THE ESSENTIALS OF HEALTH

A Health Talk at the Sanitarium Chapel, Battle Creek, Mich., Tuesday, January 22, 1907, at 1:00 P. M., by J. H. Kellogg, M. D.

I am glad to see we have such a good representation of our family here today. I wish everybody was here. I wish it were possible for th whole family to get together at some hour during the day and join in this worship, in the singing, and the Bible reading,--what a splendid thing it would.be. If some of you willwork out a scheme by which that thing can be done, I am sure the management will feel very grateful to you; you will be greatly rewarded. In a factory the work goes by machinery; each man has his place, begins at a certain time, stops at a certain time, and it is easily managed; but this thing is run day and night, different departments overlap, and it is impossible to do it.

I have about seventeen minutes in which I must tell you something about the essentials of health. I have often considered the difference between a healthy man, and a man that is not particularly healthy,--what a marvelous difference there is. It is best, perhaps, for us to look at a horse. Keep a couple of horses in mind,--a poor, old, wornout plug of a horse, and a splendid specimen, just the finest kind of a horse you ever saw,--a good, big, splendid horse. The first time I went to Belgium, I saw some of those splendid old Dutch horses, magnificent creatures, moving down the street so majestically I felt like taking off my hat to them. I never see such a horse going along with a mountain of weight behind him, moving along as easily, that I do not stop and look at him. I have seen a few such horses here in this country, but if you want to see fine horses, splendid horses, you must go to Belgium and some parts of Germany. The people think the world of those animals. I have often seen a poor man, a cadaverous looking man who looked as though he was half starved, driving one of those splendid horses. They always have them decorated, have some ribbons tied to their harness somewher, and generally have a tassel suspended over

over each ear, or a big frame erected on the harness, and that is all decorated with tassels and ribbons. They feel proud of those horses, but I dare say they do not feel at all proud of themselves. Now why should we feel so anxious with our reference to our horses, that we should have splendid horses, that we should have splendid oxen, have animals that are healthy, well, and able to do a splendid amount of work, and should keep them up to the very highest efficiency by the greatest care in diet and in grooming, and in exercise, while thinking nothing of ourselves? Does a man care more for his horse than he does for himself? A man in New York some time ago said a friend of his had some dogs and some boys, four dogs and two boys. This man, he says,hired a tutor to teach the boys and he paid very little attention to his boys; he himself paid very little attention to his boys; but he looked after the dogs himself, and gave them a great amount of care. He said to him, "How is it that you pay so much personal attention to your dogs and yet you turn your boys over to a tutor?" "Oh," he said, "don't you know, my dogs have a pedigree." The boys did not have any pedigree, you know, and were not worth taking care of, you see. If a man has got a horse of a fine strain, if he is raising horses, how much pains he takes to keep those horses up to the very highest degree of excellence. He would not have any bad blood get mixed in withhis horses for anything. He studies feeding, studies exercise, studies his barns very carefully. I was down in Kentucky some years ago, and visited one of the famous farms there. It was General Jackson's farm, I believe, where some of the fine horses that made the first records in this country were raised. I believe the horse was there on that farm that made the first 2:20 record; and the farm is very famous throughout the United States as having produced some of the fastest trotting horses in the world. And I went up there with the American Public Health Association, who had a meeting near there, and we went over by special invitation, to visit this farm. And the owner took us out to see how those horses were cared for, and how the barns were a

arranged. The barn was simply an open shed built around a hollow square. There were no doors on the inside of the barn. The inside of it was wide open, with no partitions at all. Those horses lived outdoors summer and winter. They were never shut up in the world, never once shut up. There was no inside wall at all, but simply some stanchions put up. There was no inside wall. Notwithstanding that, in order that those horses might be sure to have fresh air, there was a great big ventilating shaft, two feet in diameter at each horse's manger right up through the roof so that horse should be sure to get an abundance of fresh air, and that is the way those horses were made hardy. They lived right outdoors all the time. But that man himself did not look hardy a bit. He had a red nose,had a blotched face, and he lived in an air tight house, and his diet was anything he chose to eat. But he was extremely particular about what he fed his horses. He did not take into account what was going into his stomach. That man was feeding his horses the things that were the very best food, the very best grass and hay, the best corn, the best oats, and he took pains to give it to them in the very best possible way. But how about himself? If he had had some dogs he would have given them a different diet from what he gave his horses; and if he had some oxen, he would have fed them a little different from the way he fed his horses. If he had had chickens,he would have given them a different diet from what he would have given his horses, and if he kept fish, he would have fed the fish on something else: but what does that man eat? What does the average man eat? He eats everything there is. I was reading in a medical journal a day or two ago that the proper thing is for man to eat all kinds of food. Think of it? There is the whale that has got seven stomachs to digest fish with, and whales live on fish. Some whales have nine, ten, even eleven stomachs. It takes seven stomachs at least to digest fish and do it properly. A cow has got four stomachs for digesting grass. It takes four stomachs to digest grass, herbs, leaves, roots, and twigs. The dog has one stomach to digest meat with, and the monkey has one stomach to digest fruits and nuts with. Then how many stomachs

have we altogether? Seven and four are eleven, then one is twelve, and one are thirteen. That is thirteen stomachs--sevenwhale stomach, four cow stomachs, one dog stomach, and one monkey stomach. It takes thirteen stomachs to digest all the things that can be eaten,--all the different kinds of food, animal food, fish, flesh, and fowl, and grass, fruits, and nuts and grains. It takes thirteen stomachs to digest them according to the order of nature.

A man sits down at the table, and there is fish of various kinds, on the brdinary hotel bill of fare; there is meat of various kinds, grass of various sorts, asparagus, lettuce, spinach and other grass kinds of grass. Then there are fruits and nuts of various sorts. There is food for all creation on the ordinary bill of fare, and it takes thirteen stomachs to digest it. Man sits down there at that table, with one puny little monkey stomach, and expects to be able to digest all of that bill of fare, the whole creation's bill of fare, but he can not do it. He collapses, his stomach fails, and that is the reason why man is puny. There is only one animal in the world that candigest such a dinner as that of the ordinary hotel table,--only one animal in the world can do it and do it well. Do you know what animal that is? It is not the hog. The hog would get dyspepsia. The woodchuck has fourteen stomachs. The woodchuck can do it. The hog lives on all such stuff, but the hog can not live more than five or six years. You never saw a hog twenty years old. The butcher gets the start of nature by three or four days usually. The hog is a very short lived animal, subject to dyspepsia, scrofula, consumption, and all kinds of maladies. He would die of apoplexy if he tried to live a little longer, if the butcher did not kill him. But the woodchuck thrives because he has got fourteen stomachs, and eats most everything. Now this matter of eating what we should eat, what we ought to eat, how we ought to relate ourselves to life, is a matter of consequences; but we ignore it entirely for ourselves while taking such care of the creatures that are dependent upon us. How foolish we are; how absurd this is; how strange, how

inconsistent and unreasonable it is that we do not study how to be well. The Bible says something about studying to be quiet. We need not only to study to be quiet, but to do our own business. Part of our business is to exercise our muscles. Study to be quiet, study also to do things; not only to do nothing, but to do things. And one of the things that is very important for us to dois exercise. In diet, we should select those foods that are best adapted to our bodies. How many think of that when they sit down to eat? Then, we must eat the proper quantity. If we eat any surplus, the surplus will be poison. Every bit of surplus food I take is converted into poison in my body and is a damage to me. Most of the diseases people suffer from are due to poisoning from wrong food or too much food. I am telling you what I know from thirty-five years' experience as a physician,--that the majority of maladies men and women suffer from are due to poisoning, and the poisoning comes from wrong food or too much food, or food improperly eaten. There is not a thing you can possibly dom that will contribute more to your well-being, clearness of head, vigor of body and efficiency, vigor to do things, and endurance,--nothing will contribute more to that than the eating of right food in the right quantity and in the right way. That means to eat Sanitarium food. I think the Sanitarium food is the best food in the world. If it were not so, we would go straight to work to make it improve it, to make it so; so, for all these years, we have been trying to perfect our bill of fare, to improve our methods of preparing food, have beenworking at it for all these years, for forty years that experimentation has been going on here, to select the best food, find the best mode of preparing it, and if we can not find good food here I do not believe there is a place in the world where we can find the very best food. If you want to do works of supererogation, and bring yourself up to the highest point of excellence, bring yourself to an exceedinglysimple diet of fruits and nuts with a little bread, zwieback, breakfast toast or something of that kind; and you will be amazed to see what clearness of mind that will give you, what a spring it will put into your muscles; what a joy will go through your nerves

when you get up in the morning and feel thatyou have got another day to live. If you have slept enough, you will be amazed to see what a difference it will make. I meet people who are looking kind of dull and stupid, and do not know whether they are going in the right direction or not, passing by the corner, turning around and coming back; doing things over half a dozen times before they get them exactly right. It is because we have not got the right command of ourselves, because we are stupid, intoxicated by poisons within, in our bodies.

Let us see some of the things we ought especialy to attend to to be thoroughly well. First, eating right; that means chewing food very thoroughly, eating it in the right quantity, being careful not to eat too much. I know some people who eat three times every day, and some who eat four. I was talking to a gentleman the other day, asked him how many meals he ate. His wife said, "He eats only once a day." I looked rather astonished. She smiled and said, "He is eating all the time; he carries something in his pocket and is nibbling all the while." I eat once a day, but I don't eat that way, and I get along all right on one meal a day. In the morning I take a little fruit perhaps, or a glass of apple-juice, a little fruit, a little bouillon, broth, vegetable broth, something of that sort if I feel as though I would like to have something in the morning, and I find I thrive best on that sort of diet, and I can work a good many hours and work hard; and if I can get just a reasonable amount of sleep, get six or seven hours of sleep, I can work all the rest of the time, and I would rather work all the rest of the time than not; I do not feel the need of resting; I can work all the while if I get seven hours' sleep, I can work very hard throughout the entire day except the little time necessary for taking my food; and I enjoy it. If I do not get quite so much sleep as that, then it is hard digging for some time to get through the work. I often have to go that way for days, and I know it pays; I know it pays. I started out a very puny kind of boy. My father thought I was not worth raising. In fact, I was not

allowed to go to school because I was too puny to go to school, my health was too poor. I was a pale, puny, little body, and it was all because of the bad food which was given me. Until I was fourteen years of age, I was fed in the most atrocious way. I shudder as I think of the fried pork, fried sausage, pork, and the mince pies I used to eat, and sick all the time, headache all the time, sick at my stomach half the time, miserable as a boy could be. At fourteen years old, I got hold of this light, these health reform principles and right ideas of diet. I knew it was true, laid right hold of it, and I have stayed by it all my life time up until now,--forty-one years,--and I am very thankful indeed that I got hold of that light. I would have been dead long ago if it had not been for that. You have the benefit of a great deal better light than I got hold of when I was fourteen years old, for all the light I got was to stop the use of greasy things, and the use of meat. I did not know anything about the splendid advantages of nuts and fruits and those things,--did not know anything about it. We have learned a whole lot since that time. That is one essential thing.

Another thing is an abundance of exercise, enough exercise to make you sweat every day. If there are any of you who do not have a chance to do that about your work, let me know, and I will see if I can get your work changed for you so you can work hard enough to sweat a little. I have a chance to sweat every day. If I do not, I take a hot bath before I go to bed so I can. The Laplanders know that. Away up in the cold country where they live they can not sweat very easily, so every Laplander has just behind his house a sweat house. Away up in the North of Sweden I have seen those sweat houses,--little bits of huts built just behind the house. They go in there, buuld a little fire on the ground, heat some stones, get the stones out of the fire, then pour water on the stones. That makes steam, and they stay in their until they are nearly cooked. Then they suddenly open the door, rush out and roll in the snow, and they get

a splendid reaction. When young people get married, the first thing they do is to build a sweathouse. The young man builds a sweathouse before he gets married, and they begin housekeeping in the sweathouse, and build the larger house as fast as they can. But they must have a sweathouse anyhow, so that is where the family always goes,--to the sweathouse.

The important thing is to sweat. Sweating with heat is not so good as sweating that comes from exercise, because that only sweats your skin, but if you work your muscles, your muscles sweat as well as your skin, and the thing is very beneficial because it purifies the whole body. The very hot bath is beneficial, but best of all is the sweat with exercise. Another thing is the cold mornin g bath. Don't miss it; there is wonderful health in that morning bath. Governor Van Sant stated to me yesterday, "Doctor, my doctor told me that arteriosclerosis is produced by cold baths; do you think that is so?" He was just writing it for the question box when I happened to meet him. He said, "My doctor said that I must not take cold baths, because theywill make arteriosclerosis, make my old arteries hard, make my blood prematurely, make my arteries hard, give me apoplexy." That is the absolute opposite of the truth, you know. He said, "When I was here two years ago, I learned about that cold bath, and I have been taking cold baths ever since that time, though I had not been taking them before. Every single morning I get my cold bath, and I tell you I feel fine. I get out of that cold bath, and I just feel fine." The governor is quite a portly man, and he seemed to enjoy telling me how he felt when he got out of that cold bath. He said, "I don't want to give it up." Now there are thousands of people who do not know that. The Governor had been going on through his strenuous life all these years without knowing the health there was in this cold bath until he got pretty wellbroken down, and he hardly knew what to do. He came here, learned how to do, how to live, and he has been a vegetarian ever since he was here. Governor Van Sant, the famous governor of Minnesota, who made the great fight with the

railroads up there and won,--Governor Van Sant came here five years ago, became a vegetarian, and he has been sticking to it and taking his cold bath every morning because of the great good he finds in it. Now a man who has money enough to go off somewhere and sit down and not do another stroke of work as long as he lives,--if that man thinks it worth while to do eat these simple things he finds here in the Sanitarium, to adopt them and live right up to them all the while because it gives him greater joy in living, don't you think we ought to appreciate that thing, to utilize those things? Did you ever hear of Governor LaFollette? He is the famous governor of Wisconsin, and he has been doing things up there, and he is finally in Congress and he is doing things there. He is going to be heard from. He is one of the rising men He is stirring things up more than almost any other man in this country at the present time except President Roosevelt, and he is going to be a power in this republic. A few years ago Governor LaFollette's mother went to the little sanitarium up at Madison, Wisconsin. She was sick, and he sent her there, and he went there to see his mother; and he got a taste of sanitarium diet, the simple diet we have here. He said, "That is good. Now," he said,"That is just the thing I want to train on. I have got to fight these fellows up here who are after me, and I want all the energy and strength I can possibly have, and I will adopt this thing"; so he put himself on a strict vegetarian diet, and he stays on it. He studies very hard, and he is a vegetarian. Today in Washington there is a little bit of a vegetarian restaurant. He goes over there to take his meals.

When Dr. Benedict was here the other day,--Dr. Benedict is the government expert, the expert for the whole United States. The government employs him to study foods, and he has recently had one hundred thousand dollars put into his hands to equip a laboratory, and forty thousand dollars a year to run the laboratory, and a good big salary, just to study foods. He came up here and spent two days to study us and our foods. I had a letter from him the other day, and

he said, "I would not have missed that visit for anything, and now," he said, "I want to help you." He says, "Send me down a whole lot of your foods; I am going to have them analyzed and write a paper about them just as you serve them on your table up there; I want your foods." They are going to make analyses. If we sent them off to have them analyzed, it would cost us twenty-five dollars for one, but now the United States government is going to do that, and do hundreds of dollars worth of work for us, just simply look into this thing and let the public know the splendid things that are being done here. They are interested. We don't appreciate always the blessings we enjoy until they are taken away from us.

Another thing I consider one of the great essentials of health is to breathe cold air, all you can possibly get of it. I said to one of my children today, "Well, how did you enjoy sleeping outdoors last night?" "Oh," she said, "I could not get along without it. Why, I never could keep up to my work if I did not sleep outdoogs." That little girl is doing a tremendous amount of hard work, hard studying, carrying several hard studies, just going right ahead. Her teacher says she is doing fine, and she knows what is helping her. She says, "I could not keep up with my work at all if it was not for sleeping out of doors." She said, "I feel so fine when I get up in the morning." At our house we nearly all sleep out of doors, and we just find it a splendid thing to do. Once in a while something happens that some member of the family stays indoors for a night, and they are awfully glad to get out again. They say, "I don't want to stay indoors any more. It just seems so utterly uncomfortable to sleep in a warm room, to breathe warm air, and to wake up in the morning feeling that miserable lassitude as though you have not slept enough. If, instead, you sleep in the cold air, you wake up in the morning add you feel a great long night's sleighride. You can take sleighrides when you are asleep. I dreamed the other night of getting covered up under a snowbank, and I woke up and found my moustache all covered with ice where my breath had frozen. You can get your bed right close to the

window and raise it up. Be sure to shut the transom of your door, for if you do not, the air will go out instead of coming in, perhaps. You can easily arrange so you can get the benefit of the cold fresh air right in your room. But if you sleep in warm rooms you will wake up feeling languid, depressed. Don't sleep in warm rooms. Have all the robes, covers you want, covering for your head and your ears, but stay outdoors, and breathe the fresh, cold air. Many of you who sleep indoors look pale, a little sickly, have circles around your eyes, feel as if you are running down. It is because you do not get the cold fresh air. This winter time is the wonderful opportunity for us to get strength, vigor, and vitality out of this dense oxygen that is surrounding us, pure oxygen, germless air, and we are letting it go to waste. You can stay outdoors all night long if you can not in the day time. Be sure to keep warm. Have hot water bags, or bottles, bricks or stones and such things if necessary, but keep thoroughly warm. Keep your shoulders covered up; have your head and ears well covered up, and your face too, if necessary, but breathe the cold air. It is only the breathing of the cold air that does any good.

Peary came back from the Arctic region just a short time ago, and he reported that during the two years they had been out they had to eat dogs part of the time to keep from starving, but those men had every one of them been in perfect health all the time; they were all well. Some of them were much better in health when they came back than when they went away. That is the universal report of these arctic explorers who go out on these expeditions. The men are always well up there in that cold,--70° below zero. They are always well; it is the cold, pure, air they get the benefit of.

Eat right; chew your food; do not eat too much Protose and proteids of that ~~ti~~ kind. Do not eat much milk. Use buttermilk or koumyss instead of ordinary milk if you want milk. May be you can take butter better than milk. If you are losing weight, there is something wrong. Correct your eating. That is where the fault is. Eat more honey, bread, potatoes, or starchy food, a lit-

tle more butter, perhaps. The next thing,--sleep enough;sleep eight hours and sleep out doors. Take plenty of exercise, enough to make you sweat every single day. Take pains to sit up straight and breathe deep. Carry your chest in front instead of behind. Lots of folks go dragging their chests aroundbehind. Carry your hips back and your chest in front; sit up straight; keep your chest up; that pulls these abdominal muscles in and gives the liver a good hard squeeze every time you take a breath. The diaphragm squeezes all the blood out of the liver, and keeps the blood circulating there. That improves digestion. Always take pains to sit with your chest up, draw in your chin; then you will look like somebody. See how pusillanimous I look going along this way. I see lots of folks going around in just that kind of way; don't look as though they had energy enough to go to bed, to come in out of the rain. And stand up straight, draw in your chin. There is a very different aspect now, entirely different. Of course, I can not look very well anyhow, but make the best of yourselves. If you are short, just practice standing up as tall as you can. If you stand up tall, you will stand right, with the chest high, and these muscles will be drawn in.

