CLINICAL DIETETICS

Lecture I.

To Classes in Domestic Science, Physical Culture, and Nursing, at the Sanitarium Chapel, Battle Creek, Mich., Monday, January 16, 1911, at 2:00 P.M.

By

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I am going to talk to you a little about digestion—the wonderful process by which common things, inanimate things, are made into the most wonderful of all created things, made to think. Did you ever stop to think about it?—what we eat today—that wholesome bread, potatoes, possibly ham sandwiches and deviled crabs and bedeviled oysters, and other wicked things—the things we eat today are walking around and talking tomorrow. That is a serious thing to think about. The things we are eating today, that we swallow, that we take off our tables, take off our plates—perhaps we do not eat them properly,—those things are walking around tomorrow and talking, and thinking. They are promoted, they are transfigured, so that they become living, become sentient, and become intelligent; so the process of eating and the process of digestion is really a wonderful, a miracle working process. It is not a common, every day thing. It used to be supposed that digestion was a process entirely peculiar to animals. But now we know that vegetables digest; that even the most microscopic speck of life, the germ that we see under the microscope can digest and does digest. It digests, it assimilates, it excretes,—the little germ does, the minutest vegetable organism—just as human beings do.

That is how it happens that alcohol is a poison. Alcohol is an excretion; it is the fecal matter, if you please, of the yeast cell. That is why it is poison; for all excretory substances are poison. That is the reason why
germ poisons are so deadly—they are all excretory poisons, they are excretory substances. The human body is an excreting organism. The food substances we eat today are organized tomorrow, walking around and talking, they are doing things; and the next day are converted into poisons, into deadly substances. So it is a complete process, it is a cycle of life by which inanimate things become sentient, become intelligent, become active, become potent, become dynamis, and afterward die and pass off by a process of excretion, back into the world of matter again, and become dead, inert, inanimatus; then afterwards are reconstructed again, built up again in vegetable forms, in different animal forms, and in human forms; then back into the earth again. This is an endless cycle that is going on for ever.

There is a little film over the top of the earth of material that is capable of going through this round. Down in the center of the earth, the granite, the sandstone, metals and those things are not capable of such transformations; but there is a little material on the surface of the earth which we call the soil that is capable of undergoing these transformations so marvelously wonderful.

Now, digestion is a process by which food substances are rendered capable of being absorbed into the blood and assimilated. There are substances which can be absorbed which are not food. There are substances which can be taken in, absorbed and circulated which are not food. Alcohol is one of those substances that is supposed to be a food when it is not a food. From the earliest times down to the present time, alcohol has been considered a good creature of God, whereas it is not a creature of God at all; God never made alcohol. Alcohol is a product of decay, a product of great change; it is an excretory substance. As I said a little while ago, it is the fecal matter of the yeast cell. So whenever you think of alcohol, you think of that if you please. It is the excretion of the yeast cell. It is as deadly to yeast cells as it is to human
beings. When yeast is growing in some sweetened water, it grows very rapidly at first, but when alcohol is produced even in so small a quantity as one part in a thousand, the yeast cell almost stops growing; it grows very slowly after that; and when the proportion of alcohol is a little greater, it kills the yeast cell. So the only way to make strong liquors is to distil the fermented liquors and separate the alcohol off, and in that way get the concentrated alcohol. The yeast cell can not stand alcohol any more than human beings can; it is very deadly to it. It is the excretory substance of the yeast cell and is very deadly.

Now, this process which was once supposed to be very simple, is known now to be a wonderfully complicated process. We are only beginning to find out just a little about it. Up to ten or fifteen years ago we practically knew almost nothing at all about digestion. We thought we knew a lot of things which we did not know; but about twenty years ago a Russian professor by the name of Pawlow began to study digestion in his laboratory at St. Petersburg. He induced the government to make a small appropriation and give him a building; and as teacher of hygiene for the army of Russia, he had an opportunity to begin experimentation. He had been trained in the schools of Germany as an experimental scientist; so he got this laboratory built and maxitily pretty well equipped. There is his face. That is Prof. Pawlow. I esteem it an honor to introduce his face to you upon this screen. I had the pleasure four years ago of knowing him in his laboratory. I heard such wonderful things about this laboratory, the marvelous things that were done there, and the wonderful experiments that were made that I went there four years ago for the express purpose of examining his work, of seeing some of his marvelous experiments, of making certain that they were all true, that the results and conclusions were valid; and to get some further information that I had not been able to get by reading his books. He
is one of the most charming men I ever met. I was only sorry I was not able to speak his native language with him. He could not speak English, so I could only visit with him in German and French, and my German and French were not very fluent, because I didn't have much opportunity to speak those languages. I can read French probably as well as I can English, but I can speak but very little.

Now, Prof. Pavlov devised a new kind of operation upon the stomach of the dog and other animals, especially dogs, by which he could render the stomach convenient for experiment. The old experiments had been very crude and gave very imperfect results; but by making an incision into the stomach in this way, separating off about one maxima part of the stomach from the rest of it, then performing an ingenious operation, he was able to make a little stomach which I will show you in a moment.

Here is the Professor and his assistants. This is Prof. Sokoloff, one of his ablest assistants. He is making an operation upon a dog. You see the most careful antiseptic precautions are taken. Nobody ever goes into this room without their wooden shoes and these gowns. They have to make preparation in an adjoining room just as though the operation was for a human being. The dogs are scrubbed, shampooed, disinfected, and prepared with the very greatest care. The operations are done with all the antiseptic nicety that modern science renders possible. I never saw operations done with such care as Prof. Pavlov's operations upon dogs. Here is an operation that was performed while I was there. Here is Prof. Sokoloff; here is Prof. Haeckel--two of his first assistants, and these others were subordinates; and here is another man there that possibly you may have seen before, acting particularly as spectator, or assistant, as the French say. In France the man who assists at the operation simply stays by and does nothing but looks on.
This is the little stomach that is made by the operation. It is separated entirely from the large stomach, you see. It is called the "kleinemagen" or little stomach; or sometimes it is called "Pawlow's pouch." You will see it is separated entirely from the large pouch, and has about one tenth the capacity of the other. It is connected with the skin. It opens upon the skin, so that it is possible to look inside, and the tube can be put inside here. Now, when the dog stomach is at work, the little stomach is also at work, and because the nerves which go to the stomach have none of them been separated or destroyed. They run along the greater border of the stomach, and this small stomach has the same nerves which the large stomach has, and when a message goes to the big stomach to go to work, it goes to the small stomach also; so whatever the big stomach does, the little stomach does. So by this means it is possible to study the of the stomach under different conditions, with different kinds of foods; and a vast treasury of knowledge has been disclosed which we had not the slightest inkling of before these experiments by Prof. Pawlow.

Here is a dog that has had a somewhat different operation performed upon him. He has had a fistula made into his big stomach; he has had his esophagus divided so that the two ends are attached to the skin, and when he swallows food it does not pass into his stomach, but passes back into the pan he was eating from, and eats it over again. He keeps going round and round. He gets more and more hungry all the time. He may eat all day and get hungrier every minute; so you see how much he enjoys his dinner. Now, if you want to enjoy your dinner like a Pawlow dog, you must fletch and inize it. This dog does an enormous amount of fletchering you see, and while he is chewing in this way, the food is dropping out into the pan and is taken back again, and the gastric juice is being secreted. I am going to tell you more about that a little later on—just as though the food went into the stomach the gastric juice is being secreted, and
it is being secreted down in the little stomach and runs out of this tube, and
collects over there in that jar. The dogs have to get up at four o'clock every
morning, go to the laboratory, and there they are stood up in a row here. Dr.
C ase took this picture for me, and the dogs were looking at the camera while
the picture was taken. These dogs had been eating breakfast since four o'clock
in the morning—it was then ten o'clock, and each one had done his stint which
consisted in producing one quart of gastric juice. This gastric juice is filtered
and aerated so that the canine smell is entirely removed, and is sent out all
over the world. We have it here in our pharmacy—no, it is just out. I got
a telephone message last night to get some more of it.

After the dog finishes his morning job, he goes down into the basement
of the building and a tube is put into this opening and passed into his stomach,
and his food is passed down through a funnel; so he eats his breakfast in about
half a minute after he has been chewing four hours and enjoying his breakfast
more than anybody ever did before, because he gets hungrier every minute; and
yet no food enters the stomach; but his mouth is watering, and he is having an
awfully good time. One of us can not eat so long as that because the stomach
gets full, but this dog has a hole in the bottom of the stomach so to speak, so
the food drops out as fast as it goes in, and he can enjoy life more than any-
body.

We saw these dogs out around the lawn, and if you saw them playing about
and how they wagged their tails when they saw Prof. Pawlow coming in, you would
say there was no cruelty to animals after all. There is doubtless temporary
soreness and some inconvenience from the anesthetic; but I suppose the actual
suffering of the dog is not any more than you have when you have a tooth pulled;
so it is not very great, while the knowledge that has been gained is simply
immense. Now, I want to tell you some of the things Pawlow has discovered,
but before we go on to that, I want to call your attention to the digestive organs as a whole, so we will have the subject well before us.

Here is an inside view of the body showing the lungs and heart removed. Here is the liver; here is the stomach, and here is the colon. Please observe the colon structure. Here is the cecum on the right side, passing up to the liver. You see it makes a turn at the hepatic flexure, then passes over to the other side, and passes on up nearly to the diaphragm, makes another very sharp turn, and this is the splenic flexure of the colon; then it passes on down to the descending colon and makes a curious little twist, the sigmoid flexure, shaped very much like the letter S, so it is called the sigmoid flexure of the colon. It comes finally to the upper part of the rectum. Here is the mesentery, here are the large blood vessels that distribute blood to the colon and other parts. Here we have another view of the stomach. This stomach has a different shape from that you have been accustomed to seeing given to it. You have been accustomed to seeing the stomach pictured as horizontal, but it is not horizontal; it is vertical; it lies pretty nearly underneath the liver. The spleen is at the left hand, and the gall-bladder lies just at the right end of the stomach.

Here is the pylorus. Here is another view of the stomach in its correct position. Here is the liver turned back over the gall-bladder; here is the pancreas which lies behind the stomach; and the spleen. Here is the duodenum. This is just below the pylorus that has been cut off, and this shows the duodenum passing around the head of the pancreas which discharges its secretion into the duodenum through a small opening which also admits the bile from the liver.

This shows the stomach turned up and shows the large blood vessels behind. The duodenum here has been divided, but I want particularly to call your attention to this apron. Sometimes it is termed by the butchers the call. It affords protection for the bowels, lies in front of them, and is a wonderful doctor, a wonderful means of resistance to disease. The omentum which spreads
out when it is well developed covers the intestines and the contents of the whole abdominal cavity, and is sometimes called the abdominal doctor, because whenever there is any trouble anywhere, it works off into that corner and looks after it. It has a great number of blood vessels, you see, and consequently can bring a great number of white cells to fight against any inflammation or infection that may occur. So it is a wonderful protector.

Here you see the colon after the small intestine has been removed. Here is another view of it. It does not show just the right view of it here, for it does not rise up quite high enough. This shows what happens to the colon sometimes. The sigmoid flexure has become enormously elongated, and it sometimes gets twisted around so it becomes obstructed and makes a form of intestinal obstruction. Here is a case in which the transverse colon has fallen down, and the sigmoid is enormously dilated. It is such cases as these that suffer from appendicitis. Appendicitis is more than half the time in the bowel instead of in the appendix. So-called cases of appendicitis many times are entirely in the bowel, and not in the appendix at all. Here is an enormously elongated transverse colon. I have met a good many such cases in operating upon the abdomen, and had to pull out the transverse colon which had fallen away down deep into the pelvis. Such cases are almost certain to have constipation and other bowel troubles.

Here is another picture showing the right shape and the normal position of the stomach--mostly vertical you see. This is the cardiac portion here, and this is the horizontal part which is comparatively small. This shows a picture of the stomach taken with the X ray on a patient a short time ago. Here is the pyloric portion; this represents the horizontal portion, and this is the vertical portion. The patient took a glass of yogurt containing some bismuth, and the bismuth is opaque to the X ray, so we get this shadow on the photographic plate, you see, and this gives us a picture of the stomach just as we find it in the
living person. It is not lying down across the body, you see, but it is vertical. And it is not lying away down here somewhere. A lady some time ago said she was suffering pain in the stomach, and I asked her where, and she put her hand away down in the left side. It was pretty nearly a foot below the place where the stomach belongs. Sometimes the stomach gets down there.

Here is the cardiac orifice where the food comes in, and here is the cardiac portion of the stomach where the digestive work is done. When the food goes down, it passes into the center, and it keeps working out, so the food which goes down first is on the outside of the ball of food, and the food that comes down last goes to the center. That is very interesting isn't it. When persons vomit, they vomit food in the order in which it was taken down. The last taken is vomited first. The digestive fluid which is formed here acts upon the outside of the alimentary mass. The gastric juice is formed and acts upon the outside, gradually works it down and renders it liquid. We really have two stomachs. Cows have four stomachs, and we have two. This stomach is shut off by the other by a muscle here which is generally relaxed when the stomach is found inert. But we can see it with the X ray, see this muscle contracting. Sometimes it becomes contracted too strongly. The liquid portion comes down into the pyloric stomach, then the pyloric stomach contracts just as a bulb is squeezed only it squeezes itself; it works like the bulb of an atomizer. You contract the bulb and force the contents out as you contract or compress the bulb of a syringe to force the liquid out. That is exactly what the pyloric stomach does—it works just like a bulb, and the liquid portion is forced out from the pyloric portion into the intestine. If there is anything any of you do not understand, just ask me about it, and I will be glad to explain it.

Now, this shows a stomach that is enlarged. You see instead of being vertical, it is dilated at the bottom. That is because it has lost its
power to contract; it has lost its tone so it has not power to contract and hold itself in shape, and it is simply an inert pouch, and food accumulates in the bottom of it instead of being held up and passed on.

This is what we see in a cat's intestine under the X ray. The cat was given the dose of bismuth, and pretty soon the bismuth began passing out of the stomach, passed on down into the intestine, and the intestine would be seen to contract. You see it is formed into notches, and pretty soon this notch would disappear and another set of notches would be formed the length of the intestine. It is not the contractions starting at one point and working the whole way down, but it is the whole thing acting at once. When the stomach contracts, the intestines contract, and the series of these contractions look like a series of skips all along the length of the intestine by the alternate contractions.

Then a few moments after or a few seconds, you would see another long set formed and in that way the foodstuffs are pushed along into small masses, you see. They are divided up into little masses and carried along and become less and less distinct as they get farther down. I have seen this with my own eyes in a living being. I have seen it not only in the intestine when operating, but I had an opportunity to see a most remarkable case in Switzerland when I was there last. Dr. Roux found a boy who had swallowed some marbles, and the result was there was inflammation of the esophagus, and the esophagus was shut up tight so he could not get any food down through the esophagus. It looked as though the boy would starve to death, but Dr. Roux made a new esophagus for him out of a piece of small intestine. He opened the abdomen, cut off a piece about a foot long, attached the ends of the intestine together again, then took that piece of stomach, attached one end to the stomach, pulled the other end out right here so there was a new road to the stomach. The end of the esophagus was attached to the skin of the chest here, and he was just as happy and well nourished as he could be. He passed the food through his mouth, then
passed it through a little rubber tube down into this little esophagus through the skin. Now, the interesting thing was what happened to the esophagus. You see, the intestine lay just right under the skin, just exactly as you might imagine a snake lying under a piece of thin silk or gauze, so you could easily see all his movements; they would be indicated on the surface. Now, that is just exactly the situation. Here was the intestine lying under the skin. The doctor who was showing me through the hospital and showing me this case tucked a small lozenge into the upper end of the opening, and almost immediately there was a series of scallops formed all the way down, clear down below the rib where it went deep into the abdomen. All of a sudden there was a kind of jerk, and a new set of formed; and pretty soon a little sort of twitch and a new set formed, and in that way I saw this lozenge travel by jumps along down and finally disappear at the lower end. It was a marvelously interesting spectacle, so that we know something now about the action of the intestines, and the action of the stomach. The large stomach is a laboratory, as I said, and the small stomach, the pyloric stomach at the right end is the mill, you might call it, or the injector; it is the pump properly that takes the digested food and pumps it down into the intestine.

Now, these processes we have been talking about we can readily see are wonderfully intricate, and they require intelligent management. They are so marvelously intelligent and so exactly adapted one to the other that we can not avoid the impression that they are under a masterly control; but they are not under the control of the will. Prof. Roger has been studying these intestinal activities, and one of the things he has studied is the manner in which the intestine or the stomach deals with a pin of a needle. For instance, he introduced into the intestine of an animal an ordinary stickpin. Suppose a small boy or girl swallowed a stickpin. Such a thing happens sometimes. I got a telephone message in the night some time ago, about two o'clock in the morning,—"Dr. Kellogg,
won't you please come down to our house right away? The baby has swallowed a stickpin. Bring your instruments along; we want you to operate at once." They wanted me to operate upon the baby's stomach at once to find the stickpin. I said, "Are you sure the baby has swallowed a stickpin?" "Yes indeed." "How long was it?" "About two and a half inches long." It was difficult for me to imagine how the baby could get such a thing down, but I said, "I don't think anything serious will happen; that baby's intestine knows how to take care of the stickpin. Don't be in a great hurry. Just wait a little and see." About nine o'clock the next morning, I called up to see how the baby was getting along, and they said, "We found the stickpin on the floor; the baby didn't swallow it." I was very glad. But suppose the baby had swallowed it, this is what would happen. The pin began sticking into the intestine, and right away the intestine began to swell up like that so the intestine would swell so much the pin would not push through. Then the bowel begins to lift up, and push the pin up here into a vertical position. Then it keeps on pushing until it pushes it clear over, and pretty soon it is going head foremost down stream, and all is well. Now, isn't that a wonderful thing? It is the intelligent power which the intestine possesses through the creative guidance which it has, for it takes the same power to keep us alive that it did to make us. There are some people that don't believe in God--I am sure there is no such person here. Anybody who studies physiology has to believe in a great, controlling masterful intelligence which looks after us. When God made man he made such a wonderful creature, he made such a wonderful machine that he had to stay right by to take care of it. When he made man in his own image, he put himself into him, in other words, to take care of him. He has to be right present with every little cell and every organ of the body all the time, every instant of our lives, to keep things going right, and to keep repairing the parts that are wearing out to keep things going.
We have got an electric light machine down here, a coarse, great bunglesome machine, and we have to have a man standing by it all the while. Suppose a railroad train should be allowed to run itself,—just think what would happen. The body is a much more intricate machine, needs much more careful guides; it is infinitely intricate, so it requires constant care.

Now, I want to go back to the very beginning again. We will hurry along until we find the right one. Now, I want to talk to you about this stomach and some of the things Pawlow has discovered. The most remarkable discoveries of Pawlow have been in relation to the stomach. Pawlow discovered, as I told you, that whatever happened in this stomach happened here. Of course we knew that, but he discovered that different kinds of foods produced different kinds of gastric juice. I am not going to try to give you all the alimentary canal needs about digestion, because you have learned that already; but I want to give you some of the great, fundamental things we all ought to know about that help us particularly in our work. He found, for instance, that when he gave the animal fat to eat—olive oil or any kind of oil, or fat, the stomach simply made no gastric juice at all. It is a good thing to remember that. He found when he put a pint of water into the animal's stomach, things went on merrily, and gastric juice was made in abundance. Sometimes a patient will say to you, "Why, even water sours on my stomach." You have the explanation of it now. Water is one of the substances which cause the stomach to make gastric juice if you take it in sufficient quantity. That is a good reason, too, you see right away, why people who have hyperacidity should eat dry food—because water causes the stomach to make gastric juice. Now, he found that if he put one grain of acid soda in a pint of water, one grain of carbonate of soda, the stomach made no gastric juice at all. That is a pretty good argument against baking powders, isn't it, and salaratus, soda, and all kinds of alkalies. You
see it is a pretty plain case that those things are harmful; because one single grain of soda in a pint of water was enough to cause the stomach to make no juice at all. It is then pretty easy to see why people get bilious when they eat so much fat—because when they eat a good deal of fat, the stomach makes no gastric juice, and the food does not digest, and it lies around and rots. The same thing exactly would happen if you had a lot of dead cats, rats, sheep, dogs and things lying around the back yard, and you didn't have any chlorid of lime to disinfect them. Gastric juice is a disinfecting agent, and if there is no gastric juice to disinfect the food, there is nothing there to disinfect it or preserve the food, nothing to prevent decay of food; it is not digested, but simply rots, decays, produces poisons, and these poisons are absorbed and produce nausea, headache and other mischiefs, and this bilious attack or acute autointoxication, which is the same thing. Tawlow found that a pint of water will produce an abundant flow of gastric juice, while fats produce no gastric juice. Olive oil had the most marked effect of any fat substance in checking the flow of gastric juice for some reason. So if people make too much gastric juice, olive oil is a very good thing to give them, isn't it?—because that of all substances will hinder the flow of gastric juice the most.

Now, he found if he gave an animal bread, that made a very powerful gastric juice; not a very acid gastric juice, but it made a great amount of pepsin, and had a very high digestive power—the highest digestive power of any gastric juice which the stomach made was made when he gave the animal bread. On the other hand, when he gave the animal meat, the meat juice, or Liebig's extract of beef,—when he gave the dog any of those substances the stomach made extremely acid gastric juice, which had nothing like the digestive power — only about one third the digestive power of the juice made when bread was eaten; but it was three times as acid as that which was made by the bread juice. That is, the
extract of meat caused the dog's stomach to make gastric juice that was extremely acid. So you can see right away without stopping for any long deductive process that if a person's stomach is making too much acid that meat would not be the proper thing to give him, because meat stimulates the stomach to make more gastric juice. It is the most powerful stimulant to the formation of acid in the stomach of anything. Bread produced a very active and very powerful gastric juice. Now, milk produced less acid gastric juice, and not so powerful a gastric juice as bread produced, not so acid a gastric juice as meat produced, but a sort of intermediate gastric juice. The amount of activity of the gastric juice depended upon the amount of fat in the milk. The more fat the less juice. So skim milk, you see, would make more digestive juice than cream. So if a person makes too much active gastric juice, we would give him cream instead of milk, because the more fat there is in it the more the formation of acid will be inhibited and discouraged.

Now, there is so much about this that I am going to stop right here a moment now to let you ask some questions. We will have a little sort of review on the subject of digestion. It is so simple I think we can learn the foundation principles of the physiology of digestion in a few minutes, the anatomy and physiology, the elements of it we can get in four or five minutes. Now, listen. There are five digestive organs, --mouth, stomach, liver, pancreas, intestines. Each one of these digestive organs makes a digestive juice; so there are five digestive fluids. The mouth makes saliva, the stomach makes gastric juice, the liver makes bile, the pancreas makes pancreatic juice, the intestines make intestinal juice; so there are five digestive organs, and five digestive fluids. Now, the digestion is for the purpose of rendering the food fluid so it can be absorbed, digesting and preparing it for absorption and assimilation. We have five digestible food elements. The whole thing goes by the rule of five, you see, --five digestible food elements--starch, albumin, fats, sugar and salts.
We study mostly about three—starch, albumin and fats; but we have two more—
sugar and salts which require the action of the digestive fluids to prepare them
for absorption.

Now, I have told you, not the whole story, but the fundamentals. These
are the brick and mortar out of which we can build our house. There are five
digestive fluids, each one made by one of these digestive organs. Each digestive
organ makes a digestive fluid; there are five of them. The mouth makes saliva,
the stomach makes gastric juice, the liver makes bile, the pancreas makes pan-
creatic juice, and the intestines make intestinal juice. Then there are five
digestible food elements.

Memory, you know, depends entirely upon the strength of the impression.
The reason we do not remember some things, is because we were not impressed by
them. That is the reason. You meet a person, shake hands with them, meet them
several years afterwards and you have forgotten all about it; don't remember
having met them at all. Now, suppose you met a man in the street and he was
holding a revolver in his hand, demanding your money, and he kept you standing
there two or three minutes. You would never in the world forget how he looked.
The reason why we do not remember is because we do not get impressed. That is
why I am asking you to do this thing intensely—yup so you won't forget it, so
that it will be burned into your memory.

We name starch as the first food element because it is most abundant.
About three quarters of our food is made up of starch. The average man requires
about sixteen ounces a day of starch, possibly a little less, fourteen to six-
teen, we will say, according to the amount of work he is doing. Now, the next
most important element is albumin. We might perhaps put albumin at the head of
the list. Perhaps instead of saying albumin, we should say protein, because
protein covers the whole class. I will be glad to have you change that. There
has been a little change in the nomenclature since I began to teach this way, which was about forty years ago; so I have to change a little too with the rest of the world. Starch, protein, fat, sugar, and salts--those are the five digestible food elements. Starch is the most important in quantity. Protein is the most important in essential need. We must have protein. We can get along without starch--we can put something else in its place, but we must have protein. Fats we can dispense with for a while, for we need fats. Sugar we can dispense with all the while as we will see by and by, for we make it ourselves. Salts we must have. Now there are several different kinds of starch. Every vegetable has its own kind of starch. But we will continue this next time.

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v-3-6-11.
I don't get up in this chair so you can see me but so I can see you. I like the looks of you there. I don't know where I can find a better looking lot of folks than I see here. I tell you it is no small satisfaction to me to think that I am talking to an audience of our own helpers here, looking into the faces of young men not a single one of whom smokes, and not one that chews tobacco or drinks whiskey; and these young ladies—they are all of them from the best families, young people that could be thoroughly recommended to anybody as good housekeepers and excellent nurses; so I always feel at home, you see.

Now, we are going to have a little review first of all. We talked yesterday about the digestive organs; how many are there? Five. How many digestive fluids are there? Five. I don't expect you are ever going to forget that in the world. What are the five digestible food elements? Starch, protein, fat, sugar and salt. Now, we must take a step in advance. I think we will remember that part of the lesson very well.

