DIETETICS

A Lecture to Medical Juniors and Sophomores, January 5, 1906, 12:30 P. M., Room 15, College Building, by J. H. Kellogg, M. D.

I thought the best thing for you today was to give you some of the words of Chittenden. You have not got time to go through this volume and pick out the summary, but I have done it because I have had to have it. We want to know the very latest things, so I am going to tell you just what he says.

Chittenden selected soldiers, professional men, and athletes. That covers, you see, the three great classes of people. The soldiers represent the average healthy man who is supposed to be a thoroughly sound, healthy man. The professional men represent the sedentary class of men, the editor, etc., the deteriorated men, if you please; and the athletes represent the men who are supposed to stand at the top physically, who are in just as fine physical condition as they could be gotten by the methods which they were pursuing; they were in the very pink of condition.

Here are his experiments with the professional men. He begins by giving an account of himself, tells everything he ate every day, just the quantity of foodstuffs of all sorts, and I will read to you his report of a sample meal so you will see what he ate: Coffee 147 grams, cream 26 grams, sugar, 30, baked potato 38. The total amount of nitrogen was six grams. Knowing the nitrogen to be six grams, how do you find out the amount of proteids?--Multiply by 6 1/4. He uses that

factor, 6 1/4, so if you use that factor, multiply the six by 6 1/4 that would be 37 1/2, so that is about an ounce and a quarter of protoid, wasn't it. Under this arrangement the urin contained 5.9 grams of nitrogen; so there was just a tenth of a gram more; there was a balance of one-tenth of a gram. He took in six grams; and he eliminated through the urin one-tenth of a gram less.

Well, his bills of fare run along about that way. Some days he took five grams of nitrogen, and some days seven, and the elimination of the urin was always a little less.

I will give you the summing up of his results. During the balance of the period he occasionally took a week in which he examined also the fecal matters for a week so as to get the absolute balance, and here is the report. "During the balance of the period the average daily intake of nitrogen was only 5.8 grams," or about an ounce and a quarter of protoids. "The average daily fuel value was only 1549 Calories"--just about half what most people are eating. The average daily out put of nitrogen was five grams. 4.09 corresponding to the metabolism of thirty grams of protoid food; hence the results confirmed the balance of the previous period, making it quite clear that this subject, with a body weight of 57.5 kilos, would be maintained in that equilibrium, a nitrogen equilibrium on a dailydiet containing only 5.8 grams of nitrogen, or one ounce and a quarter, 36.6 grams, or a fuel value of 1600 Calories. That is a thing to remember. Prof. Chittenden, weighing 105 lbs. sustained his weight and nitrogen balance on a diet of an ounce and a quarter of protoids, a total food value of 1600 Calories.

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Calories. He was working hard. He is director of the scientific department of Yale University, had extremely hard work to do; he was looking after all the soldiers, and the whole business in addition to his regular work, so he had plenty to do. Under these conditions the daily amount of nitrogen metabolized was very small, averaging only five grams. Compare this figure with the average accepted standard of 16 grams of nitrogen,-- 5 grams compared with 16 grams, which is the standard, and we see quite clearly the extent of the physiologic economy which is attainable by the body, and emphasizes the extent of unnecessary and worse than useless labor put upon the body by the prevalent dietetic habits of the majority of mankind. He was able to maintain his body weight and his nitrogen balance on an equilibrium, a nitrogen equilibrium on a diet of 5 grams of proteid, or rather of nitrogen, instead of 16 grams. Let us see how much proteid that would be. 31.5 grams instead of 16 which would be just 100 grams of proteid; 5 grams of nitrogen instead of 16 grams. He was able to maintain his body weight and nitrogen balance or equilibrium on a diet in which he metabolized 31.5, or we may say about an ounce and one sixth, about 1 1/6 ounces of proteid. When you compare this with the ordinary standard requiring 100 grams of proteid to be metabolized daily, which is claimed by standard authorities, we see at once the enormous amount of physiologic economy, that is the amount of labor which the body has been saved; for the amount of metabolism required to dispose of this food element was less than one-third of that which is required by the standard authorities, by the diet which is adopted by people

in general. Carbohydrates were not decreased in the same proportion, but it was diminished. There is not quite the same economy in all food elements.

1600 Calories was the amount. What is the total food requirement compared with the supposed-to-be standard authorities? What is the requirement of the stardard authorities in total Calories?--3000, a little over 3000, 3133, or an average of about 2 3200. What was the total number of Calories required by Chittenden?--1600. That is half the ordinary average of our food, isn't it? That is not the calculated amount, but half the average amount that people are found to be eating. These observers, German, Swedish, Italian, French, English observers, watched the people, observed how much they ate, took large companies of men of different classes of people, observed how much they ate, and put it down, and they found it to be on an average about 3200 Calories. Now, Prof. Chittenden cut his nitrogen down to one-third, his proteids down to one-third, to one-third the average amount, and he took the whole bill of fare and cut it right in two in the middle, so that he eats just one-half the total amount of food, and one-third the amount of proteids. And he maintained his weight and maintained his nitrogen balance and equilibrium. That ought to prove something. That is the result with the professional man. He says the physiologic economy is easily attainable, and it does not involve the adoption of vegetarianism. Of course it does not, because you see he ate meat. It is interesting to see what kind of meat he ate and how much. For instance, here is Sunday, June 26, here is what he ate. Coffee,

cream, sugar, roast lamb 5 grams. How much roast lamb would that be?--less than two ounces you see. About an ounce and three-quarters of roast lamb. How big a piece would that be? That is all he ate in all day in his three meals,--just an ounce and three-quarters. Of course he is not a vegetarian. Here is another day. Monday he ate 9 grams of roast lamb. How big a piece of roast lamb would that be?--Just enough so he could say he was not a vegetarian. His experiments were not made in the interests of vegetarianism. Creamed cod fish 8 or 9 grams. How much cod fish do you suppose there was in that? How many ounces would that be?--Three ounces of cod fish gravy, and how much cod fish was there in that?--Just enough so he could say he was eating corpses and was not living on an absolutely pure diet.

Here is another day, Saturday, I will read you everything he ate. Coffee, milk, sugar, bacon 9 grams, French potato, biscuit, butter, iced tea, ginger snaps, cream cheese, popovers, olives, oranges, crackers, and cottage pudding. How much meat did he eat that day?--9 grams of bacon. How much proteid was there in that bacon? There wasn't very much was there in that fat bacon? That would be about one-third of an ounce to start with, and about one-tenth of that was proteid; so you see he ate just meat enough so that he could say it was not a vegetarian experiment.

Here is another day: 10 grams of bacon and 3 or 4 of beefsteak. There was not a single day he ate any meat to speak of; but, as he says here, it does not involve the adoption of vegetarianism. You could not eat a pork chop, or a beefsteak

as it is supplied on the table, or could not eat roast beef, but just enough meat so you could say you took a taste of it, and still adopt the low proteid dietary.

"Physiological economy in nutrition is easily attainable and does not involve the adoption of vegetarianism. It doesn't mean, however, temperance and simplicity in diet, coupled with intelligent regulation, which, however, soon becomes a habit and eventually leads to a moderation in diet which fully satisfied all the cravings of appetite as completely as it suffices to maintain the body in equilibrium and in a general condition of health and vigor." That is splendid isn't it? I tell you this is splendid preaching. I don't know of any book that has been issued that I think will accomplish so much good, because this comes with the authority. Prof. Chittenden was awfully afraid he would be classed as a vegetarian, and he talked with Mr. Fletcher a great deal about it, said it would not do to let these vegetarians make capital out of these experiments. He was very much afraid I was going to lay hold of it and make use of him, and I am, and I am going to show up that his camivorous practice is purely a sham; that he eats meat just enough so that he could say he was not a vegetarian. So while he says here that the physiologic economy in nutrition is easily attainable and does not involve the adoption of vegetarianism, still it does involve the practice of vegetarianism. You have got to be practically a vegetarian. If you eat meat it is just enough to spoil your reputation,--that is all.

Now, he says, "Whether we are justified in saying that this figure"--that is about six grams of proteids a day,

about an ounce and a quarter of proteid a day, "Whether we are justified in saying that this figure represents the minimal proteid requirement of this particular individual is perhaps questionable, since the proteid or nitrogen requirement will of necessity vary somewhat with the amount of non-nitrogenous food consumed." He diminished the non-nitrogens as well as the nitrogen. It has been recognized for many years that the proteid requirement could be considerably diminished provided the non-nitrogenous was increased; but he did not increase the non-nitrogenous food; he did not increase the fat, as some did, but he actually lowered it. "Doubtless, the nitrogen metabolism could be reduced still lower by increasing the intake of non-nitrogenous food, but under the above conditions of life, following a plan of living both congenial and satisfactory, one that fully sufficed to keep the body in equilibrium and with the practice of a general physiological economy, we may say that the metabolism of 0.1 gram of nitrogen per kilo of body-weight was quite sufficient to meet all the requirements of the body." Suppose we see what that would be. 0.1 gram of per kilo of body-weight. How much is a kilo. 2.2 lbs. 0.1 gram is how much?--1 1/2 grains. So 1 1/2 grains for 2.2 lbs. would be how much for one pound? It would be practically 0.7 grain for a pound. How much would that be of proteid? Multiply bhat by six and one-quarter and you have 4.4 grains of proteid. We want to ascertain how much proteid per pound we are going to consume in a day.

I want to say to you I am not making my remarks here to offend any of you, but so as to wake you up so you will remember the thing we are getting at here. I want you to remem-

ber it because this is practical; this is a thing you make practical use of every day when you sit down to your breakfast or dinner; you want to have a practical knowledge of it.

This professor states he has found out that 0.1 gram of nitrogen per kilo per day is sufficient, 0.1 gram of proteid food for each kilo of body-weight is sufficient to mairtain the body in perfect health. Now we want to see how much that that corresponds to in grains and pounds, because we eat in pounds and grains rather than in kilos. A kilo is 2.2 lbs. A gram is 15.4 grains. 0.1 gram is 1 1/2 grains. Divide that by the number of kilos which that represents, to which that corresponds--the number of pounds. It is 1.5 grains for every 2.2 lbs. so divide by 2.2 and that will give us the number of grains per pound; and that is ab .7 grain of nitrogen for every pound of body weight. Multiply this by the factor 6.25 which is necessary to convert nitrogen into proteid--why is that?--Because because proteid, albumin, gluten, casein and these proteid foods contain about 16% of their weight in nitrogen; 16% of the weight is nitrogen, and 16 is 1/6-1/4 of 100; so multiply by 6.25 and it will give us the proteid. So we have 4.4 grains of proteid per pound of body-weight. So Prof. Chittenden has proven we can be maintained in perfect health, strength, vigor, and physiologic balance by eating 4.4 grains of proteid for each pound of body-weight. Then you can easily figure out, each one of you, just how much proteid you ought to eat; and I should advise you to do that thing, because there is the physiologic fact that has been established, and you know now how much to eat, and the great question that

has bothered us at all times has been to tell the patient how much to eat. I have never had any faith in these standards that have been adopted. The actual proof was that our helpers were eating as they wanted to eat, and were not eating as much as the standard requirement, so I knew there was something wrong; I tried it myself, and I could not possibly eat the standard bill of fare, and I could not get patients to eat it.

Some one wants to know if a man who had 20 lbs. of fat on his body would figure the factor for that fat. Of course, that fat is another man, and does not belong to him. He has that much of a burden that he is carrying around. Here is a man that ought to weigh 150 lbs. who weighs 300 lbs. He is simply carrying another 150 lb. man around on his back, and he should not be counted in. And still we must reckon something for this 150 lbs. of fat, because he has to be supplied with blood, and because that man's heat production, his temperature is likely to be a little higher, and his heat production must be equivalent to, must correspond to his skin area, and when heat production has taken place, a certain amount of proteid will be consumed. You could not say to subtract ~~m~~ 150 lbs. and then reckon on 150 lbs. for the actual man; you could not do that, because he consumes a certain amount of proteid in keeping that great mass of tissue alive. And it has to build in its other tissue besides fat; so I should say in that case, I would call that man possibly 200 lbs. instead of 300 lbs/ and base it on that.

Mr. Ruble here weighs 150 lbs. so he would require 660 grains you see. How many ounces would that be? Divide by 437.5, or 438, we will call it, and see what we have here.

We have almost exactly an ounce and a half. How much Protose would that be? Protose is about two-thirds water. All these proteids contain water. Beefsteak is about three-quarters water,--28% solid matter. This is dry proteid, you see, so we must multiply this according to the percentage of food we are taking. Suppose we are eating white of egg; that is only 1/8 solid matter, and 7 parts water, and if this is in the fom of white of egg we would have to multiply it by 8, and that would give 12 ounces of white of egg. Suppose it should be pure gluten biscuit, then how much would it be?--Just an ounce and a half. There is just about 1.2Q of its weight of starch in it, 5% of starch, possibly some other things sometimes as served at the table, so it would be perhaps an ounce and three-quarters. If it was protose you would multiply it by three. Protose is about 33 1/3% proteid. Multiply by three, so you would have 4 1/2 ounces of protose.

