sufficiently clear the relation of the nervous system to the gastric and renal lesions involved in functional innutrition and convince us of the existence of a neuro-alimentary dyscrasia as the basic element in the malady. The pathologic showings, such as we have, of the importance of the duodenum as a functional center for those metabolic changes by which saccharine matter is derived, intimate the relation of the "second stomach" to the etiologic factors in diabetes. Dr. J. M. Allen, in a paper before the Association, in 1899, reviewed the symptoms, and pathologic evidences in twenty-six cases, and arrived at the conclusion that it is the duodenum in which chiefly occur the lesions that are causative of the dreaded malady. Taking into consideration the origin and distribution of the par vagum and the connection of the duodenum with the sympathetic centers, he is inclined to regard "peripheral irritation as the more probable factor in the disturbance of the glycogenic function. Brown-Séquard and others have well established the fact that reflex irritation is sufficient to arrest and prevent secretion, and, if continued long enough, to produce structural change of tissue."

TREATMENT.

In the detail of treatment founded upon these conclusions, he advises the taking of such foods only as can be digested in the stomach, thus allowing the duodenum to rest, and preventing congestion. For the control of reflex irritation morphin or chloroform three times a day is advised. The principle in view is not deprivation of the carbohydrates in the food given, for the sake of avoiding the excessive secretion of sugar, but to supply the diabetic with ample nutritive material, and at the same time afford the nidus of functional derangement the quiet essential to recovery of normal condition. The use, then, of codeia by the older physicians is seen to have a physiologic foundation, and, with our better comprehension of the procedure of digestion, we should be enabled to combine the principle of rest with the principle of appropriate feeding in treating diabetes and allied maladies more successfully.

Reviewing the points involved in the field I have traversed with such brevity, is it not clear that one factor in the vital economy of the human constitution has been much neglected, viz., the relation of the nervous system to digestion? Is it not a matter of oversight that heredity may be a causative factor of diabetes, or that a gouty diathesis has a relationship to its existence, or that there is a possible connection between it and a disordered pancreas, as Von Mering and Lepire appear to insist? Nevertheless, the chief objective in the management of diabetes is to bring about a better nutritive condition, an improved constitutional feeling, a more cheerful view of one's personal relations to life.

On this account have we not resorted to methods in treating dyspeptic cases that were either quite unnecessary or contributory to greater disturbance of the alimentary organism? Instead of inducing calm have we not considered it necessary to give excitants and stimulants to arouse the weak and atonic stomach, when what was really required by its nervous apparatus was rest? After all our generalizations we have not fathomed the mysteries of nutrition, and the fact remains that nature in the recesses of subconscious activity can better manage the procedure of tissue building and repair than we can with all the wonderful array of tonics, emulsions and extractions. If it be rational to "give the devil his due," it should be more reasonable to give the gastro-

intestinal system credit for capacity to do its own work, and not hastily or deliberately interpose obstacles to hamper or prevent its effort to serve us.

DISCUSSION.

DR. WINFIELD S. HALL, Chicago—I believe the recommendations of Dr. Drayton are in line with a general movement in the medical profession, namely, that of a very much less degree of medical interference and of giving Nature a chance. I am heartily in sympathy with his views regarding the giving of digested and partly digested foods. I believe the custom has the same deleterious effect upon the alimentary canal as that of putting an arm into a sling and expecting its muscles to develop. We can not develop the secretory glands if we furnish for them the substances which they ought to be allowed to secrete for themselves.

DR. H. S. DRAYTON, in reply—We are organized naturally to want those stuffs which we deem foods. We have different degrees of appetite, and it is impossible for anyone to determine the exact amount of food which should be placed within the stomach of an individual. Experiments have been made by many biologists without special result in this regard. We remember the case of a distinguished professor, Dr. Oliver Wendell Holmes. He lived for many years by rule. He did not reach the age of a centenarian, though he died an old man, to be sure, probably attaining the good age because of his method. We see men living beyond the period of Oliver Wendell Holmes who give little thought to the quantity of food that they should eat. If we look over the array of old men in this country we would find that the majority belong to the class who are indifferent as to the quality and quantity of food which they take from day to day, and certainly quite indifferent to the scientific relations of their food.

