all events, the man with one kidney is very like the showman with his head in the lion's mouth, who calls out: "Is he wagging his tail? for, if so, it is all over with me." If this one kidney is attacked with disease, it is likely to be all over with him.

(To be continued.)

THE THERAPEUTIC VALUE OF MALT.

BY CHARLES W. TOWNSEND, M.D.

ONE of the fashionable remedies of the present day is the extract of malt in the form of one of its numerous preparations. Its valuable properties are generally considered to be: first, the concentrated nutriment it contains; second, the digestive power it possesses owing to the presence of diastase. From its first property it is indicated in cases of malnutrition where a concentrated food is desired, and one that is in a condition to be directly absorbed. From its second property it would seem to be indicated in cases of starchy dyspepsia, where some artificial ferment is needed to aid or supply the place of the natural ones in digesting starch. That the diastase found in malt and in good malt extracts is capable of digesting starch at the temperature of the body in a test-tube is a fact easily confirmed. Will malt do this in the alimentary canal? If not, malt given after a meal, as is usually prescribed, is of value only from its contained nutriment and its diastatic power is simply wasted. In the test-tube experiment malt and starch are brought in contact in a watery medium and are raised to the temperature of the body, but in the stomach the malt would have to act on the starch in the presence not only of the other solid and fluid ingesta and the products of their digestion and decomposition, but also in the presence of the gastric juice. Now it may be that the diastase is either destroyed or its action so hindered by the acids produced by fermentation from the ingesta, or by the hydrochloric acid of the gastric juice, or by that and pepsin combined that it is unable to act on the starch. To determine this point the following experiments were performed: First, the effect of various percentages of hydrochloric acid on the diastatic power of malt. Second, the effect of pepsin alone and of pepsin combined with hydro-chloric acid on this power. Third, the diastatic power of malt in the stomach of the living animal.

To test the action of malt in the presence of hydro-chloric acid, a water bath was used, kept at a temperature between 99° and 104° F. by an alcohol lamp. In each experiment one ounce of clear starch paste, made by boiling fifteen grains of starch in one ounce of water, was used, and thirty minims of a liquid extract of malt. This proportion of malt to starch was larger than was really needed to convert the starch to sugar, but saved time and made the results of the experiments more satisfactory. Chemically pure hydro-chloric acid was used, and the percentages calculated are those of the anhydrous acid. The paste, paste and water or paste and acid solution were first put in the vessel in the water-bath, the malt was then added, and the solution tested every few minutes by placing a drop in one of a series of test-tubes containing a solution of tincture of iodine, in the proportion of two drops to the ounce of water. The experiments were continued from twenty-five to forty-five minutes, and most of them were verified by repetition.

No.	Paste	Water	Percentage of HCl.	Malt	Result
1	1 oz.			30 m.	Paste liquefied in two minutes, all changed to sugar in ten minutes
2	1 oz.	6 oz.		30 m.	In one minute starch mostly changed to sugar as shown by purple tint with iodine; all changed to sugar in seven minutes
3	1 oz.		.2 or 1-5 per cent.	30 m.	Starch as abundant at end of twenty-fifth minute as end of first minute
4	1 oz.	6 oz.	.03, about 1-33	30 m.	Starch as abundant at end of twenty-fifth minute as end of first minute
5	1 oz.	6 oz.	.015, about 1-66	30 m.	Experiments continued for forty-five minutes and starch still found as abundantly as at first
6	1 oz.	6 oz.	.0111, about 1-90	30 m.	Experiments continued for forty-five minutes and starch still found as abundantly as at first
7	1 oz.	6 oz.	.00740, about 1-135	30 m.	In four minutes starch partly changed as shown by purple tint with iodine but not till thirty minutes was it all changed to sugar
8	1 oz.	6 oz.	.00565, about 1-177	30 m.	The purple tint with iodine showed itself in two minutes; starch all changed to sugar in thirty minutes
9	1 oz.	6 oz.	.00370, about 1-270	30 m.	Changed to purple with iodine in one minute; all changed to sugar in seven minutes; results same as that of experiment two