If you are going to eat bread, there is 4% to 7% in bread. We will say 6% for an average of proteid in bread. Here we have it--whole wheat bread, 12 Calories to the ounce, of proteids. Take off 1/5 of that and it will give you the percentage. That would be practically 10% if it is whole wheat bread that is extra good. I think it will average somewhere about 8%; that would be about 1/20, so when you get in bread the amount of proteid required, how many ounces of bread would you have to eat. It has about 1/12 its weight of proteid. How much bread would you take to get an ounce and a half of proteid?--18 ounces of bread. Then if one should eat 18 ounces of bread, he would get all the proteid required, and he

would come pretty nearly to getting all about everything else he needed except fat. That is, for one day.

Question: What are you going to do with your appetite?

Answer. Chittenden says you will get used to it. If you chew very thoroughly you won't mind it. I have for a couple of months been trying the experiment of going without breakfast, eating practically once a day. I never eat supper, and I have been eating once a day for the last three months. I have occasionally taken a very little breakfast, perhaps a piece of breakfast toast with a glass of apple-juice, or an couple of apples, or something of that sort, and I find really that I am getting around to where I don't want any breakfast, and it is repulsive, and I am not hungry at all for breakfast. I eat my dinner at one o'clock, and I am not hungry for supper, don't want any supper. I think I eat about 1200 or 1300 Calories, and I don't care for any more; I am sure I have sometimes over-eaten, and sometimes eaten as much as 1900 Calories, and that was more than I needed. Here is what Prof. Chittenden says: "With a daily consumption of say 40 grams of proteid food and sufficient non-nitrogenous food to yield 2000 calories, why should he load up his sytem each day with three times this amount of proteid food, with enough more fat and carbohydrate to yield 3000 plus calories?" What becomes of this surplus that you take? The soluble part may go into the blood, but a lot of it will not be digested at all; nature will refuse to digest it, so it will lie in the colon and decay. When one brings himself to the physiologic basis, he not only finds his mouth is sweeter and his breath sweeter, but his excretions

are all sweeter, because they are not loaded with these products of imperfect metaboliism; the urin is not loaded with toxins and ptomains and the great excess of nitrogen; the fecal matters even cease to be loathsome as they are with a person who has taker a great surplus of foodstuffs which rot in the colon and produce these loathsome, putrescent fecal matters such as those of the cat or dog. This is not a pleasant subject, but it is physiological and we have to talk about it. We must recognize both ends of the nutritive proces, and the residual end is an index to the whole thing. There is no question about that. When the residual end is physiologic in the human being, there is no reason why there should be anything more offensive than there is with the fecal matters of the deer or of the sheep, or of any other animal that lives in a physiological way. Dogs are carnivorous animals, but they have only become carnivorous by misfortune, and because they could not help themselves. There was a time when the lion and the dog were not carnivorous. They are simply animals that have been left in an unfortunate situation, being compelled to eat meat or starve to death. That is the way the lion became carnivorous. The lion was not made to eat flesh. The lion was made to eat green cocoanuts. His teeth were made to cut the thick husk of the cocoanut, and his long teeth were to help him in cracking the nuts, and I am sure that is correct, because I have seen a squirrel with his long teeth cracking a nut, gnawing a hole in the nut with his long teeth; and I have seen that same squirrel when he could not get nuts, trying to catch a bird. If he can not catch nuts to eat, he will eat birds.

He can not live on bark, or leaves, or grass. He must either eat nuts or food in which starch is practically digested, or else he must eat birds. Man is in the same condition. Man must either eat fruits, that is, take his food in its natural condition as he finds it in nature; but if the wild man can not have nuts or fruits, he is reduced to the necessity of eating meat; and the lion and the dog have never learned to cook, and because they could not cook, and because the nut crop failed, there was nothing for them to do but to eat anything else which they could get, which they could digest, and meat was the only thing. My dog Rick taught me that. I caught him one day cracking an English walnut, picking out the meat with his carnivorous teeth. I found what those teeth are for. They are tooth picks, or, rather, they are nut picks, teeth for picking nuts, and for tearing off the rough husks of the nuts which used to grow in great abundance, and the lions and all kinds of carnivorous animals lived on these nuts; but the great nut trees have disappeared, and the great pine trees that used to produce those great cones filled with luscious nuts have disappeared from the earth very largely. They used to tear down those great cones, tear them open with their so-called canine teeth, and live upon the pine nuts. I have proven this thing, for some years ago I gathered up in my barn, I constructed a little menagerie there, some animal houses, and gathered in all the different kinds of wild animals I could get hold of. I had a wolf, and I had raccoons, and I had foxes, and I got various other kinds of animals around in this park, and I got among other things hawks and eagles,--got hold of every kind of

carnivorous beast I could get access to, and I set to work to reform them, and reformed every one of them but the bald-headed eagle; he was an old sinner and would not reform. He would starve to death before he would eat the right sort of food.

E.J.Waggoner: The same principle is found in the carnivorous plants. The Venus Fly-Trap, living on the sandy barrens down in South Carolina, is compelled to eat flies in order to get nitrogen, but if the nitrogen is supplied from the soil, it does not eat flies. It only catches flies when it is nitrogen-starved.

J. H. Kellogg: That is what the lion and the dog and all the members of the cat family, the so-called carnivorous animals will do. The bear will never eat an animal unless it is very hungry. It will not attack a man in the woods when it can get honey or other things it can subsist upon to eat. The more you study that I think the more you will be persuaded it is right.

Prof. Irving Fisher of Yale is stopping with us now. Last evening he was saying to me, "Why is it aboriginal men are believed to be by all ethnologists, believed to have been carnivorous?" I said, "The argument that all primitive men, or that the first man ate meat does not seem to me any more consistent than that all animals originally ate meat." Mr. Ernest Thompson-Seton was here a few years ago, I thought it would be a good time to make a vegetarian of him. I took him up to my house with a great deal of enthusiasm, showed him all my vegetarian boys and girls, and I was very much horrified to see he was rather tired out by what I was saying to him about

the ethical side of vegetarianism, and he said, "O, I don't think it is any harm shooting and killing animals." I says, "You don't! Why they are so intelligent." "O," he said, "That is true, animals are intelligent just as men are intelligent; but why not shoot a man if you are hungry and can not get anythigg else to eat? I would not object. Of course, one thing is just the same as the other, I admit, but then we are naturally carnivorous; all animals were originally carnivorous." I said, "Pray tell me, if they were all carnivorous, why they did not exterminate one another. It would have been like the Kilkenny cats. It takes a whole sheep to make a day's rations for one lion, and that means 365 sheep every year for one lion; so if a lion eats 365 sheep in one year, in ten years, it would have eaten 3650 sheep; so it would hardly be possible that all animals should be carnivorous. The great majority of animals anyhow were originally vegetarian; had to be, because only a few could belong to the carnivorous society, don't you see. The few animals that are carnivorous are unfortunates. They have by force of circumstances been compelled to eat meat; and that is the way meat-eating came in among human beings. The Bible gives us a hint that Noah was given permission to eat meat after the flood. If we had the whole of that story, we probably would see a great deal more. We can read a great deal between the lines that we do not see there; but the fact is, there was no permission to eat meat until after the flood, and that leaves the strong inference that man was forbidden to eat meat before the flood, if not expressly forbidden, they felt they had no right to eat meat, so it was

necessary for the Lord to say to Noah that it was permissible for him to eat flesh food rather than to starve; and that permission was given to animals under the same circumstances, and no animal was ever created to eat another animal. I was very much disillusioned when I discovered Mr. Seton-Thompson's great love and sympathy for animals was on paper altogether; it was simply sympathy for sale. It was not a bona-fide thing. We have something better than that. The recent works of Funge on that subject are very interesting.

There is plenty of evidence that salt is just as unnatural as meat eating, and entirely unnecessary. I surprised Mr. Thompson-Seton very much when I proved to him my deer could not be induced to eat salt, but simply went right away from it, and would not touch it. He would not believe it until I demonstrated it to him. I gathered the deer all around a pan of salt in the midst of some apples, and they ate the apples, but the salt they would not touch. They had been brought up properly you see. A great many of our unnatural habits have been acquired.

In our new diet tables representing the foodstuffs as they are served on the table, you can see the amount of proteid exactly in the food as it is served at the Sanitarium and over at the Dormitory. It will be very easy for you to calculate the Calories. We will have care taken to have the food weighed, and we will have a list published showing the weights of the different foodstuffs. I think it would be a good plan for you to appoint a committee to look into that thing and investigate the weights of foods served; and it will be a good thing with reference to your meal tickets as well as in

relation to your calories. You want to know how many calories you are paying for, don't you see? You want to know whether you are getting your money's worth, and I would suggest that you have a committee appointed to investigate that thing and get out a list of foods as served at the Dormitory. Dr. Colver will take hold of that matter with you and get that straightened out so you can begin to make careful obsefvations on your nutrition. Get yourself balanced. After a little while you will know just where you are, and you will know by the food you are eating, you will learn how to balance your nutrition to your needs. I want to say to you it is worth everything to do that while you are young. Do not wait until you get old and your whole life has been modified by wrong nutrition. Just think of it,--all this surplus proteid waste matter floating around in your body and modifying your metabolism; it modifies your brain structure, your nerve structure, and modifies your muscle structure. Your whole body is being moulded by these poisons. Your whole body is receiving the stamp of these poisons. It is just as bad for a man to manufacture poisons in his own body as it is for him to take them into his body. It is just exactly as wrong for a man to overeat as it is to smoke. We haven't any right to hold ourselves up as being upright, and hygienic physically, you might say hygienic pharisees, in a certain sense,--we haven't any right to hold ourselves up above the rest of the people, and say, "How good we are! How pure a diet we are eating, and how very free and circumspect we are in all these matters of hygiene!" We have no right to do that when we are sitting down at the

table and filling our bodies up with material out of which poisons are just as certain to be made as if we were taking in the smoke of cigars. The poisons produced by the partial oxiddtion of proteids are just as deadly poisons as those found in a cigar. Isn't that so? You have had your course in physiologic chemistry, and don't you know it to be a fact that some of the poisons which result from the oxidation of proteids in the body are just as deadly as nicotin? Isn't that so? The poisons produced by the decomposition of undigested proteid in the colon and absorbed into the body,--those ptomains and toxins are deadly in even smaller proportions. They are the most deadly things known, these toxins that are formed by the decomposition of proteids; they are the most deadly things known to man. These are the poisons the savage dips the tip of his arrow in so when that arrow strikes a man he is certain to die. It is almost equal to prussic acid. So we are doing ourselves an irreparable damage when we go on all through youth and through life eating twice as much as we should, eating an unbalanced dietary, following a perverted appetite, not a normal appetite, but a perverted appetite. If we chew properly, eat properly, and educate ourselves, in a few weeks' time we find the instinct that has been buried up and lost sight of, that we have paid no attention to,--it will come back, and begin again to lead us and guide us in the way. There is a physiologic significance in that divine promise that must have been a comfort to you many times as it has been to me, "I will be a voice behind thee saying, This is the way." That voice is just as practical when it speaks to us in relation to

our diet as in relation to the matters of what we call conscience. This is a matter of conscience, and I hope you will take hold of it. I will supply every one of you with one of these little diet lists, and this makes the way easy before you; they have been prepared at the expense of great labor and trouble, and we have got it ready, and I think it is as nearly as perfect as it can be made; and by the aid of this you can bring your nutrition into harmony with your needs.

4.4 grains of proteid to each pound of your weight. If your weight is abnormal, you can easily see about how much abnormal it is by comparing it with the standards for your own height on the physical charts. The average person, I think, can take his weight as he finds it,--4.4 grains per pound, of proteid. Prof. Chittenden weighed 105 lbs., ate 1600 Calories in a day. Now let us see how many calories that would be per pound. That would be 15.25 calories per pound, for each pound of body-weight, and 4.4 grains of proteids. A food unit and a calory is just the same. Sometimes in our class work we use the British Thermal Unit, sometimes the calory. These food units we are using--we are using the calory altogether here; it is more convenient, but the food unit and the calory are the same. That is the reason why I put both terms together, so that everybody will know that a food unit and a calory will mean the same thing. The word "Calory" is a new word, and the

average patient is not supposed to go into all the depths of the subject, and I thought it would be more convenient on the whole to use Calory, because this term is one they will find in their books. ----------

V-2-7-5.

D I E T E T I C S .

Lecture by J. H. Kellogg, M. D., to A. M. M. C. Juniors and Sophomores, January 10, 1905.