How are these several food elements digested? What are the five digestive fluids? The saliva, the gastric juice, the bile, the pancreatic juice, and the intestinal juice. You are bright scholars; you learn fast. Now, we want to know what these different digestive fluids do, then we will learn a little something more about how they do it. Here are the saliva, gastric juice, bile, pancreatic juice, intestinal juice. What does the saliva do? It digests starch. What does it do to the starch? It converts the starch into sugar.
What kind of sugar? Neither cane sugar nor grape sugar. Saliva converts the starch into malt sugar. Remember that: Saliva converts starch into malt sugar. I think we all know that. The saliva converts starch into malt sugar. Now, what does the gastric juice do? It digests protein; it digests meat; it dissolves perfectly the connective tissue of meat. That is the reason why the dog does not have to chew his dinner. Give the dog a piece of meat and he swallows it as quick as he can, and is ready for another. The gastric juice can melt that meat down just exactly as warm water melts ice; it digests it completely and dissolves it. That is its special function. That is the reason why the dog does not have very good arrangements for masticating. The dog, you know, can chop, cut up his food, he can move his jaws up and down but can not move them back and forth nor sideways, but only chop; so you know how a dog eats. That is the way he eats. But a cow eats very differently. A cow works her jaws from one side to the other, first to one side, then after while makes a change and works the jaw towards the other side. She chews first on one side for a few minutes, then on the other side for a few minutes. She changes off. In that way she gives the salivary glands of one side a chance to rest. People who chew gum do not give their salivary glands a chance to rest at all; they are going on all the time. I throw in these suggestions as we go along, by way of entertainment and amusement.

Now, the saliva converts starch into malt sugar. The gastric juice digests proteins, converts the proteins into peptone. The bile digests fat, it makes soap out of the fat. The alkalines of the bile combine with the soap and make soap in just the same way that your mother used to make soft soap from the lye in the leach barrel down behind the barn and the grease that was gathered up, odds and ends of various things. In the same way the bile, which is a sort of lye leached out of the body, a residual waste product. The
bile is an alkaline substance which combines with the fat and makes soap of it. Now soap you know is soluble. Fats are not soluble in water, but soap is soluble in water. You can mix oil with water, but you can mix soap with water. So it is with fat. Fat when mixed with the blood can not be absorbed, but the soap which is made from the fat is readily absorbed just the same as water. It goes into solution and is quickly absorbed in the blood just as soap is. So saliva digests starch. Gastric juice digests protein, and the bile digests fats. Now, there are the three most important food elements—starch, proteins and fats, and we see they are digested respectively by the saliva, the gastric juice, and the bile. Now, that is easy isn't it? What is it that digests starch? Saliva. What digests protein? The gastric juice. What digests fat? The bile.

Now is there another digestive fluid? The pancreatic juice is the next one. There are five altogether. We have considered only three. And what does the pancreatic juice digest? It digests what the saliva digests, what the gastric juice digests, and what the bile digests. It does the work of those three digestive fluids. It is easy to remember that isn't it? The pancreatic juice does the work of the three preceding digestive fluids. It does what the saliva does, and what the gastric juice does, and what the bile does. It not only does the work which these three digestive fluids do, but it does it better. It contains digestive principles which are able to do what the saliva does, and are able to do what the gastric juice does, and which are able to do what the pepsin does and what the bile does. So these are three separate, distinct digestive principles found in the pancreatic juice. Now, they are not always found in the same proportion. Sometimes the element which digests fat is most abundant. The pancreatic juice does not always contain the same proportion of these digestive elements, because sometimes one is needed more, and sometimes another. It contains sometimes more of the fat digesting element, sometimes more of the protein digesting element, and sometimes more of the starch digesting
element; and under various conditions, these vary.

Now, there is another digestive fluid. What is that? The intestinal juice. What does that digest—the intestinal fluid? That digests sugar—malt sugar, cane sugar, and milk sugar. It digests milk sugar in babies, but after babies get to be two or three years old, then the ferment which digests the milk sugar, or lactase, is not present in so large quantity, and so many people can not digest milk sugar very well. When they take milk, they have fermentation and gas in the bowels, because it is not well digested. They haven't the lactase necessary to digest milk. The ferment which digests the cane sugar is present in the intestine only after three or four hours after the cane sugar has been eaten. It is not always there. The sucrase which digests cane sugar is not present in the intestine when you sit down and eat your breakfast and heap a whole lot of cane sugar on your oatmeal, for example—there is no ferment down there in your small intestine to digest it; there is no provision for it; but nature gets notification and prepares for an emergency, and makes some sucrase about three or four hours after you have eaten; and when the cane sugar finally gets down into the intestine, then the sucrase begins to digest it; but it is a slow process to digest cane sugar, and the body does not make very good provision for it. It is very important that it should be digested, because if some cane sugar gets into the blood, it is poison, and is treated as a poison; it is removed from the body by the kidneys as a poison. If some milk sugar gets into the blood, it has to be carried off as a poison through the kidneys. It can not be utilized. Now, there is another kind of sugar we talked about. What was it? Malt sugar. Malt sugar is quite different. The ferment which digests malt sugar is always present. It is present in almost every fluid of the body; it is present even in the blood; it is present in the intestine always, so that malt sugar is digested at once, quickly, as soon as it reaches the in-
testine, and if some of it is absorbed into the blood it makes no difference, because it will be digested in the blood. If some of it were injected into a muscle it would be digested there in the muscle, because malt sugar is the sugar which the body deals with most readily, and that is the reason why we have it on the tables here—why we have malt sugar instead of cane syrup—because malt sugar is the natural sugar for the body; it is better adapted to the body, and it produces no ill effects, but is always received in a more friendly way. It is important to know these simple facts, and I am glad of an opportunity to give you the reasons for some of these things.

I might say a word further about malt sugar. My attention was first of all called to it about thirty-five or thirty-six years ago. When I began practicing in the institution here, I found some patients were greatly benefited by Liebig's extract of malt—simply malt syrup made by evaporating down the extract of malt—mostly sugar. I very soon became satisfied it was not because of the assistance given to the digestion that this malt sugar was useful, but because of its food value. So I began using malt very largely as a food, but it had a very bitter, rank taste, so that most patients could not take it; and on that account it was objectionable; so I began experiments more than twenty-five years ago, trying to produce a malt sugar which was eatable, and finally, after a number of years, succeeded in getting meltose, as we call it, or malt honey, which is a solution of malt sugar, with some dextrin mixed with it. It is not pure malt sugar. There are no impurities with it, but simply the dextrin which is not yet entirely converted. So you know about that.

Now, I should mention one other sugar. There are fruit sugars, the sugars of fruit, the sugars you find in figs, in raisins, and in apples, and all the different kinds of fruits with the exception of the date. The sugars of these fruits are fruit sugars. This fruit sugar is a mixture of levulose and dextrose. Now, levulose is a substance which when you look at it through a
polariscope, the ray of light is turned off to the left; and dextrose is a substance which when you look at it through the polariscope, the ray of light is turned off to the right. That is why one is called levulose and the other one dextrose—they look alike and taste alike, but the levulose is about fifteen times as sweet as dextrose. Levulose is more easily assimilated than dextrose is, but both of them are already digested, and when taken into the blood they can be assimilated, although the cane sugar can not be.

Now, in the process of digestion, if cane sugar is converted into levulose and dextrose. Maltose when it is digested is converted into two kinds of dextrose. There is a right and left dextrose, and just a little difference between the two. When milk sugar is digested, it is converted into galactose, and dextrose, but you do not need to worry about those things. Please remember that fruit sugar is already digested.

Now, in the case of the date, we have cane sugar instead of fruit sugar. In the case of the fig, we have fruit sugar, not cane sugar. Why? Because when the sugar is found in the sap of the fig tree, it is cane sugar, and the sugar found in the sap of trees generally is cane sugar. But as the cane sugar is brought up from the stem to the fig, as it reaches the fig, it at once encounters a digestive ferment which converts that cane sugar into fruit sugar, so it is deposited in the fig a fruit sugar, and that is true of dates too, generally; but there are a few varieties of dates which lack this ferment, which are defective, and they do not have the ferment particularly needed to convert the cane sugar into fruit sugar; so the cane sugar is deposited as cane sugar in these dates, and so they become defective dates. It seems rather strange to call them defective, because they are so plump and nice, and so sweet, and we are famed fond of the cane sugar; but they are an accident; they are defective dates; they differ from the ordinary fruit, and the
process is not the ordinary process. So we see that the natural sugar of the body is maltose, because that is the sugar that is formed from the digestion of starch, and starch constitutes a larger part of our food. Either maltose or malt sugar or fruit sugar, the form in which the sugar is already found in fruits. You understand now why it is that fruits are so refreshing. When one takes fruit juice, he feels fine, and refreshed and strengthened right away. A glass of lemonade does one more good than a glass of water. One takes half a glass of water, perhaps cannot take any more, but of lemonade he can perhaps take two or three glasses, because it is food, you see, as well as water, and the instinct of hunger comes to the rescue, and enables you to take a much larger quantity of fluid in the form of lemonade than in the form of water. If you nurse patients and cannot get them to drink water, put a little lemonade in it, or some tamarinds, or orange juice, or apple juice, or raspberry juice, or grape juice—any sort of juice which will give the water a little flavor; then any patient will drink it very readily, whereas plain water would be so repellant to them they could hardly swallow it.

Now, let us review a little to see how much you remember. These things are all easy, and you have been listening—if you have not been thinking about the folks at home, or somebody at home, or if you have not been thinking about what you are going to do next when you get out of here, or the troubles you are going to have tonight when you have got that disagreeable patient to take care of, or something else, then you will remember, I think, what I have been telling you. So let us see if we can review it a little bit.

In the first place, what does the saliva digest? Starch. What does the gastric juice digest? Protein. What does bile digest? Fats. What does the pancreatic juice digest? All of them, starch, protein and fats. What does the intestinal juice digest? Sugar. What kind of sugar? All sugars? Cane sugar, Milk sugar, and fruit sugar are already digested.
and you cannot digest a thing that is already digested, can you? The intestinal juice digests some sugar. How many different kinds of sugar does it digest? Three kinds. First malt sugar; that is its legitimate business. Milk sugar is its legitimate business for a little while, while we are babies; and cane sugar. Malt sugar it is always ready to digest, and milk sugar it digests in infancy; and cane sugar it digests under protest.

Now, we have been talking about several food elements. We have discussed starch, protein, fats, and sugar. Is there another one we have not talked about as yet? Salts. How are salts digested? Salts are digested by all the digestive fluids. The saliva, the intestinal fluids, the pancreatic fluid, the bile—all these digest or dissolve those salts which are soluble in alkaline media, while the gastric juice digests or dissolves those substances which are soluble in an acid medium. So we need them both.

Well, we have gotten the real foundations of the subject of digestion, and now let us go back and consider a little more all the processes by which foods are digested, and I will throw upon the screen now some pictures, and the first one is those Pavlov dogs you saw the other day. Every one of these dogs has a tube attached to him that carries off the fluid that forms in his stomach into a flask. I want you to see that the dogs are not very unhappy; they are very happy looking dogs; those are nice looking dogs. They are all of them intelligent fellows, and very glad to see their master. They are all in good condition, and some of those dogs have been there in the laboratory seven or eight years, making gastric juice all the time, working hard at it. Here you see them out for a frolic. They are tied up with strings, because they are very valuable dogs, and some of those dogs are worth their weight in gold almost. They have been useful in most wonderful experiments. Here are the bedrooms where they sleep. Each one has a little room for himself, and they are kept as clean and nice as possible. The passageways are washed out with hose, and kept
as clean as possible.

Here is a diagram of the dog we were looking at yesterday. Now, I want to tell you some of the wonderful things Pavlov has discovered in relation to the secretion of gastric juice. It was formerly supposed that the formation of gastric juice in the stomach began about half an hour after food was taken into the stomach; but now we know something different from that. Pavlov, in making his experiment, divided the esophagus so that the food fell back into the dishes, so that it could be eaten over again, thus separating it from the stomach, and connecting the stomach by means of a tube with a flask; and he made a series of studies which are of the greatest practical value, which have cleared up many of the hazy corners of the physiology of digestion, and of practical medical dietetics.

Pavlov observed that when the dog began to chew the food, and before any food had entered the stomach--because it could not, you see, the passage was interrupted there,--without any food at all going into the stomach, he observed that four or five minutes after the dog began to chew the food, the gastric juice would begin to trickle down through this glass tube, and pretty soon would make its appearance in the flask. Within four or five minutes after the dog began to chew the food and before any food had entered the stomach at all, the gastric juice would begin to flow out of the stomach, and that proved that there was some sort of connection between the mouth and the stomach.

You know at the back of the tongue there are some large papillae. We had a lady some time ago who made that discovery, and thought cancer was coming on her tongue because she saw those circumvallate papillae. This is one of these papillae magnified so you can see how they look under the microscope. Here is a single one of the papillae. The papilla has here a little trough around it. This is a section, you see. Here is a little trough that runs clear around it.
On either side of this deep trough are found the taste buds connected with the
gustatory nerve, and these nerves pass along through the tongue, then up to the
brain and connect with certain psychic centers, certain nerve centers in the
brain. Now, while chewing food, as the saliva mingles with the elements of
food, it dissolves the sapid, soluble substances of the food, and they are car-
rried down into this sulcus here. This dissolved food elements that have flavor
are carried down into this little trough around the papilla, and there they go
come in contact with the taste buds which you see here—a wonderful arrange-
ment for capturing the smallest amount of the sapid liquid, so that its properties
can be tested,—it is carried down here by the saliva dissolving some of the
food substances, and its true quality is recognized, and a message is sent along
these nerves up to the psychic centers of the brain, and from the psychic cen-
ters in the brain a message is sent down to the stomach. So you see how it is
that when the dog begins to chew, within a short time the stomach begins to pour
out the gastric juice. The gastric juice has been prepared; the stomach has
been notified, you see, that food is coming, and an advertisement has been sent
to it that food is coming, and it has been requested to get ready for that food,
so it begins to pour out juice. Now, this juice formed in this way is called
psychic juice, or appetite juice, and it is the most important element of the
digestive fluid of the stomach,—the most important element of the gastric juice
is this psychic juice which is poured out before the food ever enters the stomach
at all, and which is the result of the nervous impressions made by the presence
of food in the mouth during the mastication of the food.

Now, Prof. Pavlov learned that it was not even necessary that the food
should enter the mouth. That if the dog saw the food, that the liquid, the
saliva would begin to pour out of his mouth, and the gastric juice at the same
time would begin to pour out of his stomach. So when you have the experienc
that your mouth waters, according to Pavlov's experiments, we have proof that
the stomach waters at the same time. So you see it is quite important, if your
patient does not have a very good appetite, and you want to nourish your patient,
it is very important you should give the food patient food that will make his
mouth water, because if you want his stomach to water, you want the gastric
juice to flow, the saliva must flow first, there must be an appetite, and there
must be an appreciation of the flavor.

He found also that the dog's stomach produced gastric juice when the
dog was able to smell the food, and not see the food at all. I will tell you
an experiment a little while later that will illustrate that. Still further,
Prof. Pavlov found that when the man who was accustomed to feed the dog, the
man from whom the dog was accustomed to get his food,—when this man came into
the room in the morning, when the dog was hungry, the dog's mouth at once began
to water, and the gastric juice would begin to pour down out of his stomach.
That is, sometimes the cook is so successful that even the sight of the cook will
make one's mouth water, don't you see. It is a good thing, then that the cook
should be presentable and good natured and amiable, don't you see, as well as
that the food should be well prepared. The whole thing, the whole process of
nutrition, the whole presentation of the nutrient material must be agreeable. I
imagine that some people would find it very hard to eat dinner at some other
people's tables. That is a bad state of mind to be in. Down in India I am
told they sometimes make a test as to whether a man is a thief or not by means
of rice. I have been told that if anything is stolen from a house, the master
will take all the servants from the house, take them to the judge, and the
judge stands them up in a row, and he gives each one some him dry rice, and
he has to chew it, and he comes and looks them all over, and the man that stole
the article that is missing, his mouth will be dry, while the mouths of the others
will all be moist. The guilty one is not able to make any saliva. Now, I sup-
pose at the same time his stomach is just as dry as his mouth is—not making any gastric juice there, because the elements of the rice are not dissolved. He is not tasting them, and the psychic centers are not stimulated to activity.

Now, Prof. Pavlov discovered that different food substances produced different effects. If a man takes into the mouth a tablespoonful of oil, for example, olive oil produces no gastric juice because gastric juice can not digest oil. It can not do anything to it. It has no effect upon it, and oil inhibits the stomach from making acid gastric juice. Now, you see why it is that very fat things are sometimes nauseating. Instead of inviting the intake of fats, when we take fats in excess, there is a nauseous sensation produced in the throat by means of which the fat is likely to be rejected. On the other hand, sometimes there is a great desire for fats, a great craving for fats, and this craving for fats means that that the condition of the stomach is such that fats may be very useful or necessary. One of our missionary doctors who is here was telling me at the dinner table today a very interesting case of some one that had terrible pain in her stomach, and had a great craving for a special kind of bread—Scotch short bread, I think it was called, which is made almost entirely of butter or fat, and a very little flour, very short, much shorter than bakers' bread, and has a very large amount of fat in it. She was very fond of this and she would eat a great quantity of it, and it seemed to do her good. She had such a large amount of acid in her stomach that needed to be suppressed that she was able to digest it. Up in our ward a while ago I did an operation upon the stomach of a patient and found she had a large ulcer there, and after the operation we gave her two tablespoonsfuls of oil every day before she ate. That is to prevent the formation of this very acid gastric juice. The old way was to give such a patient a beefsteak. The beefsteak would absorb the gastric juice, but at the same time it would excite the stomach to make more gastric juice, because gastric juice is necessary to disinfect the beefsteak. That is why. Hydro-
chloric acid is an excellent disinfectant, and it is necessary to disinfect the
beefsteak. But if you do not eat beefsteak, you do not need so much disinfect-
tion, so the stomach does not make so much of this very acid gastric juice. Dogs
produce a very acid gastric juice, and if a man lives on a dog's diet, he has a
dog's gastric juice, don't you see, whereas if he lives on a monkey's diet he has a monkey's gastric juice. If he lives on a man's diet, which
is his proper diet, he has a gastric juice that belongs to the man, and his
stomach is able to stand it.

Now, a dog's stomach can stand the gastric juice, but if you feed the
dog on a pure meat diet steadily, the dog by and by gets ulcer of the
stomach. There is a doctor down in Chicago who has made a great study of ulcer
of the stomach for a good many years, and at a meeting of the American Medical
Association not very long ago, he made this very strong declaration; he said,
"Gentlemen," -- in the surgical section where they had been talking about gastric ulcer, etc., he said, "Gentlemen, I don't think you know much about gastric ulcer. I have been studying gastric ulcer, and I am have found out that gastric ulcer is a meat eater's disease." Dogs have gastric ulcer when they eat meat; and men have gastric ulcer when they eat meat. But without meat we are not likely to have gastric ulcer. That is the reason for it. The very highly acid
acid gastric juice attacks the mucous membrane of the stomach.

Now, Prof. Pavlov found just what I have been intimating here, that
the different state of mind of the dog had everything to do with the condition
of the gastric juice that was formed.

Here is a Pavlov pouch. Here is the normal stomach so food can be
passed down in it without being mingled with the juice in the small pouch at
all. He found when the keeper came into the room the juice began to pour out
even though he had not eaten anything at all. He found if the dog were made
hungry or irritated the gastric juice would begin to stop flowing. If the dog was disappointed, disgusted with anything, the gastric juice would cease to flow at once. So you see how important it is that the mental state should be right.

Right here I might tell you a very interesting observation I made when I was in Pavlov’s laboratory four years ago. After showing us the dogs, Dr. Pavlov said, “Come with me, and I will show you something very interesting, something very, very interesting.” So we went with him upstairs. He showed us first a dog that had little tubes connected with its salivary glands, so that the saliva trickled out of the sides and collected in little bottles. The dog’s salivary glands did not connect with the mouth at all, but only with these little bottles. He held out some meat meal,—meat that had been dried and ground up, and had a very strong meat flavor—he held out some of this close to the dog’s nose, and when the dog went to take it he snatched it away. He held it back again, and snatched it away just in time, so the dog could not get it. In a very short time, the saliva was pouring down those little tubes and filling up the bottles rapidly. But by and by he slapped the dog’s ears gently. The saliva stopped flowing entirely. The dog was entirely disappointed. He came and offered the dog something else, the dog did not like, and the saliva did not flow at all.

He told of some other very interesting experiments he had made also. He put a marble into the dog’s mouth, and the dog chewed the marble, and he collected the saliva, but there was very little saliva. He stood off at a distance and tossed the marble to the dog, and the dog caught it in his mouth—almost no saliva was produced. Then he took that marble and powdered it into dust so it was fine dust; put it into the dog’s mouth, and torrents of saliva went down into the bottles. It was the same marble, but it was powdered, and had the quality of dryness which the marble did not have. The marble had the
quality of hardness, but not of dryness. So you see this experiment showed the
quality of dryness is a thing that causes the saliva to be secreted. Then he
stood off at a distance of several feet with some sand in his hand. He shook
the sand at the dog and threatened to throw the sand at the dog's mouth, and the
amount of saliva that trickled down was just the same as though the sand had
been put into his mouth. When he threatened the marble very little saliva tri-
ckled down, but when he threatened the dog with a handful of sand, the saliva
just poured down the dog's salivary glands, showing that psychic effect is pro-
duced you see—that the salivary secretion, as well as all these other secre-
tions, is under the influence of the centers in the brain. The dog saw the sand,
and simply seeing the sand caused the saliva to pour out. For a moment he im-
agined he had that sand in his mouth, and the saliva behaved just as though the
sand had been in his mouth.

But we went on another story, and there we found something that was
remarkably wonderfully interesting. We went into a room, and there was a most beau-
tiful dog, a large, tall, rather slim dog, with a beautiful brown color, the
daintiest head I ever saw on a dog, a wonderfully intelligent looking dog with 1
large eyes; and as we stepped through the door the dog recognized Prof. Pavlov,
and looked at myself, and Prof. Benedict, and Dr. Case who was with us,—looked
at us a moment, and we sat down on a bench and kept very still. This dog was
arranged in the same way—with a little bottle attached to the salivary glands,
so as to collect the saliva. There was no saliva pouring out, but, as the
Professor approached the dog, the saliva began to pour into the bottle. The
professor was very much surprised; he didn't understand it, and he spoke to the
attendant who was there, sitting on the other side from which the dog was placed;
and the Professor said, "What does that mean?" The attendant says, "the dog
smells your hands. You have had your hands in meat powder, and the dog smells
your hands." So he stepped out, washed his hands, came back. In a short time
the saliva ceased to flow entirely, and didn’t begin to flow again until he came back. We all sat there perfectly still, absolutely still, no one moving, no one saying a word, and not a drop of saliva was appearing at the end of the tube where it dropped into the bottle. While we were all in breathless suspense, the attendant, without making any other motion of his body at all, pressed his foot upon a bulb underneath and that through a tube communicated with a musical instrument, and a very high organ note, a note away up in the clouds somewhere, was sounded, a very high, shrill organ note. Within ten seconds, the saliva began to pour down in a stream from this dog’s salivary glands. Now, it had been found out by experiment that that particular note would cause this dog’s saliva to pour out abundantly. And it is possible that everybody’s salivary glands are responsive to some particular note—I do not know. Prof. Pawlow’s experiments on this point have not been entirely completed. That is the reason why we have the orchestra in the dinin room, you see. We are hoping to charm the salivary glands of our patients to pour out so much saliva that they will be encouraged to fletcherise, you see; then we hope they will fletcherise to the tune of the music and that this will help to keep up the rhythm of the digestive process.

These experiments of Prof. Pawlow, you see, then, have established the whole science of medical dietetics upon a sound basis. We know now why it is necessary we must have things cheerful at the dinner table. Some years ago I made a very great mistake. Digestion stops when things are not cheerful. I made a great many mistakes, but I remember at this moment this particular mistake. I ordered the mail delivered to the patients at the breakfast table. The patients were all there, and it was handy to find them, and deliver the mail directly to them, not having to leave it in the rooms so as to run any risk of its being lost, and they it seemed really a very rational thing to do; so we decided to distribute the mail to patients as they were at table, at the meal. One day a
letter was handed to a lady just about ten minutes after she sat down to the breakfast table; the letter was handed to her, she opened it, and the letter said, "Mayy, come home at once. Both children have got the diphtheria." She lost her appetite, arose from the table, hurried out of the dining room, and she had hardly reached the door of the dining room before her stomach rejected all that she had eaten. Now, that was a sudden reversal of the digestive process, you see. Everything had been going on merrily as a marriage bell, as the saying is, merrily as possible; everything was going on happily, until she got that letter. Instantly the whole digestive process stopped; and Nature knew that that food could not digest; it would not do to let it lie down there and rot; so the proper thing was to reject it because there was no possibility of digesting it. Many experiments of this sort have been made.

I remember another case of a man some thirty-five or thirty-six years ago this summer, a man employed in the institution here came to me and said, "Doctor, I don't know what I am going to do. I am afraid I am going to starve to death. You know, day before yesterday, I was down working around the field, and I turned a plank over, and underneath that plank I encountered something so loathsome, so perfectly terrible, and had such a dreadful odor that it made me sick at my stomach, and I vomited my breakfast. Then when I went in to dinner, and sat down to dinner, and just began to eat, and I happened to think of that thing, and it made me sick at my stomach, and I went out again, and I hung onto an apple tree, and you know, I think I vomited everything that I had eaten in three days. At supper time, I sat down at the table, just got started, and happened to think of that plank, and it started me off again. And I missed all my meals yesterday and today so far, and I can not eat, and I am afraid I am going to starve to death." Really, that was one of the most peculiar cases I ever had. The only thing I could do was to say to him, "forget it, forget it," and I did that most emphatically; then I sat down at the table with
him and endeavored to entertain him by telling him some funny stories to keep his mind entirely occupied, so he didn't think about the plank.

Well, Pavlov has shown us, as I said before, the absolute importance of a proper mental state to encourage digestion. He has shown us that the digestive process depends upon these psychic operations, the delicate flavors which the food contains are recognized by the brain, and this recognition enables it to regulate the stomach so that the stomach shall produce just the gastric juice that is necessary for the digestion of that particular food.

Since these experiments were made, Prof. Cannon, of Harvard, has taken up the work and carried some of the experiments farther on cats. I showed you the picture yesterday of a cat upon whom an experiment similar to his experiments was being carried on. Prof. Cannon made this observation. He had a cat under the X-ray, and he gave the cat some milk with bismuth in it, and he saw that dinner, the cat's dinner in its stomach, saw it leaving the stomach, saw the stomach working away, churning up the food, and everything going on happily and merrily as possible; saw the little crinkles in the small intestine and everything going on merrily, and the cat purring beautifully; and just then he pinched the cat's tail, and the cat screamed; everything stopped. The stomach stopped, the intestinal work stopped, the whole digestive process stopped, and it didn't start again for half an hour. Now just think of that. So we don't want to hurt anybody's feelings at the dinner table. That isn't any proper place to be discussing unpleasant things. These young men, if they are fortunate enough to get married after while, and get a good wife to cook for you,— don't criticise the cook at the dinner table. It will spoil her dinner and probably spoil yours too, for she will say something back and you won't feel any better than she does; so the whole dinner will be spoiled and the digestion will be upset. Thousands and thousands of people are miserable dyspeptics.
just because they carry their worries to the dinner table so the stomach cannot do its work.