The gastric juice, according to Foster,¹ contains two per cent of free hydro-chloric acid. The contents of the stomach after a meal has, of course, a less acidity than this from the dilution of the juice with food and drink, but, as reference to the table will show, .011 per cent. of free acid was sufficient to stop the diastatic power of malt entirely; .00565 per cent. of free acid checked the action of the malt to a slight extent, but .00370 per cent., an extreme dilution, had no effect whatever. Now .0111 per cent., the minimum percentage according to these experiments necessary to entirely check the action of the diastase of malt, would be about the percentage of acid in a stomach containing one ounce of gastric juice and nineteen ounces of other fluid, and it is probable that the percentage of acid in the stomach is usually much greater. The following calculations show this to be the case: The amount of gastric juice secreted in twenty-four hours, according to Bidder and Schmidt,² is 6,400 grammes or about fourteen pounds, and even supposing that it is secreted equally at all times, whether food is in the stomach or not, this would give one-and-one-sixth pounds secreted during the two hours of stomach digestion following a meal. Flint³ calculates that as two ounces of gastric juice have been found to be secreted in response to stimulation in ten minutes, twenty-four ounces, or a pound and a half, avoirdupois, are secreted in the two hours of gastric digestion. Now, in order to reduce the normal .2 per cent. strength of hydrochloric acid in the one-and-one-fourth pounds, we will say, of gastric juice to a .011 per cent. solution, the minimum amount of acid needed to stop entirely the action of diastase, it would be necessary to ingest about twenty-two pounds of fluid at that meal. Of course, this amount of fluid is not taken at one meal, at least by invalids for whom malt

¹ Text-book of Physiology, New York, 1880, p. 246.

² A. Flint, Jr. Physiology of Man, Vol. II.

³ Ibid.

is intended, and, therefore, the percentage of acid in the contents of the stomach must be much greater than the minimum percentage needed to check the action of diastase. In fact, the amount of acid needed for this purpose is so small that great diminution in the amount and acidity of the gastric juice would be possible, and still suffice to render the diastase worthless.

But, it may be asked, will not the malt be able to act on the starch when it has passed from the acid stomach to the alkaline duodenum? To determine this point and to imitate this process in the living animal, experiment No. 6 was repeated, but at the end of thirty minutes sufficient hydrate of potash was added to neutralize the hydrochloric acid. At the end of twenty-five minutes after neutralization a deep blue precipitate was still caused by the addition of a drop of the solution containing the malt to the test solution of iodine. In a second experiment the same solution in the water was made slightly alkaline at the end of thirty minutes, but the starch remained unchanged after fifteen minutes more, when the experiment was discontinued.

From these experiments it seems rational to infer that the diastatic power of malt is permanently destroyed by the presence of hydrochloric acid in not larger quantity than is found in the stomach, and therefore that malt given by the mouth is of no value as a digestive.

The action of diastase was found not to be noticeably affected by the presence of pepsin alone, or of pepsin and of as much hydrochloric acid as had previously been found to have no effect on this action. This is to be expected, for pepsin acts best in a two per cent. hydrochloric acid solution, and refuses to act in a neutral or very faintly acid solution, and it is probable that in a stronger acid solution, where the acid alone is sufficient to arrest the action of the diastase, the presence of pepsin would assist by digesting this ferment.

As confirming the results of these experiments in which a water-bath was used as an artificial stomach, the following, in which living stomachs were used, are of interest.

A litter of five kittens about one month old were chosen, and each one was given by the mouth some milk containing a measured amount of boiled starch, followed immediately by some more milk containing fluid extract of malt. More malt was given than would have been sufficient to digest the starch at the temperature of the body in a test-tube in seven minutes. The kittens were killed by ether ten, fifteen, twenty, thirty and sixty minutes respectively after their meal of malt, and the contents of the stomachs turned into vessels and tested by the iodine test for starch. In all cases starch was found present in large quantities.

Having considered this diastatic property and shown, it seems to me, conclusively that it is valueless in the ordinary method of administration of malt, the direct nutritive value of malt remains to be considered. That this is great is abundantly proven clinically, cases of malnutrition improving under its use in the same way as from the use of cod-liver oil. Malt, however, is often preferable to cod-liver oil, as it is free from disagreeable odor and taste, is not so liable to loosen the bowels as the oil is so apt to do in infants and young children, and is in many cases much more easily assimilated. It is hardly possible to make a compari-

son of the nutritive values of malt and cod-liver oil by an examination of their constituents, for the latter is composed almost wholly of various fatty acids,—oleic, palmitic and stearic,—combined with glycerine, with the addition of biliary principles and small amounts of iodine, phosphorus, lime, magnesia, and iron, and phosphoric and sulphuric acids, while the former consists chiefly of carbo-hydrates,—glucose and dextrine,—with a small amount of nitrogenous substances, among which is diastase, and of inorganic substances, chiefly phosphates of potash and magnesia, with small quantities of lime, soda and iron, and sulphuric and silicic acids.