Is the alimentary canal of man most nearly like those of frugivorous animals? It is identical with them. A recent writer who has been giving attention to the comparative study of men and apes, and particularly to their blood, takes the ground that man and apes are descended from the same ancestry; that the ape is an older type than man; that man is a more nearly evolved type, and that they belong to the same class; their blood is so nearly alike it is practically impossible to tell it apart.

Question: Do you believe that?

Ans. O, no; I don't believe man came from a monkey or a megatherium either. I don't believe man and the monkey had a common great-great-great-grandfather somewhere,--don't believe any such thing as that; but all the facts that are brought forward to prove evolution, all those things prove simply that there is a unity in the whole animal kingdom. It proves that there was one great Artist that painted all the pictures. That is all it proves. If you go into a picture gallery and you see here a picture, here another picture that seems to be like it only in cruder form; and here another that has some of the characteristics of the other, you do not say, "This picture came from that one; this changed from the second one here, and the fourth one grew out of that one." You say simply that there is a common artist; you see the marks of the same genius in all those pictures, and you say that the same

artist made all those pictures. That is what these theories that are brought forward to prove evolution prove--they prove nothing else but that. To try to prove that these animals have descended ffom one animal further back is entirely gratuitous. It has not even one leg to stand on. It is not a natural deduction from the facts. The natural deduction, the most reasonable and patent deduction from the facts is that there was one Creator, one Mind that created all these different forms of life. Does not that seem reasonable?

E.J.Waggoner: One of the last things Darwin wrote on evolution, in a manuscript left after his death was, "It may not be logical, but to my imagination it is more pleasant to conceive that animals all had one common ancestor."

Dr. Kellogg: Yes, but Darwin did not go quite so far as Henkel and other evolutionists. He said God made four animals at the start, and out of those four animals all of the rest have come. Darwin believed in four original types. Henkel went a little farther back, to but one, and that one was a little jelly drop,--the slime of the bottom of the ocean, and an animal produced from it by the electricity coming from the water. All that nonsense is looked upon as foolish at the present time.

Evolution is true; evolution is correct; there is no doubt that there is evolution going on in the world. We see that. Here is a bud; nothing but a little bud. By and by that bud evolves into a beautiful flower. Here is a little child. By and by that child evolves into a man. Here is a little bit of a single cell; that cell evolves into an animal after while. So evolution is the process by which the Creator

is continually at work; but these men see this process of evolution at work, and they xxx attribute too much to it. They make evolution the greater; whereas evolution is nothing but a method by which the Creator works; but they give to this evolutionary process which they see in operation the power to originate, to create, to do things which only a Creator can do. In other words, they make the instrument the operator. Now you see a knife cutting, and you say, "See how that knife cuts; that knife is performing a wonderful operation; what a skilful knife that is!" It is just as reasonable to say that as it is to say that evolution can make species, or that evolution can make animals, can make orders. Nothing of the sort. These questions are all germane to our subject.

Student: There have been forms that do not exist now, and there are forms now that did not exist before.

Dr. Kellogg. I don't know about that. I don't know; I think there are some things, of course, because there are new things developing all the while. God is still creating. He is always creating. Modifications are taking place all the while. There were never two human beings just alike; there were never two roses, two leaves, or two blades of grass that were just alike. You see a German family that comes from South Germany, comes here to this country, and when they come here you can look at them and you can tell where they came from; you know they came from the South of Germany by their physiognomy. Some of those children are ten or twelve years, old, and some are one or two years old when they come. The little ones grow xx up in this country, and you would think

they were born in America. Those who were ten or twelve, or fifteen or sixteen years old, retain all their lives some characteristics of the country they came from. The children's children are Americans, and you would never dream they came from Germany or any foreign land at all. It is just so with every country. The country modifies the physiognomy.

Student: I don't see the reason why it is not a good thing to eat some cellulose.

Dr. Kellogg: I have not said we should eat no cellulose. I said we should not eat coarse stuff for the purpose of loosening the bowels. The thing we should eat is our natural diet, and we should eat just as much cellulose as there is to be found in our natural foods. When we come to study our natural foods, fruits and nuts, we find in those fruits and nuts a certain small amount of cellulose; but the amount is really very small. When we go outside of those which are natural foods, and come to the green herbs, and other things of that sort, we find an enormous amount of cellulose, more than human beings were ever intended to eat.

Student: In the beginning it was commanded that man should eat fruit of the trees whose seed was in itself. Would ~~it~~ you think that would mean wheat or anything of that kind?

Dr. Kellogg: Yes, every tree bearing fruit in which is the seed thereof; also the herbs bearing seed. Yes, but it was not dry seed; it was soft. When we come to study the grains, we find that when the grain is in its unripened condition, before it has become dried; when it is mature but has not yet been dried,--for instance, corn in the ear, in which you

eat the green corn, the roasting ears, and the sweet corn in the ear in which we eat it sometimes; that is the natural way to eat it. It was never intended to be eaten in any other way. In the country in which man was first placed, the corn could grow and ripen every day of the year. He could have green corn every day of the year. In tropical countries at the present time the same condition exists. In all countries which are naturally hospitable to man, in which man can live in a reasonably natural condition, in all such countries you can raise corn, green corn, wheat, barley, rye, and all grains, and these can be eaten in the milk stage. Christ and his disciples going through the field, you remember, ate the corn in that condition. In that condition it is very different from the state in which we find it. Its natural hard, tough, woody envelope is intended to preserve it. It contains a considerable amount of sugar and dextrin; the starch, the saccharine elements especially, have not yet been converted into insoluble starch, but are in the form of dextrin and sugar. That is why sweet corn is sweet in the milk,stage, but is not sweet when it becomes ripe when it has but very little sweetness. After it becomes a little bit too old, you do not care for it.

I watched a monkey some time ago, eating a prune. I had a monkey, kept him for several years on purpose to study his habits. I got more information from that monkey than from all the books on dietetics I ever read. I learned more from that monkey than from any teacher I ever had, on the subject of diet; he taught me more. I noticed when that monkey ate raisins, or grapes, or apples, or prunes, or any other fruit,

he carefully separated the skins, and licked off with great care the inside of the skin, and rejected the skin. You never saw a monkey swallowing a prune skin. The monkey knows better. There is no food in that. So with the nuts. I have a frugivorous animal to be my example,--a very intelligent little creature--my bird, Dick, the white cockatoo. If you don't know him, I wish you might get acquainted with him. He will teach you a whole lot of things. He takes the greatest pains when he eats a prune, or a bite of apple, to remove all the edible part from the inside of the skin, but he not to swallow a bit of the skin. There is no food in it. The skin is there for protection. You might as well eat the cover of a fruit can, or the fruit can itself, as to eat the skin of the apple. The skin of the apple is to can the apple, to protect the apple, to preserve it until it comes to you. It is the paper in which the little morsel of food is done up. It is the dinner-basket, if you please. You eat the inside of the basket, but you don't eat the basket. So it is with the wheat. The bran is for the purpose of protecting and preserving the interior, and in the milk state the bran is not yet hard; the large quantity of cellulose has not yet been developed.

Now I am defending my thesis for the first time. I have not taken quite as strong ground as this before any class before; so I am glad to have you pick it to pieces. I have been experimenting upon it for a couple of years, studying it carefully, and thinking about it, and I have become more and more satisfied we have done our patients a great amount of harm in prescribing for them coarse food and rubbish which their stomachs could not digest. I am not going to say the man who

has the average good stomach can not eat these things with comparative impunity. Pennies, marbles and all sorts of things will pass along. I think I ought to say that one of my old colleagues, Dr. Kress, became impressed with this thing before I did, and he used to labor with me by the hour to get me to prohibit everybody from swallowing seeds of any kind, and I remember I used to ridicule him. I said, "Doctor, imagine yourself sitting down to the dinner-table to a dinner of blackberries, huckleberries, or strawberries and picking out every seed." He said, "I admit we could not do it." "And figs, etc.,--how in the world are you going to do it? it is impractical; the pylorus is mi large enough to let grape seeds through, and if it does not do any harm to eat blackberry seeds, why should it be so harmful to eat grape seeds?" That was my superficial reasoning. When I came to think it over and to practice it, I found it is just as easy to separate raspberry seeds as anything else, and in fact I find it a great deal of satisfaction to do it, in chewing the raspberries so as to get all the flavor there is in the raspberry, and the first thing I know there is a little wad in your mouth of raspberry skins and seeds that you are glad to reject, get rid of it, you do not want to swallow it. You would think of swallowing sawdust just as quick as you would of swallowing that little wad of raspberry seeds and skins. The same thing is true of peas. If you chew the peas until you get the whole thing masticated, you find you have got left just outside of the teeth a little wad of peas skins, of hulls of peas that you would no more think of swallowing than you would think of swallowing paper.

You feel as though you want to get rid of it. It makes an impression upon you that you ought to cast it out. I can not get a pea skin down my throat. We eat figs the same way, and you ought to eat figs that way. I found that is the proper way. You can eat figs that way; and I find when I eat figs I do not like to eat them any other way. If it is a steamed fig it is different. I don't know--I don't think I have made my experiments as extended as I want to on figs. Still, some observations I have made lead me to believe, if I eat figs--I don't like them very well, don't eat them very often, but the last time I ate figs I really thought that I was accomplishing something in that direction. I will try that again. I think it makes some difference, perhaps, how the fig is treated. But there is no doubt about its being good; it is a very good scheme. In what we call fig bromose, in order that patients might be delivered from these seeds, we have been making what we call fig bromose for the benefit of people who need something to relieve constipation. I found out it was not the seeds that relieve the constipation. We have it put through heavy rollers, and the seeds are completely crushed. They are ground up so fine they can not really do any harm. I used to give my patients bran; used to have bran biscuit, and bran in various ways, feed them bran at the table, mix a little hot water with it and take it for constipation, and it did relieve some people, but I discontinued it years and years ago, for I was satisfied it was not a physiologic thing to do.

Student: If this coarse food is good for relieving constipation, why are blackberries constipating?

Dr. Kellogg: There is an astringent in blackberries,

allied to tannic acid.

Student: Is it because of a lack of appetite that you can not swallow the skins?

Dr. Kellogg: No; I think it is a lack of sense that you do swallow them. I do not mean the lack of common sense or intelligence, but I mean the lack of a proper gustatory sense. When you have that sense properly developed, it will tell you not to swallow the skins.

Petersen: In Germany peas are are quite valuable, and they do not have them as often as they want them; but on Christmas Eve, they have peas; then they have a good big treat, and these peas are so good, and they burst after they are well cooked; and some potatoes are put in, and they make a whole mash of that; and I can remember now how sweet those things tasted, and how the peelings went down my throat.

Dr. Kellogg: I suppose you could also tell us about several varieties of ~~sausage~~ sausage went down your throat.

Petersen: I did not hear of a single child around there but what was just as big, and fat and strong.

Dr. Kellogg: Perhaps it was because they ate the peas hulls only once a year. We are talking about an every-day diet you know. I will admit that one might swallow some peas hulls as a luxury on Christmas day, and that the ~~whole~~ pea hulls of the peas would be far better for a person than a dead turkey; but it is a question of what is the very best way.

Petersen: We know about these things, but the people there don't. These people do not have anything to prepare potatoes. They take the potatoes, put them in ovens, bake them, and then eat the potato just as it is. That is the way they

live, sometimes for four weeks at a time, without eating anything else at all.

DR. Kellogg: I read not very long ago in a medical journal, a summary of statistics in Germany, and one of the things remarked was the astonishing decrease of longevity in Germany during the last forty years. Longevity had decreased 60% in forty years.

I think we shall have to suggest to our German friends to hold a German convention, and agree upon what should be put forward as truly true and authentic.

Student: There is a doctor in New York, Julian P. Thomas, who advertises very largely raw foods. He puts them out as being specially adapted to the cure of constipation. I would like to know something about that.

Dr. Kellogg: He buys wheat at three cents a pound, puts it up in packages and sells it at thirty cents a pound. It is very good business. If you read his ads you will see he has no sense, no science--nothing you can discover, but simply pure commercialism. There is no doubt that some people do a great deal better to eat Thomas's raw wheat and other raw things than to eat fried pork, and sausage, and everything else, you see. It is better to eat one thing or two things, no matter how crude they are, than to eat a thousand things, or a hundred things, or a mixture of things.

I will say just a word or two more to make this subject clear. Man ought to eat his natural food just as far as he possibly can. If he goes outside of these things which are natural to him, which are physiologic to him, then he should subject these more or less unnatural foods to such processes

as will bring them as nearly as possible, make them as nearly as possible like the natural foods which he is accustomed to eat. That is the whole thing to my mind; and there is very little cellulose in fruits, or nuts, or in the unripe grains. That is the natural diet of the monkey. The monkey in tropical countries will visit the corn fields; the baboons will come down and arrange a whole row of baboons just far enough apart so they can throw an ear of corn from one to the other. One will strip off the ears and throw them to another, and so on along the line, and throw the corn clear up to the forest. They will strip a whole corn field in a night, if it is not too big; but it is when the corn is green, when it is still unripe they do this, because it is natural for them to eat corn in that state.

