficiency of fat, and an excess of sugar. I ordered patient to take with each meal Hawley's Pepsine, and for about a week an emulsion of cod liver oil with white of egg. The child began immediately to improve, slept better at night, and grew plump ; in short became a fine specimen of a baby. The quantity of milk was so increased that it ran from the breast, and at times it was found necessary to milk it off, to relieve the accumulation. The mother increased in weight and health. The pepsin was continued until the termination of lactation.

I have now briefly indicated the chief uses of pepsin in the treatment of disease ; each particular use has been illustrated by a few appropriate illustrative cases, collected from various sources. It seems to the writer that the therapeutical value of the pepsin as a remedy has been abundantly established by the experience of the medical profession. High authority has declared in its favor. Dr. S. King Chambers, in speaking of it in diseases in which there exists "an anæmic condition of the alimentary

canal which results in a disgust for food," says, "I do not know any remedy which more *readily*, *obviously*, and *directly* does what it can towards checking such a state of things than pepsin. It acts *immediately* and *surely*."

In another place he says : "On the whole, then, I cannot but conclude that we have, in pepsin, a *valuable* and *safe remedy*, and an important aid to rational medicine." I cannot refrain from quoting one more case from Dr. Chambers on Indigestion. "Amelia D., aged 20, was admitted to St. Mary's, June 19, 1857. She was well fed and not overworked, but her employment necessarily confined her a good deal to the house. The thorax was healthy, though she told a tale of having had cough and hæmoptysis. She complained of pain in the left side and sickness in the morning, especially after breakfast. Her appetite was very bad, and the sight of food made her gorge rise at it ; but still she forced herself to eat.

"She was at first dieted on milk guarded with lime-water, rice pudding, and ice, and took a grain of opium every night.

"After five days she was no better, so the opium was left off, and ten grains of pepsin powder three times a day substituted for it. In three days her appetite had returned, the vomiting and nausea had ceased, and she spontaneously asked for meat. She continued taking that without vomiting. It would be easy to cite cases where drugs had effected the same purpose, but I chose rather to select an instance of the simplest form of restorative treatment, in order to direct the reader's thoughts to the *true* theory of healing."

Much contrariety of opinion has existed as to the

USEFULNESS OF PEPSIN AS A REMEDY.

This is sufficiently explained by the following paragraph from Dr. Chambers : " But I think, since its introduction to general use through the ingenious preparation of Dr. Corvisart, it has caused more disappointment than satisfaction. This is because it has been *given in unsuitable cases and because impossible expectations have been founded upon it.*

Another reason why pepsin has in many instances caused disappointment and consequently lost favor, is made apparent by the following extract from Dr. Pavy, of Guy's Hospital, London : " Now, speaking from the examination of several specimens of pepsin procured from some of the largest pharmaceutical establishments in London, the bulk of that which is sold is totally devoid of any active property. Whether this arises from too much heat having been employed in its preparation, or from whatever cause, the fact remains that the chief portion of the pepsin sold and administered, being perfectly inert as a digestive principle, is destitute of any real value as an agent for affording assistance towards the performance of digestion."

It would appear, therefore, that the successes and failures which have attended the introduction of pepsin into the Materia Medica are easily reconcilable ; the successes have been real and in accordance with physiological reasoning ; the failures are to be attributed to improper use, extravagant expectation, and inert pepsins.

APPENDIX.

For the satisfaction of those who may desire to see the unabridged tables of digestive tests from which abstracts have been made in the foregoing pages, they are here appended.

DR. KRETZSCHMAR'S TABLE.

Name of Manufacturer.	Amt. of Egg Albumen dissolved by 10 grammes of Pepsin.	Percent. of Pepsin.	Price of pepsin.
E. Scheffer, concentrated or pure	10.	100.	$4 00
Bullock & Reynolds, London, known as "Beale's,"	9.1	91.	4 00
J. Hawley's sacch	9.0	90.	45 cts.
Phœnix Chem. Works	9.0	90.	1 00
Bœnz, Good & Co	8.5	85.	1 75
Boudcault (starch)	8.5	85.	85 cts.
E. Scheffer's sacchar	7.7	77.	60 cts.
Smith & Pitkin, Syracuse	6.7	67.	
Kidder & Laird, sacch	6.3	63.	35 cts.
W. H. Schieffelin, sacch	6.2	62.	
Lehn & Fink, pure	6.2	62.	90 cts.
Armstrong's sacch	6.1	61.	35 cts.
Carl Jenson's pure	5.5	55.	1 50
Austin's sacch	5.4	54.	35 cts.
Lactopeptine	4.9	49.	70 cts.
Hance Bros. & White	4.5	45.	
Lazell, Marsh & Gardiner	3.4	34.	
McKesson & Robbins	3.0	30.	
Morsen Peps. Porci., pure	2.3	25.	3 40
Ingluvin	1.7	17.	1 00
John Wyeth & Bros	1.5	15.	66 cts.