LIVING ON BREAD.*

ALEXANDER HAIG, M.A., M.D. OXON., F.R.C.P. LOND.

Author of "Uric Acid as a Factor in the Causation of Disease."

LONDON, ENG.

There are several forms of the uric acid free diet as I have elsewhere mentioned,¹ such as: 1, that which consists of milk, cheese, potatoes and fruit, and contains no bread; 2, that which contains these things with more or less bread and breadstuffs, and 3, the form with which I am concerned to-day, in which bread and breadstuffs form the chief sources of nourishment and a small quantity of fruit and vegetables are taken merely as sauces for the bread.

For the sake of comparison I shall give the approximate quantities required in each of these diets for a man of 140 pounds weight, who is supposed to be young and leading an active life, and therefore requiring a rather full diet, one that will yield 3.3 grs. of urea per pound of body weight per day.

The milk, cheese, potato and fruit diet for this man would be about:

	Per cent. albumin.	Albumin.
2½ oz. cheese	containing 33	= 350 grs.
3 pints milk,	" 3	= 787 "
15 oz. potatoes,	" 2	= 126 "
16 oz. fruit,	" 2	= 137 "

Total 1400 grs.

We see at once that this is a diet containing a large amount of fluid, and that nearly all the nourishment is obtained from the milk and cheese.

The mixed diet might be:

* Read at the Fifty-second Annual Meeting of the American Medical Association in the Section on Physiology and Dietetics, and approved for publication by the Executive Committee.

1. "Diet and Food," J. & A. Churchill, London, 3d Ed., 1901.

	Per cent. albumin.	Albumin.
10 oz. bread,	containing 8	= 340 grs.
2 oz. oatmeal,	" 12	= 104 "
2 pints milk,	" 3	= 525 "
1½ oz. cheese,	" 33	= 210 "
1 oz. nuts,	" 16	= 68 "
18 oz. fruit and vegetables	" 2	= 153 "

Total 1400 grs.

And lastly the diet with which I am now specially concerned might be for the same man:

	Per cent. albumin.	Albumin.
11 oz. bread,	containing 8	= 340 grs.
12 oz. biscuit,	" 10	= 516 "
2 oz. rice,	" 5	= 43 "
4 oz. macaroni,	" 11	= 188 "
4 oz. oatmeal,	" 12	= 208 "
5 oz. potatoes,	" 2	= 39 "
4 oz. fruits,	" 2	= 32 "
Butter and oil <i>ad lib.</i>		

Total 1400 grs.

The bread may be taken chiefly as toast, or, like the rice and macaroni, it may be made into pudding.

A biscuit may be eaten after the meals, simply carried in the pocket and eaten between times, when there is an appetite. This is one of the points with regard to such a diet, that toast biscuits and similar breadstuffs can be eaten almost all day long without strict attention to meal times; they can be added after the meal is over or before the next meal is begun, in a way and to an extent that milk and cheese could not be used, without causing severe dyspepsia.

The oatmeal may be taken as porridge twice a day, and it should be thoroughly well cooked, not ten minutes or twenty minutes, but it should be placed in a double kettle and left on the fire or by the side of it all day. The same is true of rice and macaroni; they can not be too well cooked.

The porridge may be mixed with a liberal allowance of butter and some salt, though others may prefer sugar. The rice may be eaten with olive oil and salt, or with fruit or jam. The potatoes may be mixed with oil or butter and eaten with the bread, biscuits and cereals; or other vegetables in season may be substituted for them and used in the same way. The fruit may be taken with the bread and cereals, either raw or cooked, or as jam, or in puddings.