With malt liquors and Liebig's food or malted wheat, however, a comparison can more easily be made, and the nutritive value of both of these is well known. Beer is essentially a solution of malt in water with the addition of hops and of alcohol and carbonic dioxide, the two latter formed at the expense of some of the glucose. Alcohol adds, of course, to its nutritive value, but that the chief value resides in the malt is evident, when we consider that people who drink the light wines, which are equal in alcoholic strength to beer, do not display that rotundity of figure seen in the beer drinkers. Liebig's food is malted wheat and differs from barley malt only by not possessing diastase, and by being made from a different grain. The nutritive value of wheat is, however, superior to that of barley, as it is superior to that of most other grains, it being especially rich in nitrogenous substances, constituents in which barley is comparatively poor.

In the following table, the amount of nutriment in a glass of beer, a tablespoonful of fluid extract of malt and a tablespoonful of malted wheat has been calculated from analyses given by Payen⁴ and Leeds.⁵

	Glass Beer (3 viij).	Ext. Malt (3 ss).	Malted Wheat (3 ss).
Water	gr. 3636.480	gr. 53.928	gr. 12.000
Alcohol	172.800	3.816	
Glucose and dextrine .	158.976	148.728	205.056
Nitrogenous substances.	2.026	7.464	14.280
Inorganic salts . . .	.706	2.784	3.536
Glycerine		22.248	(fat) .360
Lactic acid		3.816	
Grains	3970.988	242.784	235.232

The small amount of alcohol in the malt extract is due to the presence of the tincture of hops. The above is interesting, as showing that a glass of beer and a tablespoonful of the malt are practically of the same nutritive value as far as the sugar is concerned, while the tablespoonful of malted wheat or Liebig's food contains one-third as much again of sugar; but the two latter are superior to beer in nitrogenous substances, the malt containing more than three times as much, and the Liebig's food more than seven times as much; and they are also superior to beer in the inorganic salts, the malt having nearly four times as much, while the Liebig's food has nearly five times as much. Beer, of course, contains alcohol in addition.

⁴ *Précès théorique et prat. des subst. aliment.*
⁵ *Leeds, Phila. Med. News, July 21, 1883.*

The superiority of the Liebig's food in nitrogenous substances and minerals makes it preferable to malt, if the diastatic power of the latter is to be disregarded, by taking it directly into the stomach.

By way of summary, it may be said that although malt by reason of its contained diastase is able to convert starch into sugar in a watery medium at the temperature of the body, it has no power over starch in the living stomach, owing to the presence of the gastric juice. Administered directly by the mouth, therefore, it is of use only on account of its contained nutriment, and is inferior in the amount of nitrogenous and inorganic principles to a food formed by the action of diastase on wheat, that is to say, to Liebig's food.

REPORT ON PROGRESS IN THERAPEUTICS.¹

BY FRANCIS H. WILLIAMS, M.D.

NAPHTHALIN.

Naphthalin seems to be of special value as an intestinal antiseptic or germicide — being so sparingly soluble that much of it remains to act upon the intestines and their contents from the stomach to the rectum. Rossbach advises it in intestinal catarrh. Borelius reports cases of typhoid in which it seemed to relieve the abdominal symptoms. Its value is especially urged by Dr. L. Emmet Holt,¹⁷ in a paper on the "Antiseptic Treatment of Summer Diarrhœa." His conclusions are: That summer diarrhœa has many remote causes, but the single immediate cause is putrefactive changes taking place in undigested food in the stomach and bowels, the products of these changes acting either as systemic poisons or locally irritating agents, causing catarrhal and inflammatory conditions in the intestines. The diarrhœa is, at the outset at least, salutary, and the use of astringents and opium is not only useless, but, in the beginning especially, may do positive harm by checking peristalsis and increasing decomposition. (Opium in many other forms of diarrhœa he regards of value.)