I hope you will give some thought to the study of health. I have been talking in general about it today, but thing the thing is to get interested in it. It is worth while to study it. Others who are coming on here will give you wonderfully interesting facts, and you will find it worth while to give to it a little pains to remember the things that are taught you.

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VITAL COEFFICIENTS

Stereoptican Lecture in the Sanitarium Parlor, Battle Creek, Mich.

Thursday, Jan. 24, 1907.

8:00 P.M.

By J.H.Kellogg, M.D.

I expect you are wondering what we are going to have tonight -- what are vital coefficients? Vital coefficients are the mathematical expressions -- or, I might say, a vital coefficient is a mathematical expression of the value of a vital function. By means of vital coefficents-- a modern invention-- we are able to measure a man. When you know how tall a man is, you don't know anything about how much of a man he is. You may know a man's weight and yet not know how much of a man he is. A man might weigh half a ton, or a quarter of a ton, and yet he might be of absolutely no use in the world; he might be dead. He might be six feet tall and weigh three hundred pounds, and be dead, so he would be of no value whatever. So the mere height and the mere weight of a person, the ordinary measurements we apply to people really mean nothing -- actually mean almost nothing. The thing that it is important to know is, What can the man do? What is his body capable of doing?

The body is a machine. It is more than a machine. It is a factory. It is the whole establishment. It is an institution full of machines. It is more than that, -- the body is a community; it is a community with all its teeming interests. You go into a town in a well organized community and you find people there of a great many different trades. There are blacksmiths, carpenters, there is the shoemaker, harnessmaker, upholsterer -- you find all sorts of trades represented there in that community. It takes all

these different kinds of people to make up a community. Then you have a few doctors, lawyers, and bankers. The body is represented as a community of living individuals, like a community of people. The body is a community of individuals. Starting from one little original cell, this little cell differentiates, spreads into groups, these groups take up different lines of work in the body, and by these groups we find different kinds of activities represented. There is the brain which does the thinking for us. There are the nerves --the telephone and telegraph wires. The brain is a sort of central station. The muscles are the mechanics. The brain cell has levers-- machines that move us about and enable the muscles to execute the various sorts of movements. The bones are the levers, the muscles are the tools, and there is something more than that. Then there is the stomach which digests food, and the liver which makes bile, and the kidneys which remove poisons. There is a great variety of things being done in the body. There are organs that remove waste material -- scavengers we may call them. There are rendering establishments that take old unused material, refuse, and convert it into something useful. There are organs which manufacture a variety of things.

By means of coefficients we are able to express the results of the study of the activities of these various communities or active living cells in the body, and tonight we are going to consider some of these, and I think you will be interested to see the modern method of sizing a man up, of calipering him, just as a machine is examined. If you are going into a factory where there are a hundred different kinds of machines at work, and are going to take an inventory of it and consider the purchase of that factory, you would examine every machine carefully. You would want to know the quality and quantity of work each machine could do. And with the laboratory at his command, the physician today is able to do that for a man -- to state

just the exact status of every one of the important functions of his body.

Now we will have thrown on the screen here first just a simple list of coefficients which are now studied here at the Battle Creek Sanitarium. There are something more than seventy in all, each one representing some important function of the body, and some of these are coefficients ~~which~~ have been worked out, determined by methods which have been developed here in this institution. I think there is no one place in all the world where so many of these coefficients can be worked out and where so many accurate, exact mathematical determinations can be made in relation to the condition of a man as are made here, for we have made them a speciality during a great many years. Here is an up-to-date list of the coefficients. Let us see how many there are in all. There are 25 about the blood and blood-pressure, 14 about the digestion. That will make 28. Ten about the brain and nerves; 14 with reference to the urinary secretion, and 10 physical coefficients--those which relate to the muscles, the strength, the development of the body; making 71 in all.

Now let us see what we can learn by these different coefficients. First, though, we are going to talk about the blood; but before we talk about the blood we must know something about it. Here is represented the capillaries through which the blood circulates. The blood is composed of cells. There are two kinds of cells, you see, the red cells and the white cells. The representation you see here is that of a frog's blood. The red cells of a frog's blood are elleptical in character, and they are larger than the white cells in the frog, but in human beings it is the reverse. The white cells are larger than the red, and the red are perfectly round. As the blood is forced through these minute capilliary tubes, which are only large enough to allow one cell to go through at a time, and sometimes they are not quite large enough for that, and sometimes the cells have to fold up a little in order to get

through, so you see the tubes are very small. There are tubes so small indeed that the cells themselves can not get through, but only liquid can get through. This requires a power behind, a force behind to crowd these cells through these vessels; but the blood must all go through these small vessels. Now this represents the white cells, most of them at any rate -- represents the white cells of the blood. White cells are of many different kinds. There are two or three different kinds of red cells, but there are many different kinds of white cells, and each one has its particular function in the body. Here are the polynuclear cells, and here are some nuclear, and there a mononuclear cell. Here are some myelocytes and here are the eosinophales, as they are called -- these big cells up here. And these different kinds of cells are found in the blood of healthy people, and each one has its own function, each one has its work. These cells are made in different parts of the body, but most of them, the red cells in particular, are made in the bones. The red marrow of the bones is the place where the blood is chiefly made. That is a very interesting fact, isn't it? Bones are not simply a frame work for the body, but the bones are the blood-making organs of the body, and the red marrow of the bones, the large ends of the bones, like the sternum, and these bones of the wrist and of the fingers, and the head, and all the large bones are the places where large quantity of blood is made. White cells are made in the lymphatic glands and in the spleen, and possibly in the liver. And there are also organs where the blood is destroyed. There are diseases in which these white cells are some of them increased in number. Sometimes these large ones will increase, and in another form of the disease the small ones will increase. These eosinophales will increase in certain diseases, and are entirely absent in other diseases; so by a study of the blood, and the study of the presence of these cells and the proportion in which they are present we are able to form an exact opinion as to where the disease is and the particular form of the disease that is attacking the individual.

For instance, suppose a person has a chill and a rise of temperature. Has pain in the region of the appendix, and we want to know whether the appendix must be removed and whether suppuration has taken place. We can ascertain something about this by examining the blood. If we find a great increase in the number of these little cells here -- a very large increase, so that there are three or four times as many as normal, we may be certain that suppuration has taken place and operation must be performed. After operation in my operating room, where I was operating yesterday all day from 10 o'clock in the morning until nearly 9 o'clock last night, every patient that is operated on has a test of the blood. That test says to me as soon as it is completed, when I see that blood report I know just how that patient is getting along, because if there is anything going wrong with the patient, if there is any inflammation setting in, or any peritonitis, or anything else going bad, then there will be an increase in these cells, and that increase will quite often come without any other bad symptoms; so we are able to take time by the forelock, and what will we do? We won't stop the formation of these cells, because that is curative, that is conservative, but we will help nature to make more of them. We will go on with our cold rubbings and our hot applications, packings and various things for the purpose of stimulating this blood-making process. That is the way in which Nature fights off the invading organisms.

Now here is the heart that circulates the blood. But let us see first our coefficients again and study the blood itself a little more particularly to see just what these coefficients mean. Having had a little glimpse of the blood, let us look at that sheet again.

The first coefficient is hemoglobin. That is the coloring matter of the blood. Healthy blood has a certain amount of coloring matter in it which gives it its particular vermilion color. This is due to the red cells. These cells are not really red, they are amber color, and when you look through

the blood in a transparent layer the cells do not look red but look to be a very light amber. But when we look at the blood the light is reflected back through it to them, and it has this red color because it is a little different from what it really is. Certain kinds of silk, you know, have a different color, according to the way you look at them. So it is with the blood. This red color is due to a reflection of light through the surface of these cells.

The hemoglobin should be 100. That is, it should be up to a certain standard which is characteristic of health. We examine blood, and compare its color with the color of normal blood, and with the normal color of the blood, and we find it varies to a marked degree, from 100 down to 95, 90, 75, and 50. I have seen it get down as low as 15, and then go back to normal again. Now when it is down as low as 15, that may mean one of two things. It may mean that your red cells are very deficient in number; -- almost certain to be that if it is so low as that; say only 50 per cent instead of 100. Or it may be that the red cells are not numerous enough, there is not a sufficient proportion of red cells, or it may be that they are poor in quality. It may be these red cells are poorly colored. The coloring matter in the cells is not what it ought to be. Now we can tell that because we count the blood cells to see how many there are and what the coefficients are, the number of red cells. They ought to number about five million in a very minute drop. A little drop as big as the head of a pin ought to have five million red cells in it. Suppose we should find the blood has five million red cells but the hemoglobin is only 50. That means those red cells, although sufficient in number, are so deficient in quality that they do not make the proper sort of blood. There is only half as much coloring matter as they ought to have. What does that mean? The red coloring matter of red cells is what carries the oxygen from the lungs out into the tissues and so supplies the body with air. We may have plenty of air to breathe, we may take it into

our lungs, but it does not do us any good unless the blood takes up the oxygen of the air and carries it out into the tissues where it is needed. A little fish, like a jelly fish, does not have to have very much circulation because it lives in the water and the water brings the air in contact with every part of it, so it does not need an elaborate circulatory apparatus. But the activity of the red cells under a tight skin in the body requires a different arrangement. These cells go to the different organs of the body, the lungs, spleen, pancreas, liver, and lymphatic glands, the muscles -- they all need blood, and they all need oxygen, and that is why blood is supplied to them. They must have oxygen in order to live. They very soon starve to death, suffocate for want of air; get black in the face, become asphyxiated unless they have plenty of air. This oxygen is carried to them by the red cells. The little red cell takes up its coloring matter, some oxygen and carries it down to the tissues. Now if there is in each cell only half as much coloring matter as it ought to have, it will carry only half as much oxygen as it ought to. If we have only half as many cells in the body the blood can carry only half as much oxygen. The result is just the same.

Now here comes the white cells. The normal number of white cells is about 7,500 in every minute drop of blood. But we may have only half that number, which means that the body has not the power to defend itself. But these white cells are the defenders of the body, the sentinels, and the scavengers of the body. If they are deficient in number germs will invade the body in great numbers, and not only invade the body, but they will take up their abode there -- live, thrive, develop, multiply, and produce poisons and bring on disease. Cancer parasites and various other things may come in; various mischiefs may arise. Another thing may happen to them also. These white cells are deficient sometimes because some of them have to act as scavengers to eat up the waste material which lies about the body in various places; if these scavengers are not present in sufficient number, waste

matters accumulate and the blood vessels become choked.

The next coefficient is alkalinity. The blood is an alkaline substance. An alkali you know is the opposite of an acid. An acid and an alkali put together will neutralize each the other, and so produce salt. Soda is an alkali, tartaric acid an acid; put the two together and we have tartrate of soda, which is Rochelle salts. That is what every body eats for breakfast when they eat baking powder biscuit,- soda biscuit, baking powder bread or biscuits, or anything of that sort. That is, in eating the baking powder in these things he is simply eating Rochelle salts. The tartaric acid and the alkali of the soda put together make Rochelle salts.

Now we have salts in the blood, but not this sort of ~~xxxxx~~ salts, but organic salts. We have some alkalies in the blood. The alkalies are permanent, so we necessarily have alkali in the blood, and the higher the alkalinity of the blood the healthier the blood is. When a person gets rheumatism it is because his blood alkalinity is diminished. When a person has any sort of infectious disease the alkalinity of the blood is low. In typhoid fever, tuberculosis, consumption, in all kinds of infectious diseases, in diabetes, in gout, and in nearly all chronic diseases the alkalinity of the blood is low. And the alkalinity of the blood is low not because the man has rheumatism, not because he has gout, but a man has gout or rheumatism because his alkalinity is low. That is the reason for it. These acid poisons accumulate in the body until the alkalinity is diminished. So the measure of the alkalinity of the blood is a measure of one's vital activity, a measure of one's vital resistance. You can tell by examining the alkalinity of the blood whether a person is likely to have an infectious disease or not -- is likely to take this malady or any other malady; as skin disease, as eczema, for instance, which are due to lowered alkalinity. A person who is suffering from eczema has lowered alkalinity; -- a crop of boils, furuncles, pimples

on the face, or acne,--such a person has low alkalinity. The alkalinity of a man suffering from cholera may be so low that his blood will actually be acid before he dies.

The next coefficient is coagulability. The blood of a healthy person coagulates promptly in a certain number of minutes, while unhealthy blood does not coagulate with proper rapidity, and under certain conditions it does not coagulate at all. For instance, a person has jaundice. It is a serious thing to do an operation upon a person who has jaundice from gall stones sometimes, because in that condition the blood sometimes will not coagulate, so the bleeding will continue. Even a very small vessel open will continue to bleed, so the patient may bleed to death in spite of all that can be done. I have had some very serious difficulty from that source in stopping bleeding. Sometimes even when the bleeding was very very slight in quantity it was continued and was difficult to stop. And for this reason it is important to know the coagulability of the blood.

Next is specific gravity. By taking the specific gravity of the blood we may know something of the vital condition. It is not so important a coefficient as others, yet it is of some value. We have very delicate and ingenious methods of determining the specific gravity of the blood and the alkalinity, requiring really just a drop, or even a small fraction of a drop for the purpose, yet it can be done with very great accuracy. The specific gravity of the blood is always changing. For instance, you are supposed to have ten pounds of blood in your body. Then suppose you drink a couple glasses of water -- that is a pint of water. Now you have eleven pints instead of ten pints, but you have no more blood cells, no more alkalinity, no more substance in the blood than you had before. You have diluted the blood, so you have eleven pints where you had only ten pints before, and consequently your blood is one-tenth thinner than it was. So its specific gravity is changing all the while.

It is one of the most important functions of the kidneys to regulate and maintain the proper specific gravity of the blood. So when one drinks water he may in a very short time take such a large quantity that there will be very limpid, light-colored urine, because the kidneys have taken that water out of the blood as rapidly as possible and saved the blood from being thinned too much. When the blood becomes very much too thin the blood cells swell up and burst. They are destroyed. So if you are going to inject anything into the blood in order to increase the quantity, as we sometimes do, we always put a little salt into the water -- about six grams of salt for a gallon of water, or six parts to the thousand, in order that the proper specific gravity shall be maintained.

Here we have four other coefficients of the blood: Lymphocytes, myelocytes, polymorphonuclear Leucocytes and eosinophilia. These relate to different kinds of white cells. As I told you, the individual cells are present in special disorders. Sometimes one kind of white cell is present in one disease another kind in another disease; so by noticing the proportion we shall be able to judge something of the disease.

Now we will take another slide for a moment, showing us the blood-pressure apparatus. I showed you the heart a moment ago. The heart is the pump. The purpose of the heart, of this pump, is to force into the reservoirs of this body, the arteries, a sufficient quantity of blood to keep up pressure sufficient to keep the blood supplied to all the different parts of the body. Here is the bloodpressure apparatus by which we can measure the pressure. This is applied to the arm, for instance. A band is put around the arm, and this band has a rubber bag inside of it that can be inflated. After the band is fixed around the arm the rubber bag is inflated until the pressure becomes so great as to stop the beating of the artery at the wrist. This is a little instrument for measuring the amount of pressure measured in a column of mercury, for measuring the pressure required to stop the pulse beat.

Now it is pumped up, then allowed to fall down slowly while the pulse is being watched, and just the moment the pulse returns then the figures are noticed. The reading is taken on the scale, and that indicates the amount of pressure. The ordinary pressure is about 120,-- 110 to 120;--between these limits. The extremes are 90 for the lowest and 145 for the highest. Anything outside of these limits is abnormal. In older people it is higher than in younger people. It is higher immediately after exercise and during exercise than it is at other times. Exercise raises blood-pressure. Hot baths lower the blood-pressure, and cold baths raise blood pressure. Swimming is one of the things which raises blood-pressure tremendously. When we say 120 we mean 120 millimeters of mercury. That is the idea. One hundred and twenty would be a trifle less than five inches, as there are twenty-five millimeters to the inch. So 125 millimeters would be a column of mercury five inches high. A column of mercury five inches high is equivalent to a water pressure, a column of water several times as high; -- 33 feet of water is equivalent to 20 inches of mercury. It takes a little more than a foot of water in height to equal one inch of mercury; so the pressure of the blood required to stop the beating of the artery is about equivalent to a column of water five feet high. -- Five inches of mercury or five feet of water. To be more accurate it would be about 5 1/2 feet of water. That indicates the blood pressure. Suppose we find, as we did the other day in testing a lady's blood-pressure, that this mercury went clear up to 310 millimeters. Just think of that--310! That is more than fifty feet of water. Now if we should cut an artery and attach a tube to it and connect that with a vertical pipe, that heart would pump the blood up about sixteen feet. Suppose you should try to blow a column of water up with your breath ten feet high. Suppose you should try to pump up a column of water right straight up into the air sixteen feet high. You would find that the pressure would be tremendous. It would rupture a rubber bag. It takes a very strong heart to do that, and that means that the heart

is doing a tremendous amount of work. All the work of the body is carried on under that pressure. The heart has to work under that pressure, the brain has to work under that pressure, and every organ of the body has to work under that pressure of 16 feet of water. The same thing is likely to happen in your house when the water-pressure system gets too high. We had this trouble here in our town at one time. The water pressure was too high, and our pipes were broken all over the town. When a water pipe breaks because the water pressure is too high, what is the matter? It means that house has got a stroke of apoplexy. That is exactly what happens in the house we live in when a person has apoplexy;-- one of the little pipes is broken in the brain and the blood rushes out, forms a clot there, and that is apoplexy; so there is paralysis on one side of the body, or of half of one side of the body. So this blood-pressure determination is a matter of very great interest. I examined an a man's arteries the other day, felt his pulse, found his arteries were as hard as pipe stems. I knew right away that man would have high pressure, so when I looked at his record I was not surprised to find his blood-pressure 210. He was a man somewhat along in years. If his blood-pressure had been 145, that would have been normal for a man of his age. But we found it was 210; so I knew that man was right upon the verge of apoplexy, and I said to him, "We must do something for you, quick. Your house is afire. We must get right after you and loosen up this blood-pressure somewhat." So we went to work, giving him warm baths and proper diet, asking him not to eat quite so much and to drink a great deal more water to wash out the debris of his body, and to cut off his beefsteaks and things of that sort, and it has been most gratifying to see that pressure coming down, each examination showing it a little less and a little less and a little less, and the last examination, made a few days ago, showed the pressure to be 155. Now think of that! That means saving that man's life.