We will go on with this subject again Thursday.

v=3-7-11.
FOOD

A Stereopticon Lecture at the Sanitarium Parlor, Battle Creek, Mich., Thursday,
January 19, 1911, at 8:00 P. M.

By

J. H. Kellogg, M. D.

I will talk to you tonight about food, a subject of perennial interest.
I think the subject of food is of more general interest to more people than any
other question. "All that a man hath", as the Bible says, "will he give for
his life"; and food is the means of sustaining life. Air, water and food are
the three great essentials of life. An old proverb says, As a man thinketh
so is he. There is an old German proverb that says a man is as he eats. We
could put these two proverbs together and say, as a man thinketh so is he; as
a man eateth so is he; you see we have two things equal to the same thing are
equal to each and other; so, as a man eateth, so he thinketh. The things we
eat today are walking around and talking tomorrow; so it makes a difference what
we eat, doesn't it? I have not been at all surprised when I have seen certain
young ladies I have known who had a disposition, when I considered the spiced
pickles and spices that they eat. The wonder was that they could be so amiable
as they were.

Some time ago out west some Indians who had been out hunting for three
days wanted some water for their ponies, and they asked for it, but for no
water for themselves. They asked for no food, but some food was offered them.
The officers had just gotten up from their meal, and there were several dishes
that had not been eaten, and among them some spiced pickles. One of them gave
the old chief a spiced pickle, and he swallowed it before he had chewed it thor-
oughly, and after he swallowed it he began to appreciate what he had done, and
he was so exasperated he thought he had been poisoned. He was so angry he seized his scalping knife and made for the officer, and if he had not been seized from behind by two or three men, he certainly would have removed the officer's scalp. He felt that he had been insulted and abused when given a spiced pickle.

Now, mothers do not always stop to think that the things they are feeding their boys may be cultivating intemperance. Frances E. Willard has well said that the kitchen is the vestibule of the saloon. Some years ago Prof. Liebig made a very interesting experiment. He took a bear that was very unfriendly, very cross, and he made him a very amiable bear by feeding him strictly upon vegetable food. Some years ago I had a bear myself. In fact, some years ago, about twenty years ago, I made quite a study of this problem. I conceived the idea that all animals at one time subsisted upon vegetable food, and I thought if fed on vegetable food it would be possible to reform the animals; so I gathered up all the animals I could get hold of, of different species of flesh eaters in this part of the country, and I had bears, and foxes, and wolves—at least one wolf, and various other animals of the flesh eating animals I could get hold of in this part of the world. A man came down from the Northwest and brought a wolf which I purchased of him, and I set to work to reform these animals. The bear got on first rate on a vegetable diet; in fact, I had the impression that the bear rather preferred the non-flesh diet. He was such an amiable creature that he played with dogs just as though they were little cubs, and they rollicked and played together; in the same yard was a donkey, and the bear was tied up to his post, and the donkey was loose, and the bear and the donkey used to perform the quaintest tricks together; they would stand up and wrestle together. The bear never thought of biting the donkey. If the bear got too affectionate, the donkey would suddenly turn around and land his hind legs between the bear's eyes. He would paw his head with his foot, and make
a fuss about it, and then they were good friends again. They were kept in a yard down below the boilerhouse, and it was a common thing to see the high board fence completely lined with people watching that bear and donkey perform. It was really a most amusing thing. They were perfectly amiable. One day I changed keepers. In those days we were still more or less ignorance and barbarism here, and we had meat upon the table; that is, we had certain tables in the dining-room for the unregenerate, you know, for the gentiles, so to speak, and we used to allow them to have beefsteak at those tables, and of course, there were some leftovers; and this new man who was put in charge, who was skirmand changed without my knowledge in fact, was carried out some of the meat that was left from the table, and the result was that inside of one week that bear had killed three or four dogs, and become so savage the donkey was very glad to keep his distance. A little dog he had been playing with before, that had been on very friendly terms, came up to him, and he mux seized that dog, tore his body open and had devoured him sooner than you would believe possible for one animal to eat another. After a little while he became so furious that he tore himself loose from his post and he set out to catch some men, and one man came very near getting devoured by him. He was torn and was quite badly hurt. So we had to have twenty men gather around him with guns, and we got the bear in a corner and finally captured him and shut him up. A butcher downtown heard of it and said he would like to kill that bear. So he came up and shot the bear, dressed him, and hung him up in the shop downtown, and he was eaten by the people in this town. He was buried in the sepulchres of the stomachs of the people of Battle Creek; so the stomachs of the people of Battle Creek are the catacombs in which that bear was buried; so I don’t know exactly where he is at the present time. I have nothing but his skin. I wanted you to see what happened to a backslider, you know. So long as he was a flesh abstainer, he was a
good, respectable citizen, and was admired and was appreciated; but when he
became a flesh eater, as I said before, you see what happened to him. I have
given you only a short account of his history.

Now, another one of my animals that was a wolf. This wolf was a very
amiable creature too. He was really very docile like a dog. I had to keep him
chained up because there were chickens close by. I do not think he was entirely,
thoroughly reformed, but he ate protose with delight. He had never eaten anything
but fresh beef when he came here, and the next morning he began eating protose,
and he seemed to appreciate it very much, had no difficulty at all, didn't have
to coax him to take it; he was always ready for his breakfast of protose. After
some months his chain got worn out, he got away one day, ate several of the
neighbor's chickens, and in three hours he was dead. Again you see what hap-
pens to the backslider. It is dangerous. Flesh pots are very dangerous.

Now, the rest of my animals, the fox, and the raccoon, and the various
other creatures, every one of them were reformed with the exception of a bald
headed eagle that was too old a sinner to reform, and he was incorrigible. A
fishhawk, however, was reformed, and took to protose and other natural foods
very well. The suggestion was not originally mine, but I got it from my dog.
I had a very fine St. Bernard dog, and I noticed one day—brought him up a flesh
abstainer too,—and I noticed one day he was digging the meats out of a walnut
with his canine teeth, and doing it in a very dextrous way. He cracked the
walnut, and was picking out the kernel of the nut with his canine teeth. I
discovered then what the canine teeth were for—they are to break into nuts—
cocoanuts, perhaps, tearing off the husks, and getting the inside out of the nut.
About that time I met one of our missionary nurses who had been out to the
Samoan Islands, and she told me that one day she saw a chicken, a dog, and a
little boy all making a meal off the same cocoanut. They were all eating
at the same coconut,—the chicken, the dog, and a boy. The coconut furnished food for them all. And I thought it would be a very good idea to try the scheme of reforming these animals to see if they would abandon the natural diet, and they did. The monkeys in the zoological garden in London are fed on four things—the oranges, and chimpanzees—and the first thing is lettuce, the next oranges, the next bananas, and finally bread. They have the whole thing there. Carnivorous animals required cooked food just as man does; but if you feed a carnivorous animal on cooked food, you find everything necessary in the vegetable kingdom. Without nuts, it is necessary that they should have cereals, but with nuts they can get along without cereals. Fruits do not contain fats in sufficient quantity, but they contain chiefly sugar. But we will have some pictures on the screen here which will speak louder than words can speak, some things I want to communicate to you and by which I can give you a little more definite idea of the scientific side of this question of dietetics.

Thousands of men and women everywhere throughout the country are becoming more and more intelligent on this question of diet, and there are thousands more who want to become intelligent about it, want to know the scientific facts relating to our eating, and appreciate the fact that we are made of what we eat, that our efficiency depends very largely upon how we treat our stomachs.

Now, this first table indicates the length of time required for the digestion of various foodstuffs, and notice that rice is digested more quickly than any other food upon the table. Apples come next, then next come sago, and broiled venison. I am sorry that venison is there because it gives me a pang when I look at that. But the reason why venison is so quickly digested is because it is dissolved in the stomach. The objection to meat ordinarily, to the lean of meat, is not that it is hard to digest; the real objection is that it makes mischief in the body after it has been digested. The trouble comes
afterwards, and not at the time. When it comes to roast pork, salted beef, and ordinary beefsteak, you see, it will require hours; even stewed oysters require three hours and thirty minutes. Fried veal, boiled chicken, roast duck, cheese—"supposed to be a mighty elf, digesting all things but itself"—it does not digest itself certainly, and it helps other things not to digest. Marrowbone soup which contains so much fat, fat of a kind that is hard to digest—soup that is made from a soup bone. It is a very indigestible kind of soup, while vegetable soup, the simple sort of soups that we have on our tables here, are digested very readily. Bean soup requires some little time for its digestion.

Here we have boiled beets and vegetables generally, and they are also rather slow of digestion. It is a curious fact that raw cabbage digests in two hours and thirty minutes, while boiled cabbage requires four hours and thirty minutes. The boiling does not increase the digestibility of cabbage or lettuce or things of that sort; it rather has the opposite effect. It coagulates some elements that are readily digestible in the raw state.

Here is the egg. A whipped egg digests in an hour and a half, while a fried egg requires three hours and a half. Soft boiled eggs require three hours, hard boil eggs three hours and thirty minutes. You see there is two hours difference between a hard boiled egg and a whipped egg. The reason is whipped the albumin in the egg is in thin films which are readily dissolved by the gastric juice, whereas, in the case of the hard boiled egg, the food is swallowed in masses which are much more difficult of digestion.

Taking a kernel of wheat as an example, we learn something of the general structure of vegetable foods. This kernel is covered outside with a rough, dark envelope. Here is a grain of wheat with the outer coat removed. Here is one that has had the bran removed that has the cellulose, part of the bran, showing the different layers of cells. These superficial layers are the
layers which contain the protein of wheat. Here again are the cellulose cells
upon the outer portion of the grain of wheat; here are the protein cells, cells
that contain the gluten of wheat, and here are the large cells which contain the
starch granules. These are starch granules inside of these large cells. This
is a cross section more highly magnified, and here is another section still more
highly magnified. Here you see the outer layer, and flat layers of cellulose,
and there is a middle layer, and here is a deeper layer still; and now comes the
inner layer of starch. Here is where we have the protein. Here are the protein
cells here, and here is the starch further in. Here are the large starch granules.
still
Here is a still more highly magnified layer showing the starch granules of the
potato, of vegetable structure, and here is the framework of the potato, and
here are the cells which contain the starch granules which are pure carbohydrate.
Boiling has the effect to break these cells open and to increase the size of the
starch cells, and to increase their digestibility.

Now, when we come to study the characters of foods and their nutritive
values, we find a very great difference just as we find in their digestibility.
This table shows some common flesh foods. Porterhouse steak shows us about twenty
per cent or about one fifth protein, and almost as much fat, and in a pound
there are 1100 calories. That is just about two thirds of a hundred calories in
an ounce, two thirds of a portion in an ounce. Brain, you see, has only about
half the value, and the same is true of beef, liver, and you see a number of
other things here of very much less value. Chili con carne—some of you who
have lived in Mexico or on the border of the country know what that is—that has
half the value of beefsteak. Dried beef has about the same value as beefsteak.
Veal cutlets have about two thirds as much. Head cheese more—contains a large
amount of fat and that is the reason why it has a higher value. An ounce of
pure starch has a caloric value of 116; wheat flour has about 100 calories. It
has a little moisture in it, and so has about 100 calories. An ounce of sugar or an ounce of starch has just about one portion, or 100 calories. The same is true of an ounce of dried gluten, or pure protein which has almost exactly the same calorific value as starch. When used in the body it has only about four fifths as much, or hardly that—a little less than four fifths as much as starch, because it is not entirely burned in the body as the starch is; it is not entirely utilized. An ounce of fat contains 264 calories, more than two and a half times as much as the same weight of starch. Now, you see, here is ham, about the same as beefsteak. Here comes smoked bacon, two thousand. It contains a large amount of fat. You can't make the objection to bacon that it is not nourishing. A pound of bacon would be a day's ration for an ordinary man.

Goose is 1500, on account of the fat also—has more than beefsteak. Turkey 1000, less fat. All fish generally have less than half the nutritive value of beefsteak. The turkey has practically the same as beefsteak. When we come to the oyster, we see it is the lowest of all,—235. Tallow, that is almost pure fat—4000 calories,—about four times the value of beefsteak. Beefjuice, 115, the least of all, and yet many people imagine it is highly nourishing, but it is the least of all; it really has only one tenth the value the meat has. Meat contains about one tenth its weight of extractives which are of a poisonous character.

Now, here are those starch cells we saw a moment ago that have been baked. You see the starch cells are now spread out, and no longer have the peculiar appearance we saw before, but they are spread out; they have been hydrated, the starch has been hydrated, and we have now something which is readily soluble in the digestive juices, whereas raw starch is not soluble; it is not so readily digestible by the action of the saliva.

Now, let us look at some vegetable foods. Artichokes, beets, cabbage, asparagus are all about the same. Beets, you see, have 215 calories. Then if
one was to make his entire day's rations on beets, and his ration was 2100 calories, he would have to eat ten pounds of beets for a day's ration. If his ration was to be on beef juice, he would have to eat some twenty pints of beef juice. A pound of beef juice has only 115 calories, so if one were going to live on beef juice, it would take 2200 calories; it would take twenty pounds of beef juice to make one day's ration. So you see a person in taking a glass of beef juice three times a day is not getting any nourishment worth while. He is getting about as much as he would to eat a slice and a half of bread. A slice and a half of bread would give a man as much food value as a pint and a half, or say two ounces of bread would give one as much nutritive material as three half pints of beef juice. Now, a pint of apple juice has a nutritive value of 200 calories. There are a little more than 200 calories in a pint of apple juice, whereas a pint of beef juice has only 115 calories. Apple juice has fully twice the value of the beef juice.

Here are other things. The cucumber has almost no food value, less than one portion in a pound of cucumbers, but the cucumber affords something besides nutriment. It has some useful juices. It is really a wholesome vegetable when properly chewed, but it should be thoroughly masticated. When it is soaked in vinegar, it becomes indigestible. When it is hardened with salt, it also becomes indigestible. When it is served with a little lemon juice it is entirely harmless, because the lemon juice and the cucumber are both digestible, and the lemon juice does not harden the cucumber; but when it is served with vinegar, salt and pepper, it becomes a very indigestible thing.

Lettuce has 90 calories in a whole pound. So one does not need to count the lettuce in figuring up his calories, except the dressing on the lettuce. If one has a dressing of olive oil, sugar and lemon juice, those things must be taken into consideration, because an ounce of olive oil put on a serving
of lettuce would give only a caloric value of 250 calories, whereas the lettuce would not count for anything at all. It is really the dressing rather than the lettuce that is of value so far as the calories are concerned. Pumpkin 120. One would have to eat about twenty pounds of pumpkin, you see; it would take a pretty good sized pumpkin for a day’s rations if one were going to live on pumpkins entirely. It would be pretty hard to do, and the stomach would be hardly big enough to manage so large a bulk.

Here we have spinach and tomato. The tomato is chiefly useful because of its wholesome acids and its appetizing value; it is really a relish. Cabbage and turnips also have a nutritive value less than two portions to the pound. Vegetables may be counted as principally water with a certain amount of starch. Certain vegetables have no starch. The turnip and the parsnip contain no starch. They contain a little sugar, so little sugar, however, that they are very useful for people who can not digest sugar. Persons suffering from diabetes can not use sugar, and for them they are very useful.

Now, when we come to fruits, we find figs, for example, are 100 calories to the ounce, 1600 calories to the pound—very much more nourishing than vegetables. Dates 33. Dried figs about the same. An ounce of dates or figs has a nutritive value of about 100 calories, about one portion to the ounce. That is a good thing to remember. Now, grapes have about a quarter of this value you see, 450 to the pound. The muskmelon is just about the same as the cucumber, you see and the lettuce—just about the same. There is very little nutritive value in melons. When we come to dried prunes and raisins, we approach the same standard as the dates, nearly. Dried raisins and dried prunes represent about 100 calories to the ounce. It is good for us to get a few general ideas in relation to these matters to help us in guiding us in raising our ration when we have a bill of fare in which the calories have been figured out.
we come to cereals and legumes,—here are beans, and see what a very high nutritive value they have,—1600 to 1800; it is only the green peas and string beans that fall below. Aside from those, an ounce of beans or an ounce of peas, or an ounce of flour, or an ounce of any of the cereals is a portion. When we come to oatmeal, it is a little more, and popcorn a little higher, and corn meal—those things have a little higher nutritive value, and the soy beans, because they contain a proportion of fat; and the fat which they contain runs the number of calories up; but in general you may say that the cereals and legumes, the peas and beans and all kinds of cereals in a dry state furnish about 100 calories or one portion to the ounce.

Now, when we come to nuts here, we have something that is really surprising—the marvelously high value of the nuts—just about double right straight through—just about double the cereals and the legumes, and more than three times the value of meats. You remember beefsteak is 1100. Almond butter here is three times the beefsteak; the nutritive value of a pound of almonds, in other words, is three times the nutritive value of the best beefsteak you ever saw. Even the bacon you remember had a nutritive value of 2000 because of the large amount of fat it contained, yet it does not approach these nuts here.

Here is almond meal 3300, beech nuts 3000, Brazil nuts 3200, and that is 200 calories to the ounce you see, and for the most part nuts have about 150 to 200 calories to the ounce. The dried chestnut has less for the reason that the chestnut contains a considerable proportion of starch, about 60% of starch. The chestnut has a composition very much allied to that of the acorn. It is not much like the nuts as one would imagine, from its name. It really is not a nut. It contains almost no fat. Here is the hickory nut—3300 calories; pine nuts 2800 calories, walnuts 3200 calories, pecans 3400 calories—the highest nutritive value of any food we have, and you see here the pecan contains a very large amount of fat. Here is nuttoulen—what is prepared from the peanut; and
bromose which is prepared from peanuts and malt honey have about the same nutritive value. Protose is 912—comes down near the meat, because it contains a considerable proportion of water. It is made with the raw gluten. Here is a table which shows us the amount of energy contained of blood-building material, calories of protein that can be bought for a shilling. This gives us something of an idea of the economic value of foods, the amount of energy in the form of different foods which can be bought for a shilling. For instance, we begin with beef, and it has less than a thousand calories of energy—less than a thousand calories can be bought for a shilling, or twenty-five cents. Eggs give us about the same as meat. In the form of eggs we have to pay just as much as we do in the form of meat; but when we come to the cereals, you see, we get 2500 calories for a shilling, which is rather more than fish, or eggs, or beef. You get a little more in the form of fish, because it is generally cheaper than meat.

Apples almost three thousand calories. We can get quite three times as much food in the form of apples for a shilling as we can in the form of beefsteak; so apples would be a cheaper diet than beefsteak, because calories are what we want; and even milk is cheaper than meat. One can get three times as much food in the form of milk, three times as much for twenty-five cents as he can of meat. Then the potato, see how high that goes—away up almost—well, about 3700 or 3800 calories,—nearly four times as much food in the form of the potato for a shilling as of beef. But when you come to peas, here is an enormous rise; that goes away up to nine. As a matter of fact, you can say it is about ten times, for the beef does not come up to the 1000 mark. Ten times as much food can be bought for a shilling in the form of peas as in the form of meat; and we are talking now about the protein principle; we are talking, that is, of the material which beefsteak furnishes. Beefsteak is chiefly a source of protein; it is chiefly composed of protein.
Now, we have ten times as much protein for a shilling in the form of peas as we can get in the form of beefsteak for a shilling; and besides that we have two or three times as much starch and other wholesome things that are necessary for certain nourishment as of protein. When we come to bread, see what we have. Bread goes clear up to the top, 10,800—eleven times as much protein in the form of bread as we can find in beef for a shilling; eleven times as much, and besides that the starch of the bread of which there is two or three times as much as of the protein.

And this superiority of vegetable food applies not merely to carbohydrates and fats, which are its chief constituents, but to protein as well. One pound of protein in the form of peas costs seven cents; in the form of beans fourteen cents; in the form of oatmeal fifteen cents; in the form of bread about 37 cents; in the form of milk about 52 cents; and in the form of beef about 64 cents. On an average, therefore, one gets about four times as much vegetable as animal protein for a like sum; so we do not need to depend upon beefsteak. In fact, it is a very luxurious thing. As Mr. Hill says, the real thing we are suffering from is not the **maximal** high cost of living, but the **high** cost of high living.

These facts are more graphically shown in these diagrams. For instance here is a diagram of the potato. Here we have water seventy-six per cent, protein one and a half percent, starch nineteen and a half per cent, extractive one and a quarter per cent, fiber six per cent, mineral matter nine tenths of one per cent. Fat six hundredths of one per cent. So we have here, as you see, of protein about one and a half per cent, which is about five per cent of its total nutritive value, and the rest of it is almost entirely starch. I think the amount of protein estimated here is a little low; but most analyses of the potato show that the protein is about ten per cent of the edible, nutritive
value.

Now, here is a diagram of a loaf of bread showing its composition. It contains water 39%, carbohydrates 51%, protein 6%, fat 1%, mineral matter 1%. That is mostly common salt. This is converted in the body, in the process of digestion and of assimilation and excretion which leaves the body, two thirds of it in the form of gas. Now the actual composition of a tumblerfull of ordinary milk, percentage of loss through non-absorption, of water 248 parts; protein seven parts, sugar of milk 13 parts, mineral matter two grams, and the fat which rises to the top 11 parts; so you see of the nutritive part we have seven protein, thirteen sugar, and eleven of fat. Milk contains so much water that it is necessary for a person who lives on milk entirely to take about four quarts of water in twenty-four hours.

Here is the composition of an egg which is interesting. Water 85.7%. The composition of the white of the egg and the yolk of the egg are given separately, you see. The white of egg is 85.7% per cent water, nearly all water; the protein 12.6%. That is practically all protein and water. You see the white of the egg is about one eighth albumen, and the rest of it water. The yolk of the egg is 50.9 per cent water, and protein 16.5%—one third more than there is in the white of the egg. The fat is 31.75%; mineral matter 1.09%. As a matter of fact you see, then, although the yolk of the egg weighs only half as much as the white of the egg, it has more than double the nutritive value of the white of the egg. It weighs half as much, but has twice the nutritive value. The per cent age is four times as great, but it only has half the weight; so that as a matter of fact, the yolk of the egg has twice the nourishment in it that the white of the egg has, although it weighs only half as much, and has the other advantage that it is more easily digested. Now, here is the kernel of the walnut. See its composition here: water 4.6%; protein 15.6%. In the
walnut then, there is as much protein as there is in fish, nearly as much as there is in mutton, and a little less than there is in beef. 62.6% of fat. What an enormous amount of fat there is in the walnut. More than half, nearly two thirds of its weight is fat. The carbohydrate in the form of starch, 7.4% of starch, just a little starch in the walnut—more than most other nuts, with the exception of the peanut and the chestnut.

Now, there are other respects in which the various foods differ. They differ greatly in the amount of lime which they contain. Here we have beef containing three parts of lime, the potato ten parts, peas fourteen parts, cows' milk 150 parts, goats' milk 210 parts. From this you can get an idea of the relative value of these different substances as sources for lime. A potato has more than three times as much lime in it as beef has. That is, a pound and a half of beef would contain this amount of lime; and a pound and a half of potato would contain this amount of lime; a pound and a half of peas fourteen grains of lime. A pint and a half of mother's milk contains 24 grains of lime. Limewater contains 120 grains of lime. Cow's milk you see contains very much more lime than lime water. It has six times as much as mother's milk, and considerable more than limewater, one fourth more. It is important to know that. Cow's milk contains more lime than lime water does; so when diluting cow's milk for a child, it is generally necessary to add lime water, but it is not necessary for the young child to use lime water at all. The cow's milk has lime water enough. If you dilute this cow's milk it will still contain 75 calories, double the amount of water. Add equal quantities of water to it and we still have seventy-five parts of lime in a quantity in which mother's milk would contain only 24 parts of lime; otherwise the mixture has three times as much lime as the mother's milk has when it is diluted with water. So it has lime enough. The increased amount of lime in cow's milk is due to the fact that the calf grows so much more rapidly than the human infant does. The amount of lime...
always in proportion to the rate at which an animal doubles its weight. The infant doubles its weight in 180 days; the horse doubles its weight in 60 days; the cow doubles its weight in 47 days; the sheep doubles its weight in ten days, while the dog doubles its weight in eight days, and the dog's milk contains 450 grains of lime, or nearly twenty times as much as the natural food of furnished to the human infant. Some people think it is very important to feed children on goat's milk; that it is much more easily digestible than cow's milk. But goat's milk contains so much more lime than cow's milk does that it is far less suited to the sustenance of the human infant. The milk of the horse, or asses' milk is much better. Goat's milk has 210, and mare's milk 110, which is just about one half as much lime; so mare's milk or ass's milk is recognized by scientific authorities to be far better adapted to the nourishment of the infant than goat's milk, and even much better than cow's milk. Such milk is supplied in London and some other large cities, and is found to be of very great service to children under certain conditions.

Now, we have perhaps considered sufficiently the nutritive value of food, but this gives the percentage value here, not the actual value in calories; but note that the cereals all have a very high calorific value and that the vegetables have a low calorific value. On the whole the calorific value of fruits is about equal to that of the vegetables if we include the cucumber and lettuce. Many of you remember a lecture by Prof. Fisher a very few days ago. I had a letter from Prof. Fisher the other day. He is still reminding me of the pleasant visit he had with you here, and I think perhaps I would not be violating any confidence when I say to you that Prof. Fisher remarked to me in my office as he was going away, "I become a little more thoroughly convinced every time I come here. This time we have been talking the matter over, and we have decided that we are going to leave meat out of our household when we get back; we are not going to eat any more meat. We have been eating a little, about a
couple of times a week, but we are going to drop it out. We are satisfied that we are better off without it, that we do not need it, so we are going to try the experiment of going without it."

Prof. Fisher has had special occasion for giving study to this matter of nutrition. He spent several years out in the mountains recovering from tuberculosis. I think he has made a complete recovery. Examination with the X-ray does not show any trace of the disease left behind there, and I want to show you here some diagrams he has prepared, which he has worked out—a very ingenious instrument by which it is possible to sort of weigh the bill of fare. On going to the table, sit down and eat what you like. Take those articles which represent different weights which are put upon the card, and the card points to a certain spot which will show the exact proportion of the various elements you have eaten. This is the diet he ate when he was suffering from tuberculosis; he was living on a high protein diet. Eight hundred calories of protein a day, as compared with 210, which is the normal. Now, this is the ration he was taking in June 1905. That was about a year after his first visit here; about six months after his first visit here he had already begun to make a radical change in his diet, and you see here a very great difference. Instead of 800 calories, it is 230 calories. He is still taking a little more than the normal ration. And at the present time I think he is taking considerably less still than at that time. In October 1904, 486 calories. That was about the time of his first visit here. He was taking really 500 calories a day. He cut it down to considerably less than 300 and he has been steadily improving as he has been cutting his rations down.