Down in New Mexico there is a community of vegetarians, and they have been experimenting in this way for some years. They believe in living without any kind of animal food substance of any sort whatever, taking only vegetable foods. They claim to have had a revelation. The founder of this community at Las Cruces started witha certain man in Boston who claimed to have a certain revelation, a new bible given to him in revelation, and one of the tenets of this bible of theirs is non-flesh food. His wife came here some years ago. The famous Dr. Tanner, the Doctor of fasting fame, has been spending several years with them there. A wealthy Bostonian was induced to put a large sum of money into the hands of this man; he became convinced there was something in it, and put into his hands five million dollars with which to develop this colony, and people from Russia and all over the world joined that colony.

I have met a number of very interesting people from there,--very enthusiastic and conscientious people. Among the things they started out to do was to take the youngest boys and girls they could get down there and educate them. They got some babies that were only two or three months old, and the question was, what were they going to feed them. They made a preparation for those babies by planting corn, getting corn in the milk, and feeding the milk of the green corn. The wife of the founder of this place--he is now dead--told me the babies thrived all right, got along beautifully on the milk of the green corn. That was an interesting fact. I have never seen it tried, but this woman seemed to be a very honest, conscientious, serious, dignified woman, and I do not know that it is not true. The corn in New Mexico can grow all the time. You can have corn coming along every week, you see. They are going right on in the same way. It is a little bit of a town, and their community is growing. They are apparently very strong, sturdy and vigorous. I learned considerable of their ways from Dr. Tanner who was here some time ago. He lived there with them three years. The community I think is going to pieces. They had failed in some of their investments. They built a great dam for catching the rains, and the floods came and carried their dam away.

I think I have made myself clear. I do not say we should eat no cellulose. A certain amount of cellulose is needed, but we should eat only so much cellulose as was originally intended for us to eat, but we ought not to gather up cellulose and eat wood, hay and stubble for the purpose of giving ~~~~ bulk unnecessarily, and unnatural bulk to our food. We must find some other way which is better.

V-3-16-5

DIETETICS

Lecture to Junior and Sophomore Medics, January 11, 1905.

J. H. Kellogg, M. D.

Suppose we take our proteids from any source whatever, from milk or any other source, how much proteid would we want for a days' ration? How much fat would we want? How much carbohydrate would we want? Suppose we make it 10 ozs. of carbohydrates, and 2 ounces of fat, and an ounce and a half of proteid,--that would be a pretty well balanced bill of fare; that would answer very well. I think you would be satisfied with that, and be nourished.

Now, if we should take proteid from milk, or wheat, or any other source, and have one ounce and a quarter; take pure fat from some source, butter or olive oil or some other fat, two ounces, and ten ounces of starch and sugar, cornstarch, or some other carbohydrate in pure form, and put those three together, that would make a good day's rations would it? Would it be satisfactory? That is, if you had pure proteid, pure fat, and pure starch, or a combination of starch and sugar? We want to get the proportions exact, so we take the chemically pure things. I am supposing the case; we want to get the exact proportions, and I want to know if you thinkthat would be a satisfactory diet. You seem to be a little in doubt about it. We will put some sugar or salt in to make appetite juice. This is a hypothesis; it is nobody's idea. How many of you think it would be a satisfactory diet, or that it would sustain

life? How many think that would sustain life and health? Why not health? It would sustain life for a time, but if it would not sustain health, it would not sustain life only temporarily. What do you think is the objection? What is that rouble? Somehow common sense tells us that would not be right. But why? There is no salt there. But suppose we bring in the salts. They have been carefully exempted, but we will restore the salts. That is not a natural combination. We will take the flour, and take the starch out of the flour, take the gluten out, take the salts, and then we will put them all together again in just the same proportions. We are only separating them mechanically. We will take the starch out by washing out the milk, and separating the casein and the sugar and the salts--they can be quite easily separated from the milk and the water,--and put them all together again. Would not that be all right? You seem to have a prejudice against these chemical foods. How about these prepared infant foods? You have to add a few shavings too, you think?

Student: Bunge said there was some principle in the milk that was a part of the food, and when the different elements were separated from the milk something could not be gotten out, and probably it might hold true with food in this case.

Student: Experiments were made in which the elements were all separated, and then put together again, and the animals died.

J.H.K. That experiment was made, and I wanted to see whether you remembered it or not. Yes, there is something more in the food. It is not a principle, but it is a constituent;

there is a constituent in the food that escapes the chemist, and these elements we are talking about are only the cursory, the major elements; but there are minor elements that are just as important as these are, and the food must contain these elements. What are these elements? They are the elements which regulate the secretory and the digestive process. The pure gluten taken into the stomach will not cause the stomach to pour forth hydrochloric afid. Pure proteid does not have that effect. Hydrochloric acid is needed to digest protéid, and yet pure proteid will not provoke the secretion of gastric juice. There is something more that is associated with the proteid in the food as it is produced. So we see when we come to talk about combinations, we must first of all recognize the fact that nature's combinations are the proper combinations. That is the reason why I have brought this question up. I have used it for both purposes--to test you a little on the proportions; but especially to bring out this idea that nature makes combinations that are perfect, and they can not be imitated; and so, in all our combinations of food, we as nearly as possibly follow nature's combinations.

Here is fruit: Fruit is a perfect example of food; it is a perfect dish, if you please, served up, not by a cook, but by the Creator of all things. The infinite feeder prepared in our foods as they come from the hand of nature--that is a bad word, and I do not like to use the word at all,--as they come from the hand of the Maker they are perfectly right, and we only need to combine foods. So it is not combining elements but combining foods; but we may study foods to recognize their special characteristics, and so combine them in such a way as

to adapt them to our different needs at different times. Why should it be if our food should not be a perfect food, that is a food which contains all the elements of nutrition in just the right propottion? That is the way a man would go to work to make foods. He would make foods in such a way that every food every fruit, every nut, every thing that was used for food would be complete in itself, and supply all the elements that we need. That would seem to be perfect in itself, wouldn't it? But that would be exactly contrary to all the thought we get from nature. There is no man, no tree, no flower, there is nothing which is complete in itself; everything depends on some thing else; every man is dependent on some other man to help him. Man himself is in two parts which are complementary,--the masculine part and the feminine part; and the complete man requires both, it requires both to make the complete man. So we have no example in the whole world, in the whole universe there is no example I know anything about except in God himself of completion, of perfection in one thing, in one unit.

Now, in our foods there is another reason, and that is that we require at different times different assortments, different elements, different proportions of the elements. We require on an idle day a different proportion of elements from what we require on a busy day. We require on a cold day a different combination of elements, different proportions from what we require on a warm day; so with the changing seasons, changing occupations, changing necessities, there is a change of the amounts required and a change of the proportions of the different elements. Now, for instance, on a cold day, for example,

when we are engaged in very severe muscular work, on a very cold day, the body would require the maximum amount of heat-producing food, wouldn't it?--the maximum amount of food? If we are working hard on a very cold day, the man working very hard, as hard as he can on a very cold day requires the maximum amount of Calories, and why? Because when a man does work amounting to 500 Calories, how many Calories has he required in heat? A man working hard and has done work which is equivalent to 500 Calories, how many Calories of heat has he produced at the same time? How many of you know that? Four times as much. The physiologies teach you that--four times as much--, so he must consume if he is working in such a way that he has consumed 500 Calories in work, then he has at the same time, in connection with that work, has used up 2000 Calories in keeping his body warm. When he works he sweats, perspires, his blood circulates very vigorously in the skin, and as the blood comes to the surface it is rapidly cooled, because it is circulating in the surface; his heart works more rapidly, keeps the blood circulating through the surface, moving about, so that the heat of the interior is rapidly carried to the surface and dissipates. Now, suppose you had some water perfectly still in a water pail, and you have here water in a pail that is being stirred. xWh That water pail is set down in ice, perfectly still; here is another one w in which water is being stirred; which one will cool the most rapidly? The one that is being stirred, of course. That is very natural. Now, the heart beating stirs the blood, moves it from the interior to the exterior, and when the beating of the heart is more

rapid, then the cooling off of the blood will be equally rapid, so really requires an increased heat production. Heat is a sort of by-product of the work, and there is four times as much of the by-product as there is of the real thing, of the product itself; so remember that. Don't ever forget that again.

Then, we must have a great variation in the food elements in accordance with the thing we are doing, so we must combine our foods in such a way that one food will be the supplement, or complement to the other food, and in that way we will make a perfect diet. This, you see, necessitates the study of the foodstuffs, and a careful study of the foodstuffs also a study of the body needs, and every physiologic physician, or physician who undertakes to practice medicine in a physiologic way, needs to know all that is known about foods; needs to know the qualities of all foods. You have all been studying that textbook on the subject of foods, and you have learned the elements found in different foods; I think you are pretty well posted on that, but we are going to test you one of these days; I am going to put in your hands a little pamphlet--I hope it will be out tomorrow--put a copy of this into your hands just as soon as we get complete proofs,--and I want you to study that until you know the whole thing thoroughly. It will be worth your while to do it. I am going to test you on it until you know foods. The study of the tables in the books is not sufficient, because it gives you dry foods, uncooked foods, raw foods, and you do not know what they are when they come on the table. So we have prepared a table which shows what foods are, the food values of all the different foods as they are served on the table; and when you get hold of that it

will be worth while to make yourselves familiar with the whole thing, and you will find out when you come to study this that soups have on an average about twenty Calories to the ounce. I am going to try to see how much I know now, so I am reciting my lesson to you. I have not learned the subject, but I am just telling you what I remember in going over the subject and helping make the tables. I remember that soups furnish about twenty Calories to the ounce. That is, the thick soups. The water soups only furnish four or five or six Calories to the ounce, so may almost not be counted at all, as they are simply water. Some, like Protose bouillon may be as high as nine. I remember also another thing, that is that the oyster only has about half as much value to the ounce as an ounce of pea soup. The nutritive value of the oyster is less than half that of an ounce of pea soup; so a pint of oysters will have less nutritive value,--there is less food in a pint of oysters than in half a pint of pea soup, or of any otherkind of thick soup for that matter. Ordinary potato porridge or soup mix has twice the value of oysters of the same weight. I remember, too, that beef juice, supposed to be so very nourishing, an ounce of beef juice supposed to be the concentrated nutriment of meat, and meat supposed to be the most nourishing of all foods, yet the actual value to the ounce of pea soup is twice that of an equal quantity of beef juice. When it comes to bouillon, that has nothing only three or four Calories to the ounce. Beef juice is practically waste matter. As a French authority says, it is simply a solution of ptomains. That is what a French writer calls it; that is a very good name for beeftea. They do not call for beeftea and chicken broth in our surgical

ward any more. People have found out these things are not to be had, so reconcile themselves to the inevitable, and settle down to get along without them. It is very pleasant to see that we do not have people come to the Sanitarium any more who call for beefsteak. Scarcely anybody thinks of calling for it, because they are getting intelligent. The publication of this table and of these facts that I am giving you, and the education of the public more and more, will advance that state of things, and will increase this contentment, I hope, with the wholesome, and the natural, and the first-handed foodstuffs which we take just as God made them for us to eat.

I remember that the dry foods like bread have a Calorie value of about three-fourths of 116, or 80 to 85, because bread as we make it here is about three-quarters solid substance. It is carbohydrates and proteids almost entirely, consequently it should be reckoned as one. You can figure it as 4.1 to the gram. So we have about 75 or 80, from 73 up. I remember an ounce of butter has 239 Calories. That is very high, you see, very rich. Well, I won't tell you all I remember, I remember quite a little. I am going to read it over a few times, and I think I will have the whole of it then. This is Sanitarium butter, of course, with the salt. An ounce of fat has more than that. 30 multiplied by 9.3 you see would be more than that,--279, you see. The fat value is four-fifths of the butter. The actual value, as determined by Dr. Atwater, the average is 239, practically 240. I want you to go over this table when you get it, go right at it and learn the whole thing until you know so that when anybody asks you what is the food value of a certain article of food, you can tell right

right off approximately. You may be several calories out of the way, but group them together. Put all the soups together, as I have mentioned to you, and you will not be very far out of the way. You can group all the breads together. The eggs, yolk, and white, and the nut foods, all the nuts you can get together, and you will find they are practically all the same, so by making a few groups you can easily carry the whole thing in mind. All you have to do is to classify it. We have classified these foodstuffs into groups which have a very closely allied caloric value; but when you get down to the miscellaneous table, that will be a little more difficult, especially desserts. You will be surprised to look them over and see how much nutrition there is in desserts. One of the patients complained the other day. He says, Pie is higher than beans; there is more food in pie than there is in beans. I guess I will live on pie, and stop eating beans." That is an important thing for people to know, because it may be considered, most people do consider the dessert of something that you eat at the end of the meal simply as a luxury to finish with, and that has no real food value; but when you come to learn the facts about it, you find the desserts are, many of them, more highly nourishing than some of the staple substances, or articles of food containing more Calories. I am opening this up to you in a general way so as to set you to studying it, and suggest to you what things to look in to.