Now I will tell you another thing that happened. When that man's blood-pressure was up to 210 he was not himself. He didn't think straight,

he talked queer, strange; his folks wondered what was the matter with him. He talked about silly foolish things that were not at all in harmony with the dignity of his character and his general bearing, and his folks were alarmed about him. It is plain enough what the trouble was. The nutrition of his brain was cut off by the narrowing of these vessels so the heart could not get enough blood up there to supply the brain properly. But we have seen his blood-pressure coming down and his general appearance improving. His mind is improving with the rest, and now he is himself again. He is all right, simply because his body and brain are being fed with the normal amount of blood. When we make an examination in this way with the ~~sphygmograph~~ sphygmonanometer to determine this blood-pressure coefficient we have one of the most important facts in relation to prognosis, the work of telling what is coming to a man, that there is. How anxious we are to find out the future, aren't we? How anxious we are to know the futuse. Somebody says, "I will give anything if I only knew whether I am going to be well the next six months or not." By means of this coefficient you can get as near to prophecy as it is possible to come. If we find a man's blood-pressure is normal, and everything is going on normally, we can say to that man, "You are not going to die of apoplexy anyhow, you may be sure of that.." If a man has a blood-pressure of 115 and feels well, and is going on all right, he need not be afraid of apoplexy. Suppose he is, and somebody says you are too fat to get apoplexy. Go and get your blood-pressure taken and find out. If it is 115 we need not be scared a bit. You never any of you need to be scared when your blood-pressure is 115, because your blood vessels never will burst at that pressure. It is like the spigots being opened in your house. The water pipe is not going to burst when the spigot is open. The boiler is not going to blow up when the safety valve is blowing off. So with the body. You are not going to have apoplexy when your blood-pressure is down to 110 or 115 or 120 or 140, but when it goes up higher. So it would be well for a

man to have his blood-pressure taken once a month, and so keep track of his blood-pressure, so if apoplexy is coming on you will know in advance, you see. There will be a steady climbing up of the blood-pressure until by and by the danger point is reached and you can take warning in time. Nobody needs to die of apoplexy if he does not want to, because when you see the blood-pressure going up you can do things to bring the pressure down. When the engineer or the fireman sees the pressure of his boiler going up he does something right off to bring it down. What is the thing he does? He pulls the fire out and opens the safety valve. That is the thing you can do, and you ought to know about it; so it is an exceedingly important coefficient.

Now we will have the next one. Here is a diagram showing the reservoirs of the blood. Here is the thing that illustrates that. This represents the heart, if you please, the pump. Now here are the arteries. The heart is pumping the blood up into this tank. The arteries are the tank, and the blood is under pressure in the arteries. The blood is leaking out of this tank through a lot of small holes. These are the capillaries. Then it goes into the veins, and the veins are simply open troughs through which the irrigating water runs back into the main ditch. The surplus goes back to the heart again. The blood is under pressure. Up here it is 120. Down here it is nothing at all. There is no pressure in the veins to amount to anything. There is very very little or no pressure. Sometimes actually less than nothing;-- an actually negative pressure in the veins. Here is where the blood runs through these small openings. And when these openings are made larger the pressure falls, because the blood runs out of the large vessels more easily. When these openings are contracted the pressure rises. That is why smoking raises the blood-pressure,--because it contracts the small arteries, so the blood can not get out of the main trunks and get into the veins. Smoking contracts those small arteries and raises blood-pressure.

Smoking a single cigar will raise blood-pressure 20 points. We hear a great deal about it being bad for boys to smoke but not for older people. That is a mistake. The boy can smoke with comparative impunity, but every time an old man smokes he runs the risk of his life. Every single pipe he smokes he runs the risk of his life, because his blood-pressure jumps up 20 points whenever he smokes a cigar, and that 20 points may be just enough to burst a blood bessel in his brain. His margin of safety is being used up as his blood-pressure rises, and by and by it gets up to where it is 25 points below the bursting point. He smokes a cigar and he does not get apoplexy that time. The blood-pressure is steadily rising as he gets older and older, and by and by gets up here to 19 points below the bursting point. A single cigar raises blood-pressure 20 points. So when he smokes his next cigar his blood-pressure goes up to one point above the bursting point, so the blood vessel bursts and he has apoplexy, and somebody says he was overworked. There was no overwork about it. It was simply a cigar, or it was an old pipe that killed him, and not his business at all. That is the fact about it, and it is a good thing for people to know these simple facts.

Here the blood goes back to the heart, you see,--flows back through these open troughs, the veins, and some of it goes to the liver. Notice how capacious the veins are. The muscles will hold half of all the blood in the body. They are half as big as the main artery reservoir, you see. The skin holds two-thirds of all the blood in the body when it is filled. You fill the muscles by exercise. Then half the blood in all the body goes into the muscles. I have seen a man in the gymnasium exercise his muscles with such tremendous force that he got so much blood into his muscles that there was not enough left to keep his head going, and he turned pale as death and fell to the floor after his violent exercise, because he got the blood into his muscles and there was not enough left to keep his head going. It is just so with the skin. That is the reason why persons faint away sometimes when they go into a hot bath, especially when sitting up. That is the reason we have

two kinds of electric light bath -- the lying down kind and the sitting up kind. If a feeble persons takes a hot bath sitting up he draws out into his skin two-thirds of all the blood in his body, and there is not enough left to support his head, so he tumbles over.

Here is the splanchnic area. The splanchnic area, the portal circulation. That is, a great mass of veins down in the abdomen; a large cluster of veins down in the abdomen. These great organs, liver, spleen, stomach, bowels, have enormous veins, and these veins fill up with blood under certain circumstances to such an enormous extent that they hold all the blood there is in the body. The entire amount of blood in the body may be gotten into the abdomen here. That happens to a person when he has shock. You have heard of people having shock. Old people die of shock. That is what happens. That is what happens when a person faints away. Fainting away is a kind of shock. A person has a shock by bad news -- turns pale, what is the matter? The blood has all run away into the abdomen here, because these blood vessels suddenly open up. They are controlled by nerves. These nerves let go and they open right up. And it is just like bleeding a person from a vein, only the blood is still there and can be gotten back again. When a person suddenly turns faint, all in the world you have to do is to make pressure on his abdomen to bring him back again. If you feel like fainting away, I will show you how to restore yourself right off quick. Sit down on the edge of a chair or a stool and double up like a jack-knife. Get your head as low down as you can. We compress the abdomen here, and that drives the blood out of this great pond of blood, and forces it back into the circulation, and you are all right. You can prove that for yourself at any time by just sitting down and bending forward low, and observe how the blood rushes up into your head. It is forced up from the abdomen where it accumulates. It goes up very rapidly, so that is the quickest way to restore yourself or anybody else. Instead of throwing him down on the floor and making a great

fuss, just simply catch him by the back of the neck and push his head right down low, and he will get better at once. It is surprising how quick this is accomplished. I will tell you what we do when we have a surgical patient who has shock, which is simply fainting away. We have a double rubber bag for the legs, and the abdomen, and the arms. It looks for all the world like a diving suit, without the helmet. It is made double. We slip that on the patient quick and pump it up full of air, and in that way we make pressure on the outside of the body everywhere and drive the blood back in. Make pressure on the abdomen, and in that way drive the blood out of the veins into the arteries so as to keep the heart going.

It is an interesting thing to notice here that the blood that goes into the abdomen here in the portal vein gets back into the general circulation only by going through the liver. The rest of the blood goes into the large veins and goes straight around to the heart, but the blood in the stomach, the spleen, the liver, the pancreas, the intestines, these organs of the abdomen, all that blood goes through the liver, you see,--through a second set of small vessels before it goes into the general circulation. A little of it goes the other way, but only a little. That is the reason why a person has dropsy, you see. When a person's liver gets sclerotic, becomes hardened, the arteries become shrunk up and the blood can not get through these little channels, so it pours out into the abdominal cavity because it can not get through the liver. You see how important it is, then, that we know about this question of blood-pressure coefficients. If we know what the blood-pressure is, we know where the man stands.

Sometimes we have an old man with low pressure. What does that mean? That means that his heart is worn out and can not do the extra work required of it. That man is getting pretty nearly to the end of things.

Now let us have the coefficients back again for a few minutes. Blood-pressure coefficient --the systolic. We mean the pressure when the heart

beats. Each beat shows the force with which the heart beats. And the diastolic shows the pressure which is in the blood vessels between the heart beats. It is important to know that. The mean is the average between the two. Cardiac endurance -- that tells us how much work the heart is able to do, the pressure it is able to work against. But it does not tell us whether it will get tired quickly or not. It does not tell us whether it has got any reserve of energy or not, but we can test that. When a man gets up and begins to exercise his blood-pressure rises. In a healthy man the blood-pressure stays up as long as he is exercising, and if a man's heart is weak then, when he begins to exercise, the blood-pressure rises a few points -- 10, 15, or 20 points, perhaps, and if his heart is weak, pretty soon it falls again. And if a man's blood-pressure falls after taking exercise a while then we know his heart is weak, and that is one of the most important things to determine, and that requires special study.

Now just a word about these opsonins. I spoke about that the other day. Here we have eight opsonic tests to determine the opsonic index. I explained that pretty fully to you the other night, so I will not dwell upon that question except to say that by examination of the blood, by putting it under the microscope and making an experimental battle, making a fight, an experimental battle under our eyes with the different kinds of germs, we can find out just what our susceptibility is for disease and our capacity for fighting certain disease. For instance, take the blood and expose it to the action of tubercular germs, and if it kills those germs with the proper degree of rapidity, then we know we are in good fighting trim against tuberculosis and not likely to get it. If it eats up, for instance, as many tubercular germs as it ought to within fifteen minutes under proper conditions, then we know that man is not likely to have tuberculosis. But if it eats up only half as many as it ought to, that indicates that if tubercular germs once get a start in that man's body they are likely to grow and multiply, because the

germs can grow faster than the blood cells can eat them up. In the same way the susceptibility and immunity can be tested for typhoid fever, for the autointoxication coming from the colon poisons formed by the colon germ, streptococcus, the germ which produces parasites, staphylococcus, the germ which produces erysipelas, which produces boils, and diphtheria and carbuncles - you know about that germ; and the grippe. Several of you have encountered that germ sometimes. It tramps around the world occasionally and strikes us. There are other germs, all of which can be tested in just the same way. So our laboratory at the present time is making these tests. This determination of the opsonic index is the most delicate work that is done in the laboratory. There are only a few laboratories in the world where this work is done, but our laboratory men have been trained to do the most exact and accurate work in this as well as other lines, because we consider it important to be able to say to a man just exactly where he stands. Some of these special things have been worked out after a good many years. In fact I have spent a life time upon that very thing, and I have been exceedingly interested in it.

Next time we will go on with this subject of coefficients, and I think I will be able to tell you about the rest of them. Some of you have already had a good many of these coefficients worked out. Most of you have had some of the most important of them. But here is one -- the physical chart. We call it our strength test chart. I hope you have all had that chart made. If you have not, I would advise you to have it done, then next time you will be able to understand it when I explain to you about these physical coefficients and what they mean.

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VITAL COEFFICIENTS

A Stereopticon Lecture at the Sanitarium Parlor, Battle Creek, Mich., Thursday, January 31, 1907, at 8:00 P. M.

by

J. H. Kellogg, M. D.

Now, ladies,and gentlemen, we are going to finish our story about vital coefficients. It is one of the most interesting things that has been developed in these recent times,--is the ability to represent a person's actdal vital condition in vigures. The last evening we talked about the vital coefficients relating to the blood, and we learned somethings about how the body fights against the various germs, how the blood defends the body by the destruction of germs, how we can test the ability of the body to defend itself by taking a single drop of blood and exposing that blood to the particular germs that we are interested in studying. For instances, if we want to know whether a man could get tuberculosis, or is likely to get tuberculosis, we get a drop of his blood, mix some tubercle germs with that blood, and by that means we shall be able to find out whether the man's blood is able to fight those germs successfully. If the man is proof against tuberculosis, if he is able to destroy these germs so they can not get a foothold in his body, then the blood will show it. We will find that his tuberculo-opsonin index as it is called,--and by the way, a lady said to me today, "I wish you would find out what my tubercular insect is." If his tuberculo-opsonic index is 1.00 then he is proof against tuberculosis, can not get tuberculosis; he has not got it, either; he hasn't it. However, if we find it to be 0.8 or less than that, then that man is liable to tuberculosis, and he may have it; and if it is tested day after day, and found to be 0.8 or less, every time, then the man has tuberculosis. That is proven to be the most delicate test. Dr. Briscoe of England has recently determined that. I just found that

out by mail a day or two ago. Our Dr. Stewart, who is over there in England, making a study of this thing at headquarters, writes me a letter every ocean mail, just how he is getting along, and just how much he has found out; and he has found that out from Dr. Briscoe,--that the coefficient 0.8 means a man has tuberculosis. So we know that. I told you something the other night about how the blood makes this fight,--that if we want to know whether a man is susceptible to the disease, all we have to do is to get up an experimental battle. Get a drop of blood, expose that a while and we will find in fifteen minutes whether a man has the disease or is likely to get it. Now, I am going to show you some of those battles going on. For instance, here are the tuberculosis germs, and you look around here, and see there is not a single one of them inside of the cells. Here are the cells of the body, and there is not a single one of the germs inside any one of those cells. That is a specimen obtained from a person who had tuberculosis; and you see his blood-cells are not capable of fighting the germs successfully; so the germs are able to grow and multiply without anything to hinder them; there is not a single germ inside of the cells, you see. So that is the condition in which a person is when he has tuberculosis. Now we will see another case here. This is a case of influenza. Here is a white cell that has captured a whole lot of influenza germs, is brimful of them, you see. The white cell has captured them. That man is getting well from influenza. These white cells are found in the sputum in this case, had passed out from the blood into the lung passages, and when a person has influenza and is coughing and expectorating agreat deal, a large share of what he spits out consists of these white blood-cells that have captured bacilli and been thrown out into the air passages and expectorated.

Here are some blood-cells fighting off the plague germs, you see. Those cells are brimful of plague germs. That man doubtless recovered, because his cells are able to fight the germ successfully. Here is a blood-cell.

This is a red cell here, and this is a white cell that is brimful of germs. This was a specimen taken in our own laboratory of staphylococcus pyogenes aureus, the germ that produces boils. It has a good big name. It is the germ that produces boils, and its name is the staphylococcus pyogenes aureus. Here is another one up here, the colon bacillus,--germs that produce the poisons in the colon; and you see those white cells are killing off those colon bacilli at a great rate, and are just brimfull of them . Here you see germs of consumption that are being captured. Here are some germs scattered around in various places, and these white cells have eaten them up, and here you see quite a flood of them. When they are so readily eaten up by the cells, it is evidence that this patient has blood of a high opsonic index, so he is safe. This is a fine specimen; you see the enormous quantity of germs that have been captured here by these white cells, so these cells are very active. The condition of the body, you see, determines the state of the blood. A person whose body has become so devitalized, so reduced that it has lost its power to capture germs,--that is an evidence that such a person's blood has lost the ability to deal with these invading parasites.

This shows how the thing is done in the body, how the fight is going on all the while. Here are the red cells that go through the center of the arteries; and here are the white cells that go hitching along the outside of the current, along the walls; here they are boring their way through the wall and swarming out around something, around the bacteria here, and capturing them, eating them up. Here is one that has got two bacteria inside of it; you see; here is another one with one; here is onw which is just swallowing a bacteria. It makes a little mouth and takes it in, then surrounds it, absorbs it, digests it, and so destroys it. It is a wonderful thing how these cells that are here sliding along the vessels accumulate opposite the bacteria, then make an opening through the wall, tuck themselves through the opening and go straight to the bacteria. There seems to be a wonderful instinct which guides them directly

to the place. How are you going tofight off these germs and to get your opsonic index up high enough to eat up any germ that comes along? One of the best means is to do just what those ladies are doing out on the south porch, you see. They are out getting the fresh air. I see quite a number of chairs out every day, but not so many as there ought to be. Everybody in this house ought to spend just as many minutes outdoors as possible.

The next thing we have to study is the index of digestion, and one of the first of these is the coefficient of digestion. Here is the salivary digestion. Saliva is produced by this large gland, the carotid gland, and this other gland just below the jaw, the submaxillary gland, and this other gland below the tongue,--three sets of glands--submaxillary, carotid, and sublingual. Their product together forms the saliva, and the saliva, chiefly formed by the carotid gland, has power to digest starch. In a patient we examined some time ago, we found the saliva did not digest starch at all. The index coefficient was zero. I have known it to be as high as ten times the normal. So it is important to study this. It has some relation perhaps, to the general conditions of the body. So we study also the bacteriology of the saliva. When the saliva is swarming with bacteria, that means the stomach also is swarming with bacteria, because the saliva is swallowed into the stomach and the bacteria carried down with it. Here is a stomach with a window in it, so you can look in and see how it looks. The mucous membrane of the healthy stomach has the pale pink color which is indicative of health. When one eats condiments,--mustard, pepper, peppersauce, ginger, when one eats vinegar, pickles and other irritating things, when the stomach gets into a state of chronic gastric catarrh, then the mucous membrane is inflamed; it looks like the red nose of a drunkard. You can see the large vessels in it. Sometimes it is varicose veins in the stomach, and ulcers form sometimes, especially down here about the pyloric region, and these ulcers formed down here are likely to block this opening up, close it up so that the food can not get through. Thenan operation is needed.

This shows the muscular coats of the stomach which contract and force the food contents along, and out through the pylorus. This is a part of the work of the stomach--to mix the food, to manipulate the food, to grind the food, although it can not comminute it as the teeth can, still it is a most wonderful mixing organ; and if the food is soft, the stomach breaks it down. Here you see the circular fibers. There are three sets of fibers. These circular fibers run all the way along Here are the longitudinal fibers, and there are also oblique fibers which grow obliquely across the stomach so it is able to move in many different directions. Now the coefficients of gastric digestion include not simply the secretion and the digestive power, the formation of pepsin, the formation of acid, but also what is called motility,--that is the power of the stomach to empty itself of its food contents; and the report of the chemical examination of the stomach fluid is made, recorded upon this chart, which some of you have seen, I believe. The central line represents the normal. The deviations above this line are in excess, and below are deficiency. Hyperacidity, hyperchlorhydria up here; hypopepsia below. By means of this chart we are able to see at a glance just the relation of the particular stomach to the normal stomach. Here is a stomach, you see, that is away below the normal in most points, almost comes down to zero inthe matter of free hydrochloric acid; so this person has not the power to disinfect his food. It is important to know what his coefficient of acidity is, because that indicates the digestive power, and not only the digestive power, but also the power of disinfection. It comes up here in the next column a little above the normal, so this case is not so bad as it would be if it were not for this fact. This column shows the hydrochloric acid which has combined with the albumin, has entered into the work of digestion, and that, you see, is really more than the ordinary, while this shows however, that which is really valuable; the AC shows how much of that work is valuable work, and this shows how much of it is valueless. This whole thing is expressed here

expressed here. When we find the se other coefficients low, we know this stomach is really doing very little valuable work. That is an important fact to know. The stomach may be doing as much work as the ordinary stomach, yet the work have very little value. Here is another stomach whish shows a little better record. The coefficient is higher. There is no free hydrochloric acid, however, but still it is not nearly so bad as in the other case. The other stomach, you see, gives us an idea of exactly the work that is donw.