No doubt there are many who can not at once take as much bread and breadstuffs as are here given, and I myself, when a meat eater, used to be a great meat eater, and rarely took more than three or four ounces of breadstuffs in a day. But the habit of eating larger quantities can be gradually acquired, and I myself can now manage sixteen ounces a day without difficulty.

Those who can not take the above quantities of bread and cereal foods must take a little milk and cheese, say: one ounce cheese, 33 per cent. or 140 grains albumin; one pint milk, 3 per cent. or 262 grains albumin, a total of 402 grains, and then take sufficient cereal foods to supply 1000 grains of albumin.

Though I can not do it myself, there are some who can live on the above breadstuff diet, which, of course, can be modified by substituting other cereals in ways I have no space to mention, and my experience seems to show that those who do live on such a diet, or even on its modified form, with a little milk and cheese, gain several important advantages. First of all, many people are unable to take much milk and cheese, partly because they do not like them, partly because they fail to digest

them; while bread is a much more important article of diet all the world over. It is more generally eaten and to a larger extent than any animal food, and it is only in a comparatively small part of certain countries, chiefly in Europe and America, where the diet has come to consist almost entirely of flesh, that bread has come to be but little used. It has long appeared to me that this which is pre-eminently the food of man is deserving of study and attention.

Then milk and cheese, if taken beyond quite small quantities, may undoubtedly cause constipation and pale, powdery evacuations, which are so hard as to increase the discomforts of piles, from which meat eaters so often suffer, and even to tear the mucous membrane at the anal orifice. Milk especially, under the conditions which attend its distribution in large towns, is a vehicle for many diseases, and to be rendered even moderately safe must be boiled or sterilized. Again, milk in any quantity, as when two to three pints per day are taken, may cause dyspepsia from a mere excess of fluid; this tends to dilate the stomach, it dilutes the gastric and intestinal juices, and the result is that fermentation and dyspepsia may take the place of digestion.

Similar unfortunate results are produced by the silly practice of putting in uric acid containing foods with one hand, and trying with the other to wash out the excess of this substance by copious libations of fluid far in excess of thirst and its demands. As I have for years been pointing out, it is far better to leave the uric acid outside the body, and then there will be no need to dilate the stomach—as the Germans are said to do with excess of beer—or gorge the blood vessels and even dilate the heart with fluids for which there is no necessity, and which are, after all, of but very little use in eliminating uric acid.

So far as I know there is but one rule: Eat when you are hungry and drink when you are thirsty; and if you go beyond this you are certain to suffer; but to introduce unnecessary uric acid and then to try to wash it out with unnecessary water is to pile suffering upon suffering, even to the destruction of life itself.

Similarly in disease, as in the high blood pressure conditions from which flesh eaters and tea drinkers so frequently suffer, it is little short of insane to pour in fluids in excess of the demands of thirst. Look at these poor sufferers, how they improve on a drug that frees the capillaries and lowers blood pressure and allows of a diuresis; see how they improve further on a purge of calomel and colocynth that sweeps out a few pints of fluid from the intestines. And yet the very people who have watched this improvement may go on in thoughtless routine to pour into the patient hour after hour ounces of fluid in excess of the requirements of the body, far in excess of thirst, for in such cases there is often none, with the result that they dilate the stomach, gorge the vessels and increase the dilatation of the heart, which it was their object to diminish.

The great advantage of the bread diet in certain conditions of dyspepsia, and especially in conditions of high blood pressure, morbus cordis, and dilated heart, is that it is a dry diet; that the fluid taken can be reduced to one and one-half pints or even one pint in twenty-four hours, till nature asks for more by making the patient thirsty, and then alone can we be sure that we are not giving too much. The great point in the taking of breadstuffs and that which prevents them from causing dyspepsia, is their thorough and complete mixing with the saliva in the mouth; and this is greatly facilitated by taking them in a dry state except for a little butter. And

for this reason dry breadstuffs, as toasted bread, biscuits, rusks, into which the saliva can penetrate easily, are much more readily and certainly digested than such things as new bread, bread and milk, porridges or milky puddings, into which the saliva can only get slowly and with difficulty and after more or less dilution with other fluids.