I am going to hand up this subject of combinations. This is the practical part of it. The whole thing can be summed up in a sentence: Make your combinations as nearly as nature makes them as you can. If you take pains to chew thoroughly,

every particle of food which you take into your mouth until it is liquid,--I don't say thoroughly dissolved; of course it is not a perfect solution; but until it is liquid, liquid in the mouth, and to reject everything which you can not reduce to liquid in your mouth, swallow nothing which can not be reduced to liquid in your mouth, you do not need to pay any more attention to the matter of combinations than what I have already said to you. You can combine vegetables, and fruits,--all foods, because in a liquid state everything combines. The whole trouble with this matter of combinations is the taking into your stomach of foods that are only partially chewed, like vegetables whichcontain a large amount of woody matter, and taking right along with those foods fruits which are easily dissolved, almost perfectly digested, and require no stomach digestion at all--there is no effort made at stomach digestion except with the chestnut and a few nuts,--we are talking of fruits now; there is no effort towards gastric digestion. Fruits have already gone beyond the stage of gastric juice digestion. The starch has been converted into sugar and dextrinized--that is all the saliva is capable of doing, and practically contain no proteids at all. Of course we will omit such fruits as the date and the fig; but the ordinary fruits that we eat, the fresh fruits and stewed fruits of our climate, acid fruits and sub-acid fruits,--these contain nothing which the stomach can act upon or which the gastric juice should act upon; and so it is only necessary to chew the fruit to make it liquid before you swallow it, and it passes quickly out of the stomach just like water or any other liquid, in fact

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more quickly than water, because it is acid, and acid helps to stimulate the stomach and to move it off. That is the reason why you can take fruit as a refreshment, take an orange any time you feel thirsty, or eat an apple if you feel thirsty. The reason why you get immediate refreshment from fruit is because there is food there which is already predigested, and ready for immediate absorption, and you feel better right away. If you are exhausted, you eat a water melon--don't swallow the pulp; that is nothing but wood. If you are careful to reject everything which you can not make liquid in your mouth, you can take fruit at any time; there is nothing in it for the stomach to act upon. Now if we eat the fruit along with the vegetable, if you eat fruits and vegetables together, you take along with this vegetable,--don't take pains to chew the vegetable thoroughly, swallow it in the ordinary way,--potato skins, and beans, possibly, with hulls and skins and everything-swallow that rubbish all together into your stomach, and take along with that fruit, let us see what the consequence of that would be. The beans, and possibly the potato skins will have to stay there in the stomach anywhere from four to seven or eight or nine hours. It takes a long time for the stomach to worry that woody rubbish out. If you eat fruit along with it, the fruit will stay there right along with the beans or the peas, hulls and skins,--some portion of the fruit will be adhering to them you see. The sugar of fruit and dextrine ferments very easily. After that foodstuff has been in the stomach about two hours and a half, the gastric juice is absorbed at the end of three or four hours, three hours and a half, and

then there is almost no acid left there; the consequence is the putrefactive processes begin, and the saliva that is swallowed introduces thousands of new germs into the stomach, and yeast is swallowed through the mouth so infection occurs, gas is formed, and the patient has a sour stomach coming on late after eating. That is a state of things which many people suffer from who eat fruit and vegetables together and that is the whole difficulty. The same thing is true of milk. If such a person takes a glass of milk, it sours, and large, hard, tough curds are formed, and they will worry about in the stomach for hours before they get out. The fruit juices along with with those curds makes a most fermentable mixture so trouble will occur; whereas if the milk had been taken by itself, this would not occur. But in that combination you have difficulty. If instead of that, you take milk, sterilized milk, and in little morsels, and chew it very thoroughly--milk needs to be chewed just as well as other things,--and if the fruit is also chewed until it is reduced to a liquid state in the mouth, very small, soft, fine curds will be formed in the stomach, and these will pass out of the stomach within an hour and a half, or two hours, and there will be no difficulty. I learned this many years ago. I found that acid fruits agreed perfectly with milk if the thing was managed in the right away. I added lemon juice to milk for a patient and gave him the curds, and found it was more digestible than ordinary milk. The difficulty is in swallowing the milk whole and allowing a large, hard, tough curd to be formed there in the stomach, which the gastric juice can only dissolve by attacking the outside of it slowly, just as warm water will dissolve a big lump of ice.

I think the banana as we get it here is one of the most difficult of digestion of all fruits. It requires the greatest care to chew it thoroughly. You should take great care to select bananas that are thoroughly ripe. Never eat a wilted, tough banana. It was picked before it was half ripe, and is just like a green apple. Some Sometbers of this class here have lived in tropical countries, and you know how different the banana is when it has been almost matured on the plant. My supposition of the matter is, from what I have observed in Mexico, and you see this in tropical countries, they cut off the bunch of bananas before it is perfectly ripe, when it is still green, just before it begins to turn; then it is hung up and allowed to ripen in the shade. I have been told if it is allowed to change color and get completely ripe on the plant, some of the juices of the banana are drawn back into the plant, and it is less toothsome and less perfect than if it is cut and then allowed to ripen in the shade. They are all right then; they seem to be perfect; they are mellow as peaches, and all right; but I have been told the reason is that some of the juices of the banana are sent back into the plant. If you let an orange remain on the tree too long it becomes dry. There is some reason for it. It is customary in tropical countries, just as here; but of course when these bananas are to be sent thousands of miles away so it is going to be weeks before they are going to be consumed, they are cut greener, very much greener; so we never get bananas here in a perfect state. In New York you could get bananas down at the wharf when the ship comes in with a load of bananas, there are great quantities of bananas there ready to go to decay, and you can get the very nicest bananas.

get the very nicest bananas. Down in Nicaragua where natives bring down bananas for the ships, they bring them down cut out in canoes, and I have been told the bay is all full of great bunches of bananas that have been thrown overboard, too ripe to be shipped. The very best ones we never get at all; they are left there floating around in the bay to be food for fishes. You can buy bananas there, magnificent great bunches of bananas for two or three cents a bunch. Quantities of them are piled up there and allowed to decay. At Blue Fields, Nicaragua, they put up a factory lately for drying bananas; getting ripe bananas, cutting them into slices, and drying them in an evaporator such as is used in drying apples in this country, and I have received some packages of dried bananas and banana flour, which are really very nice. It has not been introduced as yet into this country. They have dried bananas in London. London is the best place in the world for getting everything. You can get everything there at all seasons of the year. I remember very well when I was in London, I was surprised to see very nice, fresh apples, different from anything I had ever seen before. It was in May, and they had new apples in London. Where do you suppose they came from? Tasmania. They were Tasmanian apples, and they were very nice and perfect; they came from the other side of the world you see, on the other hemisphere, and they were just like the fresh apples we get in the fall.

Give proper attention to chewing and the combination will take care of itself. Mr. Fletcher has shown us that if we chew long enough our own taste will call for the food we want.

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It is the dominant characteristic of the food which determines what the fod will be. If we eat olives, the dominant thing is fat; if we eat fruits the dominant characteristic is sugar and malic acids. You remember in studying fruits you found that sour fruits have a good deal of sugar in them. The lemon has almost as much sugar in it as the orange has. It is not more, but it is almost as much; but it is simply one neutralizing the other. In an egg it is chiefly the albuminous element--proteid. In the yolk of the egg the dominant factor is fat. I think that is the point of Prof. Pawlow. When we eat potato, the dominant thing is carbohydrate; when we eat some very fat food, the fat will predominate; it is the dominant element; it is the thing which acts chiefly upon the gastric juice. He did make experiments in taking the individual elements, but he found it was necessary to combine the elements in order to get proper action. For instance, if an animal ate white of egg alone, there was no gastric juice at all produced. The white of egg does not stimulate chemical juice in the stomach; but together, combined with sugar and starch, carbohydrate, that provoked an abundant secretion of gastric juice.

V-2-23-5.

MEDICAL DIETETICS

Lecture to Juniors and Sophomores, by J. H. Kellogg, M. D.

January 16, 1908.

If I am telling you something I know is important from my own personal experience, and I see some one is not attaching any importance to it, but is engaged in something else, and I know is thinking about something else, I feel disconcerted; I can not go on until I feel that I have got that person's attention.

Thirty years of blundering teaches a man something. I have been blundering along in this matter of diet for thirty years, and I am just beginning to see something in it. This is the hardest question we have had to wrestle with--the question of diet--altogether the hardest question. We have had to have an exoteric doctrine and an esoteric doctrine. We have had to teach the people what we believed, while at the same time we were shaking in our boots for fear it was not true, because we did not have scientific facts. Now, scientific facts are finally coming. Prof. Fisher who was here, said to me the other day, "Doctor, it must be a great satisfaction to you to see science coming up now proving the things you have been teaching for thirty years. How did you get at it? How did you get hold of these things thirty years ago?" I said I knew it was right because it tasted right; it was ethically right, and a thing ethically right must be right scientifically. He said, "That does not appeal to me; I confess your ethical argument does not appeal to me at all." I said, "It is the thing that appeals to me all the time. It is the original thing that has

appealed to me all the time; a thing that is ethically right, must be right every other way." He said, "Now, for instance, in slaying animals, you say it is cruel to kill these animals. I do not see it so. Here is an ox, for instance; you say it is cruel to slay him. I think it is doing him a favor. It is better to kill him painlessly than it is to let him die of old age, and starve to death; that would be a miserable death. I can not see any harm in it except the harm that comes to the man himself. It has a bad effect on the people that kill animals. It is naturally repulsive to us." I said, "Now stop right there. Why is it repulsive to you? Why is it repulsive to you to take life and kill animals?" He thought a minute, and he did not make any answer to that. The reason why it is repulsive is because there is something in our nature; there is something inside of us that tells us that it is wrong. That is the only reason why it is repulsive, and that thing that tells us it is wrong is an infallible voice, is a divine voice that speaks to us, tells us that thing is wrong; that is why it is repulsive. That is the evidence the thing is wrong isn't it? That is better evidence than any scientific argument you can get up; because it is a divine voice that speaks; it is an infinite wisdom that is speaking about that, and that is conclusive.

Prof. Fisher is so interested in this question of diet he has been writing all over the world for the last two years; in fact, for five or six years now, he has been discovering nutrition; he has discovered that nutrition was the great thing for him. When he got tuberculosis, the doctors said, "Eat

all you can stuff; they stuffed him and he got very fat, but he did not feel well; he was weak, miserable, and by and by he began to have some suspicion that that was not the way; there must be something wrong about it, or he would not feel so badly. So he began to inquire, and he has been corresponding with the best authorities he could get all over the world, Being a professor of political economy in Yale, he is able to command respect, and to get an answer from anybody on the face of the earth. His position commands attention, so he has been able to get answers from men you and I could not write to and get any attention at all; but he got his answers. He finally wrote to me a few months ago, and said, "I have been reading your books, reading GOOD HEALTH, and I have been trying the vegetarian diet now for six weeks, the non-flesh diet, and it goes pretty well, better than I thought it would, although I have all my life been a most extravagant meat eater; could not eat cereals at all, just lived on meat all my life. Now I have dropped it off entirely, and after looking the thing all over, I have made up my mind Battle Creek is headquarters on this question of diet. I get fancies from people; I get information from people, I get opinions from people, but I do not get facts." He wrote me a whole lot of questions, about sixteen or eighteen pages of questions, typewritten pages of questions. It took me a whole night to answer his questions. I wrote a small book and sent it on to him. It was about twenty pages, and I answered his questions as briefly as I could; and I sent another letter about the same length. He wrote me back that he had got more information from my letters than he had gotten from all the rest of the folks, and more

scientific facts. Another thing that confirmed him was Prof. Chittenden's work. Prof. Chittenden of Yale has come out with scientific experiments, with his report of the result of his experiments, and his report confirmed the things that have been held in this institution for the last thirty years, and he has given the absolute proof of their reliability. We have just gotten into a position where we have sufficient practical, scientific facts in hand so that we can take every disease, and we can fully deal with that disease scientifically, and know exactly what the man ought to do eat, and why, and know the reason for it.