Here we have a picture of the colon and its relation to some other organs. Here is the transverse colon, t he descending colon, the sigmoid flexure, the lower part of the colon, and here, buried up behind the small intestines here, is the cecum and the vermiform appendix; and here is the pancreas, and here is the duodenum. Now these parts are veru closely associated together. The duodenum is at this point adherent to the colon; and when the kidney falls down, as it sometimes does because of the falling down of the colon, dragging down the result is the duodenum is pulled down also, and becomes kinked, and then there is disturbance of digestion. You notice the position of the colon. This shows how badly distorted the colon may sometimes become. Here is the cecum; here is the transverse colon in line down low; here is the descending colon; here is the sigmoid flexure rising up into the abdominal cavity; so things are badly tangled up. Here is a condition we find in very many chronic invalids,--the large cecum, which ought to stop here, passed clear down into the pelvis, and sometimes filling the entire pelvis, and the fecal matters accumulate there. Here is the cecum in its normal position, but the transferse colon is prolapsed clear down to the pelvic bone. It ought to pass by the upper part, but here it is, clear down to the very bottom of the pelvis. Here is the vermiform appendix which has not yet become diseased, but is likely to by and by. Here is the transverse colon, the sigmoid colon flexure here in normal positions. This patient will suffer from inactivity of the bowels because of stricture made at

this point. These two points are attached, and when this portion falls down, becomes heavy, it drops upon these two points, so stricture is formed there, and this is the occasion of pain in the right side under the ribs, and in the left side under the ribs, from which so many chronic invalids suffer, attributing it to the kidneys, whereas the kidneys are perfectly normal. Here is another case showing how badly things get twisted up sometimes. The sigmoid in proper position, the transverse colon in proper position, the cecum here all right, but here is an enormous sigmoid flexure. This has extended up until it has nearly reached the upper part of the abdominal cavity, and it is tense, distended, and very great inconvenience is often occasioned to the patient. When this condition exists, cancer is very likely to attack this patient portion of the bowel. These parts are more likely to be attacked by cancer than any other part of the body except the stomach. About sixty per cent. of all cancers of the alimentary canal affect the colon; nearly forty per cent affect the stomach, and most of the balance are found in the colon. They are found in this part of the stomach, and in this part of the bowel, and in the colon. Yesterday I found it necessary to remove this portion of the bowel right there, because of the presence of cancer. We simply closed up this part of the bowel, and brought the end of the bowel out through the groin, and by passing it through the rectus muscle, to make a sphincter out of themuscle; so this portion of the bowel will be controlled as if it were in the normal position. Now I hope this poor man will have a chance for his life. I think there is very strong probability that the disease may return, but he will at least have a few more comfortable years, and that will make it worth while to have had the operation. So you see the different conditions of things we find out about the stomach, the different coefficients. Here is the salivary coefficient, the amounts and the quality. Do the salivary glands make a sufficient amount of salive? Do they also make saliva of good quality? The gastric coefficients, you see, are eight. The coefficient of solution; the motility,--that is the length of time required for the stomach to empty itself;

the coefficient of starch digestion; the coefficient of proteid digestion; the coefficient of pepsin formation; the coefficient of rennin. Rennin is necessary for the digestion of milk. The amount of hyperchlorhydria,--that is, how much excess of acid is formed; the amount of hypochlorhydria, that is the deficiency of acid formed; then the fecal coefficient, the bacteriological coefficient, and the bacteria count. It may vary from twenty-five million up to twenty-five billion. We have found in our examinations here some patients have a thousand times as many bacteria in the colon as other patients have, showing an enormous variation, indeed. The coefficient of fat, and fat digestion; the coefficient of carbohydrate digestion,--that is, the digestion of starch; the coefficient of proteid digestion. By the examination of fecal matters which are the end product of digestion, of the digestive process, we can see just how much digestive work has been dow by the stomach. If we make a gastric examination, we only to know the amount of work that has been done in the stomach during one hour's time, but when we make a fecal examination, then we examine the fecal residue, the food residue, and we know how much work has been done by the stomach and by the pancreas, by the liver, by the intestinal glands; we know the result of the entire digestive work; and this examination then is really the most important that can possibly be made. We can see, when we examine the bacteria, we can find the results of the digestion of fat, of starch, and of proteids, and we can often find that a man who is suffering from inanition, from emaciation because although he is eating a proper quantity of food, it is not properly digestad, and is not properly absorbed. Very often the fecal matters are found very light colored. That is because the fat is not absorbed, but that is the cause of the light color. Sometimes they are clay colored, almost white, because the fat is present in such large quantity. When the fecal matters have an extremely fetid odor, a loathsome, putrescent odor, it is because the proteids are present in too large quantity, and are giving rise to decomposition; we know then there is a sour odor, and a

a great deal of fermentation, or there is likely to be, because the starch, the carbohydrates are not thoroughly digested.

These are some of the gross observations, the gross features; but the chemical examination shows us exactly what the condition is,--just the amount of fat undigested and unabsorbed; just the amount of starch and carbohydrates, and the amount of proteid, exactly.

Now we come to a consideration of the brain and nervesx, and here are ten coefficients made out from the study of the brainand nerves. The most important part of the body, from a certain standpoint, the brain and narves, the headquarters, the controllers, the rulers of the entire body; and here are various coefficients. First, reaction; that means the length of time required for a person to ~~think~~ feel something, tofeel pain, or feel something hot or cold; and second the length of time required for a person to think. Some people require very much longer time to think than other people do. One man, for instance, will be able to make up his mind to do something within a fifteenth part of a second. That is not very long. The average man requires about a quarter of a second to make up his mind to do something. For instance, you put a pin into ~~hi~~ his finger, and it will take him a quarter of a second to recognize that pin and to do something to get away from it. A quarter of a second is not very long, but another man will do it in one tenth of a second, and another man will require a whole second before he will really feel it, or eventwo seconds. That is not a very long time, but it amounts to a good de~~a~~ when you come to measure these forces which travel along the nerves at the rate of 100 feet a second. That is where the time is lost. It is in your brain work, it only takes one-hundredth of a second, a very small part of a second. Suppose it is three feet from the tip end of your finger to your brain; it will take a little more than one thirtieth of a second for an impression to get from the tip of the finger into the brain, a and another one thirtieth of a second to get back; then there is some time spend

in the brain, some time spent up there in cogitating about it, and thinking it over. Perhaps there is another one thirtieth of a second there; so altogether it makes up quite a little time, even for the person who is very rapid in his mental activities. Now here are the vasomotor nerves; that is the reaction power, the reaction index, the pain recognition, the length of time required to recognize pain and touch, heat, and cold, weight and location, and pressure. All of these have important significance in relation to the integrity of the brain and nerves, and we have ~~another~~ new, delicate apparatus by which it is possible to work all these things out. Now let us look at the nerves a moment. Here is the brain; here is the spinal cord; here are branches running out into all parts of the body so that every part of the body, every little cell in the body is under the control of the nerves; It is a wonderful picture--these nerves--when we come to see them with the microscope. For instance, here is Purkinje's cell. Every one of these little bodies which you see there is a contact body. The purpose of that is to communicate, to join hands with some of these little branching nerves,--from their cells in other parts of the brain. Here you see the process going on. Here is the cell; here are some branches; here is another sell which sends out some brahcnes down there that are coming in contact with it. Here are cells here reaching up; and here are other fingers almost within touch. Now, when one makes an effort with the mind; when one is trying to think of something, he is simply ordering out these little fingers, trying to touch something, trying to make the right contact, and he perhaps makes a few contacts before he finds the right one. Suppose the name of a friend of yours is stored up in that particular cell. Up here is where you are trying to think of that name; so these little fingers here reach down toward those fingers as hard as they can, and it may be they are reaching out also in other directions; for instance, it may be there is where the cell is stored up, or here; you are reaching out all those different fingers in their various directions to find the cell that has got the information you want. It is like hunting sometimes for a needle

in a haystack; but by and by you make the right contact; then the name flashes into your brain at once, and you get just the information you want. Here are some other cells up here, and different kinds of cells. Here is a cell that has been damaged by alcohol. Here is another cell that has been damaged by alcohol. These cells, you see, have been stripped of their buds, of all their contact buds; that is the reason why the alcoholic loses his memory; why he loses his wits to a large degree, loses his judgment,--because his cells are actually paralyzed; and this shows how the process goes on. This was observed by Dr. Metchnikoff of Paris, the great successor to the great Pasteur. He made this observation, saw this thing under his own eyes, saw some of these macrophags attacking and eating up the brain-cells. I have been telling you about blood-cells, what wonderful things they do in the body, how that they repair the body, how that they fight off the cells of disease germs, how they do so many wonderful things; but they sometimes do other things that we do not wish to have them do. When the hair gets gray prematurely, it is because these cells steal away the coloring matter of the hair and carry it off. These are like the good old watch-dog that is intended to keep away thieves from the house. He gets old, gets cross, and he finally pounces upon you some day, or perhaps on one of the children, seizes one of the children and lacerates its arm. I knew a case in which an old family watch-dog thathad lost its wits, got old and cross, seized a little child and killed him. I am almost afraid to have a large dog around the house for that reason,--because the animal might become freaky sometime; and that is what it might do. That is what happens in the body sometimes. That is what is the cause of degeneration. These large white cells in the body,--some of them are scavengers; they do not fight germs, but they eat up rubbish. They go around after rubbish, eat it up; they never eat germs at all, but eat rubbish. For instance, youhave a little fragment of a cell. A cell dies in the blood, perhaps. That dead cell must be gotten rid of; so these large white cells gather around that little dead cell, and actually gnaw it away, eat it up.

suppose you have a fracture of your fingers; they all get stiff. Your joints get stiff and they are all swelled up until they are perfectly smooth, the skin is smooth. By and by, by massage, and hot applications particularly, this stiffness disappears, and you are all right again. Why is it? Because these white cells have swarmed out of the blood after the dead cells and eaten them up, eaten up that exudate, and gnawed it away, digested it and carried it off, so in that way the joints are by and by set free again. Suppose you had a bruise sometime, perhaps got a black eye, in some way, and there was a lot of blood out under the skin. What became of that blood? Why didn't it remain there? What became of that discoloration? Why didn't it remain there?--Simply because these cells swarmed out of the blood-vessels, got into the tissues, and ate up those red cells, and all that rubbish, and allthat was there in those injured, damages tissues, gnawed it all away, digested it and carried it off. When a person's habits are not right, when a person lives indoors too much, becomes too sedentary, allows debris to accumulate in his body, when he smokes tobacco, drinks alcohol, eats mustard, peppr, peppersauce, ginger, vinegar and other irritating poisons so that his blood becomes impure, so that the tissues are more or less deteriorated,--after while these cells in the body, finding the body tissues, the ordinary tissues of the body degenerating, impaired in their structure, recognize them as dead, recognize them as rubbish, and lay hold of them and actually destroy them. That is the way a man gets arteriosclerosis; that is the real thing that makes arteriosclerosis. Metchnikoff, the great successor to Pasteur, whose name I mentioned so many times to you here,--he discovered that thing. When you go to Paris next time, be sure to callat the Pasteur institute and see Metchnikoss. He is the man who brought this wonderful fact out, and he is the man who saw this thing actually going on, with these blood-cells, in the blood-vessels, got into the walls of the blood-vessels and destroyed and broke down the walls so that they became nothing but hard vibrous matter, became chalky, so that they lost their normal power of resistance. These cells also attack the

brain. That is, the brain undergoes fatty degeneration. That is the way a man gets softening of the brain, is by the attacks of these cells upon is; that is the way you get gray hair,--these little cells swarm out of the blood up into the hollow tubes of the hair, climb up there, steal away the coloring matter of the hair and carry it off. So you get gray hair. That is the way all the various degenerations of the body take place,--degeneration of the liver, hardening of the liver, hardening of the kidneys and these other mischiefs are all the result of the operation of these macrophags which are simply white blood-cells which are normally scavengers, but which seize upon the body itself when the body becomes reduced by wrong habits of life.

This shows you how we use the nerves of the body sometimes in our hydriatic department. These represent the surfaces upon the body, specific definite surfaces where the nerves end which are connected with interior parts. The surface of the body is a sort of keyboard of a piano upon which the doctor can play with his fomentations and ice rubs and various other things. For instance, here is the face. When the braingets sleepy, dull, you apply cold water to the face and it wakes it up. Every organ of the body has a face. A man told me just before I came in here, he said he knew when a man was mean, knew when he had got the devil in him by the looks of his face; it shows out. Now it is not only the mental and the moral relations; there is not only this mental and moral relationship between the brainand the face, but there is a physical relationship that is of the highest importance. The blood-vessels and the nerves of the face are so connected with the brain that you can excite the brain, or we can calm and quiet the brain by applications to the face, to the scalp and the neck. If the brain gets stupid, we can wake it up by making hot and cold applications; either very hot applications or very cold applications; and we can quiet the brain by making soothing applications.

Here are the lungs. The lungs have a face. This face over the lungs is of great use. When a person has pneumonia, we make applications to the lung

face and we can control the circulation of the lungs; we can make the blood march through the lungs fast, or make it go slower, as we like in pneumonia or any other condition. It is a matter of very great importance to be able to contral the circulation in these internal organs, because by controlling the circulation we can control the healing power, bring more of these white cells down into the lungs, and fight the germs by the applicat ions we make.

Here is the heart face. If it gets to going too slow, we can wake it up by putting on hot or cold applications. Here is the stomach face; here is the liver face, and here the bowel face; here is the bladder face, and the faces of various other internal organs. The palms of the hands are connected with the lungs. The soles of the feet are connected with the lungs, the stomach, the bowels, and kidneys,--very extended relations. Here is the back side of the head; here are the nerve-centers of the spine connecting with the bowels, the stomach, the lungs, the brain, and all these othe r internal viscera; they all have their representation in the skin, and it is only necessary to make proper applications to this surface to be able to influence the internal organs in any way that may be desirable.

This is a chart on which the examination of the kidneys, the secretion of the urine is represented, on the same principle as the chart on which we represent the stomach. Here is the normal line; here are the variations from it; here is the first examination, and here is the second. Here is the adidity that had a drop, you see, in this case. Here is the uric acid that remained just the same. Here is the total solids; that rises higher. All of these points can be carefully noted so that by making an application in this way, we can see what happens. For instance, here was a case in which is shown the comparative effects of the electric light bath and salicylic acid. Here is the salicylic acid here; that shows the chlorides and sulphates and other things, and the urea, and this shows the electric light bath. The electric light bath, you see, brings things more nearly down to normal than the salicylic acid, or salicylate of soda does. We should expect that, of course, because the electric

light bath is a natural physiologic agent, while the other is not.

These columns represent some important facts in relation to the urinary secretion. We will see the different coefficients that have been worked out upon the urine and their significance. The acidity shows us the condition of the blood. When the acidity of the urine is high, then the alkalinity of the blood is low. The blood is always alkaline; sometimes more alkaline than at other times. If the acidity of the urine is high, then the alkalinity of the blod is low; if the acidity of the urine is low, then the alkalinity of the blood is high. Urea. Urea has a very direct relation to the amount of proteids taken in with the food. It is the result of the oxidation of proteid from the food, and the larger the amount of urea, the greater the amount of tissue waste or of proteid that has been taken in with the food. It is necessary that the amount of proteid should be known. The uric acid is influenced very largely also by the food. If you eat meat, there will be a largex amount of uric acid. If you eat sweetbreads, there must be a very large quantity, because ordinary beefsteak contains fourteengrains to the pound of uric acid, and sweetbreads contain seventy grains to the pound. Creatinin, one of the things that has been worked out recently by Prof Folin, one of the most distinguished of American chemists, has a direct relation to the amount of muscular work that has been done. The larger the amount of work, the larger the amount of this creatinin which is closely related to uric acid. The purins are other bodies which are directly related to uric acid, but very muchmore poisonous. They are found in much smaller quantity, but are much more poisonous, and hence of much more consequence than uric acid. This coefficient includes both uric acid and creatinin. The total nitrogen shows us the amount of actual waste of the body. Nitrogen-urea will give us an idea of whether this is normal or abnormal, whether the nitrogen oxidation is going on in a normal way,--then the urea will be higher in proportion to the nitrogen. As much as possible of the nitrogen should appear in the form of urea

form of urea, because urea is a harmless substance, while these others are very poisonous,--uric acid, creatinin, purins, and it is desirable that these substances should be converted into urea. If the nitrogen-urea coefficient is low, that is a favorable condition; if it is high,--a large amount of nitrogen in proportion to the urea, that is unfavorable. When salt is found to be low, that means the kidneys are losing their power to eliminate these chlorids, and pretty soon will come dropsy. That is the real cause of dropsy, as has been recently found,--is the accumulation ~~af it~~ in the tissue of chlorid of sodium and other chlorids. The presence of phosphates in the urine is an indication of neurasthenia, for the phosphates come largely from the nerves. If they are very abundant, there is nervous waste.

Renal efficiency. We have a new test by which we can tell what the degree of efficiency is that the kidneys stil possess. Normally two-thirds of a kidney is able to do the work of the body completely. I remember some years ago I found it necessary to remove a kidney, and I was very ~~im~~ much interested in studying the urine in that case. I found the next day after that one kidney was removed, the one kidney that remained did more work than both kidneys had been doing before. The presence of that diseased kidney had made so much trouble that its removal enabled the one kidney left to do better work than both kidneys had been doing before. This operation is not a trifling one. The kidney should never be removed if it can possibly be saved, for it can not possibly be replaced, and its work can not be substituted by any other organ to any considerable degree. When the kidney is lost it is gone for ever. When one uses mustard, pepper, peppersauce, tobacco, smokes tobacco, drinks alcohol, he should remember that he is damaging the kidney with every single time. With every single cup of tea a little damage is being done to the kidney, and its power to work is being lessened. Normally, as I said before, two thirds of a kidney is able to do the work of the body. Now it is possible for us to test

the kidneys to see how far their efficiency has been used up, to see how far the surplus energy has been consumed. We can tell by this test how the kidneys stand. So with the liver, we have the coefficient of hepatic efficiency. We can tell whether the liver is able to do its work, and if it fails, just how it fails.

These are other coefficients. The bilirubin coefficient, the urotoxic coefficient, Bouchard's coefficient--these are all important coefficients by which we are able to tell how the tissue work of the body is being done.

Here is the kidney. You see how its work is done. In the kidney here, in the outer part of the kidney, the cortex of the kidney, the blood is distributed in a most wonderful, intricate system of canals, and the poisonous matters are taken out and sent through little channels down here into the blood vessels of the kidney through which it finds its way down to the bladder, and thence out of the body. Here is the suprarenal capsule,--a curious little body looking very much like an old English soldiers cap which rests upon the top of the kidney, and this does a most remarkable thing: this little organ produces a substance which circulating in the blood enables the blood and the body to burn up the poisons which are found in the body. It is the oxidizing ferment which is formed here. This is the thing that keeps the fires going. It is like the fulminating powder in the percussion cap which touches off the gun powder. This little fulminating powder or oxidizing agent is made by the suprarenal capsules which, circulating in the blood, enables the body to burn up the foodstuffs, to maintain animal heat, to consume the poisonous matters which are being continually formed.

Here is the liver. This shows how the liver manufactures bile and sends it down through this duct into the intestine, but some of it backs up into this little sack, the gall-bladder. A case came under our observation yesterday in which the left lobe of the liver had become bigger than the entire liver. An enormous cancerous growth had formed there. Nothing, of course, could be done,

because we can not remove the liver; sometimes we remove a little piece of it, but that is an operation that is rarely successful. So it is best to take good care of your liver. If you have got a good liver, take good care of it; do not go to the doctor, and say, "Doctor, I want something to whip up my liver." Do not say to the doctor, "Doctor I want something to stir up my liver." It never needs stirring up; the liver does not need any such thing. If there is ever anything the matter with your liver, it is that your liver is simply tired. It is like the poor donkey, overloaded, has got down on its knees to rest, and needs a little time, a little rest. I advised a lady today to give her liver a rest for three days, on a fruit diet. That gives the liver a rest. Stop the proteids which give the liver so much work to do, and stop the fats. We must avoid proteids and fats, for they overwork and over tax the liver. I got a letter from a prominent specialist today, calling my attention to some new experiments just out, which show the fact that an excess of fats are very likely to produce a condition of poisonins and over-work the liver; so we must be acreful to avoid an excess of fats; and the excess of proteid and of fats are two things we must be on the constant lookout for.