Here is a diet of athletes, 243, and these athletes were living on a low protein diet. Here are some of our Battle Creek Sanitarium nurses, 338. They were taking a little more than they needed. You see he has got my ration down here which was 180—just a little less than the normal. At the present
time I am taking a good deal less than that. I think I am not taking over 130 or 140; in fact, for the last two years, I don’t think my protein ration averages more than 140, or 130 perhaps, or often even less. Now, for instance, you can tell about what I have eaten today. I have had just one meal, and have not eaten a morsel today except what I ate at the dinner table at one o’clock. And I had a portion of pea soup, three rice biscuit and butter, a glass of apple-juice, one potato, and a portion of onions. I don’t ordinarily eat onions, but I ate them today to see how they were cooked and to experiment with them. And a small pitcher of cream. That is my rations for today. I have not eaten a morsel more than that, and I am quite content—do not feel hungry nor weak in my knees, and I expect to work on until pretty nearly morning before I give up my job; so I think I can get along, and I must be getting along with a great deal less than the amount of protein figured there, which was true about three or four years ago.

Here are some interesting figures of some athletes. These were persons undergoing experiment by Prof. Chittenden. And you see the amount of protein is really very low. We have here the number of portions. These athletes, soldiers and others Prof. Chittenden was experimenting upon have given here the total number of portions. Here is Dr. Anderson, W. L. Anderson, 2800—a large man, a tall man, eating about one half what they were eating before, about one half of what was supposed to be really necessary, and about one third the amount of protein, and they all improved on this experiment which was carried on by Prof. Chittenden during nine months; and on this reduced ration, the athletes doubled their total strength, and the soldiers enormously increased their energy, activity, and their courage in physical feats of various sorts. There were four professors took the tests, two of whom were invalids, and they got well. One of them had nervous dyspepsia and recovered; one was rheumatic and he got well too; and Prof. Chittenden himself has continued to the present day, now some seven years, eight years, in fact, and he has continued to the present
day on the low protein ration, and is in far better health than he formerly was, looks very much better, is a little lighter in weight than he was before.

The life insurance folks have found out that the people that are overweight have the highest mortality; that people considerably overweight have a mortality nearly three times as great as those who **are** ten pounds under weight. It is better, then to be ten pounds under weight than to be thirty or forty pounds over weight. People ten pounds under weight have only two thirds the mortality of people who are on an average ten pounds over weight. So it is a good thing to be moderately spare. Prof. Fisher made some experiments here that I think I told you about--the arm holding experiments, squatting experiments, and leg raising experiments,--the legs raised from horizontal to perpendicular every two seconds. They were raised right along just like that until they could not be raised again. So this man standing here with his arms upon his hips lowers his body to his heels, then rises again, and he goes through that same operation every two seconds, and he continues as long as he can. One of our men who had been a vegetarian for ten years had had tuberculosis so bad I had given him up to die, but he got well in spite of it, and he had become so strong and vigorous and enduring that he had raised his legs in this way one thousand times without stopping,--one thousand times. This very young man you see standing here made this movement you see him making here, and repeated it in this way 5000 times. And when he had finished, he ran off about his work, ran downstairs, sprang into the pool, had a swim, and the next day was ready for business and just as well as ever.

Prof. Fisher told you what happened to some of the athletes down at Yale, that it made them sick, and they fainted and fell over after making these experiments just a few hundred times, 300 or 400 times, and had to be carried off. Holding out the arms. One man held his arms out straight like that three hours and twenty minutes, and could have gone on another half hour as well as not.
and he as well as not, and he was not inconvenienced to the slightest degree.

Now, there is a reason for this increased endurance. I was not aware the other night that I had talked until half past nine. I was very much ashamed of myself.

There is a reason for this increased endurance. The late Dr. Herter of New York,—we were all very much grieved to see he died the other day,—he made a very great number of most interesting and valuable experiments. Dr. Herter separated from the stools of his patients the skatol and indol that give to these excretory substances their peculiarly unpleasant and loathsome odor. Skatol and indol are substances that give to the fecal matters their characteristic odor. He separated these materials, turned them over to Dr. Lee of Columbia University, Dr. Frederick Lee, physiologist there who has been for many, many years studying the subject of fatigue. Dr. Lee experimented with these substances, and he found they produced the same effects as the ordinary fatigue poisons; that certain substances when injected into the body will cause an animal to become tired right away, just as well as though it had been working very hard, and he found these substances produced exhaustion.

A man said to me the other day, "Doctor, I am suffering from brain fog." I said, "I don't believe a word of it." I looked at his tongue and found his tongue badly coated. I said to him, "My friend, I think you are mistaken, I think you are drunk." He was a little surprised at that. "Yes," I said, "You are drunk, you are food intoxicated. There is no mistake about it. You are not tired at all; you haven't got any brain fog at all; you haven't got any nerve exhaustion at all. There is nothing in the world the matter with you except that your nerves are poisoned." Now a man ought to be very happy to find that out. When a man is suffering from brain fog, he is afraid he has exhausterd his brain. He has serious doubts whether he will be able to use it again.
But if he finds out he is suffering from the influence of a drug, there is great hope of getting out of that condition right away quick by getting rid of those poisons which the brain is in contact with. It is all right. If any of you here think you have brain fag, cheer up; you haven't got brain fag. You haven't got anything but autointoxication. I have not seen a case that I can remember of in which a man was really suffering from brain fag. That really is not a very dangerous thing. The brain has the power to repair itself to a wonderful degree. It is harder to damage nerve tissue than any other tissue. You can damage bone as great deal easier than you can the brain. It is a little lighter than water, and it consists chiefly of water, the brain does, and it is very hard to hurt it. The injury which work does is readily repaired by rest. Sleep and rest will repair the damage work does. The thing that causes people to suffer from neurasthenia, brain fag, nervous exhaustion and all that sort of thing, is simply poison, intestinal autointoxication, and these are the germs that make the poisons. They are the same sort of germs you find in a dead rat in the pantry, for example, or in a dead cat lying in a fence corner, or in a quarter of beef hanging up in a butcher shop, or in beefsteak served to you on the table—they are all the same germs, they are dead rat germs, if you please. They are all from the same source. They are putrefactive organisms, and when we sow these germs in our bodies and they grow, there, they have abundant opportunity, because they can feed upon the fragments of meat that have not been digested. When one eats beefsteak, some of that remains undigested in the intestine and the germs, when swallowed with it, swize upon that and they do to that meat you have swallowed into your stomach the very same thing they would do to a piece of beefsteak on the outside of your stomach. A piece of beefsteak inside of your stomach, in the intestine undigested, is in greater danger of putrefaction than though ya it were in your pocket or worn next the skin of your body, or put in a warm place in the house, in the pantry. It still undergoes decomposition, produces
deadly poisons,—pyrrol, skatol, indol, cresol, phenol, and a great number of other deadly poisonous substances which produce a great variety of distressing symptoms in the body.

Now, there is another variety of germs which produce acids, and which antagonize decomposition and so prevent putrefaction. These germs produce lactic acid, and they are friendly germs instead of unfriendly ones. This is a picture of how they look under the microscope. These are friendly germs which take possession of an infant within six hours in after it is born in summer time, and twenty hours after it is born in winter time, and so long as these germs continue to grow in the intestine, the baby is safe; it has no bowel trouble; it has no bad breath; it has no coated tongue, it does not worry and so keep the mother awake at night; it is good generally because it is perfectly well. The baby's stools have no unpleasant, loathsome, sickening odor. They are normal, in other words, and if they are kept and put away in a bottle, they do not undergo decomposition. That is a wonderfully interesting thing, that the bowel discharges of a healthy infant will not putrefy. There are no germs there to produce putrefaction. Instead, there are these friendly germs which prevent putrefaction. Next Monday night, or the next time I see you here, we will look at a beefsteak that has been in pickle for two years and a half, in yogurt buttermilk; that is the only thing in the world that is necessary to preserve it,—simply yogurt buttermilk. The friendly germs growing in it prevent the growth of the putrefactive organisms.

One of the things necessary in chronic autointoxication is to replace these unfriendly germs by friendly ones. That is why we recommend yogurt and tissane. Tissane is very useful we find. We have one case of a man that after several years of very great effort to regulate his diet very carefully had only been able to get his friendly germs, known on the reports as the gram positive, up to thirty, but after a few weeks' use of tissane he was able to bring
it up to 85 and he felt very proud of it. In fact, on inquiry at the laboratory in this case, it was so interesting I made special inquiry about it. -- I found there was a little question among the laboratory men. The man who is our leading expert in the laboratory said he made it out 92%. That shows wonderful improvement. It may be as high as 98%. But that was 85% of friendly germs, instead of being 97% of putrefactive germs, making poisons, and flooding the body, we have gotten his nerves vigorous and strong, whereas before he had a sense of exhaustion all the time. In the course of a few weeks he had got his friendly germs up to seventy, and only 30% of putrefaction germs; and there is a chance for him to go on further and get rid of the unfriendly germs almost altogether. These germs were once supposed to be necessary for digestion, but the observations of Prof. Levin at Spitzbergen, examining a large number of different species of animals, showed that 53% of all the animals examined had no germs at all in their alimentary canals, which is proof enough that germs are not needed.

Now, if we lived on our original diet of fruits, grains and nuts, and wholesome things, instead of living upon this unfriendly diet of flesh which encourages the processes of putrefaction, we should never have occasion to drive out the unfriendly germs by fighting them with friendly germs; but inasmuch as we have been taken possession of by these unfriendly germs, it is a good expedient to adopt. I myself take a bottle of tisane every day, and I feel very proud that I am able to keep my gram positive count up to 85 or 90; and I find my head clearer and my endurance enormously increased, when I am able to suppress these putrefaction poisons just to the very last degree possible. To keep our bodies clean, and to keep the blood clean and the breath sweet and the tongue clean is the best way in the world to keep the nerves strong and the brain unclouded.

Good night.

v-3-9-11.
I told you of some of Pawlow's wonderful discoveries, how the secretions of the stomach, of the gastric juice, under the influence of the nerves of taste; and this is what is called appetite juice. Within five minutes after the food enters the mouth, appetite juice appears in the stomach, and this Prof. Pawlow has shown is the most important, because it is the most powerful, the most active gastric juice; and you will see the great necessity for it in a moment when I get on a little further. Now, about half an hour after the meal is eaten, then another flow of gastric juice occurs which is the result of the actual contact of the food with the stomach wall. The food substances in the stomach which have been digested are absorbed and the stomach is stimulated by the elements of the food themselves. First gastric juice flows because the nerves of sight, the eyes, the nose, the olfactory nerves, all the nerves of hearing and the sense of taste are stimulated. I told you about the experiment with the dog—the sounding of a note and the saliva beginning to flow. When the dog's mouth was watering, his stomach was watering too; and about the sense of smell, and the sense of sight, how that they stimulate the flow of gastric juice; and the sense of taste does the same thing. This is appetite juice. Half an hour later the substances which have been swallowed into the stomach excite the flow of gastric juice directly and just as with chemical juice.
Now, in order to understand dietetics and to understand the management of our patients, we have to understand clearly about both of these kinds of digestive fluids; because there are some things that stimulate appetite juice, and there are other things which stimulate the flow of chemical juice the most, and we must know the conditions. Now, we see the importance, then, of thorough mastication of food. If food is to be tasted by the gustatory nerve, if its properties are to be known, if the stomach is to be properly stimulated, the food must be chewed until the elements of taste that are in the food are thoroughly developed; until we get all the flavor that is there. Every food substance contains elements which notify,—we will say that every food substance contains properties which serve as a sort of notification to the stomach, when they are taken into the mouth, as to what kind of juice is needed. Isn't that interesting? That every food has in it a substance which is necessary to call forth the digestive fluids essential for its digestion. See what a beautiful arrangement that is. Things are not haphazard. We go out and take this food, that food and the other food; they are not arranged haphazard; it is not accidental that they have this flavor or that flavor or they other. They are all especially adapted to be used.

The vegetable kingdom stores energy and the animal kingdom uses energy. That is the difference between the two. The vegetable kingdom captures the sunlight and stores it up as capital and energy. The body uses this energy. All animal bodies use this energy that has been stored up in the shape of food. Food is fuel just the same as coal is. Now in order that this force, this energy that is in the food should be made available, it must be digested; so there are put into the food flavors, sapid substances which may be recognized by the sense of smell and the sense of taste, which call forth the secretions of the digestive fluids that are necessary for the digestion of that particular food. That is a beautiful thing. It seems to me one of the most beautiful
things I know of. But in order that this plan shall operate, in order that the body shall get the notification that it requires, it is necessary that the food should be chewed, and should be chewed until we get all the flavor out of it; that is, until it is all manifest; until it is liberated, so to speak. Now, when one takes bread it does not have very much flavor, but we chew, chew, chew it, and by degrees as we keep on chewing, by and by we find it has a very decided flavor, becomes sweeter and sweeter and sweeter the longer we chew it. Isn't that so? So you see the importance of chewing in order to get the flavor.

Now, when we get all the flavor out of the food, get it all called forth, active in the mouth, then the body gets the full notification, don't you see. As another illustration, you might say that the flavor of the food is a sort of tribute we pay to the body for the gastric juice. It is necessary to make the food available. We hire the body, we bribe the body, if you please, with pleasant flavors to pour out these juices which it does at an expense to itself, in order that the food should be digested and thus be utilized. Insipid foods, you see, then are not good foods. Food that hasn't any flavor is not good. You know how you can drink a glass of lemonade when you are not thirsty; but it is very hard to drink a glass of water when you are not thirsty. Did you ever try it? I sometimes ask a patient to drink a glass of water so we can find where the stomach is, and the patient will take a few sips then pause, look at the glass, drink two or three sips more, then look at the glass again to see how much he has got out of it. Then take another sip, take another, look at it, and pretty soon he will say, "Now, haven't I taken enough? I don't know whether I can take all of that or not." Now, it looks like a very simple thing to drink a glass of water, yet, to drink when you are not thirsty is very difficult. Somebody has said you can lead a horse to water but you can
not make him drink. It is so with the body. It is hard to force the body to take in fluid when it does not want to. But now put a little flavor into that fluid, a little lemon-juice or a little raspberry juice, or any other flavor—a little sugar, for that matter—anything to give it flavor, that is a pleasant flavor, and down it goes. You can take several glasses perhaps. So we see that flavor is very necessary. Now, I think we can not impress this too much on cooks, persons who are interested in nutrition, domestic economy—we can not impress it too much—the importance of having food tasty. That is a thing we have worked at here for the last thirty years most assiduously—to find ways of making our food more tasty. There is a good deal of flavor in meat, and people who have been accustomed to the use of meat when they give up meat find that foods of vegetable origin as a rule are not so tasty; so we find them flat and insipid. I remember very well just this moment a young lady who came here about thirty-five years ago. Her father brought her here and I was called to see her next day, and she said, "Oh, Doctor, I never can stand this food." "Why, what is the trouble with the food?" "Oh," she said, "it hasn't any taste; I can't make it go down; the muscles work the other way." "Now, what have you been accustomed to eating? What would you like?" "Oh, I would like a piece of bread quite thin, and spread with butter rather thick, then some mustard on it. That is what I would like. And I would like a piece of fat pork fried very hard, thin and fried very hard; then I would like some mustard on it." Now, she could not taste anything else, you see; she had been so accustomed to condiments. I told her all right, she should have some mustard. So the next day I went up to her room with a mustard plaster and told the nurse to put it on over her stomach. We had quite a time. She threatened to go home. She said she was going straight home; she would not have such treatment. I told her I supposed she was very fond of mustard, and I thought that she wanted a mustard plaster, and that it would be a great deal better to put on the mustard plaster on the outside of the
stomach than inside, because then she could see just what it did, and it would not do so much harm, and I was surprised that she had any objection, because I understood she was accustomed to take a whole mustard plaster every day for dinner. Well, we had a rather interesting time, but I excused her from the mustard plaster that time, and she gradually became accustomed to the diet, and got rosy cheeks before she got through, on good, wholesome food. The muscles got trained so they would work down instead of up. It was because the food hadn't any flavor.

So, put before a person, especially a sick person, an insipid dish of gruel, and how sick patients do get of gruel sometimes, don't they? Over in England they put a little cinnamon or nutmeg or something else in the gruel to give it a little flavor. Over in Sweden they put a little caraway seed in the bread in order to give it a little more flavor, and it is doubtless of some possible advantage, although I don't recommend those spices, and for some sick people they would be very wholesome indeed. The thing is to develop the natural flavors which are in the food. Now, a sick person likes toast better than bread. Why? Why because it has more flavor. In the toasting process the starch is rendered soluble, so it is very quickly converted and becomes dextrin, and under the influence of the saliva in the mouth, the dextrin is very quickly converted into sugar; but Nature has provided the natural way, the way which is perfect in itself, and which can not be improved upon. Our foodstuffs, natural foodstuffs are fruits and soft grains and nuts. Now, all of these substances contain sugar. They all contain dextrin. There is a considerable amount of dextrin in the juices of fruits. So when we take the sugar or dextrin into the mouth, the dextrins are very quickly converted into sugar by the action of saliva; and while these fluids are held in the mouth the gastric juice is being formed in the stomach, the appetite juice is forming to digest the other food elements.
"As sweet as a nut" somebody has said. But now that nut contains a great amount of protein and a good deal of fat, so it requires a good deal of gastric juice to digest it, and for that reason Nature puts some sugar in it, makes it very sweet so as to stimulate the flow of gastric juice and create a quantity of appetite juice ready to digest it when it gets down into the stomach, but the nuts must be chewed. Now, when we come to cooked cereals, we see at once, the importance of cookery, because if the food is uncooked, raw starch, we get very little flavor in the mouth no matter how long we keep it there. For instance, take a mouthful of raw flour; if you chew it some little time, and it would not be any more pleasant at the end than at the start, very much; it would remain just about the same; but if we cook the flour, make it into bread, a nice crisp cracker, a little, snappy piece of baked dough, it may be nothing but flour and water, and chew that, and it gets sweeter and sweeter and sweeter every moment, because the saliva acts readily upon the cooked starch and converts it into dextrin and sugar, and this dextrin and sugar are powerful peptogenes. They are recognized by the sense of taste, by the nerves of taste. Sugar stimulates the nerves of taste, so a quantity of gastric juice is produced, appetite juice, to help the digestive process.

Now, we come to another thing which is of still greater importance. There are present in the body, produced in connection with the digestive process, what are called harmones. This is a new word. It is coined I think by Dr. Starling, professor of Physiology in London. He discovered the principle. This dextrin that is formed in the mouth, when it gets down into the stomach causes the stomach to make pepsin and hydrochloric acid. It causes the stomach to make gastric juice. Now, dextrin is not digested by gastric juice at all. Dextrin is the result of the action of saliva upon starch. The saliva in converts the starch into maltose, into sugar and dextrin. It converts it first, simply dissolves it first, makes it soluble, then makes it into erythrodextrin, then
into acroodextrin, then finally converts it into maltose. Now these dextrins which are produced in the mouth by saliva acting upon starch, when they get into the stomach cause the stomach to make the gastric juice necessary for the next substance which is to be digested, and what is the next thing to be digested, after the mouth? Protein. The stomach digests protein. The mouth digests starch and the stomach digests protein. Now, the product of the mouth digestion, dextrin, when it gets into the stomach causes the stomach to make the gastric juice necessary to digest the foodstuffs down there, other foodstuffs, the fats etc.; so you see it is like setting up a row of brick a little less than the length of one brick apart. There are a thousand of them perhaps. Tip over one brick, and that tips over the next one, and that the next, and the next, and the next, and so on, and they go like a lot of balls on a string--you have seen that in philosophy. Drop one ball, let it fall against another and it sets it going, and that sets another ball going, and that another one, and that another one, and that another one; so you get them all swinging. That is the way it is with the process of digestion. The products of digestion in one part set up the activity of the digestive process in the next part, and so it goes on clear down, probably the whole length of the alimentary canal. Now, we don't need to tell you about the gastrin, etc., and that is enough to tell you about the hormones perhaps.

Here is another interesting thing you ought to know about. When the process of starch digestion begins in the mouth, the food is carried down into the stomach, and it does not stop there. It is not interrupted in the stomach at once. It may go on for half an hour, an hour, two hours, even longer, in the stomach. When people have very little hydrochloric acid, the starch digestion in the stomach is generally very complete, and goes on a long time; but if the amount of hydrochloric acid is great in the stomach, so there is great
acidity, then the liver digestion is interfered with. The saliva is an alkaline fluid, and when it is neutralized by the acid gastric juice, then it stops its action. This is one of the interesting things that have been discovered recently, and that is, that the saliva after passing down into the intestine, after its action has been interrupted in the stomach, after it passes down into the intestine, is revived, it is revived, reactivated, as the physiologists say; it is reactivated, and begins work again, so the saliva does not stop its work in the mouth. If we give the food a proper amount of saliva, it stays with it, goes right along with it. It does not act all the time. It may be interrupted for an hour or two in the stomach, but when it gets into the intestine, and the bile neutralizes the acid gastric juice, then the saliva begins to work again and keeps right on working. Now, how do we know that? Here is the experiment that is made to prove it. A quantity of saliva which is active has a little hydrochloric acid added to it. That stops its action so it can not digest anything at all; it is entirely inactive. But a small amount of intestinal contents, just a very small amount of intestinal contents is added to the saliva; then it becomes active again. In other words, there are substances in the intestine, great quantities of a substance which reactivates the saliva when it has been killed; when its action has been interrupted. We ought to know that because it is a very important reason to give to people why they should chew. Perhaps I better dwell a little farther upon that subject, for I think you can see now very clearly the importance of thorough mastication, or what is sometimes called fletchering the food. Mr. Fletcher succeeded in calling the attention of a great number of people to the importance of chewing the food though he did not discover chewing. Chewing is a very old fashioned practice, that began away back in the ages; but the mastication of food, fletchering, is not a new thing. In the first place, why should we chew the food thoroughly? We must divide
the food very thoroughly so the saliva and all the other digestive fluids can be well mixed with it, can come in contact with every little particle of the food at once. Now, you know what would happen if you should take a big block of ice into your room and leave it there in your room at the ordinary temperature. Or if you should put that block of ice into some water at seventy degrees, say ordinary room temperature, that big block of ice, perhaps a cubic yard, would take a long time to melt, probably several hours. But now suppose we should shave that ice up into fine shavings, shave it up as fine as possible and put it into the water, would it take as long for it to melt? No, because you see every particle of ice is brought into immediate contact with the water, so it is all melting at the same time. Instead of only the outside of the mass being melted, the inside is not warm at all, by dividing it up into fine, minute particles the whole of it is melting at the same time, so it gets through in a short time.

Now, the same thing is true of food. If we swallow food in lumps, if we bolt it, take it like pills—a lady the other day her little boy told his mother that the people at the table,—"Why," he said, "Mamma, they acted just as though they were swallowing pills." The food was taken into the mouth then sort of choked down. You have seen people do that. Very often a question is asked when a person has just put a morsel of food into his mouth. He is in such a hurry to get out the answer to that question that he almost chokes in getting down the food without chewing it at all. You are insulting the stomach when that you do that, every time. The food should be chewed to a pulp until there are no particles bigger than a pin head.

This is a very bad time to talk to you, I am afraid, because during the after-dinner period, one is very likely to be prone to drowsiness; but you try to wake up the best you can. I will try to make it as interesting as I can for you.
Now, as I was saying, the food must be thoroughly divided, reduced to pulp in order that the gastric juice and the saliva and the other digestive fluids shall come in contact with every minute particle of it. If the food is not divided in this way, then the digestive fluids only come in contact with the outside of it. Now, let me show you what might happen. For instance, suppose one is eating potatoes. What digestive fluid does the potato need most for digestion, do you think? The saliva. Now, suppose one swallows a potato, maybe a boiled potato, or saratoga chips, or baked potato,—suppose one swallows it in lumps, instead of making it into a fine paste in the mouth what will happen? For a little while the saliva will continue to work away on the surface of those masses of potato; then the gastric juice will become so acid that the saliva will be neutralized and its action will cease. There are left those lumps of potato. How are those lumps of potato going to digest in the stomach when there is no saliva there? How? You can readily see they could not digest; they cannot digest because the saliva is the only thing that can make them melt them down, and there is no active saliva there. On the other hand, a part of the potato has been digested, has been converted into what? What is the result of the action of the saliva upon potato? What does the saliva do when it digests starch? It produces sugar and dextrin. The saliva acts upon starch and makes what? Sugar and dextrin. The dextrin is on the way up to sugar. Starch is away down at the bottom, and there are several kinds of dextrin, probably a good many kinds more than we know anything about; and it gradually gets up to sugar. Well, the saliva has been producing dextrin and sugar and that is there in the fluid of the stomach, and there are lumps of potato along with it. Now, what is the effect of this dextrin and sugar upon the stomach? It causes the stomach to produce gastric fluid. It stimulates the stomach. It causes it to make gastric juice. Somebody said a moment ago it ferments. That is not true at all. I want
to show you the real truth about that. The starch has been partly converted into sugar and dextrin; it is there in the stomach. Now, what does this sugar and dextrin do to the stomach? It causes the stomach to make gastric juice.

Now, I hope you will all remember that. And I hope that every one of you will know it, because this is a question that comes up all the time. Now, here is the dextrin in the stomach, and the sugar there in the stomach, stimulating that stomach all the time to make more gastric juice and more gastric juice, and more gastric juice, and is the gastric juice digesting the potato? How is it? Can the gastric juice digest starch? No. But there are lumps of potato there in the stomach, and the saliva is neutralized, so it cannot act on the potato, and the lumps are there, and the dextrin and sugar are making more gastric juice, and more gastric juice all the time, but the potato cannot digest at all; it cannot get out of the stomach until it is digested, because it has to be liquified before it can pass out. Now, what is the consequence of that sort of thing—lumps of potato cannot digest because there is no saliva to digest it; and the gastric juice is making getting more and more acid all the time, under the stimulating influence of the dextrin and the sugar, and what is the consequence? Fermentation. Why fermentation and sour stomach? Too much acid in the stomach.