Suppose we take obesity. Here is a man that is too fat. First of all we must make up our mind how much too fat he is; and how are you going to find out how much too fat he is? Here is a man who weighs 250 lbs., we will say. How do you know but what that is the man's normal weight? What coefficient will settle that question? The height-weight coefficient. That is a starting-point then for this man's diet prescription,--is his height-weight coefficient; so that man must get a physical chart, then, first of all. And we will get his height-weight coefficient, because a man of a certain height ought to have a certain weight. Of course, that is not absolutely arbitrary, because some men are broader than other men; but it is simply the average. Suppose this man has a height that ought to give him a weight of 150 lbs. His height-weight coefficient would be,--if his weight ought to be 150 lbs.' what would his coefficient be? How would you find out his coefficient? How would you determine his coef-

ficient? Divide the 250 by 150. That is, 150 is the standard, so we divide what we have by the standard, just exactly as if we wanted to know the length of this room, we should take the measuring stick which is the standard. We want to know if this room is too long or too short. We have a pattern of a room which is a model room, and we compare it with this room to see if this room is too long or too short. We dilide his weight, measure it off, by the standard weight, which is 150 for his height. That is the invariable rule in all coefficients. Divide what the man presents by the standard, and that tells you what you ought to have. So we have 1 2/3; this is really 2/3 too much. This man's weight is two-thirds more than it ought to be.

The next question is, how much shall we reduce his weight? Can we take off that 100 lbs? In the first place, let us see,--we will take that question up another time,--the evils of obesity. This man is carrying around another man who weighs 100 lbs. on his shoulders. He weighs 150 lbs., and he has got another fellow on his back and is carrying himaround with him. He has to carry him up stairs and down stairs, and if he has to run, he has got to run with him; if he jumps, he has to jump with him; if he sits down, he has got to get up with him on his shoulders; he has to carry that 100 lb. man on his shoulders everywhere he goes. We sometimes find men who weigh twice as much as they ought to. We had a man here a year ago last summer who weighed 465 lbs. Very shortly afterward, we had a man who weighed 450 lbs. Each of these men weighed more than twice what he ought to weigh. Now this extra man is

a dead weight. He does not help any; he has not any muscles; he has not any lungs; he has not any stomach; he has no liver; he has no heart; he is simply a dead weight like a load of wood put on your shoulders. We can carry him more easily because he is distributed so much. It is not all on the shoulders; some of it is on the feet; some of it is on the arms; and some of it is on the legs. By the way, a special fact that I always call the attention of obese people to is this: These man have an enormous accumulation of fat around the middle of the body, around the trunk, the abdomen, and the thighs; there is where the great accumulation of fat is. A lady said to me the other day, "Doctor, why is it this fat accumulates around here so?" I said, "Look at your arms; are your arms fat?" She said, "No, my arms are not fat? Why is it?" "Because they have so much work to do, don't you see?" She took the hint right away. This part of your body does not work you see. You sitk down at a table for instance, and your arms and hands do the work. Well, of course, when it dawned upon her what the significance of my suggestion was, she resented it for a moment, and says she, "You are entirely mistaken; I am a very small eater; I eat very little." Of course, we know better. They may say what they like about it, a very obese person is not a very small eater. The evils that come from this accumulation of fat are very great. The accumulation of fat is not on the outside only, but on the inside. It accumulates within the chest as well as without the chest. The chest is a bony wall. The fat can heap up on the outside in unsightly lumps, but it can not accumulate so easily on the inside; there is not room

for it. Suppose that represents the chest; and that is the heart; and here are the lungs filling the chest. Now, suppose fat should accumulate around here on the inside, and keeps accumulating; fat accumulates around the heart,--what effect does that have upon the lungs? It diminishes the chest capacity, you see; so the man who is very obese is always short of breath; always short of breath because his lung capacity is diminished. His two thousand square feet of respiratory area is shortened, restricted by the accumulation of fat within the chest. I have seen an inch of fat beneath the parietal pleura,--had an inch of fat on the lining. You see this in every fat dog, or ox. When there is a great amount of fat around the ribs inside, roast ribs, or spare ribs,--you often see a great accumulation of fat. The same thing happens in a fat man. The diaphram will have a great amount of fat on the inside of it. This fat accumulates in the abdomen, and it will be the same in the liver and in the stomach. I have seen the omentum very thick. It is normally thin, sometimes even transparent; I have seen it absolutely transparent; and again I have seen it two or three inches thick. I saw the other day a very fat man who seemed simply enormous, and he laid down upon the table, and I said to him "Raise your head a minute." He raised his head so as to bring the abdominal muscles taut, and the skin was lying right in his muscles; you could simply pick up a lot of skin. When his muscles were relaxed, I could take up a great mass of fat, an armful of it; but when the head was raised, the abdominal muscles were taut, the skin lay next to the muscles with only very little fat underneath. What did that prove? That proved the fat was inside, you see. Now,

then, suppose we should take away all that man's fat; he has got 100 lbs. too much fat on the inside of his body, and his abdominal muscles are enormously stretched to accommodate it; suppose we should remove that 100 lbs. of fat, what would be the situation of that man? The abdominal walls would relax, and that would leave the stomach, bowels, kidneys, liver, and things would be jostling around, you see, because they have been all padded up and held firmly in place by the fat. If we take all that fat away, there is nothing to support these organs in place, you see. If he has been in that condition for twenty years, the case is hopeless, don't you see? You never would expect to help him much. These [redacted] muscles are not only weak, relaxed, but they are stretched, elongated, you see, and he has gotten beyond the formative period of his life; it is generally the old man who is in this condition, or the old woman, and the condition never relaxes. I remember an old lady who came to us who had been very fat, and had lost her flesh. Diabetes had come, and the fat was no longer there. The sugar was no longer converted into fat, but was discharged from the body, so she had become emaciated, and this poor woman had been so enormously fat her abdomen was so relaxed it actually hung down to her knees. It was just simply terrible. The same thing was true of the thighs. There had been an enormous accumulation of fat about the thighs, but this fat had disappeared, so this was the state of the thighs. It made a most ludicrous spectacle, but it was not ludicrous to the patient at all; it was a very serious matter. That patient wanted to know whether anything could be done or not. I said nothing

but a surgical operation. Well, now, you can readily see that with this condition, all the fat removed, the internal adjustments of things must be tremendously disturbed, and consequently when you come to remove a large amount of the fat which has accumulated, and remove it suddenly, your patient may be better off with his fat than without it; patients may even be worse after the fat is removed than they were before. So we have to take into account this condition, this matter I am telling you about,--we have to take into account how much fat can the patient lose safely; and this man who has 250 lbs., weighs 250 lbs.,--how much shall we reduce his weight? How much shalll we take off? That is the first question to consider, and the most serious question. It is sometimes more difficult to decide that than any other. It will depend first upon how long he has been in that condition. So that is the question I always ask first--How long have you been fat? "Well, I have been fat all my life. I was a fat boy," and or a fat girl. "How long have you been so excessively fat?" "Well, it has been gradually coming on for the last twenty years." Then, you have got a serious proposition before you. Then comes the question, How much fat is it safe to remove? Suppose that man has been in this condition, weighing 250 lbs., that ought to weigh 150 lbs., for ten or fifteen years, gradually accumulating until he has gotten unhealthy and feels very uncomfortable, how much fat can we safely remove from that man? Fifty or sixty pounds--not more than that. Sixty pounds would be the extreme limit. If you go beyond that limit, that man would be made an invalid, by your reducing process, and he will receive great damage. The only thing that will tell you

is your own hosse sense. There are a thousand things in medicine that are beyond figures; you have simply got to exercise your horse sense about them. I know that from experience. I made a young woman an invalid once, made her so neurasthenic she almost lost her mind, by reducing her weight. She was so anxious to get rid of her fat, so she teased me for hotter baths, for colder baths, and more baths, and I yielded to her importunities, and she was delighted. All of a sudden, she came down one day, and said, "I can not sleep." You do not have to do that thing but once. That was twenty-five years ago. That immediately set me to studying upon that question. You study your books--I practiced on the subject besides-- and you won't find anything that I am telling you about this in the books,--not a word of it. It is a thing doctors do not give attention to. They do not study into the question of nutrition, metabolism, closely enough to recognize these things. You won't find a smuck word of what I have been telling you on this question in your work on practice.

Here is a man who weighs 460 lbs. How much can we take off from him? Take 150 lbs. off that man, possibly 200 lbs. if the thing is done slowly, but he ought to be two or three years about it. You can take off 75 or 100 lbs. right away quick, but after that it must be very slowly done. Now, then, let us see shuck how we will do it. This is interesting, to see how you can get right at the foundation facts.

I want to talk to you about how to make a fat person

lean, how to make a lean person fat; how to feed fevers. One is just as easy as the other; then what to do for fever patients; what to do with neurasthenics; what to do for hyper and hypo, and all the rest of the common conditions which you are certain to meet.

D I E T E T I C S

Lecture by J. H. Kellogg, M. D., to Sophomore Medical Students, Friday, January 20, 1905.

FOOD FOR DIABETICS.

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I was reading last evening a report of some work which has recently been done by a French physiologist in the sugars, and he found that levulose was burned much more readily and completely in the body than dextrose. This is in harmony with what I told you yesterday,--some new researches are just out, and the results are just the same; so we can accept that as a fact,--that levulose is more readily and completely burned in the body than dextrose. That is the true fruit sugar, sometimes called fruitose, because it is fruit sugar--the characteristic sugar of fruit. So I have found it not injurious many times to give diabetics all the apples they wanted to eat, because the sweet of apples is chiefly fruit sugar, or levulose. It is worth while to remember that. It is also worth knowing that the sugar of ripe grapes is levulose. One authority I found asserts that the sugar of grapes is altogether levulose, and that the levulose is transformed into dextrose as in raisins, when the raisins become dry. Now I have not seen that in a recent work, but it is in one of my older works. I have not seen it re-stated by any of the late books; but it is a thing that would be worth while to look into. Some of you might take the trouble to examine the juice of sweet grapes with the

saccharometer or with the fluoroscope, and ascertain which is present in predominant quantity.

Now, there is another word to be said with reference to these carbohydrates. There is another class of carbohydrates besides sugars that must be considered--the starches. There are as many different starches as there are different sources of starch. That is an important thing to be recognized. You might say there are two general classes of starches,--the cereal starches and the root starches. Fruits contain, as a rule, no starch, and nuts contain no starch, or very little starch. The Chestnut contains about fifty to sixty per cent. of starch, and the English walnut contains fourteen percent. of starch; most nuts contain a very small amount of carbohydrates--five to ten per cent. Starch in the natural process of ripening is converted into fat and sugar. In fruits, in the process of ripening fruits, the starch is converted into sugar and dextrin, and the fruit acids. It is worth while to remember this, because it is just what you want to tell folks. I am giving you the facts I make use of every day. I don't cram myself with all sorts of things to tell you, that are not of practical value, but I am just telling you the things I make use of, because the Sanitarium is a place where we have to make use of these very things, and I think it is worth more to you to have culled out things that are of every day use. So, as I said, I don't sit down, get a book, and see if I can not find a whole lot of things to occupy the time with, as the brethren say sometimes; but I simply give to you the things I have to use, the things that I am making use of every single day, so they are just as familiar to me as my A B C, as I use them

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Now, there is another word to be said with reference to these carbohydrates. There is another class of carbohydrates besides sugars that must be considered--the starches. There are as many different starches as there are different sources of starch. That is an important thing to be recognized. You might say there are two general classes of starches,--the cereal starches and the root starches. Fruits contain, as a rule, no starch, and nuts contain no starch, or very little starch. The Chestnut contains about fifty to sixty per cent. of starch, and the English walnut contains fourteen percent. of starch; most nuts contain a very small amount of carbohydrates--five to ten per cent. Starch in the natural process of ripening is converted into fat and sugar. In fruits, in the process of ripening fruits, the starch is converted into sugar and dextrin, and the fruit acids. It is worth while to remember this, because it is just what you want to tell folks. I am giving you the facts I make use of every day. I don't cram myself with all sorts of things to tell you, that are not of practical value, but I am just telling you the things I make use of, because the Sanitarium is a place where we have to make use of these very things, and I think it is worth more to you to have culled out things that are of every day use. So, as I said, I don't sit down, get a book, and see if I can not find a whole lot of things to occupy the time with, as the brethren say sometimes; but I simply give to you the things I have to use, the things that I am making use of every single day, so they are just as familiar to me as my A B C, as I use them

every day. Every time I make out a bill of fare for a patient, I make use of all these things.