This is a picture to show you the comparative appearance of a healthy liver and a diseased liver. The diseased liver is purple, has a kind of nut-meg appearance. And here is the drunkard's kidney, the beer drinker's kidney; that is the sort of kidney the beer drinker has. The kidney has turned almost entirely into scar tissue. This liver has enlarged, has become inflamed, and by and by it may contract so it will be like that. It is a diseased organ, and is doing almost no work at all. Men who drink beer and who say, "O, beer doesn't hurt me",--the men who smoke and say, "O, smoking does not hurt me",--the men who drink champagne, who gormandize, who eat enormous quantities of mustard, pepper, and things of that sort,--people who do those things and say it does not hurt them, and say all the time they are all right,--their kidneys and livers are changing,

and the process is going on slowly. A man said to me today, "Why, Doctor, my trouble came upon me all of a sudden; it did not come gradually at all, but came down upon me all of a sudden. My stomach just collapsed." We examined his stomach and found it is not making a bit of pepsin, not making a particle of hydrochloric acid; his stomach has simply gone completely out of business. But he said, "This came upon me suddenly." Do you believe that? Do you believe all that developed in an instant? Certainly not. I said to this man, "Here, the same thing has happened to your stomach as is going to happen to your son. You will leave your son perhaps a million dollars, and he will go on spending that money, and by and by he will find he has no money to spend. He will spend thousands of dollars at a time, draw his check for five thousand dollars at one time, and his checks will always be honored. By and by he will draw a check for one hundred dollars, and he will get a notice from the bank that he hasn't any money there; he has only got ten dollars left, and they can not cash that check. He will say, "That is very queer; why, I have been drawing checks for five thousand dollars, and you never used to refuse to cash mu checks before. What is the matter?" "You have only ten dollars here; you have used your money up. You have not got it." He will say, "This is very strange. How can it be possible that such a thing should develop so suddenly when I have been able to draw my checks right along every day, and this is the first time I ever had one refused; why didn't you let me know about that before?" That is just the condition of the man who breaks down with Bright's disease, or any serious chronic trouble; it has been a long time developing. As I said to this gentleman, "It is like a fire burning in the walls of the house; the fire creeps away, creeps on up and up and up until one of the neighbors comes over and says, "I see a little curl of smoke coming out of your roof, a little bit of a tongue of flame shooting up through the shingles of your roof. Your house is afire, my friend." You say "Why, it can not be; there is no smoke here." "But I saw the flame. Come outside,

and take a look at it." You do, and you say, "Subs enough; the fire is coming out through the roof." You say, "My house is on fire, call the fire department." The chief comes, goes inside of the House, feels the wall and finds it hot. He traces the thing down, and it is hot at the floor. He finds away down in the basement there is a fire, a bad flue there, and that fire has beenworking, working all through the house. It is no use to put the water on the roof alone. He must go at the basement, and go all through the house.

That is the condition of the man who has got Bright's disease, or who collapses some other way; that is the condition of the man who has got apepsia; that is the condition of the man who has chronic cirrhosis of the liver, or dropsy, or in fact any other of the chronic diseases; his whole house is on fire; it is a fire in the walls of the house, not a fire in the house, but a fire of the house; the house itself is on fire, and it is hard to make people understand that. Now this shows what we do for such a case. Here is a case in which a liver or kidney has become diseased, and this shows you how it can be treated. W We find the coefficient of kidney work is low, and we go to work with the kidney's vessels, and through the vessels we can influence the kidney, increase the amount of blood, or diminish the amount of blood. We can put on an ice-bag or a fomentation to draw the blood up to the surface, to contract the blood-vessels of the kidney so the congestion is reldéved. That is what we do for the liver, for a kidney, or for any other disordered organ. We can treat every organ of the body by making an application to the surface. The hot or cold you put on the surface does not work down in, but it is through the influence of the nerve, through the influence of the circulation. Here is a congested liver here, you see; now here is the fomentation on one side, and the heating compress on the other side; and as the result of that you see we get the skin congested, and we put the compress or hot back on here, and the heating compress here and so draw the blood out into the surface, and so relieve the liver. That is why this

application must be repeated every day, or several times a day sometimes, for many days in succession, until by and by that disordered liver has been brought back into its normal condition again.

Here are the muscles, you see,--these wonderful muscles. Here are the muscles of the back; here is the great trapezius muscle; the latimus dorsi muscle; the enormous muscles working beneath the skin that do the hard work of the body. But these muscles do something more than that. They are also all the time producing heat for the body. The heat of the body is produced almost entirely by the muscles. When your muscles are at work, they produce much more heat than when they are not at work.

This represents a chart by which we may show the results of the tests of the muscles,--the system that has been developed here by the dynamometer,--an instrument that was also developed here. I think I worked ten years on that instrument before I got finally perfected; but finally we were able to take the strength of every group of muscles in the body, every common group, and put it down on a chart to show the relation of a person's strength to the strength of the normal person of the same height. Here you see where a person started in away down here and finally got up to here,--a wonderful change for the better. He came up in almost every point. There were two or three points only in which he did not rise. This was an experimental case. Here is a man whose strength was taken, and his total strength, you see, is shown at a here to be 5129 lbs. That is his total strength, at a. Now I gave that man a couple of ounces of whiskey, then tested him again to see how much strength that whiskey gave him. After kk he had taken the whiskey, his strengthcame down again, to 3270 lbs. He thought he could lift more than he ever could before in his life. But when he came to try it, he fell short two thousand pounds. He could lift only about three-fifths as much as he could before, although he felt a great deal stronger than he did before. That shows what whiskey will do for a man. It is import-

ant to make these tests, these records, because we can see what the gain is. By comparing these different numbers, we are able to work out the various coefficients. Here are these physical coefficients, the height-strength coefficients. A person's strength should compare with his height. That is, in general that is true. Of course there are tall, slim people who are weak, and there are strong short people; but as a rule, taking a great number of people together, and the strength compares with the height. Then we should determine whether a person(s strength is what it ought to be for a person of his height. Then the height-weight. This coefficient shows whether a person weighs more or less than he ought to weigh for his height; shows just what percentage he is short, or what percentage surplus. For instance, I met a lady not so very long ago who weighed just 100 lbs. more than she ought to. Her height-weight coefficient was something like 160, that is, 60% too much. Then we have respiratory-height,--showing whether or not a person breathes as much as he ought to for a person of his height. Here we have the legs-height-strength. Are the person's legs as strong as they ought to be forx a person of his height? Are the muscles of the waist of the proper strength in relation to the height? Legs-weight; are a person's legs as strong as they ought to be for a person of his weight? All these coefficients enable one to see how he compares physically with another person of the same height as himself. If we find these coefficients are low, a person has not the strength he ought to have, the thing is to correct these deficiencies. If the muscles of the waist are weak xx as they are commonly because of wrong position in sitting,--a person sits down on a chair, lies down on the back of the chair so. This shows how a person should sit up properly in a Sanitarium chair. That shows the wrong position in standing and the correct position. This shows how to get up straight,--heels, hips, shoulders, and head against the wall. Then keeping the heels and hips against the wall, bending the head backward until the shoulders are lifted from the wall; then bringing down

the chin, and you have the shoulders in perfect, correct position; then walk away with the proper carriage with the head poised directly over the balls of the feet. Here you see the head is over the heels. The head should be over the heels so, so that when you are standing here in the proper position, you can go straight up on your toes without swaying forward; whereas if you stand in the ordinary way with the hips forward and the chest behind instead of in front where it ought to be, when you undertake to rise, you have to go forward in order to get up; but if you stand with proper poise, you can go straight up without swaying forward at all. By means of various exercises, various groups of muscles which may be weak, as shown by the coefficients, can be strengthened.

Here is a little glimpse of the outdoor gymnasium, so you see what is going on here in summer-time. Exercising in the gymnasium indoors in winter-time takes the place of this. Here is a running exercise as we had it last summer one day when we counted 141 men at one time in the outdoor gymnasium. Next summer we are going to have a special outdoor gymnasium for women, as well as this one for men; so there will be an equally good chance for the women.

Swimming is one of the most effective means of correcting physical deformities and developing the body. When a man is swimming, his head is up, and his chest well forward. A man can not swim with his chest behind, for his head would be under water, you see. He must carry his head up; then the movements of the arms, the increased breathing, the contact of the body with the cool water stimulates the heart and all vital functions, and so I really consider swimming the best of all exercises; and it is one of the very best means of raising the opsonic index and increasing the general efficiency of the body.

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Neuro Ex. 48

VITAL COEFFICIENTS.

The results of the examination are carefully worked out into coefficients which indicate the percentage variation from the normal standard. That is, normal being 1.00, half normal will be .50 and double normal, 2.00. The following are the more important of the various coefficients determined in each case(with the exception of those pertaining to the stomach which are determined only when a special gastric examination is indicated as necessary.)

Corps

Vital Coefficients.

BLOOD.

1. Hemoglobin
2. Color index
3. Red cells
4. White cells
5. Alkalinity
6. Coagulability
7. Specific Gravity
8. Lymphocytosis
9. Myelocytosis
10. Polymorphonuclear leucocytosis
11. Eosinophilia

Blood-Pressure.

12. ~~11.~~ Systolic
13. ~~12.~~ Diastolic
14. ~~13.~~ Mean
15. Cardiac endurance

Opsonins

16. ~~15.~~ Tuberculosis
17. 16. Pneumonia
18. ~~17.~~ Typhoid
19. ~~18.~~ Colon
20. ~~19.~~ Streptococcus
21. ~~20.~~ Staphylococcus
22. Diphtheria
23. La Grippe.

DIGESTION.

Salivary

1. Amount
2. Quality

Gastric

3. Solution
4. Motility
5. Carbohydrate digestion
6. Proteid
7. Pepsin
8. Rennet
9. Hyperchlorhydria
10. Hypochlorhydria

Fecal (here)

Brain ?

NERVES

1. Reaction time
2. Psychic
3. Vasomotor
4. Pain recognition
5. Tactile recognition
6. Thermic recognition—hot
7. " " cold

URINE.

1. Acidity
2. Urea
3. Uric Acid
4. Creatinin
5. Purins
6. Total nitrogen
7. Nitrogen-urea
8. Chlorides
9. Phosphates
10. Renal efficiency
11. Hepatic efficiency
12. Bilirubin
13. ~~Uro-toxic~~ coefficient
14. Bouchard's

PHYSICAL

1. Height-strength
2. Height-weight
3. Respiratory-height
4. Legs-height — strength
5. Arms-height — strength
6. Waist-height — strength
7. Legs-weight

PHYSICAL (Cont.)

8. Arms-weight
9. Diaphragm-height
10. Endurance

FECAL

1. Bacteriological
2. Fat
3. Carbohydrate
4. Proteid

8. Weight
9. Location
10. Pressure

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LECTURE 5.--"Vital Force."

Apparent antagonism of force.

The plant lifts itself up in opposition to gravity.

The vine twines itself about the stalk.

The mushroom lifts a heavy weight overlying it.

Growing roots of trees raise ridges in the sidewalks. --Wedge their way into growing rocks and split them.

Still more apparent in animals.

Boy jumps--lifts himself and kicks the other way--climbs a pole.

Men harness up forces and compell them to assist him in this antagonism.

By the aid of heat or electricity man travels over the earth a mile a minute.

By the aid of other forces travels in a balloon.

Man and the lower animals maintain a heat above the surroundings.

Shown bt temperature--also illustrated by thermo-calorimeter.

Show electrical current between whole and cut surface of an apple or a potato with galvanometer.

(Look up notes of method of making a non-polarizable electrode. May have some on hand.

What is vital force?

The kernel of corn gathers a force with the material which is collected in growth. --Does not make force.

Vital force is only one manifstation of the great fundamental force of nature.

What is force?

Scripture argument.

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ORIGINAL ARTICLES

COLON DISEASE: ITS ETIOLOGY, PATHOLOGY, DIAGNOSIS, AND TREATMENT.*

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METCHNIKOFF, the eminent French scientist, whose marvelous discoveries at the Pasteur Institute, Paris, have given him a world-wide reputation, in his recent fascinating book, "The Nature of Man," calls attention to the fact that putrefactive processes taking place in the colon are, without doubt, the immediate cause of those degenerative changes which constitute senility, or old age, and which terminate in arteriosclerosis—the hardening and shrinking of the arteries, and the various disorders and pathological states which grow out of the failure of nutrition naturally resulting from the cutting off of the blood supply. Old age, in the opinion of Metchnikoff, is really a germ disorder since the characteristic features of this most universal of human maladies, which even the strongest and most resistant can not escape, are due to the deteriorating influence of the special poisons or toxins produced by the colon bacillus—a germ which is found present in the colons of all mammals.

Strasburger has shown (*Zeitschrift für Klinische Medicin*, 1902) that microbes increase in the human intestine at the rate of one hundred and twenty-eight trillions (128,000,000,000,000) every twenty-four hours. These microbes are found almost wholly in the colon. The contents of the small intestine are so nearly sterile that gunshot wounds involving the small intestine often give little trouble, whereas wounds which penetrate the colon are almost certain to prove fatal without operative interference, since the microbes, finding their way into the peritoneal cavity, develop with prodigious rapidity, producing toxins which are quickly absorbed, and overwhelm the organism.

So long as this swarming multitude of microbes is confined to the alimentary canal, their mischievous work, though carried on steadily, is so insidious and inconspicuous that it is quite likely to escape observation. Recent studies of Adami have shown, however, that multitudes of bacteria are constantly finding their way into the blood, which, being carried to the liver, are destroyed by this organ, or eliminated in the bile, and thus returned to the intestine. If, from any cause, however, the flow of bile is interrupted, the bacteria readily colonize in the gall-bladder, giving rise to cholecystitis and gall-stones.

A peasant woman of Varsovie, as the result of an abscess in the lower right portion of the abdominal cavity, suffered from a fistula which communicated with the small intestine near the colon. The fistula was so large that the entire intestinal contents passed out through it, thus retiring from activity the colon and rectum. After the patient had lived in this condition for thirty-five years, during which time she enjoyed perfect health — gave birth to three children and worked hard continuously — she was examined by a surgeon who undertook to close the fistula and reestablish the normal connection. The surgeon was greatly surprised, however, to find on opening the abdomen that the colon was so completely atrophied that it could no longer serve its natural purpose, and so was obliged to close the wound, leaving the patient in the condition in which he found her. The woman continued in good health for years after. This fact shows very clearly that the colon is not

* Read at the fourth annual session of the International Medical Alliance, Dec. 18-21, 1906.

essential to life or health. In a number of cases which have occurred in recent times, surgeons have shown the same fact by removing a large portion of the colon in cancer and other grave diseases.

Dr. Arbuthnot Lane, an eminent English surgeon, recently proposed an operation whereby the small intestine is detached from its connection with the cecum, and connected with the sigmoid flexure of the colon, thus cutting out the entire colon. He has performed this operation in many cases, and claims to have attained excellent results, not only relieving the constipation from which the patient had previously suffered, but restoring the general health which had been greatly impaired by the constant absorption of the poisons produced by the putrefaction of fragments of undigested food remaining for days or weeks in the dilated colon.

The large intestine is a sort of cesspool for the alimentary canal. Here accumulate the wastes of the digestive processes — fragments of undigested flesh foods, and other dead cells cast off by the mucous membrane, and the residues of the digestive fluids and other secretions. In the colon these waste matters stagnate for a sufficient length of time to permit the setting up of active putrefaction with the formation of enormous quantities of toxins.

The alimentary canal of man seems to be a favorite seat for malignant growths. According to Ewald, out of more than eleven hundred cases of cancer of the intestinal canal observed in the Prussian hospitals in 1895 and 1896, 89%, or nearly nine-tenths, were cases of cancer of the large intestine, chiefly the cecum and the rectum. Out of 10,500 cases of cancer affecting the digestive tract as a whole, in the same period, more than 40% were located in the stomach. It thus appears that of cancers affecting the alimentary canal, 40% are found in the stomach, 54% in the intestine, and only 6% in the small intestine.

This stagnation of the contents of the stomach and the colon, with the resulting putrefaction, is without doubt the principal cause of the deterioration of the tissues of these organs which give rise to the lowered resistance necessary to render these parts especially susceptible to cancerous disease.

Recent observations have shown that in quite a large proportion of cases, perhaps in the majority of cases, cancer of the stomach is developed upon a preceding ulcer. This is particularly true of cancer of the pylorus. The ulcer produces a cicatrix, the cicatrix produces more or less obstruction and retention of the gastric contents. This leads to putrefaction and lowered resistance, and the development of cancerous disease naturally follows.

These facts seem to indicate that man would be far better off without a colon than to keep his colon and treat it so badly as he does. It has been suggested by Metchnikoff that the operation for the removal of the appendix might be well extended to a large part of the colon, and that by the abbreviation of this too capacious organ, the process of putrefaction may be limited so there will be less opportunity for the accumulation of decomposable matter. It is not at all likely that this operation will become popular, although the risk attending the operation is not nearly so great as might be inferred from its magnitude. The colon is a part of the anatomy of the human body, and is likely to remain such. The proper thing, then, is to reform the diet rather than to remove the colon.

As Metchnikoff has well pointed out, the evils which arise from a capacious colon filled with putrefactive food residues may be remedied by restricting the diet to foodstuffs which do not readily undergo decomposition. The natural food of man being fruits, grains, and nuts, there can be no risk in doing this. The flesh of animals is especially prone to putrefaction, and when this enters largely into the food, the fragments of undigested meat retained in the cecum and other roomy portions of the colon encourage putrefaction and absorption into the blood of great quantities of toxic matters, which, as Metchnikoff has shown, set up degenerative changes of an extremely fatal character.

Metchnikoff has very well suggested that man might learn a lesson from the monkey in the care exercised in relation to the eating of food. When a morsel of food is offered to a monkey, he examines it minutely, looks at it, smells it, carefully cleans it by wiping it with his hand, tastes it, and very often throws it away even when he is hungry. The average man eats what is set before him, raising no questions for conscience' sake, or stomach's sake. The result is, man is subject to a host of maladies to which the monkey is a stranger.

The supposition that microbes are a necessary aid to digestion or that they serve any other useful purpose in the economy of the body, has been clearly proved. Pasteur, purely on *a priori* grounds, suggested that the digestive work of bacteria might be useful or even essential to human nutrition. It is well enough known that the intestinal contents of new-born infants, as well as of new-born animals of any species, are entirely free from bacteria. Travelers in the Arctic regions have recently called attention to the fact that the colons of adult animals, as well as their young, are in that snow-covered region also free from colon bacilli; but, under ordinary circumstances, within a few days after birth, the fecal matters of warm-blooded animals of all sorts are found to be swarming with colon bacilli and bacteria of various sorts.

Nuttall and Thierfelder have proved that the presence of bacteria in the colon is due to infection; that they are entirely unnecessary to the life of a warm-blooded animal. They placed guinea-pigs brought into the world by Cæsarian section, under aseptic conditions and thus kept their alimentary canals and their tissues absolutely sterile; and the little creatures developed well, showing that bacteria are unnecessary to the nutrition of warm-blooded animals, however essential they may be to tadpoles or other creatures belonging to the lower orders of life.