Somebody said fermentation. Where does the fermentation come in? What is fermentation? Fermentation is yeast or bacteria acting upon starch or some other fermentable substance,—starch or sugar, and converting it into alcohol or into acetic acid or lactic acid, or some other acid. Now, is this acid in the stomach made that way? How is it? Is this acid in the stomach formed by fermentation? Not at all. So when people eat potato and have sour stomach, is it caused by fermentation? How is it? Do you all understand how it is about that? Now, listen. I want every one of you to know about this. The saliva converts starch into dextrin and sugar. This dextrin and sugar cause the stomach to make gastric juice, cause an outflow of chemical juice. When one eats potato
and swallows it in lumps, the saliva digests part of that potato, the outside of it, that it can reach, converts it into dextrin and sugar, and this acts upon the stomach, causes the stomach to make gastric juice, and the gastric juice becomes more and more acid until by and by it neutralizes the saliva and kills it, so to speak, destroys its effects so it can no longer digest the potato; then the potato remains in the stomach undigested in lumps, while the stomach continually renders the gastric juice more and more and more acid, when it can not act upon the potato; so the stomach becomes what?—Sour. Now, do you think you all know what makes sour stomach? It is not fermentation at all. It is too much acid in the stomach, and you see now just why it is, where the acid comes from, and how it comes. Now, isn't that very true? It is worth to me more than a thousand dollars, I think more than five thousand dollars it has been worth to me to just know that simple thing—that when a person eats starch and has acidity of the stomach, it is not because that starch ferments in the stomach; it is because it is an excess of acid in the stomach.

The next thing is to know how to stop it. How do you think would be a good thing to stop that acid forming in the stomach when you find it habitually? You can not eat potato even if you chew it well, you see, without getting—well, we will say what will be the first thing to do to stop that acid formation in the stomach? It will be to chew your potato and all your starchy food of every sort until it was thoroughly reduced to pulp before it entered the stomach; then the saliva would have time to act on it quickly don't you see? The saliva comes in contact with every little particle of the starch and converts it quickly, then it passes on, becomes dissolved, and passes on into the intestine. Some of you know that many people can not eat bread, have a great deal of trouble with sour stomach when they eat bread. We used to think it was because bread fermented in the stomach. Why is it? Especially new bread and hot bread,—why is it? It is the lumps, the crust of bread entering the stomach and
remaining there a long time. I have found many times when food is removed from the stomach or a person vomits after meals, I have noticed a great number of times that the thing that is always there in masses is the crust of bread, or lumps of potatoes. I remember a lady who was to have an operation in the afternoon, and she promised not to eat any dinner, but when the afternoon came and we had the operation at four o'clock there were enormous quantities of dinner, and it very soon appeared upon the operating room floor, and it looked as though she had eaten two or three dinners, and there were crusts of bread, and lumps of food; they were the things most commonly found. You always find it there. The crust of bread is hard to chew, hard to reduce, and if the bread is hot, then the crumb of the bread also enters the stomach in masses, because in the process of chewing it is reduced to little hard bullet like masses, swallowed in pellets, instead of being broken up into a crumb. Now, have you any questions upon this you want to ask?

You see, then, the importance of chewing the food thoroughly and reducing it completely to a pulp before it is swallowed. Don't forget that.

Now, another reason why it is important to chew is because by chewing the food, the taste of the food will be fully developed, so we will get the full complement of gastric juice, of appetite juice, necessary to start the digestive process. Let us see now again first just how that thing happens. The saliva converts starch into dextrin and sugar. The flavor of the food in the mouth causes the stomach to pour out appetite juice. This appetite juice causes, after the food has been swallowed, it digests some of that food, converts it into peptone, and peptone acts still farther upon the stomach. It is also a powerful peptogen, as it is termed, and stimulates the stomach to make more gastric juice, so it is not only the dextrin, but the peptone product of gastric juice that is a powerful stimulus to the stomach to make more gastric juice. This peptone passes out into the intestine to be absorbed. So we can not have, if we don't
chew well,—much appetite juice, and if we don't have much appetite juice, we won't get much peptone, so we will have very little chemical juice. If we don't chew well, we will have very little saliva, and we will have not much sugar, and not much dextrin; so here again there will be a deficiency of chemical juice which is produced by the action of these substances upon the gastric mucous membrane.

Now, if we have patients that in spite of all care to chew thoroughly well, all the care we ask them to take to chew the food thoroughly and still there is too much acid formed in the stomach, what can we do to such a person? What is there that will hinder the formation of gastric juice? Anything? Fat, take more fat. So bread and butter will be less likely to cause sour stomach than bread alone, would it? But suppose it was not bread and butter, then what? It would do it more. If it were hot bread, would it be better with the butter or without? I think I would rather have it with the butter. If you are going to swallow the potato whole, or in lumps, say in the form of pills, as most people do, if you are going to swallow potatoes in that way, you would better have fried potatoes than plain boiled potatoes. You would better have the fried potatoes, because you would not get so much sour stomach with the fried potato as with the other kind, but now that is no justification for fried potatoes; but fried potato is hard enough to digest; but I am going to say suppose you are going to shoot your stomach with potatoes that were not properly masticated, just going to thrust bullets down into your stomach, potato bullets, it would better be fried bullets than raw bullets or than simply cooked or baked bullets, because the fat will hinder the secretion of gastric juice to some degree in the stomach. I have met a good many people who say, "I can digest fried potatoes when I can not digest baked potatoes," and they ask me the question, "Why is that?" Well, you can all see the reason why now, can't you? You
understand the reason why. But it is no justification for the fried potato. The fried potato is a poor thing. The starch is saturated with fat so the saliva can not act upon it, and while it will not produce sour stomach, perhaps, so readily, it will tire out, exhaust the stomach in its effort to unburden itself, of this indigestible mass.

Now, so much for harmones. There is a lot more to be said about this, but we can take the matter up at another time. We have still a little time left, and I am going to throw some views upon the screen. Now, we will study foods just a little.

Here is a picture coming upon the screen in a moment which will show you the composition of the different foodstuffs, and the nutritive values of food. Now, let us look at this very rapidly. This is a table of nutritive values. Bread is 63%. Wheat flour, barley meal, oatmeal, and all the rest of the cereals. Now we come down here to beans. Here is rice 87%. The highest nutritive value to be found on the chart, you see, is rice, 87%. Peas come very near, 86.7%; but all the legumes and all the starches in their dry state have practically the same nutritive value, from 82% to 87%. The potato is 25%, three quarters water, you see. I should say, however, that in the cooking of these cereals, in the ordinary cooking of mushes, for example, they are associated with about three times their weight of water, so that as furnished on the table they are about three quarters water. One is eating oatmeal mush, the nutritive value of the oatmeal mush is about the same as that of the potato. Here is another. Here is the beet, the parsnip, the carrot—three things that have practically the same nutritive value. Those roots, baked parsnips and carrots—the turnips have only half as much, and the carrots one third as much you see. Sugar is max 95%; it is carbohydrate, but not really a food; it could not support life by itself. Molasses, 77%, has 23% water—no, it has
quite a lot of dirt in it. Eam Milk 14%; cream has 2\% times as much, or 34%. Now, look at skim milk, 12%. Look at meats, 28%; Lean beef 28%. You see the potato is 25%; and we come down to veal, 37%; poultry 26%; fish 22%. The nutritive value of the potato **differs** according to its percentage of food value is greater than that of fish. A pound of potato, in other words, has more nutritive value, more nutritive material in it than a pound of fish. That is not strictly true, because fish contains some fat which the potato does not contain, so its caloric value is greater. The banana is 25.8%, so there is more nutri- 
ment in the banana than in the potato. A person could live a little longer on bananas than on potatoes, even though the potato is cooked. The date has 67%, so it is a little more nourishing than bread. You understand now why the Arab can live on dates, because they have a nutritive value equal to that of bread. The grape is 15%. Notice the grape has a nutritive value a little higher than milk. Grape-juice has a nutritive value greater than milk. But one could not live on it indefinitely as well as he could on milk, because it does not contain enough protein or fat—it is simply carbohydrates. And we come here to the apple and the pear. The apple is 11%, and the pear about 11%, about the same, and the peach a little less, and the plum 10%. The plum pear and apple have about the same nutritive value. The cherry and the grape are practically alike, very nearly the same. Cherries have a very high nutritive value. They have a nutritive value almost equal to the parsnip. They have practically the same as the beet and the carrot. The cherry is one of the most nourishing fruits, except the fig and the date; it is one of the very most nourishing. The goose-berry is about the same as the plum, the apple, and pear, you see. We come to the strawberry, and it is seven and eight tenths per cent—a little more than the blackberry. The raspberry is about the same as the strawberry, and the current has the least of all, about six per cent.

Now, please notice the amount of fats which they contain. Here are
the proteins, carbohydrates and fats. Very little fats, in the cereals, you see, a very small percentage. The highest is three per cent found in oatmeal. It has more fat than any other of the cereals. Now, we come down here to the vegetables, and here is the potato, it has only one per cent. The sweet potato has as much as the cereals have. The beet has a little more, 3.7%, the parsnip one, cabbage .6%, turnips .6%; so you see there is very little fat in the cereals and the vegetables,—so small an amount of fat it can practically be ignored.

We don't get very much fat from these sources. But now look at the other chart. Milk here contains almost one per cent of fat, skim milk. These are salts in this chart. But the vegetables and the cereals contain only very little fat. This line shows carbonaceous as well as the fats, starch, and hydrocarbons combined. This is the chart which shows digestibility of various foodstuffs. You see here the most nourishing of all foods, rice, stands at the very head of the list in digestibility. When the rice has been predigested, as in the form of rice flakes, we find the test meal is digested in thirty minutes, sometimes forty minutes; but this represents boiled rice. We come now to other things—tapioca, two hours; boiled milk two hours; raw milk two and a quarter hours; venison one hour and thirty-five minutes. This venison was not entirely digested, I suppose, but simply broken up in the stomach and passed out. Roast pork two hours and thirty minutes. You see why it stays longer, because it has some fat. Roast goose two hours and thirty minutes; boiled goose three hours and thirty minutes—three times as long as the rice, and so on. The whipped egg is digested in an hour and a half because the egg is whipped up in films outside of bubbles of air so the gastric juice mingles all through this whipped mass and comes in contact with this whole mass of egg at once. Two oysters, supposed to be very digestible, three hours and a half—three times as long as rice. Beefsteak three hours; lean beef four hours; salted beef four hours; roasted pork five hours and a quarter. That is why the lumberman
of the north woods likes roast pork. He says it sticks by the ribs, which it really does. It stays right there in the stomach under the ribs, and doesn't digest, because of the large amount of fat, you see. The fat present hinders the secretion of the gastric juice necessary to digest the meat, so it remains there unbroken down.

See these others—boiled chicken four hours; boiled turkey the same thing; roast turkey two hours and thirty minutes; roast duck four hours and thirty minutes; melted butter three hours and thirty minutes; cheese three hours and thirty minutes. The melted butter is disposed of more quickly by itself than when with a lot of other things, because when taken by itself it melts and gradually works out of the stomach. Soup four hours and fifteen minutes—hard to digest because of the fat. It remains in the stomach longer than any other thing. Here are apples, ripe and sour—a mellow, raw apple, two hours; and a sweet, ripe, mellow raw apple, an hour and a half. You see the products that are most nourishing, like rice, are also the most digestible; and some of the foods which are called hearty are hearty simply because they take a long time for digestion.

The next time we will study foods a little more thoroughly. I thank you very much for your attention.

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RECEIPTION

To Drs. Morse and Eggleston,

At the Sanitarium Gymnasium, Battle Creek, Mich., Monday, January 23, 1911,
at 9 P.M.

Dr. J.H. Kellogg: Sometimes we gather our family together to welcome
someone who has been away and has come back again; and sometimes we gather
together to say good bye to some one who is going out from us. Tonight we are
together for both purposes. Every now and then, much more often now than formerly,
our family, our faculty send out some one of their number, to go abroad into the
world like honey bees gathering up the essentials of science and bringing them
back to us for our benefit, to enable us to be more efficient, to enable our
work to be more capable of doing good to those who come here. I have just
been talking in the parlor to a parlor full of patients who have come here from
all parts of the world, representatives of almost every state in the Union and
of several different countries of the world; and they have come here because of
the principles of this institution; they did not come here to see me; they did
not come here to see our buildings; they came here to be benefited by our
principles.

We had with us a few weeks ago, during the holiday week, two quite
distinguished gentlemen, Hon. Gifford Pinchot, and Sir Horace Plunkett, the
Irish patriot who has done so much for his own country. It is said that Sir.
Horace Plunkett has banished the misery from Ireland. Mr. Plunkett denied
that; he said he was sure the Irishmen would lay it up against him if he had
done anything to relieve the misery of Ireland. You know the Irishman nurses
his grievances as one of his dearest possessions. This gentleman spent a couple
of weeks with us, and I had a letter from Mr. Plunkett yesterday. He said,
"We are both enjoying splendid health, living right up to Battle Creek ideas, and we are absolutely innocent up to date in the matter of autointoxications."

He was not, perhaps, quite technical in his expression, but he meant he had not done anything to help autointoxication. It is certainly quite satisfactory to know that these distinguished gentlemen who came here and spent a couple of weeks with us have been so impressed with our principles that they were willing to go away and to continue to live up to them.

It may interest you also to know that Prof. Irving Fisher, who was here during the holidays with his family, said to me in my office as he was doing away, "Doctor, every time I come here, I am a little more persuaded; and this time I think I am entirely converted. We have been talking it over, and we are going home; and we have been in the habit of having a little meat once or twice a week; but we have made up our minds that we will caste it out of our house; we won't have it, even for our servants. We are going to live on the low protein diet constantly. Mrs. Fisher said, 'Now, what do you think our servants will say about that? How will they get along?' I said to her, 'You know Mrs. Henderson, of Washington, does not have a bit of meat in her house, and does not allow her servants to have it either, and so if she can do it, I guess we can!' So you see these principles are taking hold of people, and when we have some of our number going out to Europe, and coming back again, it is a great satisfaction always to hear them say, "We are glad to come home, and we have not found any place that is quite so good as Battle Creek, and have not found a single thing among the wise men of Europe—we have not found a single thing to weaken our faith in the great principles that have made this institution what it is." At any rate, that has always been the report so far, and I have no doubt Dr. Morse and Dr. Eggleston will tell you tonight that they are able to bring this report in harmony with all their predecessors. Dr. Morse, as you all know,
has for a long time been an earnest advocate of missionary principles and missionary ideas, and the last two or three years has been saying to me quite frequently, "I feel it is not quite consistent for me to be talking about other people going to mission lands and not going myself." I was considerably in sympathy with Dr. Morse in that feeling, for as I have always felt ashamed of myself that I was not a foreign missionary. I never meet a foreign missionary that I do not feel ashamed that he has been over there in China or Turkey or some other place a score of years or more, and I have been at home having a comfortable time, not running any risks, dangers or hardships—just having a good time; and I confess I always feel ashamed of myself, and I have wished for a long time that we had a missionary somewhere in some foreign land that we could call a Sanitarium missionary, that we could really feel was our particular representative; if we could not go ourselves, that we could feel we had a man standing for us in the mission field.

Quite a good many who have been trained here as nurses or doctors have gone out to foreign lands—by far a smaller number than I wish—about 200 doctors have been trained, and of the 1500 or more nurses who have been trained, I am very sorry that so few are in the foreign mission field. I sincerely hope to live long enough to see a much larger number. I hope the time will come when we will have a real, genuine missionary band of missionary nurses in the institution, and of missionary students; but we have quite a number of missionary students in the medical school at the present time, quite a number I am satisfied who will reach the foreign mission field as soon as they can when they get through. I hope we are going to have a band of missionary nurses here so that we may feel that we are more consistent, more consistently in harmony with the missionary idea. We have missionaries here constantly, and we tell them of our interest in missions, and do a little something, perhaps, for missions by helping missionaries to gain their health so they can go back to their fields;
but certainly with all these great opportunities we have here, the great opportuni-
ties of training we have here, we ought to be doing more for the mission
field.

I rejoice tonight that Dr. Morse has determined to go at once or soon
to a mission field, so that the work may begin and we can begin to feel that we
have got a real interest in the foreign field. I wrote Dr. Morse a few weeks
ago telling him of an opening in Porto Rico. I hardly knew whether he would go
there or had his mind fixed on some other country, some place to which he
felt God was calling him. I felt truly thankful when the Doctor told me he would
be glad to go to Porto Rico, and he felt that would be a place where he could be
fulfilling his mission. There is certainly a great opportunity there. A doctor
in Porto Rico will find a great field, and a needy field of people. Mr. Grief,
who has made this call for some one to go now, as surgeon and physician
to a large sugar plantation where there are several thousand people who must
be constantly looked after, was willing the doctor should spend all his leisure
time in mission work; and his duties for the sugar firm will not be sufficiently
arduous to take more than a small part of his time; and while he has a liberal
salary, there will be an opportunity for a large amount of missionary work;
and there certainly is no field where it is more needed.

In some places in Porto Rico there are forty thousand people
without a single doctor—a part of the United States, part of our own territory,
where there are forty thousand people without a single doctor to look after
them. Nine tenths of the people are suffering from that terrible scourge,
hookworm disease—a terrible parasite,—anemic, suffering; you see them passing
upon the street, dragging themselves along, looking just the color of ashes,
ashen gray. The poor souls—it makes one weep, almost, to think of them.
You see them in their homes doing the very best they can, the mothers for the
little ones. They are a kind hearted people, very affectionate people, and they
are very anxious to adopt American ways. I never shall forget some boys I met in a little town in Porto Rico when going out to visit a pineapple plantation on the mountains, while I was waiting on the corner. School had let out, and the street filled with boys, and the little fellows thronged about me—about eighteen or ten years old, and I thought I would question them. Some of them were saying "hello", some of them were saying, "How do do", to show me that they could speak a little English. I said, "Boys, who is President of the United States?"

A little fellow eight years old, saw on tiptoe and piped up, "William H. Taft." Then I said, "Let us have three cheers for William H. Taft, President of the United States." You ought to have seen those little fellows take off their hats and swing them, "Hurrah, hurrah hurrah." They have no such word in Spanish. They are learning English as fast as they can, learning American forms as fast as they can. They are so delighted to be delivered from the thralldom of Spanish slavery under which they formerly lived. Just think of it—they had not a single public school in all Porto Rico until the United States took the island from the Spanish. They had what they called a college, but it was in an old wreck of a building, so you can imagine how much of a college it was. But the people are aspiring to better things; they are reaching out for the privileges and advantages which American occupation has brought to them; and I am very thankful that so able a man as Dr. Morse is going there. We cannot afford to spare Dr. Morse; we need him here, and I was thinking over it today that I would have a little talk with him to see if he was sure he really ought to go; for if he did not feel the Lord was calling him there, I am very certain we need him very much here. When I think how much we are going to miss him in so many different places, I really feel very loath to see him go. But we ought not to send out our poorest representatives; we ought to send our best. Dr. Morse goes out to Porto Rico representing us; and I hope he will go feeling that we are all
behind him, standing by him, and going to back up his work, going there in the
providence of God to found a mission and to begin a work which will be a new
work in Porto Rico, something different from what has been done.

We have recently had a visit from Mr. Leo. When he came to the Sanitarium he said, "This is just what Porto Rico needs." When he left the Sanitarium, he went down to New England, and has been traveling around there among the capitalists to get money to build a Sanitarium, and I had a letter from a friend of mine in Boston, and he said, Mr. Leo told him he was going to have an institution just like the Battle Creek Sanitarium in Porto Rico. He had been praying about it, and he was sure God was going to send the money. He is going to do his best to get it up anyhow. So you see there are people there who recognize the need of these principles.

I am certain that Dr. Morse will find a very cordial welcome from the people of Porto Rico. I am sure you will be glad to hear from Dr. Morse. He will tell us about his visit to the great missionary convention at Edinburg, and his impressions of Europe.

Dr. J. F. Morse. It is a great pleasure to me to be here tonight, to meet all of those whom I have known before, and with whom I have worked; also some whom I have not had the pleasure previously of knowing. I am particularly glad to meet those whom I had not met before, because we constantly need new supplies of men and women in connection with the work here in order that those who have received training may go out.

I am glad to say just a word about the World Missionary Convention in Edinburgh, which it was my privilege to attend last June. I was delegate to the Synod Hall meetings. No one building in the city, even of Edinburgh, could hold the convention in all of its phases; so the so-called official delegates who were connected with missions already established, were held in one building, and all those who were interested in missions, all delegated who could not be
included in the official delegation had an equally large hall in another part of the city, and simultaneous meetings were held. I attended some of the meetings in the official delegates' hall, but most of them in the associate delegates' hall; also a most interesting series of meetings held by the medical missionary delegates to discuss problems peculiar to the medical mission work.

The thing that impressed me the most, I think, of all the points discussed in this medical section, was the great need of nurses. I think some of you heard me say the other night what one of the medical missionaries there estimated that at least thirty-six times as many nurses were absolutely required in the missionary fields today as there are at present in the field. I thought at once of the Battle Creek Sanitarium and the splendid work nurses had here, and the equipment which they had from that training to go out as medical missionaries, perhaps not to establish anything themselves, but to act as assistants to those already in the fields and requiring help. We have perhaps 350 nurses here, and I should think we ought to send out every year anywhere from ten to fifty or one hundred nurses to missionary fields, and it certainly would be a most glorious thing to be connected with a school which is sending out every year as many missionaries as that.

After the missionary convention which has just recently been held in the Sanitarium I think perhaps I can not add anything to the needs that were presented to you at that time. When Dr. Kellogg wrote to me about the position of which he has spoken to you, it did not appeal to me as a missionary opportunity exactly. It appealed to me as simply a straight commercial problem. However, there was this possibility brought to my mind—that after the duties of the commercial situation were satisfied, after the time which one would be engaged in the work of a physician, there would be opportunity in which the time might be used for helping those with whom one was associated; so it seemed to me that the opportunity was like an entering wedge, and Dr. Kellogg has spoken to you just
briefly of the possible missionary opportunities there would be there; and if it is possible I trust that in not a very long time at least, we may be able to spend our entire time in missionary activity; but of course, we will have to be more or less on a self-supporting basis, although there will be assistance that will come from many sources, and one may be able so far as possible to identify themselves with missionary activities already there.

Just one word I have to say—I suppose this is the last time I shall speak to the Sanitarium family, and those of you who have been here only a few days, you may little realize what that means,—more than twenty years the Sanitarium has been the home of both Mrs. Morse and myself. With all the work of the Sanitarium institution we have been interested and identified in a small way. And the great thing that impresses me is that the mission each one has to fulfill in this world is daily Christ living. We may be able to do other things. The nurses will be able to give treatments with intelligence, with effect; but if in the life of the nurse there is not the Christ life shining through, the principal thing that that nurse is living for is missed; and if in any one that is connected with this institution there is not the daily Christ living, the daily heart service, the daily growth in all the lines that God's spirit can indicate, let that include the science of healthful living or any other science that one has any opportunity to learn anything about,—let it include the service of the hands, the conversation, every talent of music or literature or art and medical science, that through it all and in it all and by it all some one is going to be made better every single day of our lives, because we have lived those lives. And the great record, if one can speak of record in that way, as I look back upon my Sanitarium experience, has been that I know all too well that there may have been many, many days in which perhaps no one was directly helped because I had done my little duty. And so I will say to you all tonight I am impressed
that that is the only message I have to leave with you—that the daily living shall be the Christ life. And when the duties here are done, to whatever field you may be called, be it in the home land or in the far away foreign field, you will be ready to go. And if the duty has been done here with that spirit, of the duty in the new field to which you shall go will be done in the same spirit. And let us remember that just in the degree that we miss the great thing here, we shall miss it wherever we go; and just to the degree which we recognize the real, true mission of our lives here today in the Battle Creek Sanitarium and whatever our opportunity may be, just to the degree that we recognize that we have a mission to perform and do it with that mind, just to that degree we shall be prepared to go into other things in other places.

It will be a pleasure to us to think of you all here carrying on the great, splendid work which is being carried on in this institution, and wherever I have met people while abroad, I have met people who knew of the Battle Creek Sanitarium and knew of its principles.

You are interested, of course, to know that one can get along away from the Battle Creek Sanitarium, and live up to the Sanitarium principles. You can. They tell me I am looking as well as when I went away. I feel just as well as when I went away. I love the Battle Creek Sanitarium principles. And I found that I could study twice as long with just as little nervous fatigue as the men who were working in the classes with me, and they lived the other way. I thought I had a good deal less fatigue; at least I didn’t have any of the complaints of headache and the nights of sleeplessness that they complained of. I attributed part of their difficulties to the tobacco smoking and some other things they did—the meat that they ate and the tonics they took by the way of liquors of various sorts; and I found I didn’t need any of those things, and that I was much better off without them. I was fortunate in being able to stay away from the Battle Creek Sanitarium more than nine months and not have a sick
day while I was gone. At least, you don't fall staying in your berth on shipboard being sick. (Applause).

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Dr. J. H. Kellogg. I heard Dr. Morse say a few moments ago that over in the great missionary conference in Edinburgh the statement was made that thirty-six times as many nurses were needed as were now in the field. When I was down in Porto Rico last spring, less than a year ago, I found almost no nurses there at all. Here we have two doctors going out, Dr. and Mrs. Dr. Morse, and they have no nurse to go with them. I wonder if the Sanitarium family would feel it would be a proper thing for us to send a nurse along to help out in this mission project. How is the Doctor going to get treatment given? The Doctor cannot spend all his time giving fomentations, wet sheet packs and all that sort of thing that is needed. Very much is needed out in that country. I traveled around sometimes with Dr. Knapp when I was there, and it was pitiful to see how these poor creatures lay there and died for just for lack of care. Don't you think we ought to send out a nurse along with the Doctors Morse? Porto Rico is a pretty nice country. A lot of people go down there every winter on outing trips, and it is regarded as one of the gardens of the world. There are palm trees growing and cocoanut ripening all the year round. There are flowers perpetually blooming. They do not know such a thing as frost. I believe there has never been a frost known in the island. They have a mountainous region in the center where it is always quite cool, but never quite cool enough for frost. There is a pleasant breeze near the shore, and it is never sultry, but really is a delightful place. I don't want to make it so delightful that there won't anybody want to go. I suppose missionary nurses are looking for a hard job rather than an easy one. Couldn't we have a nurse go along with this expedition? I understand Mrs. Dr. Morse is going to sail a little later. Perhaps she has a word to say.
Dr. Jean Whitney-Morse. I have only one thing to say, and that is that the Battle Creek Sanitarium is home to us, and has been for so many years that we shall feel like saying good bye to our own family in going away. Of course, we may be able to come back for a vacation sometimes, but we shall certainly feel as though we were saying good bye to our own family. It is good bye to all the friends and nurses whom we knew here.