There are some people who can take breadstuffs in any of these conditions and digest them without difficulty or dyspepsia, but those who do suffer should remember to take them only in that condition in which complete mixing with the saliva is possible and easy; dry breadstuffs can generally be taken by every one and eaten at irregular hours and between meals without dyspepsia. Even the possession of teeth is not necessary, for if dry breadstuffs are well sucked, they become completely mixed with saliva and softened by the aid of the tongue and gums. So that those whose teeth have been ruined by the fibers of meat and fish, for which nature never intended them, can continue to live on a breadstuff diet even without any teeth at all.

There is one other advantage of breadstuffs which I have also mentioned elsewhere, namely, their relatively slow digestion and metabolism, in virtue of which they give a steady supply of force and urea over a number of hours, thus accounting at least in part for the great powers of endurance shown by the animals that live on them.

And now I give a figure to illustrate one or two points with regard to this. It shows the hourly excretion of urea in grains on two days, which are placed on the same

Fig. 1.—Urea in grs. per hour.

paper for purposes of comparison. The curve AA shows the effect on the hourly excretion of urea of taking half a pint of milk at 8:30 a. m., no food or drink having been taken since the previous night. The curve BB shows the effect of taking at the same hour a nearly equivalent meal of albumins in the form of toast and biscuits with some water. The broken line CD shows the probable fall of urea if no food had been taken at 8:30, and is a continuation of the fall which was taking place from 7:30 to 8:30 as shown in the line BC.

The position of urea at 8:30 on these two mornings differed by some two grains, and the fall in urea that was taking place or that would have taken place if no food had been continued probably differed also. The absolute effect of the albumins taken as bread is the difference between the lines CD and CB, and the absolute effect of those taken as milk is the difference between AA and a relatively similar fall to that in CD. The object for which the figure is given is to draw attention to the fact that 130 grains of albumin taken as milk at 8:30 a. m. produce a much more rapid rise in the formation and excretion of urea than a similar

quantity of albumins taken as toast and biscuit, and that the rapid rise is followed by a rapid fall. It also shows that the albumins and force from milk are largely worked off in the first two hours after it is taken, while those from breadstuffs are spread over a longer period; the rise is slower and continued longer.

As I have elsewhere said, those who get their albumins from milk are in the position of a motor supplied with a quick burning oil which gives out great force for the first two hours, but is sooner at the end of its resources, while those who get albumins from breadstuffs can not produce so much force in the first two hours, but will be able to go on longer.

This is a part of the physiology that lies behind the superior powers of endurance shown by grain-eating animals; for, as I have for some years been pointing out,² strength and power rise with rising urea, and fall with falling urea, and, in fact, are in all conditions proportional to urea; so that the collapse that follows on severe dyspepsia or shock, is little more than the suspension of absorption of albumins from the stomach, with the consequent suspension of the formation of force and urea. The digestion and metabolism of flesh much resembles that of milk, hence the lion and tiger can give out enormous force over a relatively short period of time, while the elephant, the bull or the horse can outlast them, and perhaps produce even more absolute force in a longer period.

This is probably what patients mean when they say—and it is, I think, a common experience—that a meal of breadstuffs lasts longer than a meal of meat; for with falling urea and diminished force production, the need for more albumins is felt as hunger. This may come after a meal of milk or flesh, say in three hours, but after a meal of similar albumin value in the breadstuffs, not for four hours.

Breadstuffs form a very convenient diet for those who are moving about the world, for they can be obtained almost anywhere, while milk and cheese it is often difficult or impossible to get. Breadstuffs also can, if necessary, be conveniently carried in the form of grain, meal, rice, macaroni or biscuits.