That the habits and conditions of life connected with our modern civilization are in a high degree productive of disease is clearly evidenced by the alarming increase of chronic disorders of various sorts. The statistics collected by the United States Census Bureau give unmistakable evidence that chronic disorders of a most intractable character are increasing at a rate so rapid that a marked increase is noticeable in so short a period as ten years. For example, the death rate from cancer for 1890 was forty-seven in every 100,000. In ten years the rate increased to sixty. The annual death rate from apoplexy in 1890 was forty-nine; in 1900, sixty-six. Diabetes increased from five to nine, and kidney diseases from fifty-nine to eighty-three during the same period. These figures show an enormous increase in four of the most formidable and incurable maladies. They show an increase for cancer of twenty-eight per cent; apoplexy, thirty-five per cent; diseases of the kidneys, forty-one per cent; diabetes, eighty per cent.

When we remember that this increase has occurred in ten years, the fact acquires great significance. Such an increase within two or three centuries would be ample cause for apprehension; but an increase in five fatal maladies on an average of about forty per cent, occurring within ten years is truly appalling. If these disorders continue to increase at the same rate, in twenty years more the number of deaths from cancer will be doubled; from apoplexy, the increased fatality will be two and one-third times increased; kidney disorders will kill three times as many as in 1890, and diabetes six times as many.

At the same rate, in fifty years cancer will kill three and one-half times as many as at the present time; apoplexy four and one-half times as many; diabetes, nineteen times as many; kidney diseases, five and one-third times as many. The total death rate from these four diseases will then be more than eleven thousand, which is equal to the total death rate at the present time in many healthful localities.

According to Dr. Wines, there has been an enormous increase in the proportion of insane persons in the United States within the last fifty years. In

the forty years between 1850 and 1890, the number of insane per million increased, according to Wines, from 673 to 1,700; and the number of idiots and imbeciles increased during the same period from 681 to 1,527 per million. This indicates an increase in insanity and imbecility of 300 per cent in fifty years. In England the proportion of insane per million increased, between 1862 and 1891, from 1,810 to 3,070, from which it appears that this enormous increase in brain degeneration is not confined to this country alone.

Insanity is not simply a disease of the mind, as it was once regarded; but is the result of morbid physical states—a fact well known to Hippocrates and his followers for centuries before the Christian era, but lost sight of during the dark ages when reason slept and superstition reigned.

As regards the increase of insanity, which is only one of the indications of a rapid race deterioration, here are a few facts gathered from different reliable sources: In England at the present time the number of insane is 3 to the thousand. Thirty years ago, the proportion was 1.8 to the thousand. In Ireland, the proportion is greater, or about 3.6 to the thousand; while on the Isle of Man, the proportion reaches 3.7. In Scotland the proportion of insane to the sane at the present time is 1 to every 337, or nearly three to the thousand. Twenty years ago the proportion was 1 to 448, or 2.2 to the thousand. In Schleswig-Holstein the number of insane has suddenly increased during the last century, as shown by the fact that in 1803 the proportion was 1.1 to the thousand, while in 1840 the proportion was increased to 2.8, and in 1880 to 3.4. According to Theo. Kirchoff in his "Handbook of Insanity," published in 1893, the increasing prevalence of insanity is an undoubted fact, and five insane to the thousand inhabitants is "probably below the truth," there being a large number of persons at large suffering from insanity, but of such a type that we do not deem it necessary to confine them in asylums.

An increase of ten per cent in the proportion of degenerates within a period of fifty years, or even a century, would be an appalling fact, as it would clearly indicate a tendency toward race degeneration; but an increase of three hundred per cent in fifty years in one of the most hopeless forms of physical deterioration is a stupendous fact which should arrest the attention of every thinking man. A ten-per-cent increase of defectives in fifty years, starting with ten defectives in a thousand, would mean that in less than four thousand years the whole population would become defective, even if there were no increase in the rate of downward progress, though race degeneration, like the velocity of a falling body, continually accelerates.

When we consider that instead of ten defectives per thousand we are dealing with a much greater number, and that these defectives are increasing at a rate of more than forty per cent every ten years, there is left no room to doubt that race degeneracy is carrying us down at a rate so rapid that the evidences of deterioration must shortly become even more apparent than they are at the present time. The causes of this race-destroying process are so many and so complicated that it is not possible to imagine that any one man from his single point of observation can even enumerate them, much less undertake to assign to each one its just value as a factor in the destructive process. But the publication of Bouchard's great work, "Les Autointoxications," has placed in the possession of all medical men who keep themselves abreast with the advancing line of progress facts which show with unmistakable clearness the prominent rôle played by autointoxication in the production of chronic diseases and degeneracy. Metchnikoff has clearly shown that the putrefactive processes taking place in the colon and the toxins produced by the colon bacillus are the prime source of the poisonous matters which give rise to chronic autointoxication, and the dire consequences which follow this condition.

Colon disease of one form or another has come to be so common it may be

regarded as an almost universal malady among civilized people. Evidence of this is to be seen in the enormous quantities of laxative drugs, all of which are guaranteed to cure constipation, but which only aggravate the malady, each bringing the patient into a condition which renders necessary the use of some more drastic drugs, or some more powerful excitant, which, in turn, a little later gives place to a new drug or combination of drugs. The final result of this perpetual drugging is atony of the colon, infection of the deeper structures of the mucous membrane, giving rise to catarrh, ulceration, hemorrhoids, fistula, and other local miseries.

But the worst mischiefs are those which develop in the body in general as a result of the constant absorption into the body of germs and germ poisons, the consequences of which we shall consider a little later.

The worst cases of colon disease are to be found among persons of sedentary habits, business and professional men, lawyers, financiers, especially judges, teachers, physicians, clergymen — the classes which suffer most among men. Women are well-nigh universal sufferers, especially in this country. Their indoor lives and sitting occupations subject them to the evil consequences of inactivity. Among the most serious results of an inactive life is the weakening of the muscles of the trunk whereby the normal support of the abdominal viscera is lost and intra-abdominal pressure is lessened.

In order to fully appreciate the effects of loss of tone in the abdominal muscles, and consequent relaxation of the abdominal wall, one must bear in mind a few facts:

1. The large viscera which occupy the upper part of the trunk—the liver, stomach, spleen, pancreas, kidneys, and transverse colon — are moored in their various locations by thin folds of membrane consisting of a very slight fibrous structure reenforced by a few muscular fibers, with an arrangement of networks of blood-vessels and nerves. These mooring ligaments are wholly inadequate to hold the viscera in their places for any considerable length of time. They are not, in fact, supports, in the proper sense of the word; they are only mooring ropes. The real support of the viscera whereby they are held in their normal places is to be found in the muscular and tendinous structures of the abdomen. When the abdominal muscles are well developed and have sufficient tone, they maintain a sufficient degree of intra-abdominal pressure, not only to hold each organ in its proper place, but to support the walls of the enormous vessels which convey blood to the various visceral laboratories which occupy the greater portion of the trunk.

2. The veins as well as the arteries of the abdomen possess muscular and contractile walls. These walls are controlled by the vasomotor system; but without the support of tense abdominal muscles these vessels readily become greatly distended with blood from the overrelaxation of their walls, from the tiring out of the muscular fibers.

3. Through common nerve-centers, a reflex relationship exists between the abdominal vessels and the muscular walls of the abdomen such that when it is necessary that the caliber of the vessels should be diminished, there is not only contraction of their walls, but also of the abdominal muscles, so that there is an increase both of vascular tension and of intra-abdominal tension. The great splanchnic nerve practically controls this action and thereby becomes the real controller of the circulation of the blood. This fact will become apparent when it is recalled that the portal circulation is capable of holding all the blood in the body. That is, if the portal vein is tied close to the liver, all the blood in the body will accumulate in the portal system; in other words, the patient may be bled to death into his own abdomen, and without the escape of a single drop of blood from the blood-vessels. This is a laboratory experiment which has often been performed upon animals.

Relaxation of the abdominal muscles, then, necessarily involves the dilatation of the abdominal vessels and passive congestion of all the organs of the abdomen. Stasis of blood is necessarily fol-

lowed by lowered vital resistance and degradation of structure through the excessive development of fibrous tissue and disturbed metabolism.

Congestion of the stomach, liver, or bowels seriously disturbs the functional activity of the organ involved, while at the same time exposing it to permanent damage through the infection of microbes, which continually swarm in the alimentary canal,—pathological bacteria which are capable of setting up disease processes of various sorts — ulceration, abscess, chronic catarrh, inflammation, cirrhosis, etc. The lowered resistance of the parts encourages the growth of bacteria in the interior of the intestine, and, as a result, there is an excessive formation of toxins. The absorption of these into the blood, as shown by Boix, leads to cirrhosis of the liver, spleen, and other organs, as well as deteriorative changes in the blood-vessels. The person whose stomach, colon, or other viscus is prolapsed, is necessarily ill, not simply because of the prolapse, but because of the condition of muscular relaxation which permits the prolapse, and at the same time gives rise to universal passive congestion of the abdominal organs.

In women, constriction of the waist, the wearing of heavy skirts suspended by bands, and especially the habit of relaxed sitting encouraged by the rocking-chair and sofa, and the general bad construction of chairs, enormously exaggerate the evils which arise from a sedentary life. Almost every civilized woman who has attained maturity is suffering more or less from disorders arising from portal congestion. Hemorrhoids, constipation, colon catarrh, and a large share of the pelvic troubles with which women suffer, may be traced directly to this cause. Errors in diet operate chiefly in a secondary manner.

The relaxed condition of the abdominal muscles compels excessive distention of the colon and other hollow viscera. This is the method which the body adopts as a means of protection against the danger from excessive accumulation of blood in the abdominal vessels. Without this protective action, the amount of blood accumulating in the abdomen through dilatation of the vessels might be sufficient to produce death; but, by the distention of the stomach and intestines with gas, the normal intra-abdominal pressure is, to a considerable degree, reestablished, so that the gravest consequences are not immediately experienced.

Thousands of women, and men also, with weak, pendulous abdomens, suffer greatly, however, when they are on their feet, through the accumulation of blood in the abdomen whereby the blood supply of the brain, spinal cord, and other vital parts outside of the abdominal cavity is notably diminished, so that these parts lose the vital stimulus which is normally imparted by the blood, and to a large degree lose their activity and efficiency. It is not an uncommon thing to hear patients complain in the examining room of a giddiness, faintness, and weakness which appears whenever they arise to their feet, but from which they are entirely relieved while in a horizontal position. Such patients are quite promptly temporarily relieved by the application of an abdominal supporter, which, by pressure upon the lower abdomen, restores the intra-abdominal tension, thus affording their vessels proper support, so that the surplus blood with which they have been distended is forced back into the general circulation, affording relief to the brain, spinal cord, and other parts which have been previously robbed of their normal blood supply Such patients often complain of dullness, drowsiness, confusion of thought, and inability to concentrate the mind. These symptoms usually occur soon after eating, and are the result of the distention of the vessels of the splanchnic area.

Some years ago, in a patient from whom I had removed a large ovarian tumor, I observed a couple of days after the operation that the abdomen was nearly as large as before the operation. The patient upbraided me very vigorously for having deceived her, believing from her size that the tumor was still present and that no operation had been performed. The intestines had become so enormously distended that they filled the space which had previously been occupied by

the tumor. I have since learned to obviate this difficulty by placing under the bandage in such cases a rubber bag of sufficient size to hold three or four quarts. As soon as the dressing is applied after the operation, this bag is distended with air, or, if the case requires, with hot water. By varying the amount of air or water in the bag, the amount of pressure applied to the abdominal contents may be regulated to a nicety.

In a recent case I had a good opportunity to observe the influence of intra-abdominal tension upon general blood-pressure. In a patient with a very feeble heart, upon whom I had operated for the removal of an enormous sarcoma, the blood-pressure, which was low before the operation, was found to be too low to be estimated. The pulse was 140; the patient had a corpse-like appearance. As soon as the rubber bag, arranged as above described, was inflated, the blood-pressure gradually arose, and when the bag was fully distended, reached 11.5 centimeters, 3 centimeters above that shown before the operation. When the air was let out of the bag, the blood-pressure fell so low that it could not be measured. When the abdominal pressure was again applied by inflating the bag, the blood-pressure at once arose, and by maintaining the pressure the patient did well. In this case, as soon as the patient was placed in bed, hot water was substituted for air for inflating the bag.

Dilatation of the stomach, intestines, and especially of the colon, is a necessary consequence of relaxation of the abdominal muscles. Dilatation of the colon increases its length as well as its transverse diameter. The expansive force, operating from within, stretches it in all directions. The colon is fixed at certain points, free at other points. The most important of the fixed points are the ascending and descending colon, the hepatic flexure, the splenic flexure, and the ileum. The parts which are usually movable are the lower part of the cecum with the appendix, the transverse colon, and the sigmoid. The transverse colon is especially free to move through a considerable area. This part of the colon lies normally above a line connecting the lowermost ribs. The under side of the colon should fall at least an inch or two above the level of the umbilicus. In performing laparotomies, I have frequently found the transverse colon folded upon itself and lying upon the floor of the pelvis. It is a very common thing indeed to find the transverse colon lying close to the bladder. The sigmoid, which normally occupies the right iliac region, as the colon lengthens is pushed down into the pelvis, and may also reach the floor of the pelvis, encroaching upon the rectum and other structures which normally occupy this region. The sigmoid having a mesentery, may likewise become considerably dilated, and become so distended and stretched as to fill the lower abdomen and crowd over nearly to the right iliac region. The ascending colon naturally loses its power to contract. The muscular structures, which are an efficient means of moving the contents of the colon along from point to point, and at proper intervals completely emptying the colon, become atrophied by prolonged stretching to such a degree that they are no longer able to grasp and control the intestinal contents. The cecum, the transverse colon, and sometimes the sigmoid, become veritable cesspools in which food residues and other accumulating matter remain sometimes for weeks, undergoing putrefactive processes, the loathsome character of which is conspicuously in evidence when one examines the black, tarry, ragged, loathsome stools of such patients. Bacteriological examination made of the fecal matters in such cases frequently discloses the fact that more than half the entire mass is made up of ~~living, active~~, toxin-forming bacteria.

(*To be continued.*)

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ORIGINAL ARTICLES

COLON DISEASE: ITS ETIOLOGY, PATHOLOGY, DIAGNOSIS, AND TREATMENT.*

(Concluded)

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The weight of these accumulating, decomposing foodstuffs in such pendent parts as the cecum and transverse colon gives rise to further distortion and displacement. The cecum, by weight of the accumulating masses which it has lost the power to force around the hepatic flexure into the transverse colon, is, by the abnormal weight acting upon weakened structures, lengthened more and more, until this organ occupies almost the entire pelvis, giving rise to distressing symptoms which are often a puzzle to both patient and physician. Lane calls attention to the fact that such patients often suffer from a constant desire to relieve the bowels even though the rectum and descending colon have been thoroughly emptied by an enema. The patient says, "There seems to be an obstruction in the way which no amount of straining will overcome," yet an ordinary examination shows nothing abnormal.

The sigmoid flexure becomes filled with inspissated fecal masses which cling to the walls of the intestine so that during straining the bowel may be forced down to such a degree as to actually obstruct the rectum.

All the time these retained masses of decomposable foodstuffs, and especially such proteid substances as meat, eggs, undigested curds, fragments of cheese, etc., are undergoing changes whereby toxins and various harmful matters are produced. Excess of proteids is especially harmful because they support the growth of pathogenic and putrefactive bacteria, which give rise to toxins of a most deadly character. Undigested carbohydrates in fermenting produce carbonic acid gas, which, by distending the bowel, still further increases the mischiefs which have already been wrought by other causes. Thus a vicious circle is formed which continually leads the patient from one miserable state to a worse one.

The accompanying cuts (Figs. 1 to 8) show some actual conditions which are found to represent not exceptional cases, but ordinary, every-day cases which may be found in the consulting room of any physician who deals largely with chronic disorders.

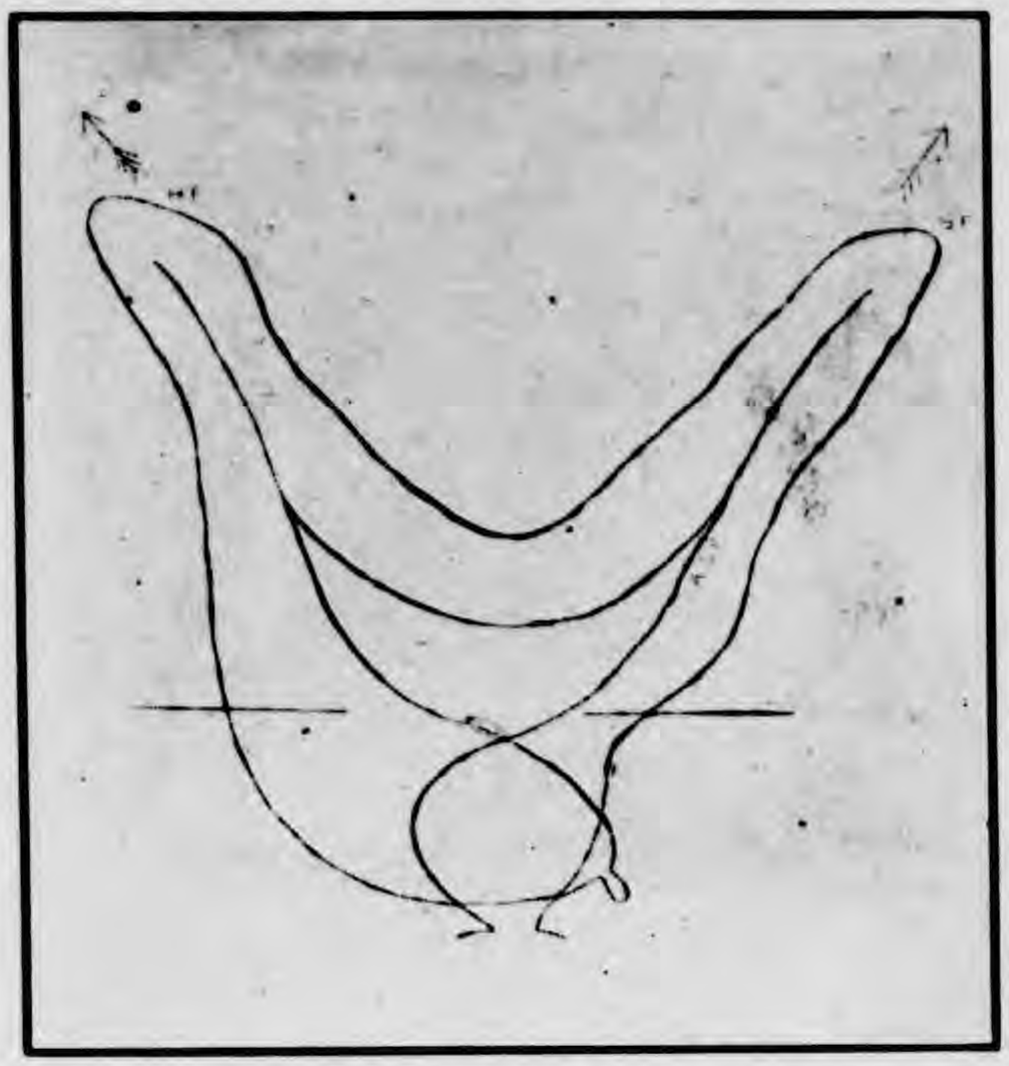

FIG. 1.—Diagram of Elongated, Dilated and Prolapsed Colon (Lane).