Dr. J. H. Kellogg. How many think we ought to send a nurse to Porto Rico? Hands up. I see all the hands up. How many think the Sanitarium family ought to support a nurse in Porto Rico? Hands up again. All right; we will ask some one to go around and call on you. Well, I feel, Drs. Morse, that the nurse is secured. Some time ago I had a letter from a man down in Ohio who said he had been up here to the Sanitarium and spent several months here, and he felt well repaid for his visit here. And the thing he thought that paid him most of all was Dr. Eggleston's smile. So we will be glad to hear from Dr. Eggleston.

Dr. Eggleston: I didn't know my smile was worth so much before. It is with feelings of happiness and regret that I face you tonight—regret because one of our friends, one of my friends, is to leave us. I came here about fourteen years ago, and one of the first men I met and became acquainted with was Dr. Morse, and from that day to this I have greatly enjoyed his friendship; and when I heard, on landing in New York last Thursday, that he was to sail shortly for Porto Rico, I assure you it was with great regret. I never think of Dr. Morse leaving the institution without feeling that we are losing our general utility man. Dr. Morse has been asked to do almost everything that needed to be done around the institution. A patient told me once he was the only good looking physician the institution could boast of. (Applause). I agreed with the lady that he certainly had been, aside from the Superintendant, the only
talking physician we have had. The rest of us are somewhat under size, and we
do not know how to talk, and the only thing we are fit for is to keep out of
sight in the talking line; and we certainly will miss Dr. Morse, because there
has never been a man in our midst who was more true to the principles of this
institution and who labored more earnestly in whatever position he was asked to
labor in than Dr. Morse; and I am sure that in leaving us, he leaves with the
most kindly feelings on the part of all who have known him, and with our sincere
prayers that he indeed will be prospered in the field to which he has decided
to go. I feel that he is very fortunate in one respect. I always think of a
missionary as being unfortunate in that he is usually dependent on some one else
for his existence. I should not say existence in that respect, because we are dependent for existence only on our heavenly father; but the
physician who feels that he must look to his home friends, or his home church
for his daily bread almost, that in case they should decide that they were a
little hard up, that his family would lack the necessities of life,—I have
always rather felt sympathy for that man in my heart; but a man who has mission-
ary zeal in his heart and can go to the field where there is really great need,
and can have his living assured, it seems to me is a most fortunate man,
and I am sure with the true missionary that will only help him rather than hinder him.

I assure you that after absence from the institution of almost four
months, that I am delighted to return. I know of no place in the world that seems
so pleasant to me as the Sanitarium, and while my journey abroad was a very
pleasant one, while I had opportunities that I hope will be profitable, and I
am sure they will be pleasant, there has been no time but what I have always
yearned to be back at the Sanitarium. Most of my time abroad was spent in
Vienna which is considered as being one of the greatest medical centers. It
is a place which attracts a great many American physicians; and at the time I
was there there were 135 staying students studying in that center. It is a particularly excellent place for an American physician, because of the large hospital opportunities. They have a charity hospital accommodating some 3000 patients, and the patients are all in the hands of the physicians, and in the hands of the physicians for clinical purposes. There is no place I think in the world where a patient so absolutely divests himself of his personality and gives himself up entirely to his physician as he does in the Vienna hospitals. The patient has absolutely nothing to say. He is divested of his clothing, almost of his identity; he is simply No. 39 and so in the hospital, and in some respects it is very unfortunate it seems to me for the patient. I would not say he is not well treated, but he certainly receives but little kindness. He receives possibly as much attention as he needs, but it is of a perfunctory nature, and he is absolutely a clinical subject, so that he may be studied as much as desired. The great aim of the Viennese faculty, or the faculty of the hospital, seems to be to be able to arrive at a scientific diagnosis. Therapeutics seems to interest them but little. Their therapeutics, I am sure, is not nearly what it might be. But their diagnosis is arrived at with great care, and they are very scientific in their methods.

Speaking of the opportunities there, it seems to me the opportunities are the result of the unfortunate condition of the inhabitants of the city. I am sure I have never been in any city where there seemed to be so much illness and so much suffering from the causes of ill health as in Vienna. Tuberculosis, syphilis, malignant diseases, such as malignant growths, and the cardio-vascular-renal diseases resulting from arteriosclerosis seem to take off a large share of their elderly people, and much before the time at which they should give up their lives. This, it seems to me, must be due to their habits of living. They seem to have but very little idea as to cleanliness, particularly the lower
classes. They know nothing about ventilation. Even in the hospitals the ventilation of the rooms is desperately poor. I think I have never seen poorer ventilation than exists in some of their clinic rooms; and their habits of life, of eating and drinking, are certainly very conducive to disease. They are an immoral people, and as the result of it disease is ravaging their midst and carrying off a great many, as I said, before their time. It certainly strikes one that a person who has lived in this country, particularly one who has lived at the Battle Creek Sanitarium and knows that the habits of life are responsible for the diseased conditions, it certainly should make one feel very thankful that they have had opportunities to know a better way. There is a great deal of drinking, a great deal of gluttony, and certainly the results are very evident. I was associated with Dr. Mortensen while in Vienna, and very frequently we used to speak of it, as to how thankful we should be that we have had light which would permit us to be free from the results of their habits of life, and how earnestly we should propagate the light which the Lord has given us. And as I come back among you again, I feel that it is a very great pleasure for me to work with you. I feel that we only to a very small extent appreciate our opportunities; and I am sure that a visit away from the institution only increases one's admiration for the principles which we hold, and increases his faith in them. I assure you it is with very great pleasure that I return to your midst. (Applause).

Elder Tenney: I am sure I speak the feelings of all who are here in saying that I am conscious of a pain about my heart as we think that this is the last time for some time that we shall see Dr. Morse; and those remarks as to his fitting in to so many places are so true. We have depended upon him so much, in so many places, especially in our religious work, in our meetings, and we shall certainly miss his help. What I wish particularly to speak of is in regard to our medical missionary conference which recently closed, and to
read you a letter which is simply a sample of a great many that are coming to
my desk nearly every day. This one arrived this morning, and you are all of you
interested. No doubt you all remember Dr. Francis F. Tucker, of China, a very
able man, who was with us. He writes from Falls City, Nebraska, 21st of January:—

(Reading letter.)

I thought it was due to our family tonight to know that their efforts
in behalf of the conference were greatly appreciated by the members of the
conference who were with us.

Dr. J. H. Kellogg. I am sure the Drs. Morse will go away knowing that
our hearts are with them and that our good wishes shall go with them, and we
shall pray for them, and remember them and hope to see them back on future oc-
casions. Porto Rico is part of the United States, you know, and it does not
seem like going really to a foreign land. It is only five days there and five
days back, and it is not so far off by wireless; so we do not feel that we are
so very far away after all. Since I have been down there, it doesn't seem any
farther away than California. I am glad the Drs. Morse are going. I shall miss
them more than anybody else. Dr. Morse has been my right hand man in operations
for years, and no one knows how much I shall miss him. And as Dr. Eggleston
has suggested, he has been our handy man on every occasion when we could not find
anybody else to help out, to do a hard job. Dr. Morse was the man to do it.

We always felt proud when we brought him up, especially I felt proud, I was
glad to be able to bring along a specimen of a real man to introduce to people.
I am sorry he was not here at the conference. So I am glad he is such a useful
man. He has been such a help to us I know he will be a great help to Porto Rico.
Certainly the Drs. Morse will be the best representatives we could send out from
this institution, and I know you all feel that way. So I am going to ask you all
to rise while Elder Tenney offers a word of prayer.
Pickled beefsteak 1,6.
No bacteria in alimentary canal at birth—Friendly bacteria 1,2.
Old age—putrefaction (Metchnikoff) 2
Hardening of the arteries 2.
Arteriosclerosis at 53 (Paul Morton) 2.
" statistics 3.
Boy of 17 old enough to be 150. 3,4.
Thomas Parr could swim at 130. Did not smoke. Died of indigestion
at 152. 3,4.
Tobacco—Imitating savages 4,5.
Two Kings committed suicide (King Edward and Mark Twain) 4,5.
Every smoker hastening his funeral 6.
Alcohol, effect upon beefsteak 6.
Tea and coffee—Uric acid 6.
Sweetbreads 6.
Arteries harmed by uric acid 7.
Factory of poisons—the body 8.
Poisons eliminated through kidneys 9.
Lead pipes 9.
Tape worm 9,10.
"How is your T.W?" 10.
Catching tape worms 10.
Eczema—Bad blood 10,11.
Cancer, short course of 11.
Fasting 11.
Kidneys in cold storage II, I2. (Rockefeller Institute)

Faster "gnaws his own bones" I4.

In fasting there is paralysis of the intestine I5, I6.

(Experiments on animals) I4.

Alimentary canal like a rope I5.

Food is the natural laxative I5.

Washing out the poisons I8, I9.

Osteopathy-Diphtheria-Hydrotherapy I9, 2o.

" Wont scare germs out of throat 2o.

" One-third of audience had tried it before coming to San. 2o, 2I

Pig, substitute for 22.

Grape fruit and cream 22.

Anemia 22, 23a.

Flesh, reducing 23.

Rheumatism, symptoms of 24.

Live hearts (Key West) I2, I3.

Death from poisoning—Extractives I3.
LEcTURe 21.

arteriosclerosis 6.
autointoxication 1.
cane sugar 7.
cezana 10.
gasting 11.
osteopathy 19.
rheumatism 24.
smoking 6.
sugar, cane 7.
tapeworm 10.
I promised to show you a pickled beefsteak. Here is a pickled beefsteak, and it is two years and a half old. It has been in pickle for two years and a half, and if you are near enough by so you can look at it, you will see that it is still entirely intact, does not show any evidence of softening or breaking down at all. Now if this had been exposed to the ordinary processes of decay, under ordinary conditions—you can see it is a strong, tough beefsteak, just as it was when it was put in pickle. It does not show the slightest evidence of decay. I am going to leave it here so that if any of you want to take a look at it after lecture you can. If you observe a sour odor, that is simply the odor of the yogurt buttermilk. I present this to you simply as an illustration of the principle that acid forming bacteria are capable of entirely suppressing the process of putrefaction. Now, Nature puts into the alimentary canal of the new born infant, some billions of these acid forming bacteria. Within six hours in summer time, and twenty hours in winter time, after a baby is born, its alimentary canal will contain no bacteria at all; but at birth, but after a few hours it is simply swarming with these acid forming bacteria. The stools of the young infant have a slightly acid odor for this reason, but the presence of these bacteria entirely prevent the process of putrefaction. If we can keep these acid forming bacteria always with us, the normal, healthy, friendly bacteria,—if we can keep them always with us in the alimentary canal, so that it has an army of sentinels or protectors of the body always present with us, no putrefactive bacteria getting into the alimentary canal at all,
don't know any reason why we might not live a thousand years. Metchnikoff has shown that the germs of old age are the germs of putrefaction. The same germs that cause the decay of a dead animal cause the growing old of a living animal. When the edict went forth to man, "Dust thou art, and unto dust shalt thou return", it meant simply that these putrefaction germs had power over man to reduce him back to dust; and the first thing they poisoned him; they got into his alimentary canal, and they would grow there and produce putrefaction and poisons; and these poisons are absorbed into the blood and harden the arteries by coming in contact with the walls of the arteries and causing the arteries to harden and shrivel up, and by and by the blood vessels burst in the brain, a blood clot is formed and a man falls down in the corridor of a hotel, as Paul Morton did in New York the other day. Now, Paul Morton thought he was all right; he looked as well as anybody; he seemed to be in perfect good health; he was only fifty-three years old, in the prime of life. The company had established what they called a Christmas policy. Somebody suggested that Mr. Morton ought to be the first one to be insured under this policy. Mr. Morton said all right, so he submitted himself to the company medical examiner to be examined. The examiner very soon discovered that he could not be insured; that he was not eligible for life insurance; that he had high blood pressure, he had arteriosclerosis, he had casts and albumin in the urine; he had Bright's disease. Now, he didn't realize or appreciate any symptom at all, or any trouble at all. He immediately changed his habits of life, began living upon a fruit diet, avoiding beefsteaks etc., but went on with his work. He had an appointment to meet a gentleman at a hotel, and walking along the corridor of the hotel, he fell insensible and a couple of hours afterward he was dead with a blood clot in his brain. Dr. Billings who had examined him said he was suffering with auto-intoxication—Dr. Billings, of Chicago. So you see there is somebody else besides Dr. Kellogg who talks about auto-intoxication. It was published in the paper that Dr. Billings
recognized the fact that this hardness of the arteries is due to intestinal autointoxication, -that that is almost always the cause of it. There are six great causes of this hardening of the arteries which is coming to be so universal in this country, and growing at a terrible rate. I have on my office table the mortality report of the U. S. census bureau for 1908. This gives a comparative table of the mortality of our various diseases in different years, beginning with 1900; and in 1900 the mortality from disease of the arteries was 6.1 in 100,000, -6.1 for every hundred thousand persons. That means that in the year 1900 6.1 million persons died of this disease in every 100,000. We have about one hundred million people in this great Republic with its dependencies, and that would mean six thousand one hundred people died of disease of the arteries in the year 1900. Now, in the year 1908, the mortality was 17.6 from disease of the arteries. See what a tremendous increase, from 6.1 to 17.6 in eight years. That shows how arteriosclerosis is increasing, how rapidly this disease is increasing. Now, it was not sometimes up or sometimes down, but each year, every year, from 1900 to 1908 showed an increase; in 1900 6.1, the next year an increase of .7, the next year an increase of 1.3, and the next year an increase of .7 again, the next year 1.4, the next year, 2.3, and so on it went, so that the increase in the eight years was 11.5, making a total mortality in 1908 of 17.6. Now, why should there be such a great increase? The question I ask myself is, why isn't the increase greater? It is most surprising to me that it is not greater when we think of the mischief tobacco does and the number of people who are smoking, and the number of pounds of tobacco that is chewed, and the number of billions of cigars and the billions of cigarettes that are smoked every year, -why, the wonder is that there are any of these smokers that haven't arteriosclerosis. A boy only seventeen years old a few years ago died of arteriosclerosis. On examination, that boy's arteries were found to
be chalky, hardened throughout his whole body. Just think of it—a boy of seventeen dying of old age. He was old enough at seventeen to be 150 years old.

In fact, old Thomas Parr, a man who lived to the age of 152 years and nine months, and who lies buried in Westminster Abbey,—152 years and 9 months—you can see that on the slab of one of the ashes of Westminster Abbey. The next time you go to Westminster Abbey in London, ask the man who shows you about to show you the slab where old Parr lies buried. I remember very well standing there and reading it—"Here lies old Parr who died at the age of 152 years and 9 months." Now, William Harvey—not the John Harvey who discovered the circulation of the blood, but William Harvey, who was a very eminent man, however,—Dr. William Harvey examined old Parr after his death and found he had no hard arteries in his body,—not one hard artery in his body. He did not die of old age at all. He died of a surfeit. The King invited him to come to see him and he was such a remarkable man. He had always lived on buttermilk and potatoes; that had been his diet— buttermilk and potatoes was his diet, and when he came up to see the king, the king fed him on beef steaks and mutton chops, and I suppose pork chops and sausage, and he had an attack of indigestion and died of it inside of three weeks. He might have lived perhaps ten or fifteen years more, for he was living with his third wife; and his youngest son was born when he was 120 years old, and he was able to swim swift rivers when he was 120 or 130 years of age—he could swim the swiftest river in England. He was a laboring man, and he had been a hard worker, and had not a hard artery in his body—just think of it. And here is a boy dying at seventeen with all his arteries hard. The difference was the boy smoked, and old Parr did not smoke. He hadn't money enough to buy tobacco with. It is a strange thing, this smoking business, any way, isn't it? When Columbus discovered America, he sent some of his men ashore to see what they could find, and they came back and reported that they saw naked
savages twist huge leaves together and smoke like devils. The whole civilized world since that time has been imitating those naked savages—smoking like devils. So it isn't any wonder we are getting arteriosclerosis, aneurisms, and angina pectoris. You see men deliberately killing themselves, smoking themselves to death, as Mark Twain and King Edward did. The newspapers some years ago reported that King Edward had stopped smoking. I thought he had really come to his senses at last, and it must be because he had been using our electric light bath. He has one in Buckingham Palace, and another one in Windsor; and I thought it must be our electric light bath that had cleared up his brain that he had come to his senses at last and stopped; so I published in my journal, Good Health, a statement that King Edward had stopped smoking and was very much improved, as the newspapers reported. You know, it was only about three months afterward that I got a letter from a man over there in Belfast, Ireland, a good old man there who is editor of a temperance paper, and he copied this little article from Good Health—I had copied it from one of the Chicago papers. It was a telegram dated at London, and I thought it was authentic. He said, "King Edward is very much annoyed because you publish the statement that he has stopped smoking, and he has had his private secretary write me about it, and he wrote to me to know where I got the information that he had stopped smoking, and I wrote him back that I got it from your journal." And he wrote me, "Mr. Nollie, his private secretary, wrote me to tell me that Dr. Kellogg doesn't know what he is talking about; that King Edward smokes just as much as he ever did, and he intends to keep right on smoking." So I published in my journal, Good Health, a little note of apology. I promised I would apologize if the apology was demanded, and I published the apology, and this was my apology: "King Edward has not stopped smoking; he intends to smoke himself to death." So last year I published an announcement in my journal, and the heading of it was, "Two kings committed
suicide." Mark Twain was one of them, and King Edward the other. They died about the same time, you know,—committed suicide by smoking. Every man who smokes is simply killing himself. He is hardening his arteries. Every cigar he smokes is hardening his arteries, and simply hastening his funeral. There is no doubt about it. You say, how do we know it? Why, German, French and American investigators have taken the extract of tobacco and injected it into rabbits and into dogs and have produced old age in those animals in the course of three or four months' time. Nicotine destroys the arteries. Now, there is alcohol, another thing that does the same thing. Alcohol circulating through the arteries in the blood comes in contact with the arterial walls, and hardens the arteries. Here is this piece of beefsteak that has been down here in yogurt buttermilk; it is still soft and pliable. I suppose if it were cooked, it might be quite palatable. Certainly it would be just as good as it ever was. If there is anything removed from it, it is only the uric acid, and all the other poisons and extractives; but if that beefsteak had been in alcohol, it would have had at the present time the consistency of burned leather. That is what alcohol does, it hardens; it is a dessicating poison. Then there are tea and coffee. Just think of the millions and millions of pounds of tea and coffee used in the United States every year; and every single cup of coffee has five times as much uric acid in it as that much of the kidney secretion. Just think of the uric acid right there. A man who drinks a cup of coffee is simply swallowing a solution of uric acid, and five times as much as there would be if it were a similar quantity of secretion of the kidneys. Well, then there is beefsteak,—fourteen grains of uric acid in every pound, and seventy grains in every pound of sweetbreads. Some people are very fond of sweetbreads. I asked a man how much sweetbreads he ate at a meal, and he said he ate a couple of pounds, and it there wasn't very much of it; you know it shrivels up, and there isn't much of
it. He was very fond of it. Many times patients have come here, and I said, "What is your diet?" "Well, my doctor has been giving me sweetbreads recently. He said that it was very easily digested." It is very easily digested in the stomach. It is not the stomach that is harmed; it is the arteries. It is not the stomach especially that the tobacco hurts; it is not particularly the stomach that the alcohol hurts; it is the arteries, and through the arteries the whole body is damaged, because the arteries furnish the blood supply to the entire body, and when the arteries are damaged and spoiled, the whole body is spoiled.

Q: Since fruit sugar is the best sugar for the body, why is cane sugar not better than malt sugar or dextrose?

A: The idea, I suppose, is that the product of the digestion of cane sugar is more nearly like the sugar of fruit. The sugar of fruit consists of two sugars, levulose and dextrose. Malt sugar is converted by the process of digestion into dextrose only without levulose. There is no evidence that I know of that dextrose or fruit sugar is not just as nourishing and wholesome as kishigia levulose; for we find these two products, levulose and dextrose in equal proportions in fruit. There is no evidence that they are not equally wholesome for the body. The cane sugar, if it passes through the normal process in the plant, is converted into fruit sugar, in nearly all fruits with the exception of the date. We find the cane sugar of the plant has been converted into fruit sugar in the fruit. By the process of digestion this cane sugar is also converted into fruit sugar; but the difficulty is that digestion does not occur very readily; that there does not seem to be normally proper provision for it. When cane sugar is taken into the mouth, there is no provision for the digestion of that cane sugar in the intestine, but Nature comes to the rescue. Here is an emergency, here is a new product which requires a new digestive agent; so sucrase, the digestive agent for cane sugar, is created to meet the emergency, and three
or four years afterward the cane sugar may be digested. The malt sugar is digested at once, because provision is made for it. It is a natural product for the body to deal with.

Q. Since, as you say, meat contains poisons which have produced cell death in the meat, are not our bodies poisoning themselves all the time by cell death?

A. To be sure. A great English physiologist many years ago made this statement: "The body is a factory of poisons"; so the body is producing poisons all the while. We are poisoning ourselves all the while. When a man sits down in a close room, and is doubled up over his desk working, he is poisoning himself very fast. When he is outdoors exercising in the open air, breathing deep breaths, aerating his blood, then he is not poisoning himself very rapidly; but we are continually poisoning ourselves; and that is why we die of old age ultimately, because we can not keep up the purifying process. We are getting just a little behind all the while, and by and by we get so far behind we die of poisoning in the end.

Q. Is it not more logical to say that these cell products, that is the waste products, are simply negative waste matters which cause no harm except the slight effort of elimination?

A. No, that is not the right thing to say at all, because they do do harm. They are deadly poisons. Carbonic acid gas, for example, is carried off through the lungs. If that accumulates in the blood for three or four minutes, the animal is dead. How black in the face a baby gets when it is coughing, perhaps, or crying and holding its breath. When a person has been down in the water for three or four minutes, he is almost certainly dead. Very few people can hold the breath even so long as one minute. Why? Because the poisons accumulate in the body to such a degree that the demand for air becomes imperative.
and we can not resist it. But the poison which is eliminated through the lungs is only one poison. Other poisons come out through the skin. Bouchard showed that seven different poisons are eliminated through the kidneys, every one of them a deadly poison; carried off through the kidneys, and these poisons, some of them produce coma; some of them produce the effect of an opiate; some of them produce the effect of an excitant like strychnia, and cause spasm; some of them produce a fall in temperature; others produce a rise of temperature. So there is a variety of these different poisons.

Q. What do you think of a city that carries its water from the mains to the faucets in lead pipes?

A. Well, it is a very convenient thing to do, but it is a very unhealthy thing to do, and people are being continually poisoned in such a city as that. The small amount of lead from the pipes, used day after day and day after day has the effect to harden the arteries, injure the liver and produce serious disease. It is very important that everybody who lives in the city should remember in going back, when the house has been shut up a little while, to let the water run past until all the water runs out of the lead pipes, and you are sure every bit of water that was standing in those pipes has been spent.

"Q. What is the best remedy to clear the mucus in the nose and throat?

A. A few sips of hot water. A tumblerful of hot water is a very good remedy.

Q. How can tapeworm live in the intestines?

A. The tapeworm possesses the power to live in the intestines of an animal, and can not live anywhere else. It is the only place where it can live. Why? Because the tapeworm has no stomach; it hasn't any digestive organs at all. It can only absorb food that has been digested by some other animal; it is a parasite. It is like one of these air plants, or parasitic plants that grow upon other plants. They put their roots down into the tree
and steal the elaborated foodstuffs which are in circulation in the sap of the
tree, that has been digested in the roots of the tree; so the tapeworm is a
parasite, and it lives upon the food which has already been digested by the
animal upon which it is parasitic. The tapeworm, I should say, can not live in
the stomach. If the tapeworm were in the stomach, it would be digested in the
stomach by the acid gastric juice; but it can live in the alkaline fluids of the
small intestine.

Q. Does the Sanitarium cure tapeworm?

A. No, the Sanitarium does not cure tapeworm, but I am sure every one
of our doctors here knows how to catch tapeworm. We have been on tapeworm
hunts a good many times, and we always catch them. I remember a very interesting
case we had here some years ago, of a little boy about five years old, and his
name was Tommy, and Tommy's tapeworm had become very famous, because many doctors had been after it and had not caught it. The trouble was he got the worst
of it, because the medicine made him sicker than the tapeworm. It takes just
as big a dose of medicine to kill a tapeworm in a small boy as a man, you see;
but a small boy can not stand so big a dose of poison; so this boy had come to
be a very famous case. He came from a large city down in Illinois, and it
became very annoying to him; his life was made miserable. Every time he met
anybody on the street, they said, to him, "Good morning, Tommy, how is your T.W."
The little fellow finally came here, so I set apart a whole day to capture that
tapeworm. We began in the morning, and before night, we had him, and I felt
very proud of it.

Q. What is the best cure for eczema in a child four years old?

A. Eczema is not really a skin disease; it is a general disease
that is manifested in the skin. Nobody ever has eczema so long as his blood
is all right. The old theory or notion which has existed among the laity the
world over from ancient times, that the skin eruptions were an indication of bad blood, is perfectly correct. It is only within recent times, however, that we have come to appreciate the fact that an eruption of any sort always means bad blood. Well, there are a few exceptions. The eruption comes from a scabes, from pedicular, parasitic animals; but these eruptions like eczema, psoriasis, and other things of that sort--acne and other things, always mean bad blood, because the blood has the power to heal; it has a wonderful healing power; and it won't allow anything of that sort; it won't tolerate anything of that sort, so long as it is up to par. It is only when the blood becomes depreciated, when it is vitiated by the absorption of poisons from the intestines that the eruptions are tolerated. It generally means intestinal auto-intoxication. It means the child would die if its bowels were in bad shape, and the poisons absorbed vitiate the blood and so permit the growth of germs upon the skin. There are always present upon the skin germs that are capable of causing eczema. They are always there. The only reason why we do not have eczema is because our tissues are fighting these germs off and won't allow them to get a foothold. So if the resistance of the body is a little diminished, then the germs may grow.

Q. Could recurrent pains in the region of the liver, extending over a period of fifteen years, the general health remaining unimpaired, be caused by cancer?

A. Certainly not. Cancer does not last so long as fifteen years. It is certainly not cancer of the liver, which is a disease which runs its course almost invariably within two or three years.