These cereals have been the foods of mankind in the past, and they are still the foods of the great majority, and only in parts of a few countries where flesh eating has been carried to great excess, have they fallen somewhat into the background. But here, as elsewhere, the majority are right, and the minority pay an enormous price for their unnatural but stimulating food. Among the flesh eaters, disease and death are rampant, the natural term of human life is but rarely attained, and even the shortened life is too often rendered both useless and miserable.

Let any one who might at first sight be disposed to doubt this statement observe for himself how many meat eaters and tea drinkers between the ages of 17 and 23 have normal blood, not merely normal as compared with a standard fixed by meat eaters, but normal as compared with that of those of the same age who have never touched meats. Let him observe how many flesh-eaters from the age of 45 onwards have either normal blood or normal circulation, and do not suffer either from dyspepsia, depression and insomnia on the one hand, or from arthritis, lumbago, sciatica or bronchitis on the other—not to mention Bright's disease and diabetes.

DISCUSSION.

DR. WINFIELD S. HALL, Chicago—I believe that one could

2. "Diet and Food," Ed. 1, 1898, Ch. 1.

scarcely have kept track of the rapidly growing literature of this question of the influence of the metabolism of nitrogenous food upon the general nutrition without being impressed with the effect that in the vast majority of cases in England and America the general custom is to take too much nitrogenous food—too much meat. It seems to me that there are two rather antagonistic positions taken in Dr. Haig's paper. I can not reconcile his statement concerning the perfect parallelism of nitrogenous ingesta and egesta with varying muscular force and work capacity, with his insistence upon a bread diet. Bread diet is largely a carbonaceous food and has to be taken in very considerable quantities to get a sufficient amount of albumin. The muscular power varies largely with the oxid of the carbonaceous rather than of the nitrogenous element. The nitrogenous element is, I consider, absolutely essential up to a certain amount. After that it is excreted or oxidized day by day, so that the nitrogenous excreta after a certain minimum is going to vary with the nitrogenous ingesta. This maintains the nitrogenous equilibrium. I have read nearly all that Dr. Haig has written, and am in sympathy in general with his opinions. I wish sincerely that he were here, for I believe he would clear up this which seems to be an ambiguity in his presentation of the subject.

DR. DAVID PAULSON, Chicago—It is surprising how little attention the medical profession gives to the subject of practical dietetics. We have been so busy studying pathology and surgery that we have but little time to give to dietetics, the very neglect of which is causing so much material for pathological study. Something which Dr. Haig wrote several years ago led me to undertake some experiments to determine whether or not the quantities set down in the ordinary text-books were not in excess of the real amount required by the human system. I, therefore, selected ten medical students and had them weigh the exact amount of fully toasted bread consumed each day for two weeks. The majority of this class of ten students were young men and women who were working their way through medical college. The average amount consumed was 16 ounces a day of nearly water-dry bread. Every member of the class gained in weight, some as much as three pounds on 16 ounces of bread a day. A second experiment was undertaken upon nearly 300 healthy young people, and it was found that they consumed on the average 16 ounces of starch, 2.8 ounces nitrogenous food, and 1.5 ounces of fat; this investigation was continued for several weeks. It may be fairly assumed that this is not far from the normal proportions, as these young people selected the food for themselves from an extensive bill of fare. Their weight was taken at the end of each week, and the entire experiment was conducted with the most careful and scientific accuracy by the Battle Creek Sanitarium Laboratory of Hygiene. It was shown from this that the figures set down by Pettenkofer and others are entirely too large for us to follow, in this country at least, and, secondly, that we normally use a larger amount of carbonaceous food than has been generally supposed. One part nitrogenous to four parts carbonaceous, as has been suggested by some, is certainly altogether too high. This tends to overstock the system with nitrogenous food elements and tends to produce the uric acid diathesis. I do not agree with all Dr. Haig's conclusions, yet I do believe that the medical profession is greatly indebted to him for the valuable researches that he has made in dietetic lines. I have been interested in noticing the power of endurance possessed by persons who live on a uric-acid-free diet. It has been my fortune to study some of the leading long distance runners, etc., and a number of the most successful of them live upon an entirely non-flesh dietary. The long-distance bicyclist, Nelson, is, I believe, a vegetarian. In these long distance races the flesh-eaters will generally lead for a short time, but the non-flesh eaters will almost invariably out-distance them, and get off their bicycles as though they had had no special exertion, while the others often have to be assisted. Another cyclist who a few years ago made a large number of successful long-distance records used no meat, nor tea, nor coffee. He stated to me that when he started out on short-distance runs the meat-eaters could out-distance him, but when they had reached the last ten or fifteen miles they would be nearly used up, while he would be almost as fresh