The indications to be fulfilled are: (1) Clear the bowels; (2) stop decomposition; (3) restore healthy action; (4) treat consequential lesions. To meet the first he recommends castor oil, the second, salicylate of sodium or naphthalin, the third and fourth, if present, call for various measures, but in the majority of cases castor oil and salicylate of sodium or naphthalin were alone necessary. He gives statistics of 300 cases treated by the old routine of opium and astringents preceded by castor oil, resulting in 50% cured, 27% improved; also of 81 cases treated during the past year with castor oil and salicylate of sodium, resulting in 84% cured, 7% improved; and of 44 cases treated with castor-oil and naphthalin, 67% were cured and 15% improved. Resorcin gave only 55% cured, 22% improved. He says of naphthalin, it is of latest introduction and seems likely to prove of very great value, perhaps the most valuable of all. He also reports seven cases of chronic dysentery and twenty-one cases of chronic diarrhœa, treated by naphthalin *alone*, with uniformly good results. Concerning the dose and administration: it may be given in powder, mixed with sugar and taken in wafers or cap-

sules, the taste is not bad, but very persistent and strongly suggestive of tar.

In summer diarrhœa of children, he used from two to six grains, according to the age, (when he used salicylate of sodium he gave one to three grains) every two hours. If the child were not on the breast he withheld milk entirely, and with vomiting he withheld all food for twelve to twenty-four hours. In chronic diarrhœa, dysentery and typhoid he used large doses of naphthalin, sixty to ninety grains daily.

One point in regard to naphthalin requires investigation before its extensive use can be with perfect safety recommended. A note in the *Vienna Zeitschrift des Oesterreichs Apotheker Vereins*, 1887, xli, p. 38, states that in the Paris Academy of Medicine, Prof. Bouchard reported that animals to whom naphthalin was administered internally developed beginning cataract within twenty days or less, generally in both eyes simultaneously, and that the cataract process thus begun did not stop with discontinuance of the drug. The theory was advanced that the affinity of naphthalin for sulphur affected the globulin of the lens.¹⁸ Doubtless the doses used were, for the animal, excessive, and very likely have no important bearing against the therapeutic use of the drug. Certainly no untoward effects are reported from its clinical use, except dark-colored urine and a single case of dysuria from large doses.

RESORCIN.

This drug is favorably reported in the treatment of cutaneous and gastric disorders. Dr. Edward MacLay¹⁹ claims for it the antiseptic properties of carbolic acid without the irritant properties of that substance. A two per cent. solution is antiseptic, and irritating to the tissues. It seems to possess special advantages in the treatment of gastric and cutaneous disorders. Dr. MacLay reports two cases of gastric ulcer with immediate recovery under its use. In gastric catarrh not relieved by bismuth, soda, etc., recovery followed at once under treatment with resorcin. Intestinal catarrhs, chronic diarrhœa, etc., were in no way benefited by resorcin, nor were the evacuations disinfected, constituting a marked contrast to the action of naphthalin, and suggesting a special field of action for each of these two drugs; naphthalin for intestinal disorders or wherever it is desirable to disinfect the intestinal canal or render antiseptic its contents; resorcin for the same purpose in the stomach and externally on sensitive tissues. Internally Dr. MacLay employs five-grain doses of resorcin three times a day, given in water with a little glycerine, or in chloroform-water. The taste is peculiar, but slight, and easily tolerated. Much larger doses have been employed, but are not advisable, thirty grains having caused febrile disturbance, and sixty grains marked toxic action, dizziness and collapse.

CORROSIVE SUBLIMATE.

The use of corrosive sublimate as an antiseptic has been on the accepted ground that in the weak solutions employed, while destructive to germs it is not dangerous to the patient. Some recent observations and cases would suggest considerable caution, at least, in its use. Fleischmann, of Prague, reports a fatal case of acute poisoning in a healthy primipara, from

¹ Concluded from page 333.

¹⁷ Medical Record, January 15, 1887. *Therap. Gaz.*, February, 1887, 108, March, 1887, 184.

¹⁸ Australian Med. Gaz., April, 1887, 165.

¹⁹ Lond. Med. Record, September 4, 1886. *Therap. Gaz.*, 1886, 761.