Q. Why is not fasting a good purifier of the system?

A. Well, the reason why fasting is not a good purifier of the system is because it does not purify. That is the reason. Now, just let me show you a thing or two about that. The tissues of dead flesh contain about ten per cent
of extractives, of tissue wastes. Now, that is the maximum amount, because the tissues of an animal do not die until after the poisons have accumulated in the tissues to such an extent that they kill the tissues. When an animal's throat is cut the animal is not dead; the muscles still quiver; and if those muscles are put away in cold storage and taken care of, kept cold so the process of life could not go on,--if the animal's heart or other tissues are put away in this way, they may be preserved for months. Down at the Rockefeller Institute, New York, they will take the kidney of a cat, and three or four months later put that kidney from cold storage into the body of another cat, attach it properly and it grows fast there and performs its usual functions, after it has been kept on cold storage three or four months. But it was necessary to keep it cold, to keep it so cold that the death process would not go on and the poisons would not accumulate. I might tell you a little story that happened to me some years ago. I was down in Key West. I went down the hill one morning to take the boat to Cuba. This was some twenty-two or twenty-three years ago, but I remember it as distinctly as yesterday. A man was coming up the hill with a big woodentray on his head, and I saw something climbing over the edge of it, and he put his hand up and pushed it back; then put his hand up on the other side and pushed something back; and I was very much perplexed to know what it could be there on the top of his tray; I thought it must be live lobsters of some kind; but it looked like beefsteak. I went on down the hill, and at the bottom of the hill was a market. I stepped into the market, and the market was all covered over with steaks, chops and various things, and there was a big heart there, and this heart was just beating. I noticed that first, and then I observed that those steaks were climbing off the counter, and the man behind the counter was all the time pushing them back; and I said to myself, certainly this is a very strange place. I thought I must be dreaming, and I rubbed my eyes to see if I
were really awake. I stood there greatly astounded, staring at it for a moment. There were those chops and steaks creeping all over the counter, and had to be continually pushed back. I said to the man behind the counter, "What does this mean? I never was in such a place as this before?!" "Why," he said, "This is the turtle market. Look out the door." I looked out the door, and there were half a dozen Tortugas turtles on their backs with their legs wriggling about in the air. Now those steaks and chops, the man told me, would not be dead until they were put into boiling water. I bought that heart and took it away with me, and it was still beating next morning in Cuba. So you see the tissues do not die when the animal seems to die. The tissue life of an animal continues until the tissues become so saturated with their own poisons that they die of poisoning. That is the only reason why they do die--because after while they die of poisoning. Well, now, here is the animal dead. Go down to the meat market--well, it is a sort of market they call a meat market, where there are dead beasts laid out, and you find there some beefsteak, and one tenth of that beefsteak is extractive; that is what the chemist tells us; it is poisonous material that has killed the ox, killed the tissues. That is why it is dead. Now, we will suppose, the, a man weighs about 150 pounds. About twenty-five pounds of that 150 pounds would be skeleton, or bones. You want to take that out. Then about three quarters of what is left is water. We will suppose it is seventy-five pounds water, and that leaves about fifty pounds of solid material. One tenth of that solid material is extractive; that is, dried extractives, five pounds of it we will say, of the fifty pounds that is left. So a man weighing 150 pounds has not more than five pounds of this poisonous, extractive matter all told in his body. That is, if he had as much as that he would be dead; so he may not have probably half as much as that; but that is the maximum amount he could have, because that is what you find in beefsteak. So here is a man whose body is impure
he thinks he ought to have a fast in order to get the impurities out of his body, when he could not have over five pounds of impurities to get rid of, you see. This man says, "Well, I weigh 150 pounds. I guess I will fast and reduce my flesh", and he begins and at the end of two weeks he weighs 130 pounds. At the end of another week he weighs perhaps 150 pounds. A man loses about one eightieth of his weight every day when he is fasting. If he goes on for four weeks, he won’t weigh more than 100 pounds. Now, he has lost fifty pounds; fifty pounds of his body has disappeared. What for? To get rid of five pounds of waste matter. Is there any sense in that? Is there any sense in the man throwing away 45 pounds of good flesh in order to get rid of five pounds of poison? But he hasn’t got rid of the poison. If we take a man and feed him upon beefsteak, just feed him upon meat and nothing else but meat, his body will become saturated with poisons in a little while. But now a man who is fasting is living on a meat diet; he is gnawing his own bones; he is a cannibal. That is the truth about it. A man who is fasting is a cannibal, he is eating his own flesh. Why, a man that is fasting is not going without food. He is simply changed his diet; that is all. Instead of eating bread, butter, potatoes, apples and things at the table, he is simply dining on himself. And that is why he loses weight, you see. That is why his weight goes down. A man who weighs 150 pounds today and at the end of two weeks weighs 130 pounds has lost twenty pounds. He has been dining on himself, you see, lunching off his arms and shoulders, spare ribs and various other things—gnawing his own bones; so he has been living on a meat diet. He is a carnivorous creature; he has been taking the tissue as it came, all sorts of tissue. Now, the experiments have been made upon animals; animals have been fasted, then the animal has been weighed; then dissected and its different parts weighed, and it has been found that there is great loss on the part of all the organs of the body. The muscles lose more than half.
It is not simply the fat that loses; it is not simply the waste matters that are carried off. The living structures of the body are destroyed. Even the bones lose part of their weight when a man fasts. The muscles lose half their weight; the heart loses one third of its weight; the liver loses more than a quarter of its weight, and even the brain and nerves lose a little, so the whole body is wasted because it is being eaten up in order to keep the fires of life going. We must keep warm; we must keep warm. Heat is the thing which we must sustain by food; we eat chiefly to sustain animal heat. Four fifths of all the food we eat is burned up for fuel in the body to keep us warm. We use only one fifth of it in mental and physical work. Another thing: when one fasts his intestines cease to act and everything is paralysed; no food enters the stomach, so the stomach does not work. The alimentary canal is like a rope. Get hold of the end of a rope and give it a twitch, and a wave travels down the length of the rope; give it another, and another, keep working the end of it, and the waves keep going down. That is the way it is we set the stomach to working, and the waves of peristaltic activity travel down through the whole alimentary canal. Food is the natural laxative. When no food is taken, there is no activity of the intestine; there is complete paralysis. So when a person fasts there is complete paralysis of the stomach and intestines. Bile is poured out that excretory substance which is the most poisonous of all the fluids of the body, six times as poisonous as the urine the bile is, and three pints are formed in twenty-four hours; this bile continues to be poured out as usual, but it is not discharged from the body. Now, it is just as necessary that the bile and other excretory substances which are poured into the intestine should be discharged from the body as it is that the breath should be discharged from the body, or that the perspiration should be discharged from the body, or that the kidney secretion should be discharged from the body; and when one fasts the bowels do not act, and these poisons are pent up and accumulated in the body.
to an enormous extent. I met a patient some time ago who had been fasting twenty-one days. He put out his tongue and said, "Doctor, look at it. Doctor, I have been fasting twenty-one days, and my tongue is just as bad as it was when I began and is getting worse all the time. What am I going to do?" That is what you always find. When you fast the tongue always gets coated, and the urine has increasing quantities of indican, and by and by in the later stages, the urine even contains carbolic acid because the putrefaction in the intestine has reached such a point that there is actual formation of carbolic acid. That has been proven by scientific physicians, by persons fasting under conditions of scientific control. I said to this man, "I guess your bowels have not been moving?" He said, "Oh, no, my bowels have not moved; of course not; I have not eaten anything. My bowels moved thoroughly before I began fasting." "How long ago?" "Twenty-one days." "Your bowels haven't moved for twenty-one days?" "No, there is no reason why they should." He had not been thinking about that three pints of bile a day for twenty-one days—sixty three pints of bile, anywhere from twenty to sixty pints of bile had been formed, several gallons of bile, and every ounce of it six times as poisonous as an equal quantity of urine, and that had been poured into that man's intestines, and it was all pent up there except that portion that had been reabsorbed; but the poison had been reabsorbed, and his blood was so thoroughly polluted that the germs were growing in his mouth as though it was a mass of filth, just as though his tongue were a mass of filth the germs were growing upon it, because his blood had become so polluted it could not resist the attacks of these bacteria any longer. I said, "I guess you better have your bowels move." A saline laxative was given him, and he told me three or four days afterward that the amount of material discharged from his body was beyond belief. He said it was several gallons of the most horribly putrescent material. That man was simply frightened. The wonder was he was not dead, and
that cured him of fasting; he didn't want to fast any more. He didn't want to fast. He had been wanting to fast for some time, and finally he took the matter into his own hands without my knowledge and tried to fast; but he had enough of it. He was several months recovering from that terrible autointoxication to which he had subjected himself. Now, I will take the liberty to tell you another thing. My friend, Mr. Horace Fletcher, was quite an advocate of fasting, and had been for a good many years. We had quite a number of friendly discussions about it, for I never had been quite as enthusiastic about it as he was. He went down and stopped with his friend, Mr. Elbert Hubbard, down in New York. Mr. Hubbard was somewhat interested in fletcherism, and Mr. Fletcher goes around there once in a while and stops with him two or three weeks, and he thought it would be a good chance to try the experiment of fasting; so he fasted for seventeen days. He wrote me at intervals during the fast, told me what he was doing; and on the seventeenth day he wrote me, "I have stopped my fast; I have gotten enough of it. The autointoxication has gotten so bad I can not stand it any longer." The autointoxication was so bad, the tongue was so badly coated, and the breath was so bad, so saturated with poisons, he had become so giddy he could hardly stand erect. He was waiting for an appetite to come. That was the old formula—fast until the appetite comes; when it is time to eat, Nature will tell you so. How could Nature tell a man to eat when he was drunk with poisons, saturated with poisons so that he could not assimilate or digest food if he did eat it? Mr. Fletcher thought he would try some experiments. He was very fond of beans, and he asked to have some baked beans prepared after the Boston formula. They were prepared and placed before him, and he looked at the beans but did not care to eat them. He smelled them, and still did not care to eat them; he didn't have any appetite. Then he put seven beans in his mouth and began chewing them, and all of a sudden the appetite came back, and the desire
for food came back, he said, like a burst of sunshine from behind a cloud, and the most delightful gustatory pleasure he ever experienced in all his life came like a burst of sunshine. He said it was really worth while to have fasted for seventeen days to have had that great burst of gustatory pleasure. Now, Mr. Fletcher came here a few weeks afterwards, and his tongue was still badly coated. He had not got over that attack of autointoxication which he had induced in himself by an artificial fast. The last time I saw him, I thought he had not recovered yet. His breath was still bad—don't you tell him I said so—and his tongue was still heavily coated, and he didn't look to me nearly as well as he had looked before. He had lost considerable flesh and had not gained it back again. A modified, sensible, intelligent fast is all right. We have a gentleman in the house here now who was taken sick, had a little fever two or three days ago, I think last Saturday, and he has not tasted a morsel of food since. He didn't want any. I think he had a scraped apple this morning. I remember when I was a young man I had an attack of typhoid fever, and I didn't care to eat. I didn't eat a morsel for a week except a little fruit. The doctor said I would die, but I didn't die, and I got along first rate. When one has a fever, he can't assimilate food. He can take a little fruit and fruit juices which contain food which is already digested and does not require any digestive activity and so can be absorbed and be of some service. A fast of a day, or even two or three days, now and then can do no harm under ordinary circumstances, unless a person is already very weak and feeble; but a fast that is carried so far as to tear down half your heart and to eat up half your muscles and to cut your liver in two, to cut a third off your spleen, such a fast as that is not doing anybody any good; it is doing them harm. We can get rid of these poisons in a great deal better way. All in the world we have to do is to wash them out. If your body is dirty outside, you wash it off with water. If you have got poisons inside, you want to get rid of, all in the world you have to do is to drink water; drink it for
washing, drink it for laundry purposes to wash out. Take a glassful when you get up in the morning; take another glassful just before breakfast; take another glassful an hour or two after breakfast; take another glassful occasionally until you have drunk eight or ten glasses a day. This can not do you any harm. This water goes in, and it has got to come out. When it comes out, it has got to bring some poisons out with it. It takes them in in solution, so you are absolutely certain to get rid of those poisons. You don't have to fast; there is no advantage in fasting in such a way as to greatly reduce the weight of the body.) There, I am dwelling perhaps too long upon this subject. I ought to give you a whole lecture on the subject of fasting, perhaps. (It is proper to fast scientifically and sensibly, but to fast as a fad, or as a panacea, or to fast for two or three weeks is simply ridiculous and even dangerous.)

Q. What do you think of osteopathy in conjunction with Sanitarium treatment?

A. Well, a rose is just as sweet under another name isn't it? Osteopathy is simply the old Ling system of manual Swedish movements with some humbuggery tacked on. That is what Osteopathy is. There isn't anything that is so absolutely new in Osteopathy except the false theories and ridiculous notions attached to it. I met a man some time ago who I thought was really an intelligent osteopath. He seemed like a very intelligent man. He had married a young lady that had been reared in our home, and she was such an intelligent girl I thought certainly she would not marry a man that was not a very sensible man; and when she introduced her husband to me as an Osteopath, I thought it must be we had found at last a sensible, intelligent Osteopath. I said, "There are some things about Osteopathy I don't see how any intelligent man can believe, and I am sure you do not believe them. For example, I understand Osteopaths teach and practice too that a person who has diphtheria may be cured by rubbing the back of the neck. I don't see how any intelligent man could ever believe
that."

"Why," he said, "I am sure of that. Why, my neighbor just like across the street had diphtheria, and I just went over there and I cured her by a couple of treatments just by rubbing the back of the neck." Now, of course, anybody who knows anything about diphtheria knows better than that. Diphtheria is a disease produced by germs, and rubbing the back of the neck won't scare the germs out of the throat. We can not possibly believe such a thing as that.

I suppose there are a good many people now who have tried Osteopathy. I wonder if I dare take a vote here to see how many people have tried it. I will say, how many people are there here who have had friends who have tried Osteopathy, or members of the family, you know? Of course, it might be yourself, but if you don't mind, hold up your hand. Thirty-four people. This audience is not more than one hundred, and here are one third of all the people present have tried Osteopathy. Why are you here? Why are you here? If Osteopathy had cured you, you would not have come. Now, Osteopathy helps a great many people, there is no doubt about that. I am not saying that Osteopathy is all humbuggery; it is not, but rubbing the back is good. Did you ever rub a cat's back and see how it enjoyed it? Didn't he come and purr and beg you to rub it again, do it some more? Now, every animal that lives likes to have its back rubbed. We are like cats in that regard, and like dogs. The dog likes to have his back rubbed. Aristotle knew that. He said, "Rub a cat's back, rub a dog's back, pick him up by the tail, then let him run, and see how he will enjoy himself." So we know that is a very old idea— that rubbing the back somehow is very grateful to anybody, and I have no doubt it is sometimes very helpful. But here is a man who has got ulcer of the stomach, or cancer of the pylorus, is rubbing the back going to cure that? I can not believe such a thing. The Osteopaths who are intelligent and honest are working in hydrotherapy continually. I find a great number of Osteopaths have purchased my little book on hydrotherapy, and I am sure a great many of them are continually adopting more and more rational methods.
of treatment. Some time ago a professor in an Osteopathic college at Los Angeles stopped here, and he told me he was certain that in ten or fifteen years in the future, if not sooner than that, the word "Osteopathy" would entirely disappear, because it is such a ridiculous misnomer; and that the Osteopaths having become educated would become members of the regular medical profession. There would not have been any room for Osteopathy if doctors in general had recognized the necessity of manual movements, rubbings and things of that sort. It is because the medical profession has been slow in recognizing the value of these movements that Osteopathy has come into being. Here at the Sanitarium we have the original thing, the manual Swedish movements; and anything that Osteopathy will do is done in our manual Swedish movement department. I say that without any hesitancy, because I have taken great pains to look into Osteopathy. I have in my library all the leading books on Osteopathy, I have looked into the matter very thoroughly. If I find any good hint from anybody, I adopt it and carry it on at the Sanitarium here, for this is a very cosmopolitan place. We do not claim to have originated everything here, but we bring together good things from every possible source. One of our doctors arrived last night from Europe--two of them last week, and another will be back in a month. They have been over to Europe visiting the experts there, at Paris, and Vienna, and Vienna London and Berlin to become acquainted with everything there that has been developed. Every now and then I send a cablegram to somebody over there in Germany, France or somewhere to send over something quick. Sometime ago you heard the tuberculin was just brought out--a good many years ago now--some of you remember it. I saw the reports of it, and I immediately telegraphed a good sized sum of money to the American consul in Berlin and asked him to send me a quantity of that remedy immediately, and it was not but a short time afterwards before I has a message from Washington sending me a package of the medicine that was sent over to Washington in the government despatch bag; so we are after everything that is
useful, everything that can be of any service in the treatment of the sick.

Q. Why not put tissane in tablets?
A. I wish we could, but it can't be done. It is a germ that grows with great difficulty and has to be cultivated with great care; it is hard to make it grow even in bottles, and it won't grow in tablets.

Q. What cereals are the best substitute for beef and bacon?
A. All the cereals I know of are perfect substitutes for beef and and bacon. Beef is made of corn, isn't it? But when you eat the beef you do not get all the corn back; that is the real trouble. So, bacon is made of corn, but when you eat the bacon you do not get all the corn. The pig has wasted a lot of that corn running around, and besides, the lime of the corn has been deposited in the bones of the pig, and when you eat the pig you do not eat the bone, so you do not get the lime all back. You have got to eat the whole hog or none if you are going to get that corn all back.

Q. Is it harmful to eat grape fruit or oranges at breakfast, also eat some cereal with cream or milk?
A. Not at all. There is no disagreement between acid fruits and milk, as many people suppose.

Q. Do not most animals lie down, at least rest, after eating food?
A. Yes, it is a good thing, especially for people who have sour stomachs or heavy stomachs to lie down for half an hour or so after eating.

Q. What is the cause of eczema?
A. The principal cause is autointoxication.

Q. Tell us about anemia?
A. Anemia is due to the destruction of the blood by poisons absorbed from the intestine. A person is anemic not because he hasn't power to make blood, but because the blood he has already made is dissolved and destroyed by poisons absorbed from the intestine. The late Dr. Herter of New York proved
that by actual experiment. He separated the poisons, he found the germs which make the poisons, and he brought these poisons in contact with blood and saw the blood dissolve right before his eyes; so we know this is the fact.

Q. What is the cause of sour stomach?
A. Too much acid formed in the stomach. It is not fermentation, but too much hydrochloric acid.

Q. What is the cure?
A. The cure is to take more pains to masticate the food, to eat drier food, and to take a little olive oil, perhaps a tablespoonful or two tablespoonfuls of olive oil at the beginning of a meal. That will cause the stomach to make less gastric juice.

Q. How long will Protose and Nuttolene keep in cans?
A. Indefinitely, because the cans are hermetically sealed.

Q. Is it possible to reduce flesh without deteriorating the blood and nerves?
A. One can reduce flesh to some degree if there is a surplus of adipose tissue without injuring the rest of the body; but if one only has the normal amount of adipose tissue, then when he starves himself he depletes all his tissues. The starvation process attacks and reduces every tissue of the body.

Q. What is a dilated colon?
A. A colon that has been overstretched by intestinal inactivity or by the formation of gas in the intestine.

Q. What is cerebral thrombosis?
A. A clot formed by the rupture of a blood vessel in the brain, cutting off some of the nerves.

Q. What is the purpose of taking Colax?
A. To furnish bulk for the intestine to act upon. It is a very good
thing for sedentary people, people whose intestines do not act with a proper degree of celerity. It also holds moisture. One part of colax will absorb ten parts of water; so it prevents the intestinal contents from becoming too dry.

Q. What is the cause of rheumatism?

A. Rheumatism is a dietetic disease. It is a malady that is cultivated at the dinner table. We eat rheumatism. If we did not eat it, we would not have it. Rheumatism is the result of auto-intoxication. It generally comes from the use of flesh foods, some portion of foods not being digested, or left to decay in the colon, and the poisons absorbed into the blood poison the entire body, and the first effect of this is to be found in the bones. If you find your finger joints getting enlarged, that is evidence the disease is beginning. It may attack the large joints next. Sometimes little spicules can be seen with the X ray even before any symptoms have been discovered at all. That is the beginning of a process that by and by becomes hardening of the arteries and arteriosclerosis. But I think I have detained you long enough tonight, so I will say Good night. Hope you will all sleep with your windows wide open.

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v-3-10-11.
There never was a time in the history of the world, unless it may have been in the golden days of Greece, when people were so much interested in the question of health as at the present time. In every community, almost in every home, we find somebody crying out, "What shall I do to be saved,"—from an awful dyspepsia, or an awful sciatica, or neuritis or some other thing; or from headaches, or backaches, or liver troubles, or some other sort of troubles.

The world seems to be getting sicker every day. We are going down hill very fast. I have on my office table a copy of the mortality report of the Census Bureau for 1908, and it is amazing what progress we have been making in chronic disease in the last ten years. Arteriosclerosis, or disease of the blood vessels, killed 6.1 persons in every 100,000 in the year 1900. That means 6,100 people in the United States were killed by disease of the blood vessels in the year 1900. Last year the same disease killed nearly three times as many—more than three times as many—almost twenty people in every 100,000, or 20,000 people in the United States instead of 6,000 people. Now, that is making some progress isn't it? In the last ten years the disease has increased to 300 times its prevalence in the year 1900. So it is time for us to begin to give some attention to this question of disease of the blood vessels. Why should the blood vessels become so readily diseased? Because they are the most of all structures of the body exposed to the causes of disease. The poisons in the blood which are the cause of tissue changes, which produce chronic diseases,—the poisons which cause these diseases and degenerations, circulate in the blood.
so the blood vessels themselves are most of all exposed.

Now, we have here some pictures upon the screen which are anything but handsome. This skeleton, for example, is the most ungainly and inartistic in outline, and yet when we come to study it from the physiologic standpoint, it is one of the most marvelous structures in the whole body. Did you know, my friends, that every one of these bones is a blood factory? In these long bones, filled with what is known as the red marrow at the heads of the bones, and in the sternum, the breastbone, and in those flat ribs, and all the flat bones about the pelvis, and these little short bones in the fingers, and in the skull, and every part of the body, in all the bones of the body, the process of blood-making is going on. The bones are not simply the mechanical supports of the body, not simply the framework; they have something more than mechanical function to perform; they are the blood-making organs of the body. For centuries search was made to find the origin of the blood. No one ever thought of looking into the bones. It is only within the last few years that the discovery has been made that the blood is produced in the bones, and not in the hollow portion of the bones which contains the gray marrow, but in the portion of the bones which contains the red marrow,—in that part of the bones the process of blood-making is going on. We have about 200 bones making blood for us if they can—sometimes they can not. We don't give them a chance. The bones require blood to make blood. They must have a circulation and movement of the vital fluid therefore, in order that they may be active in the process of making blood.

The bones are covered by the muscles. We have 500 muscles. Each of these muscles is a pump. By its movements, it pumps blood into the bones and out of the bones. That is one of the functions of the muscles. The muscles are not simply mechanical things to move us about, using the bones as levers to pry us along from one place to another; they are not simply for the purpose of executing movements, but the bones are blood pumps—the muscles
rather are blood pumps, and one of their very important functions is to pump blood into the bones and out again, so that the blood may be replenished.

The blood is a perishable fluid. It is undergoing continual destruction. Eight millions blood cells die every second of our lives. Just think of it, my friends. The largest city in the world does not contain more than eight million people. Think of the people of that great city dying off every second. Now a number of red blood cells in the human body that more than equals the great population of London dies off every second of our lives, and they must be reproduced. They are reproduced in the bones. The blood is pumped into the bones depleted, deprived of a certain proportion of these cellular elements, that is the red cells, which carry the oxygen to the tissues and carry away the poisonous gases, and so keep the body alive and active. These red cells are to the body exactly what the draft is to the stove; they carry in the air, the oxygen, and keep the body alive. The muscles are pumping this blood into the bones; but suppose the muscles are not active. Suppose, for instance, one lies in bed, stays in bed from day to day; his blood will necessarily become depreciated because the movement of blood through the bones will not be sufficient to keep the blood making organs active; so the blood becomes depreciated, and day by day goes down, down, down. Why, I have seen people who have stayed in bed until their blood got down to 50% of what it ought to be. Food is necessary for blood. The blood depletes, if we do not eat. So when one fasts, for example, the blood depletes very rapidly, because food is necessary to furnish the raw material out of which the blood shall be made. The iron that is in the blood comes from the food, and the fibrin, the protein of which the cells themselves are made come with the food; and if we are not taking in new material all the while, the body going on with its work all the while, the blood will be depreciated. So we see the bones and muscles are of immediate interest to us in this question
of blood supply.

I met a lady the other day and found her blood was only fifty per cent. She did not seem to appreciate that that amounted to anything particularly. She said, "Doctor, I think that I will have to go home next week." "What, with your blood at 50%?" "Why, yes, yes, my blood has been fifty for a long time, I have no doubt." Now, she happened to be a business woman. I said to her, "suppose the business with which you have been connected—suppose you had an examination made by an auditor and the auditor reported that your capital had fallen 50%, that the capital of the business had been lost, depreciated so that actually some 50% of it was gone, and the stock was worth only 50% of what it once was. What would you do in that position? You would say it was in a bad way. Now, the man whose blood is only fifty per cent of par, has depreciated; his fighting capacity is lessened just that much. The blood, we may say, is a militant army which fights for our lives. All the while we are being assailed; grip germs are getting into our lungs. Why don't we get the grip? Because our blood cells capture those grip germs, eat them up and destroy them. We are exposed constantly to pneumonia germs. The most of us have pneumonia germs right in our throats now. Why don't we get pneumonia? When we are going to perform an operation upon a patient upstairs, we have the patient's mouth disinfected thoroughly, have his teeth washed and scouring, and his mouth cleansed and disinfected in every way. A day or two before the operation, we give him cinnamon water to disinfect his mouth, because when he is taking the anesthetic, he will swallow involuntarily, and perhaps swallow some of those pneumonia germs, and if taking a deep breath some of those germs will get down into the lungs, and he will have pneumonia after the operation, perhaps. Now we know what it is; we didn't years ago; so we keep the mouth and the teeth clean, and now we do not have pneumonia. We used once in a while to have pneumonia after an operation.
I remember one case in which a patient died after a very simple operation because she got pneumonia, the only case we ever lost, in fact, from that kind of operation; this patient got pneumonia from drawing,—taking a sudden breath and drawing some saliva from her own throat down into the lungs. The pneumonia germs were there; she was infected, and had not the resistance to fight them off. So we are all the while exposed to these death dealing germs; and why don’t they kill us? Simply because the blood fights them off. When you get some pneumonia germs into the lungs and they begin to grow there, the blood begins to multiply. The white cells which are commonly present in proportion of 7000 in a little drop as big as the head of a pin,—in a little while there will be 100,000 cells in that drop of blood, and the man’s life will be saved.