Careful examination of the abdomen in all cases of constipation, chronic dyspepsia, gall-bladder diseases, pulmonary tuberculosis, neurasthenia, melancholia, hysteria, hypochondria, hepatic cirrhosis, hemorrhoids, chronic nervous mala-

* Read at the fourth annual session of the International Medical Alliance, Dec. 18-21, 1906.

dies of every sort, and, in fact, almost any form of chronic disease, will disclose some of the conditions which are here pictured. Fig. 1 is a diagram borrowed from Arbuthnot Lane's masterly paper on the "Operative Treatment of Chronic Constipation," to which I shall refer later. Figs. 2 and 3 are from photographs sent the writer by Professor Meinert, of Dresden, Germany. Figs. 4, 5, and 6 represent types which have been selected from hundreds of cases personally observed. These illustrations do not in the slightest degree exaggerate the conditions found present. It is impossible to represent upon paper the graphic picture which one encounters in the examining or the operating room,

FIG. 2.—Prolapsed Transverse Colon (Meinert).

of intestinal deformity, distortion, and disablement, the result of wrong habits of life.

Neglect to attend regularly to the evacuation of the bowels greatly encourages the development of the mischiefs described. The sitting posture in the evacuation of the bowels is perhaps conducive to distension of the cecum;

FIG. 3.—Dilated Stomach and Prolapsed Colon (Meinert).

as the upright position, with the muscles working at a disadvantage, naturally forces the cecum downward, whereas the squatting position, whereby the abdominal walls are compressed by the thighs, lifts the cecum up and compresses it, and thus greatly aids in the complete evacuation of the colon. It is only among the more highly civilized classes that this cause is in operation. Among the peasantry of all countries, the squatting position in defecation is commonly employed, and even in Continental cities like Paris, one finds in common houses and the smaller hotels toilet conveniences which consist simply of a hole in the floor communicating with a straight pipe leading to a receptacle in the basement, necessitating the squatting position in defecation. In most Oriental countries the custom of squatting in urinating as well as in defecation is prevalent.

The construction of the modern toilet thus no doubt tends to produce constipation by diminishing the efficiency of the act of defecation, while at the same time producing serious deformity of the colon itself, which becomes an additional

cause of constipation. The tarry, putty-like feces cling to the walls of the dilated, prolapsed cecum with such tenacity that it becomes almost impossible to dislodge them, often requiring many attempts with soap and water used in large quantity by enema. The writer has often met cases in which hardened masses accumulated in such a cecal cesspool were dislodged only after two or three weeks of daily flushing of the colon. In these cases the enema often fails to completely empty the colon. A laxative will often bring away great quantities of black, foul-smelling fecal matters having a most ancient appearance, even after the most thorough attempts have been made to cleanse the colon with enemas or coloclyster.

As before remarked, many of the most common of the pelvic disorders of women may be directly traced to re-

FIG. 4.—Prolapsed Transverse Colon with Elongation of the Sigmoid.

tention of putrefying food residues in the colon. The overdistended sigmoid, and in some cases the prolapsed transverse colon resting upon the uterus, force it downward and backward until it lies against the rectum, still further increasing the intestinal stagnation. Absorption of toxins from the colon, as Lane has shown, disturbs metabolism, causing absorption of abdominal fat, with weakening and relaxation of the abdominal muscles and the normal internal supports of the abdominal and pelvic viscera. In the general prolapse the lower portion of the sigmoid often falls down into the rectum, producing a valve-like obstruction, which not infrequently is only with the greatest difficulty overcome. General venous stasis after a time produces wide-spread infection. The resistance of the epithelial cells of the colon being lessened by long exposure to toxins, the bacteria penetrate more and more deeply into the structure of the mucous membrane. The glands become involved and chronic intestinal catarrh results. In like manner arise catarrhal conditions of the vagina, uterus, and Fallopian tubes.

The Curative Treatment of Colon Disease

This class of cases has largely baffled the ingenuity and skill of both surgeons and physicians for the reason that the real character of the difficulties to be dealt with has not been fully recognized. Laxatives of various sorts afford temporary relief, but are never curative, and, in the end, aggravate the difficulty. What is true of other laxatives is equally true of laxative mineral waters, the daily use of which has come to be fully recognized as a prolific cause of gastric disorders and intestinal disease.

Various observers have noted the fact that the number of bacilli present in the stools is greater after a saline laxative than before, while the fluid character of the stools greatly facilitates the absorption of the toxins which are formed by this swarming multitude of microbes. The significance of this fact is so great that Kocher, the most eminent of living surgeons, has called attention to it in his recent work on surgery, and insists that no important operation should be performed within two days after the bowels have been moved by a saline laxative.

Laxative mineral waters act by virtue of the saline substances which they hold in solution, and hence when used habitually, must be a means of increasing rather than diminishing the chronic

autointoxication which they are supposed to remove.

The great increase of bacteria produced by these saline laxatives, and the

FIG. 5. — Dilated Cecum and Prolapsed Transverse Colon.

congestion and irritation of the mucous membrane which they occasion, lead to infection of the deeper structures of the intestinal wall by the colon bacillus and other bacteria. The glands become infected, and the result is mucous enteritis, intestinal catarrh, and ulceration of the colon which may affect any part of it. The rectum particularly suffers. The result is leucorrhea of the rectum, fistulæ, abscesses, fissures of the anus, and other miseries of like character. It is then apparent that laxatives of all sorts must be ruled out of the question when we are seeking to formulate a truly curative method.

The application of rational therapeutics always requires a careful study of the causes which have been active or which are at present in operation. This involves in cases of this sort a very careful examination. It may be in place to give here somewhat in detail the writer's method of investigating these cases, covering points to which special attention is given.

The coated tongue, foul breath, lacerated gums, and decaying and discolored teeth often present in these cases are evidences of the lowered vital resistance which has deteriorated the blood and thus lessened the germicidal power of the saliva, encouraging the growth of germs in the mouth, and, in consequence, an abundant crop of bacterial flora upon the tongue, and disintegration of the teeth. Pimples upon the face and other parts of the body, skin disease, pigmentation, so-called liver spots, dark bands under the eyes, puffiness of the lower eyelids, a dingy, sclerotic, brownish, tawny, or icteric appearance of the skin, with emaciation, are all evidences of chronic autointoxication, the chief cause of which is the absorption of poisonous substances from decomposing food residues in a dilated colon.

Careful inspection, not only of the abdomen, but of the whole body, is essential in these cases. The patient should be inspected in the sitting, standing and lying positions, and the shape of the abdomen noted. Note also in both the standing and the sitting positions the shape of the abdomen. A straight back with bulging lower abdomen is an invariable sign of a prolapsed colon and

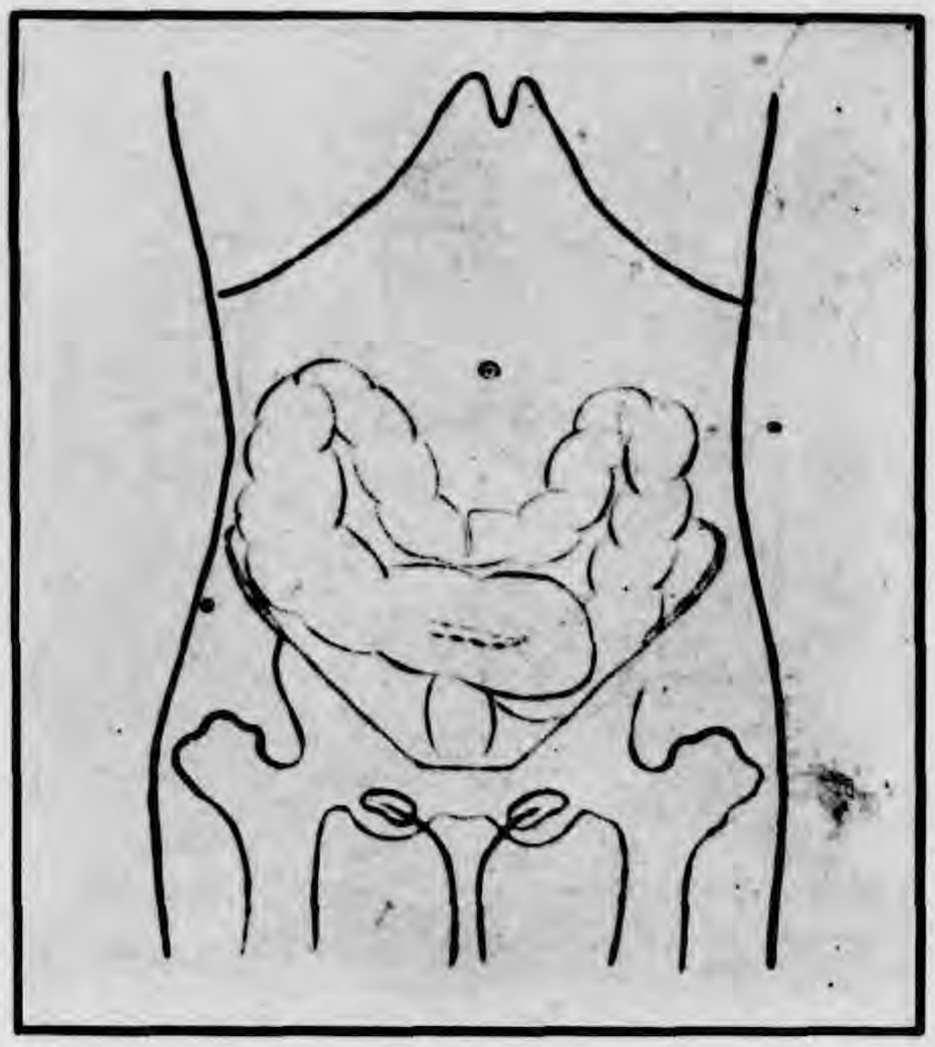

FIG. 6. — Prolapsed Transverse Colon and Dilated Cecum.

general enteroptosis. This is what one commonly meets in sedentary men, and most women over twenty-five years of

age — the result of a wrong mode of dress. Note the condition of the abdominal muscles. With the patient in the lying position, raising up the head will contract the abdominal muscles, and with the hands passed over them, note may be taken of their size, strength, and whether or not they are separated. In many cases the muscles will be found so weak and stringy that they are quite incapable of exercising any considerable degree of control over the abdominal contents. When the colon is prolapsed, the stomach, of course, is prolapsed with it—a fact which is due to the relations of the stomach and the colon to each other and to the great omentum. It is hence possible to locate the transverse colon quite accurately by inspection after inflating the stomach. It is only necessary to note the point at which the greater curvature of the stomach falls. The transverse colon is just below it.

Or, we may inflate the colon instead, making careful note of the changed appearance of the abdominal surface as the air is forced into the colon with an ordinary atomizer bulb. When the sigmoid is dilated, a movement of the abdominal wall may be easily seen (if the subject is not too fat), just above the pubes, with each compression of the rubber bulb. As the pumping continues, and the transverse colon becomes inflated, its position may ordinarily be very readily outlined. As the amount of air still further increases, the dilatation of the cecum may be observed in most cases.

To verify the diagnosis, the stomach may be filled with water, and the colon with air, or vice versa; and by a careful inspection, palpation, and percussion, the location of the colon may be determined with greatest accuracy. It is seldom these last-named procedures are required, as the location of the colon by palpation and by inflation with air, or even by inspection, will give sufficient accuracy and decisive results. When the transverse colon is greatly prolapsed, the abdomen has a peculiar shape. There is a depression at the epigastrium which extends to the umbilicus or below, with an indistinct ridge running from the top of the depression toward the hepatic flexure on one side and the splenic flexure on the other side. This is due to the strong fixation of the colon at the hepatic and the splenic flexures.

Another method which may be employed for definitely locating the colon and the stomach is the introduction into the stomach or the colon of a quantity of subcarbonate of bismuth, then taking an X-ray picture of the patient. This plan works well in thin subjects.

It is well to test the strength of the abdominal muscles. This may be done in several ways. A coarse test is to have the patient, while lying upon the back, endeavor to raise the legs to the vertical position while held straight out. When the abdominal muscles are very feeble, this can not be done. Very feeble patients are not even able to raise the head more than an inch or two from the pillow. A patient who has strong abdominal muscles will be found able to raise the body to the sitting position when the feet are held. The best method is to accurately test the strength of the abdominal muscles with the dynamometer. The strength of the abdominal muscles in a healthy woman is about 75 pounds. In a strong man, the abdominal muscles have a strength of about 135 pounds (trunk anterior). Not infrequently in women whose abdominal muscles are greatly relaxed, the strength will be found reduced to 45 pounds.

The strength of the diaphragm should also be determined. Its average strength in women is 79 foot-pounds. The dynamometer is essential for this test.

In external palpation of the viscera, one places the flat of the hand upon the abdomen, either the right or left hand or both hands. The writer usually employs both hands, concentrating his attention particularly upon the tips of the fingers of the right hand, the left hand being used chiefly for support, and being specially trained for internal palpation, while the right hand is trained for external manipulations. The hand is moved along the abdomen with a slight sidewise movement so as to avoid pushing the tissues before it, and very gen-

tle pressures are made so as to avoid giving the patient pain and setting up contraction of the abdominal muscles. It is desirable that the abdominal muscles should be relaxed as much as possible. This is accomplished by placing a pillow under the head, and drawing the knees well up, placing a pillow under the knees. The feet should be supported so the knees will not be held in position by effort of the patient. As the hand sweeps gently over the entire abdomen, especially along the normal course of the colon, care is taken to note whether any masses are present which might possibly be due to fecal accumulation. The region of the cecum, transverse colon, and the sigmoid flexure are particularly studied. Deep pressure is made in the region of the cecum, especially over the appendix, McBurney's point, to discover any possible disease of this part. It should be remembered that in these cases the prolapsed cecum may carry the appendix over toward the left side. Careful pressure is made at the hepatic and splenic flexures. There is often chronic inflammation accompanied by pain, tenderness, and even obstruction at both the hepatic and the splenic flexures. In these cases the patient has often noticed pain or tenderness under the ribs on one or both sides, which is not infrequently erroneously attributed to the kidneys. Sometimes this pain is felt only when the bowels move, especially after the use of a laxative or an enema.

The hand is next moved up and down the median line with quite deep pressure for the purpose of finding the location of the transverse colon which in thin subjects can be very easily made out. The colon may be found at any point between its normal location, which is two inches above the umbilicus, and the pubes. In doing laparotomies I have several times found it still lower down. In women it is much more often found at the umbilicus, or below, than above. I have never found the transverse colon so low in a man as in some women; but it is not infrequently found in men as low as midway between the umbilicus and the pubes.

Attention is next given to the cecum which normally occupies the right iliac fossa. The cecum is often so distended that its contour can be observed upon the abdominal wall in thin subjects, and frequently extends to the pubes in the median line, and occasionally reaches clear over to left iliac fossa. Occasionally the cecum is found contracted as the result of repeated inflammations with thickening of its walls. Such cases are often mistaken for chronic appendicitis.

The position of the kidney should also be noted. The right kidney will be found either palpable, movable, or floating in nearly every case of prolapse of the transverse colon. The kidney can not be palpated when it is in the normal position. One can barely touch the lower end of the right kidney, but can not palpate it even after the patient has been made to take a full breath. Prolapse of the kidney is, in my opinion, chiefly produced by the downward dragging of the contiguous organs, especially the colon, to which it is attached by its capsule. But it is also due in considerable part to the absorption of the peritoneal fat,—one result of the absorption of colon poisons into the blood.

In the internal examination, one will note the presence of hemorrhoids, fissures, hypertrophied folds, the presence or absence of fecal matters in the rectum, dilatation of the rectum, catarrh, irritation of the rectum, spasm of the sphincter, relaxed condition of the sphincter, collapse of the rectum causing obstruction by folding of its walls.

By combined examination, one may sometimes note fecal masses in the cecum which give a doughy feeling on pressure made with one finger in the rectum, the other hand making pressure externally just above the pubes. Accumulations in the sigmoid may also be made out in the same way. The cecum and other parts of the colon may be palpated by the combined method by filling the colon with water.

Examination of the feces should be made in every case of chronic constipation or chronic intestinal catarrh. In fact, in nearly all forms of chronic diseases. Particularly in anemia, especially in pernicious anemia, this examination should never be omitted. It should also be made in exophthalmic goiter,

FIG. 7.—Case reported by W. W. Babcock, showing Exaggerated V-shaped course of the Transverse Colon.

arteriosclerosis, various forms of skin diseases, and in all cases in which there is emaciation, pigmentation of the skin, or other marks of autointoxication. When one begins giving attention to this subject, it is astonishing what a large proportion of all chronic maladies may be directly traced to the inundation of the system with poisons absorbed from

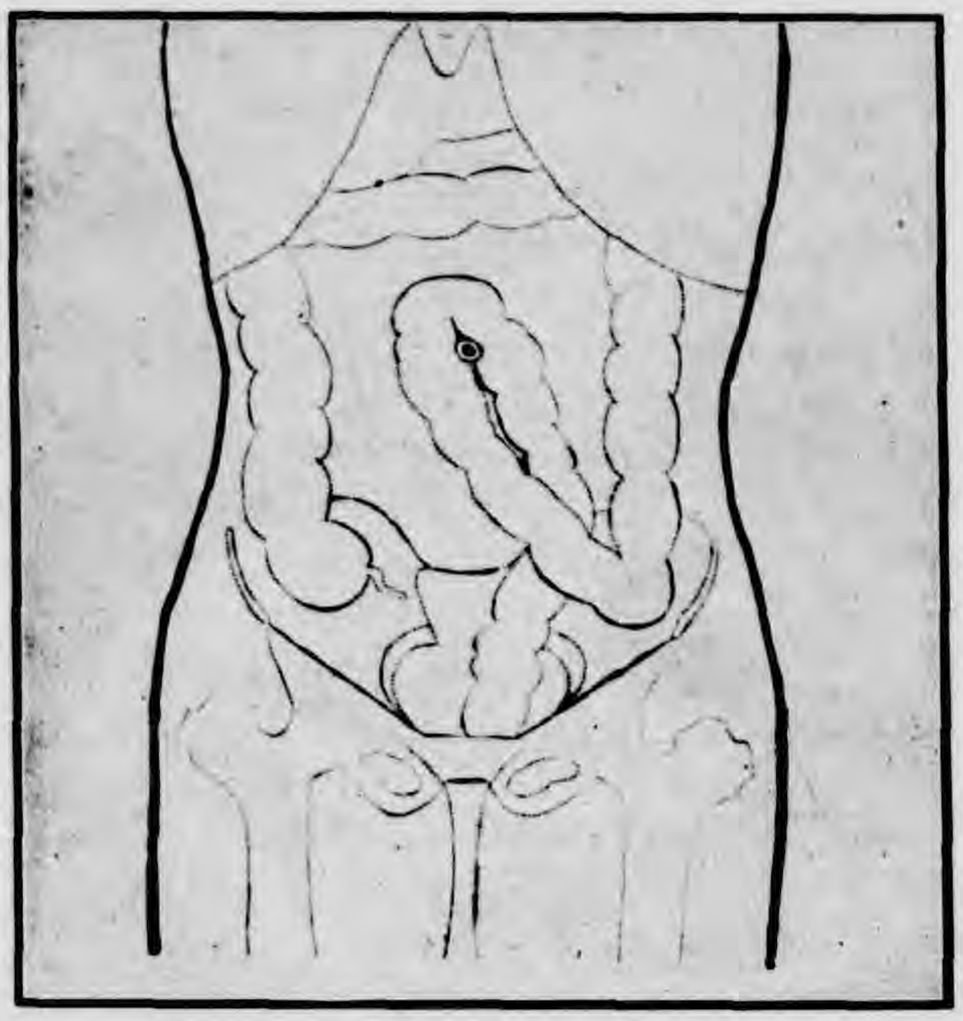

FIG. 8.—Case reported by W. W. Babcock, illustrating Exaggerated and Displaced Sigmoid Loop.

the colon. Dujardin-Beaumetz, Bouchard, Legendre, and various other eminent French authorities have been awake to this fact for more than a dozen years, and have diligently urged it upon the attention of the profession, but in this country, at least, the subject has been largely overlooked.