DR. DOWDESWELL'S TABLE,

Showing the result of experiments to ascertain the least quantities of the various preparations of pepsin capable of completely digesting 100 grains of coagulated egg-albumen.

	Preparation.	Quantity.	Result.
1	Glycerine of Pepsin, (Bullock).	f. ʒ. ss.	All digested.
2	Liquor Pepticus, (Burger)	f. ʒ. i.	"
3	Pepsina Porci, (Bullock)	gr. ½	"
4	Pepsin ex oribus, (Wright & Co.)	grs. iv.	"
5	" " (Hopkins & Co.)	grs. iv.	"
6	Saccharated Pepsin, (Finzelberg)	grs. v.	"
7	Pepsina Porci, (Morson)	grs. x.	"
8	Starch Pepsin, (Boudault)	grs. vi.	"
9	" " (Morson)	grs. x.	"
10	Lactopeptine	grs. xv.	Not dissolved.
11	Ingluvin	grs. xx.	"
12	Saccharated Pepsin, (Wyeth)	grs. x.	"
13	Pepsin Wine, (Morson)	f. ʒ. iv.	"
14	Pepsin Essence, (Liebriech)	f. ʒ. iv.	"
15	Compressed Peptonic Tablets, (Wyeth)	4 Tablets.	"

SACCHARATED WHEAT PHOSPHOIDS.

DOSE, ONE HALF TO ONE TEASPOONFUL. PUT UP IN QUARTER POUND BOTTLES.

This consists of the soluble phosphoids of wheat, including the cerealine, combined with sufficient milk sugar to render them pulverulent. It not only furnishes indispensable alimentary substances, but is also an important excitant to the nutritive functions. It should be added to the food upon which the patient is ordinarily nourished. The following from Dr. Tilbury Fox, expresses his estimation of the remedy. "There is something essentially special in the organized phosphoids, those in fact which have been formed by passing through a living organism, as compared with those artificially prepared. It is not the *amount*, but the *kind* exhibited which produce the good result."

"In infants' food, and in our bread and flour, the organized phosphoids and cerealine (which has a somewhat similar action to pepsine), have been deliberately rejected. *These may be administered medicinally to children and infants when the assimilative function is at fault.* In eruptive diseases of the scalp, (which are generally associated with faulty assimilation), Rickets, Marasmus, Chronic Diarrhœa and impaired nutrition of all kinds, the Wheat Phosphoids act marvellously. Pallid children pick up tone, color, and flesh, worms disappear, the secretions become healthy and disease goes."

It may be regarded as a true *medicinal food* which will supplement in an important particular, the ordinary diet upon which infants and children are fed. It is adapted to all cases of inanition, and to the offspring of scrofulous parents as well as to nervous exhaustion in adults. This remedy has already established a reputation for the relief of all that class of diseases due to malnutrition, especially in the scrofulous and rachitic diatheses.

BEEF PEPTONE, OR DIGESTED BEEF.

DOSE 1 TO 2 OUNCES. PUT UP IN HALF PINT BOTTLES.

It consists of fresh lean beef artificially digested. It differs from beef tea and other extracts of meat in that it contains all the albumen and fibrin of the beef (in which they are deficient), and all its other elements, *digested;* in other words ready to be received into the circulation, and perform their office in nutrition without further digestion. It is therefore adapted for the nourishment of the sick in all cases of extremity, viz.: the lowest stages of typhus and typhoid fever; cancer and other permanent impairments of the stomach, and where it becomes necessary to support life temporarily by injections. It is furnished in an acid form and should be neutralized before using either by injection or the mouth. Each bottle is accompanied with sufficient carb. sodæ to neutralize its contents, thereby converting the hydrochloric acid into common salt.

FLOUR OF BEEF.

PUT UP IN QUARTER POUND BOTTLES.

This is fresh lean beef desiccated to dryness and reduced to a powder. It is now well understood among scientific men, that beef tea, beef essence, and beef extract, contain little or no nutritive matter; but only the soluble salts and extractive portions of the meat. Important as these elements are in the process of nutrition, they when separated from the blood and tissue forming portions of the meat, act only as stimulants and are incapable of supporting life.

The flour of beef affords the opportunity of administering to the sick the entire beef, without mastication, and in a form favorable to rapid and complete digestion. Each pound represents four pounds of lean beef, or six of ordinary butcher's meat.

It may be conveniently administered in the form of a thin sandwich, or suspended in any farinaceous gruel.