Now, when a man has pneumonia or any sort of infection, we examine his blood with the greatest care to see whether he is putting up a good fight or not. When a man has pneumonia, and we find he has only ten or fifteen thousand white blood cells, we get frightened. Thxkklixx gets right after that man right away and begin to do something to stir up the blood-making organs,—give him a cold wet sheet pack, and that improves the circulation, don’t you see, through his bones and throughout the whole body. We put ice bags over his heart, and that keeps his heart pumping away to circulate the blood through the bones and through the body so as to increase his blood-making power. Now this, you see, is vitally important.

Now these remarks are simply introductory to show you the importance of exercise, to show you the importance of keeping the muscles active, pumping the blood through the bones so that the bones will be active in replenishing the blood.

Now, in order that the blood should be effective as in its body defending and fighting functions, it is necessary that it should be clean. The
blood is all the time exposed to contamination, and one of the most common sources of contamination is absorption from the stomach or intestine. Now, in order to fight off these poisonous germs that are getting into our bodies through the mouth in various ways, through the water we drink and the food we eat, the stomach when the food is first swallowed is supplied with a disinfecting fluid, so that it acts as a disinfecting chamber. What an interesting thing that is, isn't it? Nature knows how prone we are to swallow things that are dirty, how instinctively almost we put all sorts of trash into our mouths; and there are certain times that we will expose ourselves to infection by gulping down so much dirt in various ways, and so Nature wisely provided in the stomach where the things we eat and drink are received,—Nature has wisely provided us with a disinfecting fluid; so the stomach is really, chiefly one might almost say, a disinfecting chamber. And here is a little gland in which this hydrochloric acid—some of you have gas got too much of it because you give your stomach too much disinfecting to do. You have got too much hydrochloric acid in your stomach because you have given your stomach too many bad jobs of cleaning up unclean food; so it your stomach has got the habit of making too much disinfecting juice. The hydrochloric acid is formed in these little pockets.

Now, there is another thing I should tell you about the stomach. The stomach not only digests food but is an excretory organ. These glands that pour out the gastric juice make the pepsin and the hydrochloric acid, and they also excrete; that is the glands which are found in the stomach excrete poisons from the blood. When the blood comes around to the stomach, the stomach finds there are poisons in it,—morphia, perhaps, or nicotine it may be, or alcohol, or some other poison that has gotten into the blood—the stomach takes these poisons out, pours them out into its cavity, to make another effort to disinfect, if possible, and to destroy the virulence of the poisons and so save the tissues.
There is a wonderful effort made by the body everywhere to defend the tissues, to maintain the blood and defend the tissues against injury. Even these salivary glands which secrete saliva also have this function of excreting poisons. That is the reason why when a person takes mercury for example, the salivary glands pour out the mercury, excrete the mercury in the mouth, and we have ulceration of the gums, and we have other instances in which these glands become excretory organs as well as secretory organs.

Then here is the liver which is another great poison-destroying gland. When the food substances have been absorbed from the stomach and intestines and gotten around to the liver, and the liver gathers poisons out, pours them out into the bile and they pass on to be excreted providing the bowels are moving with free regularity, which means at least after every meal. The bowels ought to move after every meal. People are quite content if the bowels move once a week or so. There was a man down in New York whose bowels moved regularly once in three months. He had a general housecleaning once in three months which occupied three weeks of his time. Dr. Austin Flint, the great New York physician, knew this patient, was acquainted with him, and he told me about him. I would not dare mention the case if I did not have such good authority to back it up. This patient in the course of a few weeks would lose forty or fifty pounds accumulation of excretory substance which had been stored up in his body. Now, these poisons which the stomach and intestines are all the time excreting are retained and reabsorbed, so the body becomes supersaturated, so to speak, with poison; the blood becomes contaminated with the poisons to an extraordinary degree.

Now, here is the spleen which also has something to do with the poison-destroying function; and here is a little organ, the suprarenal capsule, located at the top of the kidney, which has a very important function to perform in the destroying of poisons. There is a whole series of these poison-
destroying glands. Here is a better view of the pancreas here, and the spleen 
and the liver and the gall-bladder. This shows only a portion of the liver. 
Here is a diagram which I had prepared to show you how important this function 
of the liver is in the destroying of poisons. This represents the liver, if 
you please, and this is a large vein that carries the blood back to the heart. 
Here is the portal vein. This vein here gathers up the materials from the 
stomach and from the intestines, carries them to the liver, and in the liver they 
are filtered; and after they have been filtered and purified, then the liquid 
material passes on into the circulation. But an operation has been performed 
here so that this case is different from the ordinary case. I saw this operation 
done in Pawlow's laboratory four years ago. It is known as the forma-
tion of an Eck's fistula. The portal vein is joined to the ascending vena 
cava so that the blood that is gathered up from the intestines and the stomach 
the spleen and other abdominal organs, and which contains the food substances 
which have been digested, and poisonous substances which may have been absorbed,-- 
this portal blood is not carried directly to the liver, but instead the portal 
vein is ligated so that it can not carry the blood into the liver, and a fistulous 
opening is formed by this portion being joined to the ascending vena cava--an open-
ing is formed so that the portal blood goes right into the inferior vena cava 
and up to the heart without being filtered through the liver. Now, what happens. 
A dog that has had that operation performed, and I saw a dog have this operation 
performed. The dog afterwards looked to be as well as ever, did not seem to be 
suffering particularly. The operation is done under anesthetic, and when 
the operation was done, the dog lay down and seemed to be entirely comfortable. 
The dog gets along all right provided its diet is right, provided he has the 
right diet. Now, that dog can live on bread and milk, and is just as healthy, 
just as well as any other dog you ever saw. He does not know anything has hap-
pened to him. He is perfectly happy so long as he lives on bread and milk. But when that dog is given meat to eat, when the dog is given flesh of any sort to eat, in three days he is a dead dog every time. Meat kills him every time. Now, why? Because the liver is not there to filter out the poisons which the meat produces. I do not know how it would be possible to perform any experiment which would demonstrate more clearly than this does, in the first place, the wonderful function of the liver, the marvelous importance of the liver as a poison destroying gland and as a defense of the body against poisons that are taken into the stomach; and second as a demonstration of the fact that meat is a poison food. I heard Mr. Fletcher say at Chautauqua a year ago last summer, before a large audience of several thousand people, when some one asked him, "What do you think of eating meat", and he shouted out "Meat is poison." Well, now, here is the proof of it. This dog lives perfectly well on bread and milk. But when the dog is given meat, in three days he is dead. Never has a dog been known to survive over three days when fed on meat after this operation; he simply can not live at all. Why? Why, because the meat contains poisons already, produced by the putrefaction of the meat. All meat is in a state of putrefaction when you eat it. Unless you kill the ox yourself, cut his throat, take off the skin and cut off a piece of his flesh while still warm and quivering, and eat it in that way, you can not get it in a perfectly fresh state. That is the way the Kalmuk Tartar eats it. He drives the cow ahead of him, milks the cow, and when he stops for the night, he has a long, curved knife, and has a little slit in the flank of the cow which he makes with the knife, then he puts the knife in very dexterously and brings out a long ribbon of meat, and they all enjoy the meat, a piece of the live cow. Then they seal the wound up with some clay, drive the cow along to the next station, and then cut off another piece. They are very skilful in being able to amputate these strings of live cow in such a
way as not to hinder the cow's traveling ability. But she is able to march on.
And so they go on day after day. By and by the cow loses so much of her flesh
she can not go any farther, and then they kill the cow and have a great feast.
Now, if you eat meat that way it is not so poisonous, but it is always poisonous
in the way in which you get it ordinarily. It is always in a state of active
decomposition.

Now, there is a wonderful difference between a dead cow and a live
cow. You think when eating the flesh of an animal, "Why, the flesh of the cow
is like my flesh, so it must be it will be good for me; it can not be so bad. It
is nearer like me than an apple or a potato is,—is the flesh of an ox, so it will
be more wholesome, perhaps, more strengthening perhaps." But one does not stop
to think of the difference between a dead cow or a dead sheep and a live cow or
a live sheep. There is a marvelous difference. Now, did you ever stop to think
of it in this way?—I presume you never did, but here is a baby holding its
breath, and it gets black in the face. Now, did you know that when that baby
is black in its face, the brain is black and the muscles are black, and the
whole interior of that baby's body is black, just as black as its face is? It
is because its blood has become poisoned by the retention of carbonic acid gas;
so if the baby holds its breath long enough, it will perhaps become asphyxiated
and die. You know what would happen to a person whose breath is cut off. If
a person lies under water too long, he will suffocate. When a person dies, he
always dies of poisoning; that is the reason he dies. Nobody dies in any other
way except by poisoning, but it is the generation of poisons within one's own
body. When one's heart stops beating, the muscles still remain alive. I think
I was telling you the other evening about a visit I made to the turtle market
at Key West, how pieces of turtle were still alive hours after they have been
removed from the body. The same is true of our own bodies. The flesh remains
alive after death occurs. The muscles will still contract. In Paris they used to cut people's heads off. You know that was the method of capital punishment. The criminal's head was cut off, and doctors often had these bodies turned over to them, and they made experiments, and when they applied electricity to the faces, the face would make all sorts of grimaces; the eyes would open, the mouth would open, and all sorts of movements would occur in the muscles of the face; and applied to other parts of the body, all sorts of motions would occur. And after death from certain diseases, for instance, after death from cholera, the muscles are in such a peculiar state and remain for hours in such a state that any touch of the body will cause the muscles to contract. I know a doctor who was pretty nearly frightened to death when he came near the body of a person that had died from cholera; the patient had been under this doctor's own care, and had to be laid out, and he came along in the dark, was passing through looking for something, and he passed along by this body, and he happened to touch it, and instantly the body struck him in the face with its fist, and he began to look around, undertook to readjust the sheet and happened to touch the body again, and it struck him again with its hand. He was very much frightened. He began to look around, and investigate, and he found that whenever he touched any portion of that body, immediately there was a great movement. This continued for several hours. I only mention this to you so you can see that the whole body is not dead when the breath of life has departed, when the brain ceases to act, and the person is dead as an individual, the somatic life is gone; the whole body is not dead; the tissues remain alive; and while these tissues remain alive they continue to make poisons; so long as a cell remains alive, they continue to make poisons, and the tissues go on making poisons after the animal's throat has been cut, or after it has been knocked in the head, or shot, or its body disemboweled, its muscles continue active and produce poisons until the poison
accumulates to such an extent that the tissues are poisoned to death. When the tissues are finally killed, finally die as the result of the accumulation of their poisons about them, because no blood is circulated, there is no circulation of the blood to carry the poisons away so they are left and accumulate, consequently the flesh of a dead animal is always saturated with poisons. It is always saturated with deadly poisons; but they are the poisons which killed the animal; they are the poisons which killed the living cells, and when you eat the flesh of a dead animal you are always swallowing them with that flesh the poisons which killed the animal, the poisons that killed the tissues of that animal. I wonder if I have made this plain. Dr. Horseford, an eminent English surgeon, made some interesting experiments upon monkeys some years ago. He was studying the human brain. We didn't use to know very much of the brain, but now we know considerable. We know the geography of the brain, what part of the brain has charge of the different parts of the body. For instance, here is a little part of the brain up here that has charge of the hand; and a little higher up and a little farther back, a part that has charge of the foot; and these are associated very closely together, and there is another place between them, a spot that is the swimming center that has charge of swimming, that coordinates the arms and legs together when we swim; and that is the reason these centers are located near by, so that they can be used jointly; and there are many others,—one that has charge of these large muscles of the back; another that has charge of the muscles in front of the back; another part that has charge of the muscles of the face. Well, Dr. Horseford removed a portion of the skull of a monkey. To make this real to you I will tell you a story.

A clergyman down in Illinois some years ago brought his son here, suffering from epilepsy, a peculiar kind of epilepsy. The spasm began in the right leg, and the right leg began to shake, and the right arm began to shake;
then the other leg and the other arm, and it would extend to every part of the body, and he would have a terrible convulsion. Now, by a study of this case, I was able to put my finger upon a certain spot here and mark out on his scalp a little spot, and to remove a portion of his skull, and found a tumor as big as the end of my thumb sticking up in that place. It was the tumor pressing on the brain that was the cause of that attack. We removed the tumor, and the boy was well. Dr. Horsey was making a study of the brains of monkeys, and was working up the science which enabled us to do this. Some people call that cruelty to animals. I don't believe it. It was done under anesthetic, and it has been of infinite value to human life in enabling us to locate tumors and various things within the brain which have been the means of relieving suffering and restoring usefulness, and often actually of saving life. Now, Dr. Horseley was making experiments with monkeys, trying to find out what different parts of the brain did; so he applied an electrical current to the brain, and this electrical current would cause different parts to contract. He would apply an electric current to one place, and a leg would pull up; he would then apply it to another place, and an arm would move; to another place and the face would make a grimace. So he was studying different parts of the brain. Now, while he was making this study, he made various experiments in applying different things to the brain to see what substances would increase the activity of the brain, and what would diminish it; and on one occasion he applied a little of Liebig's extract of beef, what you would call bouillon, diluted,--he applied this to the brain, and instantly the brain was paralyzed. Now, Dr. Horseley eats beefsteak. I do not suppose he ever thought that this experiment had anything at all to do with beefsteak, but when I saw the result of that experiment--I have the pleasure of knowing Dr. Horseley; I have been a guest at his house by his invitation, have often seen him operate in his hospital in London; I see him when I go to London,
but I do not know that Dr. Horseley ever thought anything about the bearing of that thing upon diet. But to me it meant a great deal. If this bouillon poisons the tissues of the brain when it is applied by Dr. Horseley to monkeys, why should it have any different effect when applied to man himself, when applied to the inside of the brain of a man who drinks a cup of bouillon which is simply a solution of poisons, and of profound poisons?

Well, now, these poisons are in the meat. They are there, because the flesh of the animal was poisoned to death before it died. It continued contracting and working and actively alive until its own poisons killed it; and these tissue poisons are always present in meat, and they are there in such quantities that when a dog has had the portal vein tied so that the blood goes straight into the circulation before being passed through the liver and filtered out so that it can not be filtered, that dog dies of poisoning in three days. Now, it isn't any wonder, then, that a man who eats beefsteak and wears his liver out with nicotine, tobacco, tea, coffee and other things and lack of exercise, so he does not keep his muscle pumps working to pump the blood down through the bones and get it renewed, and he does not circulate his blood actively, also his liver and his other poison-destroying glands,—it isn't any wonder that a man who eats a great deal of beefsteak and other kinds of meat gets old and dies prematurely. It isn't any wonder he gets arteriosclerosis when he is forty or fifty, and finds his blood pressure away up to 180 or 200 or more.

Here is another antitoxic gland, the thyroid gland, that helps to destroy these poisons after they get into the blood. We know a great deal about this thyroid gland that we did not used to know. We did not know formerly what made it enlarge. Now we know what makes it enlarge. I had to operate today and had to remove one of these thyroid glands. It is enlarged by poisons. I had to cut a lady's throat, so to speak. It looked as though we were going to cut her head
off pretty nearly; and I removed this part of the gland and left this other portion of the gland. Now this lady's thyroid had become overactive so that it had been producing too much thyroidin which, received into the body, excited the heart, produced physical disturbance and great mischief, and made her a complete invalid. I am glad to say she is getting along finely now even, and in a few days she will be rapidly coming up, and I suppose she will soon be perfectly well. We had to cut off that part of it because the gland had become overexcited by an excessive development of toxicin in the blood—a schoolteacher who lived a sedentary life and paid no attention to her health, suffering from chronic intestinal autointoxication.

Now, you see flesh eating overworked this gland. How do we know? Well, a German investigator in trying to find out what this thyroid gland was for, what it is, removed the thyroid gland entirely, took it all away from several dogs, and they all died. So he said the thyroid can not be removed without killing the animal. He said it was absolutely essential to the life of the animal, and the animal would be killed if it were removed. But another investigator removed the thyroid gland from some rabbits, and these rabbits all lived. So he said the other man made a mistake. Another man made another investigation. He operated upon some dogs as the other man had done before, and removed their glands, but he fed these dogs bread and milk instead of beefsteak, and the result was the dogs lived, got along all right, hadn't any trouble at all. Now, the dogs that had their glands removed and lived upon meat, were fed upon meat very soon began to show evidence of disease, and in a little while began to have most terrible convulsions, and finally they died in terrible convulsions. So we get a whole lot of suggestions from this. It was learned long ago that people suffering from epilepsy are very much relieved, sometimes entirely cured, by a fleshless diet. Some years ago I was saying something of this kind at a medical meeting,
and a physician who was present, who had charge of a large ward in an insane asylum—after the close of the session he told me he had sixty or seventy epileptics under his charge, and he withdrew meat from their diet entirely so that they had no meat to eat. He told me the next time I saw him that, keeping a careful count of the number of attacks which occurred, the convulsive seizures in three months, he found just half as many on the non-meat diet as the ordinary diet in which meat is a part. I guess every lady that has pet cats knows that if she gives her cats more than a very small amount of meat, the cat will by and by have fits. Those are epileptic fits, and the cats are quite subject to them; in fact, all carnivorous animals are subject to these fits, while animals that do not eat meat are not subject to them, or at least, only to a very small extent. So it is quite possible that the reason why epilepsy occurs is because this gland does not do its duty, and it has become degenerate.

Now, further investigations of this subject have brought a great deal of light upon the question of diet. Over in Switzerland there are places where the thyroid gland is almost universally diseased. It has been found the disease of the thyroid gland occurs only in people who get the water from certain wells. Now these wells are called goiter wells. Enormous goiters sometimes develop, goiters that hang clear down to the waist and dreadful disfigurement is produced. The study of the sources of the water of these wells revealed the interesting fact that the water from goiter wells came from old seabottoms where thousands of years ago there had been sea, and the sea had dried up and the water came down from the mountains soaked through the ground, came across down to these wells through those old sea bottoms—sort of fossil beef tea, don't you see?—maid or fish broth, clam broth, you might call it perhaps, or clam bouillon, perhaps, that some people are so very fond of—ancient clam bouillon. So there is a very strong ground for the suspicion that goiter is a meat eater's disorder. I have
never seen it in anybody that was not accustomed to the use of meat. It occurs almost exclusively in persons who have auto-intoxication. I mentioned this as one other thing that results from the almost universal auto-intoxication, and that means pretty nearly wherever flesh is taken as a large element of food. Now, the North American Indian when he was discovered by Europeans, lived outdoors, ate very little flesh, raised corn and great orchards of apples were found under cultivation by the Indians of the East, and corn was cultivated by them everywhere, and one of the generals of that day, over 300 years ago, bragged about having destroyed a thousand acres of corn and many extensive orchards owned by the Indians—destroyed the corn so their sustenance would be shut off. At that time they were healthy people, entirely free from cancer, and they are almost entirely free from cancer yet, although they are degenerating rapidly because of the flesh eating forced upon them by the American government. These Indians, aboriginees, lived outdoors, and the outdoor life compensated to a considerable degree for the various infractions of hygiene to which they were addicted, but we eat meat as the savage does perhaps, and then live indoors, and our sedentary life intensifies the auto-intoxication which results from the flesh eating because the blood is not properly circulated, the liver is not properly active, the bones are not properly active in making fresh, new blood; so the outdoor life has come to be a thing absolutely essential for our dying race, it seems to me. The living indoors, housing ourselves up indoors under conditions that would kill a North American Indian or a South American Monkey in six months is producing almost universal deterioration.

Down in old Concord, Mass., sixty or seventy years ago there lived a number of men whose names are written upon our literature so large that they never will be forgotten, and among these names was that of Thoreau. The name of Thoreau will always stand for a vigorous style of literature which was characteristic of him. He recognized this thing, that we are getting far away from Nature, that we are being sophisticated and becoming unnatural; so in order to
find out what is really natural, he went out into the woods into a little place called Walden Pond, and built that house a picture of which you see here. It was copied from one of the early editions of his Walden. He built that little house that cost him $27 he said. It was eight by ten and he had two windows and a front door, an attic with a trap door, a cupboard, a table, and two chairs, and a little leanto on behind. He said he had everything he needed. He cultivated two or three acres of land and raised what he needed to eat, and he found it cost him just twenty-seven cents a week for food, for a period of two months. He lived here two years. The house was afterwards moved away after his death, and there is a heap of stones where this house stood. Visitors to the place carry a stone and deposit it on the pile; so the pile year by year is growing larger, and the number of stones is something of an indication of the number of people who are interested in this man's interesting experience. You see that we are altogether slaves to fashion and slaves to custom. We could live very comfortably on one tenth of what we actually expend. It is the luxuries which cost us so much and not the real necessaries. Just think, my friends,—what is the cost of a pound of corn? A pound of corn and a couple of pounds of fruit of some kind would furnish one with all the sustenance he needed. Say a half pound of prunes and a pound of corn with a quarter of a pound of beans would give one all the food he would actually require. Now, what does corn cost a pound? Say a cent a pound. The actual cost would be somewhere about $7 a year wouldn't it? Just about $7.30 a year. Now, there is a man down in Harvard University that is one of their intellectual giants there, or was last year, a Mr. Long, who went through five years of college work on an expense of one dollar a week for food. That is about four times what it cost Thoreau, but food now is a little higher than it was in those days, and he did not have a chance to raise his own corn and potatoes as Thoreau had. Well, there was quite a company of people in those
days who were thinking of these things pretty earnestly. This was some sixty odd years ago, and so many of them were brought together by George Ripley, an eminent Unitarian clergyman—so many of them were interested in this matter—about 140 in all, that they established a colony at a place known as Brook Farm. This is one of the cottages which is still standing. The rest of the buildings have been torn down; and here is one of the woodland walks where Hawthorne, who was one of the number there, who went there with the rest,—and Dana was there, and Emerson was there, and Wendell Phillips was there—the greatest orator, perhaps, that this country has ever produced; and Bronson Alcott was there, and William P. Alcott was there part of the time—in all about 140 noted people, and Margaret Fuller among the rest. Louise M. Alcott who wrote the beautiful little volume, "Little Women", the author of that and many other beautiful volumes was there as a child with her father, Bronson Alcott. Bronson Alcott visited us here at Battle Creek about twenty years ago, and he told me at that time he had not eaten meat in fifty years; and Wendell Phillips told me the same. He visited us here also about the same time for a day or two, and he had the same experience.

Now, we are having some wonderful object lessons in these later years. Persons who have gone away down low in vital resistance with auto-intoxication until their ability to withstand disease is reduced so low they can no longer resist tubercular germs, and they get consumption; their lungs become affected; disease germs obtain a foothold in their lungs and they grow there, and such people find themselves going down rapidly and must do something, and thousands of such men and women have discovered that by simply going outdoors and living outdoors, their lives are saved. Now, if they had lived outdoors beforehand, they would not have gone down so far, you see. If their diet had been right, they would not have gone down so far.
This shows you a lot of patients. You would not imagine they were sick people at all. I saw them at Davos, just such poor looking people as you see here,—at Davos, Switzerland, eight or ten years ago when I happened to be there, and this is the way to get well. They have a hill there three miles long, and they slide down that hill and climb back up, and they live right outdoors, do nothing at all but live outdoors, eat and sleep and get well. Here you see a lot of them at the Basle Sanatorium. This practice of turning consumptives outdoors is becoming worldwide. A man who had consumption in New York, a typesetter, a printer had consumption, and his doctor told him to move outdoors, and he put his bed on the top of the flat roof and slept out there all winter. He had a little shelter over him, but he slept outdoors in all kinds of weather all winter, and he got well, and kept right on with his business, this unhealthy occupation as a typesetter.

There are nearly 400 of these institutions in this country at the present time besides many hundreds in Europe where people are treated for tuberculosis of the lungs, and successfully treated. Sixty per cent of the patients get well, with nothing in the world but diet and exercise, and living outdoors. Here are some outdoor shacks in Rhode Island. I should state that Rhode Island has been among the very first in establishing state institutions where the poor could be treated. Here is an old, abandoned horse car that has been pressed into service and is being used for the same purpose. Here is a sanatorium in Massagusetta, the Loomis Sanatorium. Here is one of the shacks where they sleep; here is where they spend the day outdoors, and they get well. Now, the thing that is good for people who have tuberculosis is good for other diseases. If a man suffering from tuberculosis with his lungs and arteries destroyed by this dreadful disease can get well by simply getting outdoors, can get well with the outdoor life, it simply shows you how the curative powers of the body will assert themselves and what miracles they will work when they have
half a chance.

Dr. Trudeau was one of the very first to establish a sanatorium; he established the very first sanatorium on the outdoor plan in this country, now about twenty years ago, in the Adirondaks. This is a little picture of one of their buildings there. This shows another. Patients go outdoors, sit in their chairs and breathe in the oxygen; they eat and sleep and breathe the outdoor air. They must sleep with the windows open at night. In fact, the most of them sleep on porches or outdoors. It is possible to bring this in into our own homes. If you take a walk west on Manchester street about half a mile you will come to a place that looks like this. If you walk up the driveway and around to the back side you will see something that looks like that. This portion of the house was provided especially for outdoor sleeping. Here is the institution, one of these sleeping rooms, arranged, you see, so the air can get in on all sides. These are not windows, but simply wire netting at the sides, and this is a larger view showing a part of the room. There are several beds in the room. Those who come out here to sleep and spend the night in those beds are provided for. You see this lady has felt boots on. And she is wearing very heavy garments. She is clad as though she is going out for a sleighride on a cold winter's day; so when she goes to bed outdoors, she does not suffer any more discomfort or cold than if she were riding outdoors and bundled up in heavy wraps, getting a sleighride.

This is a view of our south porch. These people are all out there getting the benefit of the outdoor life. The outdoor life is the thing that is absolutely essential if we are going to undertake to combat this race degeneracy that is sweeping us down. We must get outdoors, and I advise every one of you to give this matter serious consideration. Don't wait to get home, but begin now. Don't spend your time indoors, but get outdoors every minute
you possibly can. I see a good many people sitting down in chairs around the lobby. I wish I had their time—I would be outdoors. I would stay outdoors every minute of my time if I could possibly get the opportunity. It is worth while to do everything we can to make it possible for us to live under the conditions of life as they exist.

Here is our outdoor gymnasium, and in summer time you will see such things as this, sometimes see 150 people at a time down there in the outdoor gymnasium making the most of their opportunities. We have a very pretty river here, and we make trips down the river by boat, and walk along the bank.

Now, look at those apples. Aren't they lovely? Why shouldn't every one of you be as handsome as those apples? Why shouldn't we be as good specimens of Nature's handiwork as these beautiful apples? It is only because we do not ourselves comply with the laws of health, because we ignore those laws, violate them, and live artificial instead of natural lives. I beseech of you, my friends, take hold of this matter in earnest, make up your minds to cultivate health and live right, get in harmony with the universe; obey God's laws. It pays to be good. I thank you for your attention.

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