As I said, there are these two classes of starches--root and cereal starches. Fruit starches are so limited in quantity that we do not regard them as starches at all. Fruits contain sugar and acid which have been formed from the starch. Taste a green apple, and you find it hard and woody, with very little flavor, but an astringent taste. What is that bitter taste due to? It is due to the tannic acid, and in the process of ripening that tannic acid is converted into malic acid and fruit acids. The starch is by the process of the action of the sun, converted into dextrin. The sun does for the fruit just what the kettle does for it, just what heat does for it. It is not the heat but the actinic ray that makes this change, and it is a vital change, and the sun does not only what the kettle does, but it does what the saliva does also. Under the influence of the actinic ray, the fruit is thoroughly digested, and the process of digestion may go so far it will almost lose its flavor. The apple, when it is over ripe, is unpalatable. It is very easily soluble, however. Now, in Mexico, you go into the market and call for fruit, and the question will be whether you want "duerors" or not--hard fruit--or "cassido in el sol"--cooked in the sun. That is very interesting, isn't it?--that those simple, hardy people have discovered that the repening process is a process of cooking. Do you want it hard, that is green, or cooked in the sun? The sun cooks in this country just as well as in Mexico, but not so fast.

Hopkins: Is the tanric acid in green fruits changed

by cooking?

Dr. Kellogg: No, it can not be changed by cooking. You hide it with sugar. The green fruit is not so good as ripe fruit of course, but cooking helps to ripen the fruit. That is the reason why you can eat green fruit cooked, when you can not eat it raw. Green apples cooked are digestible, whereas they are not digestible in the raw state. The same thing is true of the potato--it is digestible after it is cooked, but raw potato would be just as indigestible as raw green apple.

How is it with gooseberries? That is a practical question. The same thing is true of grapes. You eat grapes and strawberries and they seem sweet; stew them and they are sour; stew grapes and they are sour. Why is it. The same thing is true of plums. It is because the free juice in the fruit is sweet; the sugar is very soluble and is in the juice, but, in the case of the grape, the acid is in the pulp and in the rind. The astringent part of it, the tannic acid, is in the rind, and the tartaric acid is in the pulp of the fruit; and when you stew it, it dissolves it out; but when you take it into your mouth and compress it, you have the juice which contains the sugar, and you do not get the acid. The pulp, you will find tastes sour. Chew the skin alone by itself, and you will find it is astringent. One might just as well chew some brown paper like a goat as to eat these skins. I am fighting all this rubbish just as hard as I can. I said, Boat, just then, because I want to put a taboo in your mind. Whenever you see anybody eating grapes, swallowing them whole, or eating potato,skins and all, you can just think of a goat nibbling

a paper box if you please, or trying to swallow a paper bag. You see a goat doing that sometimes. I am not making any insinuations that a man who eats grape-skins is a goat, but he is simply behaving like a goat in eating paper, and wood, and sawdust, shavings; and we are not made to digest that sort of thing.

I must tell you another interesting thing I read last night. I got hold of a copy of the Journal de Physiologie et Pathologie. It is a very excellent work, indeed. When it comes in, I can not wait until I have gone through it. I spent a couple of hours last night after the rest of you went to bed, in going through the resume. This book has about one hundred pages of resume of the latest discoveries , of great long articles boiled down to little paragraphs so you can get the gist of it. Another thing that has just been brought out is the result of some discoveries, observations made in the acetic region, by a physician who wanted to make an investigation of the question of bacteria. The colon bacillus appeared in the digestive process of digestion, and it occurred to him to study the subject in the arctic region. The bacteria was first discovered by Pasteur, but as they were in the human saliva, in fecal matters, all through the alimentary canal except in the stomach,-he said he thought they were in the stomach too--he said germs are necessary for digestion. Prof. Ducleau, one of his students had some doubts about it; so he raised some beans in sterilized water, with sterilized earth and the beans grew and developed very well in a perfectly sterile medium without any germs. Pasteur after he

had proven germs were necessary to help adjust the soil to feed the plant,--he drew the conclusion they were necessary for human beings because he found them in the system. He found germs in the body; so they must be necessary because they are there. Ducleau was a skeptic, and he said, "I will investigate"; so he found beans would grow. He told Prof. Pasteur about it, and he said, "You have only proven that beans can grow without germs. You have not proven that human beings can get along without germs." Ducleau left the matter there, but a few years later, Nuttall and Thierfelder who are German investigators,--they had an opportunity to work together, and they brought some guinea pigs into the world by Caesarian section and under sterile conditions, and placed these sterile guinea-pigs into a chamber which was very ingeniously arranged so that they might be fed. Here was a chamber placed in a vessel containing water, and here was the water rising up to this level, and here was the little grating on which the pigs were kept. Suppose this is the pig. These little pigs were fed by means of a nursing nipple, a little nursing nipple made of rubber, through a little opening in the vessel. It was certainly an ingenious arrangement. There were two air holes stopped up with cotton through which the air was continually forced, and in that way they were kept under very good conditions. With this little nursing nipple, they would come up and eat out of the fountain; and they were fed with sterile food, and the droppings from these creatures passed through into the water here. So they were kept there that way for weeks, and they grew and developed, and remained absolutely sterile, and when killed, they were still sterile. That proved that germs were

not necessary for animals. Sixteen or seventeen years ago Prof. Bond of Ann Arbor, was with myself a member of the State Board of Health. I had served ~~the~~ on the Board some twelve years, and every three months we ~~made~~ met at Lansingat the State House, discussed various questions, and this was a question that often came up. He taught to his classes in Ann Arbor that germs are necessary to aid digestion, and I challenged the statement, fought it very hard because I felt it was not natural; it was not natural on the same principle I was speaking of; it was not a natural thing and it could not be natural, because, as I said to the professor, "Suppose a child should happen to have the misfortune to be born on the top of a mountain where, as Prof. Tindale showed many years ago, there were no germs. Now, suppose a child should be so unfortunate as to be born up there on the mountain-top where there were no germs to help it live. Do you mean to say the child would die if the child happened to be born in a germless atmosphere?" He thought that was an unnatural condition; that no one expected to live on the top of a mountain so it was outside of scientific discussion. Thought it was only dodging the question. But it had occurred to this investigator that in the arctic region there must be many animals that were for so long a time free from opportunities to get germs, living in a climate in which the germs were frozen up, and the ground covered with snow, so absolutely pure they must be natural, must exist under natural conditions,--he thought there must be animals there which might have no germs at all in their alimentary canal. So he went to the arctic region to study the question, and he found fifty percent of all the animals in the region, carnivorous and

vegetarian, had no germs whatever in their alimentary canals. They are absolutely sterile. Both carnivorous and herbivorous he found it was true of both, which was a very remarkable thing, because in carnivorous animals there is such an abundant medium in which germs are very prone to grow. Now you don't want to forget that,--that in the arctic region where the ground is covered with snow, half the animals have no colon bacillus. That must be the state of things which once existed on the whole earth. Those animals must live. They can come through that frigid climate, they canthrive notwithstanding, and perhaps it my be in part because they have this freedom from the action of the germs.

Cellulose can not possibly be used in the body, be utilized in the body in any way except through action of these germs, and it has been supposed the action of the colon bacillus upon cellulose--and other germs--in dissolving the cellulose, that it was its function in the body to utilize the cellulose; but half the animals have no germs; so it is evident that cellulose is not intended for us to eat, to use, with the exception of in such small quantities as we find it in the flesh of fruits and nuts. That is, we ought not to eat the skins of the fruits and nuts. They are the envelopes to preserve the little packet of food until it should be utilized. One can chew the nut in the mouth until all the liquid portion has been separated, then reject the skin. You have in mind, I presume, the pecans. It is difficult to separate the skin, still it is possible to make some separation there. The pine nut is especially good because it has no skin. It is from the cone--belongs to the coniferous class of plants, which produce naked seeds. The

almond is very good because you can separate the skin so easily. The filbert is good because the skin can be easily separated and rubbed off. The peanut, which is not a nut, can be freed from its skin also, and when it is cooked it becomes a nut. After the peanut is cooked, it really is the same as the nut; it has the same composition.

There are different kinds of starches, as I was saying, "In general, we may classify the starches as root starches and cereal starches. These root starches seem to differ from the cereal starches in a surprising way. It is found that the diabetic can digest root starches but can not digest cereal starches so well. For scores of years, at least; perhaps for one hundred years, fifty years any way, the diabetic has been forbidden the use of any kind of food containing starch, and particularly was asked not to eat potatoes, and it was supposed potatoes were very pernicious for diabetics; but within the last ten or twelve years eminent French investigators have made the discovery that potatoes are good for diabetics, and this discovery was made by observing the results of the withdrawal of all the starch. It was found when starch was withdrawn, patients were very likely to suffer from what is known as diabetic coma, and it was found that the condition produced by the withdrawal of starch, putting the patient upon a meat diet, was one particularly prone to produce diabetic coma. The meat diet, the exclusive meat diet twenty years ago was supposed to be the only thing proper for a person suffering from diabetes. A person having diabetes has a terrible craving for bread, and says, "If I could only have just a little piece of bread." Many times, I remember, I said,"no, no, not on your life should you eat a morsel of bread;"but now we have

found out that doing that very thing has sometimes killed the patient. When the patient had diabetic coma, we would put him on a more strict meat diet, and that was the very thing he did not want, that was the thing that killed him. Why? Because of the toxins in the meat. Diabetic coma is a state of auto-intoxication. Certain poisons are developed in the body, and these poisons are the natural result of the oxidation of meats. Now, if we give a patient meat, if meat is the exclusive diet, we see what a serious state of things we are putting his body into. He requires an ounce and a quarter of proteids for his proteid ration. Now, how many Calories must he have? We will suppose he has fifteen square feet of skin,--how many calories would he require? Multiply by 110--you take 100% then 10%. Fifteen square feet would mean 1650 Calories. Add together 100 times, and 10 times. In this ounce and a quarter how many Calories would you get? An ounce and a quarter would be 150. I want to get your mind focused right on the thing. You can see that in an instant if you are thinking of it. 150. Now, then he needs 1650 Calories;if he eats nothing but meat, how much more proteid than he can utilize in the normal physiologic way will he eat?--1500 Calories. What becomes of that 1500 Calories of food? How many ounces would that be. It would be 12 1/2 ounces. What becomes of that twelve and one-half ounces? What is it converted into? How would it appear in the urine? It would appear as urea, uric acid, oxipurin compounds. That is the way it would appear in the urine. This man's blood, then will be loaded, and his tissues will be loaded with--what? With these nitrogenous wastes, and they are all very toxic--xanthin, hypoxanthin, guanin, creatin, creatinin, etc.

x c Another interesting thing has been noted,--that the pancreas produces a ferment which converts guanin into uric acid--oxidises guanin,--it is called guamase; and I find references in medical literature very frequently to lactase, and maltase, and sucrase, and the various other enzymes that are concerned in digestion. It is found that enzymes are scattered throughout the body--many of them. It is a wonderful new science, this science of enzymes. It is a new thing. If you take note of it you will see in the next ten years there will be great development in these things.

This man, then is mxt taking into his body twelve and one-half ounces of substance which is converted in to poison in his body. Sometimes, under certain conditions, deadly poisons are produced. From some of thoome substances, by imperfect oxidation, deadly substances are produced, and the patient gets into a condition where the poisons are very abundant in his body; he becomes comatose, his brain is disturbed and he goes into a somnolent condition, falls asleep, and wan does not wake up--and you can not wake him up. I have seen more than one patient die that way. Some little time ago a lady came here who had only about twenty to thirty grams of sugar in her urine; she was emaciated. I said to the doctor, We must look out for this patient, because she is so weak. A day or two later the doctor reported the sugar had diminished very considerably. I said, "Look out for her closely, then; don't give her much work, because something is going to happen." The doctor said to me next day, "This patient seems sort of sleepy." I said, "Let the nurse give her hot and cold to the spine, cold rubbings, and everything possible to keep the patient

awake; energize her heart, keep up the circulation; we must give her potatoes right away. Feed her carbohydrates." Why? Because there must be a certain amount of heat produced, you see. If the heat is produced by burning proteids, if that is the only way the body can get energy,--by oxidising proteids, you will readily see these toxic products will be abundant. If the body can get no proteid at all, it will draw upon its own proteid. If the patient was fat there would be less danger, because the hydrocarbons, the fat would be drawn upon; but when there is no fat, unless you give carbohydrates, there must be oxidation of proteids, and in connection with it, there will be production of these poisons which are the cause of the coma. So, in this condition, we feed the patient carbohydrates, and the patient is protected from coma.

The best remedy for a person who has diabetic coma is potatoes, or even bread,--any kind of carbohydrates, and a little of it right away, sugar even may save the patient's life. This woman got on very well for the day. In the evening she felt so well she said to the nurse, "I don't need you; I am all right now; youcan go home." But the nurse said, "The doctor said I must stay." The patient said, "No, I will not have you." And the nurse unfortunately allowed herself to be sent home. The patient did not know her danger. The next morning this patient was found in profound coma, snoring, was sound asleep, and she could not be roused, and before the afternoon she was dead in spite of all we could do for her. I mention this case so you will see what a tragic thing it is, and what a deceptive thing it is.