as when he had ridden only fifteen or twenty miles. I have been much interested in metabolism of nitrogens, and believe that there is much more to this subject than we now see. I hope we shall soon acquire more definite and satisfactory knowledge in this direction.

DR. JAMES PUTNEY, Charleston, W. Va.—It seems to me as if Dr. Haig were seeking to secure recognition of facts which physiologists have recognized for some time. The average of nitrogenous food is given as 100 grams per day. In the interesting account which Dr. Paulson has given us we see that the students live upon 16 ounces of bread per day, about 2 ounces of nitrogenous material. This is not so much out of the way so far as statistics go. It seems to me, too, that Dr. Haig is taking a one-sided view in his remarks about uric acid results. It is well recognized to-day that there are two classes of uric acid cases—cases of dietetic-origin, and cases of tissue destruction origin. I question whether the larger class is not the latter. It is true that we find among those people whose muscular exercise is deficient a tendency to ingest excessive quantities of food. This gives rise to the assumption that disorders of the nitrogenous metabolism are due to that fact. It should also be remembered that there is an equality in the gastric function. Nothing is better recognized to-day than the fact of the breaking down of the leucocytes attended with the development of uric acid. This indicates the distinction between those cases of nitrogenous disorders of metabolism traceable to the short cut, which the nitrogenous elements of food in excess take and the long course which the nitrogenous metabolism of tissues involves. As an illustrated case on this I want to submit the following: Mr. G., 59 years, full habits, temperate, good history, when he partook of full meat diet suffered most intense headaches and would be in bed for a day or so. With meat diet cut off, he would not have attacks until he returned to meat diet again.

THE CHAIRMAN, DR. CHARLES M. HAZEN, Richmond, Va.—I fancy Dr. Haig wishes most of all to insist upon a vegetable source of albumin, so as to get rid of ready-formed uric acid and other waste nitrogenous matter. In a recent monograph by Dr. Mallet, of the University of Virginia, it is shown conclusively that such products as kreatin and kreatinin whenever present in meats simply load up the system with proteid material of no value whatever. The point was touched upon in our discussion of the last paper in connection with food products from animals, in which it was stated that exhausted beef could not furnish proteids suitable for food.

METAMORPHOPSIA VARIANS.*

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It is possible in presenting this subject that the writer is simply going over ground that has been well covered before; though, with the endeavor to find some reference to it during the past five years, I have left no opportunity unimproved to do so, and yet without success. In fact, the subject of metamorphopsia, except that caused by the correction of astigmatism, has received but very little attention by any writer on ophthalmology to whose works I have had access; and if the cases of this variety are as uncommon as I am led to believe, the following may prove of some interest.

On June 6, 1896, while examining C. F., aged 45, for his refraction, and when obtaining his best vision with his right eye, he remarked that it was difficult to make out the line—the 30-foot line—on account of the rapid movement of the letters. He stated that they would approach each other, and again separate quite rapidly, and that the different letters of the line were continually moving up and down in an extremely irregular manner,

* Read at the Fifty-second Annual Meeting of the American Medical Association, in the Section on Ophthalmology, and approved for publication by the Executive Committee of the Section: Drs. J. A. Lippincott, Casey A. Wood and H. V. Würdemann.