We had last summer a young woman that was getting on

very well here,--had twenty grams of sugar when she came. She improved so much she was able to walk nine miles every day, and did walk nine miles every day to burn up her sugar. She got so much better she said, "I am all right now; I am going home." I heard a day or two ago she was dead. She was only thirty years of age, and I did not consider the case the most serious kind of case; but these patients quite largely die.

Another class of patients die of diabetic coma. Older patients die of diabetic coma, consumption, pneumonia. It has been found that to discard carbohydrates entirely is an error. To put the patient upon a meat diet is the greatest of all errors. With the ordinary diet the patient will not have diabetic coma; he will eliminate an enormous amount of sugar, but he will live. But if you put him on a meat diet, he is certain to die. The diet alone will kill him, even if he has nothing else. If a patient gets into a critical condition, immediately take away the proteids if you have been giving a large amount. Give him a diet of starch. Potato is the best thing. We are talking about diabetes now; this would not apply to Bright's disease. If the patient has Bright's disease with the diabetes this is all right.

Student: Wouldn't it be better not to increase the proteids so much, or to decrease the carbohydrates so fast?

Dr. Kellogg: Yes, that is right. Doctors have found out it is unwise to take away carbohydrates all at once. It kills the patient. Diabetic coma is the result of it, and it is intensified by meat eating. So there is no excuse for giving meat to a patient because he has diabetes. Tell him it will make him worse. But you must give him something. It

is establishing an abnormal physiologic state.

Mind-wandering is a bad disease. It is classified with nervous diseases. I think I will bring down an old book I have one of these days. Mason Goode(?) was an English doctor who lived one hundred and fifty years ago. I am going to bring dwn his book and read to you some of the funny things he says about some mental maladies that we suffer from. Mind-wandering is one; brown study is another. The term, brown study, is not a modern phrase; it is an old one. He describes the disease, brown study. I see some of you occasionally have an attack of brown study. It is the study we want to attend to just now, and I would like to have you all have that disease.

As I said, the doctors have found out that meat eating is dangerous. It is not all the doctors who have found that out; so when you have a diabetic patient, he will generally say, "The doctor told me I must eat a meat diet." It takes about two generations for the average doctor to find out and actually begin to practice a new discovery. Doctors are just now beginning to use water; but Priessnitz found out all about the virtues of water, the great value of water at any rate, one hundred years ago; and Carpy, an English physician, knew it one hundred years ago, and taught it; and Hypocrates, the father of medicine, three hundred and fifty years before Christ, understood it and taught it; and so we are still in the midst of the dark ages; but we are coming out; so we may take some courage and be grateful for what progress we have made. Some of you read in the Battle Creek Journal last evening the article on germs, criticising some things I have said; so we

really have some people in our vicinity who are still in the dark ages on the subject of germs,--who think germs are a very valuable part of our diet.

The diet prescribed for a diabetic patient at the present time, if it is an up-to-date diet, will be a diet in which proteid will not be very considerably increased, because it can not be that an excessive proteid diet is any better for a diabetic patient than for a healthy man. A man in a good state of health, we know from Chittenden's experiments, is damaged by an excess of proteids. It is better to limit proteids to his actual needs for the repair of his body. An excess of the vegetable proteids is still objectionable. I have seen harmful results from taking an excess of vegetable proteids. I knew a man who ate a pound of Nuttose every day for some time. What is the function of proteids? Here is a locomotive that is running from station to station along the road. It has a thousand miles to run. Every little while it takes on coal. What is that coal for? It is to be consumed under the boiler for heat and energy, and to make heat to keep the passengers warm, and energy to pull the train. Once in a while that locomotive makes a longer stop. What does it do then? It goes into the round house. In the round house it gets repairs. A nut has dropped off the engine; here and there a bolt has fallen out. The substance of the engine itself has to have some repairs put on it. Proteid supplies the bolts, and nuts, and the straps, and the fragments of the machinery that have been worn away, or fallen off. At the same time it is burned out in the body. Why?--because that is the only way

to get rid of it. It has to be burned up and consumed in order to carry it off. It has nuts and bolts that have gotten loose, or grates that have burned out. These things that have gotten out of repair in the engine are all converted into ashes in the body, because that is the only way to get rid of them. The purpose of proteid is simply to repair the engine,— We need to take just enough to keep the machine in rapair; while carbohydrates and fats are fuel, and the principal source of energy. Do you see that point? I never got the thing really clear in my mind until I got that illustration clear in my mind.

There is another word to be said about it. That is that these proteids,--the need for proteid is so great, the little you need you need very badly. Your brain is worn a little, your muscles are worn a little; before those muscles can be ready for use tomorrow, they must be prepared, and repairs must be made quickly; so proteid is of all food stuffs the most quickly and easily oxidized and metabolized in the body. It is so quickly metabolized in that body that it is known in the physiologies as quick fuel; but that communicates a wrong idea entirely. It may be quickly metabolized, but it is not metabolized for burning purposes; it is metabolized to take the place of tissue which has been worn out, and which must be quickly repaired, and what appears in the urine is not the proteid which you took for your breakfast, but the proteid which you have been sending out from your body which was worn out the day before; the fragments that were broken down the day before.

When you take an excess of proteid, more than you

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When you take an excess of proteid, more than you

need for use in the body, that of course must be simply burned, and passed on just like the rest of your foodstuff. Suppose you take quinin; what is done with it? It is absorbed and oxidized. Suppose you take strychnia. It is not all oxidized, and it is not all excreted. The same is true of alcohol; and it is true of quinin, true of morphia, and true of almost anything,--some portions may be excreted in each, but strychnia is in part oxidized. Everything soluble you take into your body is oxidized because it comes in contact with oxygen when it has all the oxygen it can take up. So that is nature's method of disposing of it. It is oxidized in the body. These oxidized products are more readily soluble, more perfectly oxidized; they are more readily soluble; they are more easily--they can be carried off through the kidneys, and they are less toxic there. The more perfectly oxidized all these nitrogenous substances are, the more oxygen combines with them, the greater ~~they are~~ their toxicity is reduced, the more soluble they become; so the more innocuous they are in the body; so these substances are to be oxidized in the liver. If the poisons are circulated through the liver it acts upon them, oxidizes them, prepares them for elimination by the kidneys. The toxicity of strychnia is reduced one-half by passing through the liver. The same is true of morphia and other poisons.

Student: Then, a meat diet would in the first place be a cause of diabetes, wouldn't it?

Dr. Kellogg: It might, without doubt, tend that way; it may tend that way.

Student: What is the condition of the stomach of the diabetic--hypopepsia, or hyperpepsia?

Dr. Kellogg: They may have either one; at first diabetics have hypopepsia.

The amount of proteids need not be increased; ought not to be greatly increased in the case of the diabetic any more than is really necessary; but if we study the diabetic we will see his proteid waste is quite large; it is more than normal, and the amount of urea is considerably increased--as high as sixty grams; but in those cases it is wholly due to the great quantity of proteids taken. I put a man once on an exclusive meat diet, kept him on it four days. The first day, it was twenty-four grams of urea elimination; the third day there were forty-eight grams of elimination, and the fifth day it was 96 grams of urea. It increased right along from day to day, showing the first few days it accumulated somewhat. That man did not want to go on with an exclusive meat diet any longer. The large quantity which is reported by observers may be due to that cause. But there is any way an excessive amount of proteids. Why? Because the patient has lost his power to oxidize carbohydrates, and while this lost power to oxidize carbohydrates undoubtedly affects the proteids also to some extent, because the diabetic patient becomes rheumatic, showing the accumulation of these nitrogenous wastes, at the same time, it may be in a given case the patient can oxidize proteids better than he cancarbohydrates, so he will cease to keep up his heat supply. The system will endeavor to keep up the heat supply by burning up the proteids instead of the carbohydrates. From this it is evident that the diabetic should have something of an increase of proteids. It would be very easy for me to give you an arbitrary rule to feed diabetics so and so. You

want to know the foundation reasons for things; so it is best I think to learn it by taking the actual facts, and then inducing from those facts the conclusions as to what we ought to try. After we have settled upon that , the diabetic patient may have double the ordinary amount of proteid; he may have perhaps double the amount of proteid; then what shall we give him next? What more shall we give him? It has been the greatest relief to me of anything that has been done in modern times in relation to dietetics,--the discovery of this French physician that potatoes can be safely and properly used, and freely used by diabetics. We have known that Jerusalem artichokes, dandelion roots and things of that kind might be eaten, but we did not know the potato could, because it is root starch. But so is the Jerusalem artichoke; so is the dandelion; and in that way, for some reason nobody can now explain, the sugar formed from the starch of the potato is more readily and easily oxidized in the body. It is probable that every starch produces its own peculiar kind of sugar. Every starch differs a little from every other starch. Starch produced by one grain is not just the same as starch produced by another grain. Potato starch is not the same as oat meal starch, or corn meal starch. I used to prohibit potatoes, and live on fruits, grains, and nuts. I did not take into account the wonderful change which cookingproduces. My eyes were opened by an investigation made by a Germansome fifteen or sixteen years ago with reference to potato starch. He called attention to the fact that when babies could not digest oat meal, or wheat meal, or any other kind of starch , they could digest potato starch; and it is now largely used in Germany for food for infants. I said that was preposterous, and I did not believe a word of it. I made the

experiment in my laboratory. I made the experiment with wheat starch, oat meal starch, corn starch, and potato starch, and the potato starch digested quicker than any of the others. The potato starch digested forty times as quick as oatmeal. It took oatmeal forty times as long to digest in the laboratory test, in that experiment, as potato. It took wheat and corn six times as long to digest as potato starch. I changed my practice immediately. I endeavor to turn right square about when I find I am wrong; immediately went to develop the potato, and we very soon had our potato meal you see; our baked potato meal, dextrinized potato meal, and I have found it a wonderful help. You will be interested perhaps, to know that Mrs. E. G. White lives largely on potato meal. I get a telegram now and then to send some potato meal quick.

We make potato porridge or gruel. Stir it up with a little hot water, and you have a delicious thing right away. That is one of the thin foods that is not constipating. It is not a constipating food only in the sense that it is perfectly digested; but it is not like the pasty mush. It is slightly granular, and it is promptly digested. These pasty, half-cooked cereal preparations are all constipating, and they are constipating because they form compact, hard, thin masses in the colon and act as a sort of poultice to the small intestine, and do not provoke peristalsis.

The question now is the quantity. How much shall the diabetic eat? We may say he may eat two pounds of potatoes a day if he wants to. He may eat potatoes freely. A couple of large potatoes for breakfast,--and you have no idea what a comfort it is to the patient. We have our potato gluten biscuit.

we have constantly in our factory here to supply to our patients these potatoggluten biscuits. We wash all the starch out of th flour, then put the potato in place of the starch, put it in with the gluten, so we are able to make bread with the gluten, with potato substituted for the wheat starch. We are playing all sorts of tricks on mother nature, so to speak. I have tried all the different starchy preparations. For instance, peas flour,--make a combination with the gluten by simply washing out the gluten. You have only to take the flour make it into a stiff dough let it stand for two or three hours, wash it out under a spiggot, kneading it under the spiggot, until you have not anything but the gluten left. You can use boiled potatoes, ground up, and work these boiled potatoes into the gluten, but work them in with the gluten very thoroughly. It is best to do it with a machine. The best way is to dry them both, then mix them in the form of dry flour, raise them with egg or some other way, and then you can get very nice biscuit. It has a little different flavor from ordinary wheaten biscuit,--has a distinct potato flavor; but it is not at all objectionable, and it is something dry that you can chew. It takes the place of bread.

Now the quantity which the diabetic should eat. How much shall thediabetic eat? You must watch his weight. He must eat sufficient so he won't lose weight. It is well to add a substitute for bread,--starch--and as much as he can of fat. Suppose he eats twice the amount of proteid, say two ounces of proteid; if the amount he requires is 1600 calories of food, let him have of that, 300 calories of proteid; 600 to

800 or 900 calories of fat, and let him have the balance of it in the form of carbohydrates in the potato. Potato is practically all carbohydrates. He can digest fat easily as a rule, but the fat must be given in a form easy of digestion. You would not say to him, "Now potatoes are good for you; eat Saratoga chips; fat is good for you, eat baked potatoes saturated with melted butter." You would not do that at all, but give him his fats in the form of an emulsion. One of the very best thiggs for diabetics is nuts on that account, because in nuts you have proteids and fats in good combination. You have for example in the pecan twenty-four or twenty-five per cent. of fatty and proteids, and sixty to seventy per cent of fats. The pecan and the hickory nut are about the same; they are relatives. The pine nut, pinon, pignolia, is excellent food for the diabetic. Nuts, acid fruits, potato, gluten preparations are really the best foods for diabetics. The quantity should begin with the patient's normal quantity, the normal amount he ought to eat, and increase that by the addition of fats and carbohydrates until his weight is stationary, or until he gains weight to a stated amount. Bromose represents nuts chewed up.

V-3-16-5.