The following table, showing the number of bacteria found in a considerable number of cases with the diagnosis made in each case, will be found instructive in this connection:

PATIENT	DIAGNOSIS	NUMBER OF BACTERIA PER GRAM OF DRIED FECES
M. T.	Chronic constipation, pernicious anemia	640,000,000
A. C. R.	Pernicious anemia	3,648,000,000
S. S.	Pernicious anemia	1,340,000,000
M. B.	Anemia	935,000,000
D. A. S.	Pernicious anemia	1,444,500,000
S. W.	Pernicious anemia—spinal sclerosis	6,250,000,000
C. B.	Pernicious anemia (after treatment)	64,680,000
H. M. B.	Pernicious anemia	21,900,000,000
H. B.	Pernicious anemia	10,080,000,000
I. E.	Anemia (intestinal cancer)	3,200,000,000
F. W. P.	Gastric carcinoma, anemia	5,880,000,000
M. H.	Gastric ulcer, hyperhydrochloria	125,000,000
C. F.	Gastric ulcer	254,800,000
A. W.	Hyperhydrochloria (neurasthenia)	3,312,500,000
M. T.	Hyperhydrochloria (neurasthenia)	231,000,000
J. Q. F.	Hyperhydrochloria (gastric ulcer)	1,170,000,000
M. McD.	Hyperhydrochloria with chronic constipation	2,083,000,000
H. M. D.	Hyperhydrochloria (neurasthenia)	7,700,000,000
S. H.	Hyperhydrochloria	1,040,000,000
J. A.	Hyperhydrochloria	1,332,000,000
A. C.	Slight Hypohydrochloria, autointoxication	180,000,000
M. F.	Hypohydrochloria with diarrhea	250,000,000
J. R. S.	Hypohydrochloria, migraine	1,500,000,000
A. F.	Hypohydrochloria, autointoxication	3,350,000,000
R. A. R.	Hypohydrochloria, chronic constipation, and autointoxication	3,750,000,000
M. L.	Hypohydrochloria, gastroenteroptosis	2,850,000,000
E. D.	Neurasthenia, hypohydrochloria	1,200,000,000
V. H.	Hypohydrochloria, neurasthenia	6,625,000,000
H. S.	Neurasthenia, internal hemorrhoids	225,000,000
R. G. O.	Neurasthenia	160,000,000
M. W.	Neurasthenia, autointoxication	12,500,000,000
A. S.	Neurasthenia, chronic colitis	1,625,000,000
I. K.	Gastric neurasthenia	333,000,000
D. D.	Neurasthenia	2,250,000,000
L. McK.	Neurasthenia	300,000,000
A. C.	Neurasthenia, constipation	476,000,000
F. M.	Neurasthenia	356,000,000
E. L.	Neurasthenia	1,800,000,000
M. G.	Neurasthenia	8,000,000,000
A. P.	Neurasthenia, constipation, autointoxication	1,140,000,000
M. H.	Neurasthenia	1,750,000,000
L. D.	Neurasthenia	2,475,000,000
J. I. B.	Neurasthenia	240,000,000
M. A. V.	Neurasthenia, autointoxication	2,808,000,000
W. J. O.	Neurasthenia	1,650,000,000
S. F.	Chronic mucous colitis	425,000,000
K. P.	Mucous colitis	504,000,000
J. R. W.	Chronic colitis	4,598,000,000
W. J. L.	Colitis	2,450,000,000
M. W.	Chronic colitis	15,255,500,000
J. R.	Infant (6 months), diarrhea	8,000,000,000
J. MacP.	Infant, diarrhea	7,000,000,000
H. R.	Acute indigestion, diarrhea, (infant)	11,400,000,000
E. E. S.	Arterial sclerosis	1,800,000,000
C. P. F.	Arterial sclerosis	16,666,000,000
M. V.	Arterial sclerosis	883,000,000

M. L.	Mitral insufficiency, chronic enteritis	550,000,000
E. T.	Mitral insufficiency, gall-stones, malnutrition	1,083,000,000
L. F.	Chronic cholangitis	3,750,000,000
Mrs. K.	Gall-stones (before operation)	2,187,000,000
Mrs. K.	Gall-stones (three weeks after operation)	306,000,000
I. B.	Gall-stones	5,720,000,000
L. W.	Chronic cholecystitis (after weeks of treatment)	53,400,000
L. B.	Appendicitis	882,700,000
L. L.	Appendicitis	4,620,000,000
M. C.	Chronic rheumatism	2,250,000,000
X. X.	Rheumatoid arthritis	8,720,000,000
A. C.	Chronic rheumatism	1,070,000,000
M. B.	Chronic nephritis	160,000,000
E. T.	Acute nephritis	8,333,000,000
A. McC.	Chronic nephritis	675,000,000
S. M. V.	Acute nephritis, complete pyloric obstruction	961,000,000
M.D.F.P.	Typhoid fever	9,000,000,000
A. L.	Chorea	987,000,000
A. J. W.	Locomotor ataxia	2,000,000,000
M. T.	Epilepsy	2,086,000,000
H. W.	Exophthalmic goiter	6,900,000,000
J. H.	MAN OF FIFTY IN HEALTH	33,000,000
A. B.	MAN OF TWENTY IN HEALTH	25,000,000

Methods of Examination.—The accompanying blank indicates the various points which are noted in the examinations made in our laboratory under the direction of Dr. E. H. Risley. The technique of the examination made can not be given here, as it will occupy more space than is afforded by this paper.

No._____

RESEARCH LABORATORY OF THE BATTLE CREEK SANITARIUM

Examination of Feces

Patient_____

PHYSICAL

Color_____ Odor_____

Form_____

Amount_____ Grams, air dried.

Foreign Substances and Parasites_____

_____

Mucus_____

CHEMICAL

Reaction_____

Total Nitrogen_____

Ether Extract_____

Bile_____ Blood_____

Fermentation_____

BACTERIOLOGICAL

Bacteria { Anaerobes_____ Millions per gram
Aerobes_____ Millions per gram

Gram stain_____ Special_____

MICROSCOPICAL

Starch_____ Fat_____

Food Remnants_____

Mucus_____ Parasites_____

Yellow Ca. Salts_____ Phosphates_____

Fatty Acids_____ Other Crystals_____

Pus_____ Blood_____

Epithelium_____ Misc._____

_____

_____

_____ M. D. _____ 190____

We are now prepared to consider the curative treatment of colon diseases. Lane commends especially the surgical method of dealing with these cases. He finds in many cases obstruction at the hepatic and splenic flexures due to adhesions set up by irritation resulting from long-continued tension. Similar adhesions are also found about the ascending and descending colon, and the sigmoid. Dr. Lane regards disease of the appendix as secondary to colon disease in a great number of cases, and in operating for removal of the appendix, care must be taken to note whether or not the conditions above described are present.

But there is a still more radical method of procedure recommended by this eminent English surgeon. It consists in retiring the colon altogether by making an anastomosis between the ileum and the sigmoid flexure. The ileum is cut off at a point about six inches from the cecum. The distal end is closed, and the proximal end is joined to the sigmoid flexure. He obtains most excellent results from this mode of procedure, the only inconvenience being necessity for somewhat more frequent stools.

While this method of procedure may be required in certain cases (certainly in cases in which serious obstruction has developed at the ileocecal valve, and in cases of cancerous disease of the cecum), the writer's experience has shown that nearly every case of colon disease, even those which have proved intractable under ordinary methods, may be relieved and practically cured by the adoption of a thoroughgoing and systematic plan of non-surgical treatment

which it is the special purpose of this paper to describe in some detail.

The essential features of the plan of physiologic treatment which the writer has gradually developed during more than thirty years' experience in dealing with these cases, are the following:

1. Regulation of diet.
2. Daily complete emptying of the colon.
3. Replacement of the prolapsed bowels.
4. Development of the abdominal muscles and of the diaphragm by special exercises.
5. Electrical gymnastics.
6. Improvement of the general health by tonic hydrotherapy, sun baths, phototherapy, general gymnastics, outdoor life, and allied measures.

1. **The Dietetics of Colon Disease.**—The regulation of diet is unquestionably of paramount importance in these cases. In guiding these patients in relation to their dietary, many popular errors must be combated. One of the most mischievous of these is the great importance attached to the free use of proteids. This error has long been inculcated by standard works on diet which have placed the proteid ration at three to five ounces, or 350 to 600 calories daily. This large amount has been supposed necessary to sustain the bodily energies, and hence flesh food has been looked upon as one of the essentials of the daily bill of fare, but within the last four years the exhaustive experiments of Chittenden and Mendel, together with the observations of Rübner, Klemperer, Siven and Peschell, and others, have shown that the actual proteid requirement of the body is less than half that claimed by previous observers. Professors Chittenden and Mendel have proved the accuracy of their observations by themselves adopting the low-proteid ration, and with great improvement in health, vigor, and endurance. Encouraged by the experiments and observations of these distinguished scientists, hundreds of others have adopted the same low-proteid standard, and have reported the most beneficial results.

These facts sufficiently disprove the necessity for a high-proteid ration, and necessarily eliminate flesh food from the dietary, since ordinary foodstuffs — all the cereals, and even the potato and most other vegetables—contain proteids in ample proportion to satisfy the needs of the body. There is no disputing, then, the truth of the assertion of Professor Chittenden that a large part of the proteids which are customarily taken and largely in the form of meats of various sorts, is not only unnecessary, but a burden to the body; and it is in connection with the subject considered by this paper that one of the greatest evils growing out of this excessive use of proteid is to be found. When flesh meats are freely eaten, the unused and partially digested fragments of animal tissues accumulate in the colon, and furnish the sort of nutrient material which is best calculated to produce most luxuriant growth of bacteria, and to develop the highest degree of virulence and the largest amount of toxins. This fact is rendered evident by the enormous difference in character between the feces of carnivorous animals and those of vegetable-eating animals. Contrast, for example, the almost odorless and inoffensive feces of a grass-eating sheep with the horribly loathsome fecal matters of a meat-eating dog or cat. The same contrast exists between the fecal matters of a vegetable-eating man and one whose diet consists largely of flesh. Bouchard showed years ago that the fecal matters of a man living upon a mixed diet had double the toxicity of those of a man from whose diet flesh foods of all sorts were excluded. Observations made in the laboratory of the Battle Creek Sanitarium have shown in certain cases of flesh eaters a thousandfold more bacteria than are found in healthy persons subsisting habitually upon a non-flesh dietary.

To toxic substances arising from the decomposition of flesh food in the colon must be attributed, then, in great part, the mischiefs chargeable to autointoxication. Metchnikoff has called attention to this fact in his work, "The Nature of Man." It is of the highest importance, then, in these cases, that flesh food should be discarded. If the question of substitute is raised, it may be promptly answered by the well-ground-

ed statement that no substitute is required; for, as before remarked, Chittenden showed that the real proteid requirement of the body is so small that it may be readily furnished by such ordinary foodstuffs as bread, potatoes, nuts, and milk and eggs if desired. Experience has abundantly proved that even milk and eggs may be excluded without detriment.

It is most interesting to notice the immediate drop in the number of bacteria found per gram of air-dried feces when flesh foods are excluded from the dietary. It is very common to observe a decrease from eight billions per cubic gram to two or three hundred million, or one-tenth as many, within a few days. It is nceessary to exclude meats of all sorts. Dujardin-Beaumetz showed years ago that fish, oysters and other shell-fish, and so-called sea-food of all kinds, are particularly prone to undergo putrefactive changes in the alimentary canal, and hence should be excluded from the dietary in all cases in which autointoxication is a dominant etiological factor. Buttermilk and kumyss may be freely used with advantage. Fruits of all sorts and fruit juices are particularly helpful. In cases in which the stomach produces a normal amount of gastric juice, vegetable fats and well-sterilized cream and butter may be freely used with advantage.

It is necessary in many cases of this sort to combat a tendency to emaciation. Sweet fruits, such as figs, prunes, and raisins, are highly beneficial because of their laxative influence. Vegetable acids are also laxative, and at the same time are valuable as antiseptics. The majority of persons suffering from colon disease have also feeble gastric digestion. In many cases the stomach is dilated, and not infrequently hypochlorhydria exists. In such cases acid fruit juices may be used freely to great advantage, and serve a useful purpose in suppressing the development of bacteria in the stomach and small intestine. They are also useful in promoting normal peristaltic activity in the stomach and small intestine as well as in the lower bowel.

Thorough mastication of food is a matter of utmost importance. Every morsel of food should be chewed until brought into a semiliquid state in the mouth before it is swallowed. Any portion which can not be so reduced must be rejected as unfit to enter the crippled alimentary canal. While the healthy stomach and intestine may be able to deal with a considerable amount of rubbish, the weakened, atonic stomach or colon should be relieved of this burden. The notion that a person whose bowels are inactive should take habitually a large amount of coarse, indigestible material is certainly an error. The effect of a large amount of indigestible residue is to clog the colon, and cause the retention of fermentable, putrescible materials an excessive length of time in the colon, thus encouraging the development of bacteria and bacterial toxins. The bacteria may be counted in the ragged, putrid fecal matters of such patients by the billions; whereas normal feces contain not more than thirty-three million to the gram of dried feces, and in favorable subjects only two-thirds this number has sometimes been observed.

Care must be taken to avoid a soft diet, such as gruels, particularly oatmeal mush and similar cereal preparations. White bread, rice, mustard, pepper and condiments of all sorts, tea, coffee, and chocolate must be carefully avoided.

It is important that a sufficient amount of food should be taken. Constipation is often due to too small a ration. The following table gives the number of calories of proteids, carbohydrates, and fats as required by persons of different heights:

TABLE SHOWING HEIGHT, WEIGHT, SURFACE, AND NUMBER OF FOOD UNITS OR CALORIES REQUIRED DAILY

MEN

Height in in.	Weight in Pounds	Surface in Square Ft.	Calories or Food Units			
			Proteids	Fats	Carbohydrates	Total
62	110.0	15.1	165	378	1,132	1,675
63	115.5	15.6	173	391	1,175	1,739
64	121.0	16.2	181	407	1,222	1,810
65	126.5	16.6	190	419	1,256	1,865
66	132.0	17.0	198	431	1,292	1,921
67	137.5	17.4	206	442	1,328	1,976
68	143.0	17.8	215	454	1,363	2,032
69	148.5	18.2	222	466	1,399	2,087
70	154.0	18.6	231	478	1,433	2,142
71	159.5	18.9	239	487	1,463	2,189
72	165.0	19.3	247	499	1,499	2,245
73	170.5	19.7	255	511	1,534	2,300
74	176.0	20.2	264	525	1,575	2,364

WOMEN

Height in in.	Weight in Pounds	Surface in Square Ft	Calories or Food Units			
			Proteids	Fats	Carbohydrates	Total
57	78.4	11.9	118	278	833	1,229
58	83.6	12.5	125	308	922	1,355
59	88.8	12.9	132	319	958	1,409
60	94.1	13.4	141	335	1,005	1,481
61	99.2	13.9	149	349	1,045	1,543
62	104.5	14.4	156	360	1,080	1,596
63	109.3	15.0	163	375	1,126	1,664
64	115.0	15.6	172	391	1,174	1,737
65	120.2	16.0	180	402	1,208	1,790
66	125.4	16.5	187	416	1,249	1,852
67	130.7	16.9	195	428	1,283	1,906
68	137.0	17.4	205	442	1,327	1,974
69	143.0	17.8	215	454	1,363	2,032
70	149.0	18.2	223	467	1,399	2,089
71	155.0	18.6	232	479	1,436	2,147
72	161.0	19.0	241	491	1,472	2,204

Water drinking is also a measure of importance. At least two or three pints of water should be taken daily. Cold water is preferable, but it should not be taken at meal-time or within half an hour before eating or two hours after eating.

Fruit juices, particularly the juice of oranges, sour apples, and moderately acid grape juice may be used instead of water to excellent advantage. The organic acids which they contain are among the very best of peristaltic stimuli.

Nothing is of greater importance in the dietetic management of these cases than the suppression of flesh food of all sorts. In some cases an increase of constipation will be observed unless special precautions are taken to avoid this result. The putrefactive and fermentative changes which are incurred by a meat diet undoubtedly have a tendency to excite activity of the colon through the production of fatty acids and various other irritating substances. Any tendency to increased constipation may be antagonized by the free use of fats, acid fruits, and fruit juices, and the use of such wholesome saccharine substances as honey, malt honey, concentrated malt extracts, and concentrated fruit juices.

2. **Toilet of the Colon.**—The suppression of bacterial processes in the colon requires thorough emptying and cleansing of this hollow viscus daily, and in some cases twice daily. This is not always easily accomplished. Ordinarily the introduction of from three to five pints of water at a temperature of 80° will thoroughly empty the colon; but occasionally this measure will fail. In cases in which the abdominal muscles are tense, there is often a contraction of some portion of the colon, producing spasmodic stricture. In such cases the temperature of the water must be raised to 100° to 102°. In cases in which the abdominal muscles are greatly relaxed and the colon dilated, the temperature of the water may be gradually lowered until water of 75° or even of 70° may be employed. In cases in which no unpleasant tenesmus is experienced, a still lower temperature may be employed. In one case which came under the writer's observation, an enema of a pint of water at a temperature of 40° secured prompt evacuation of the colon when other measures failed. In cases in which there is a thickening or narrowing at the hepatic or splenic flexure, a hot enema of a quart at a temperature of 102° to 105° followed by a pint of water at 80° or less works most satisfactorily. The hot water relaxes the irritated and contracted bowel, and the cold water produces the pesistalsis necessary to secure evacuation. In many cases it is well to add a little soap to the water. Ordinary yellow laundry soap is as good as anything for this purpose. This daily washing of the colon very rapidly reduces the bacterial count in the feces.

Organic acids are also useful. The juice of two lemons may be added to a quart of water, or a teaspoonful of lactic acid. I have found lactic acid particularly good as a means of lessening bacterial growth in the colon. The free use of lactic acid in the form of buttermilk or kumyss in the food, and the daily cleansing of the colon with a half of one-per-cent solution of lactic acid, have secured rapid improvement in a large number of cases under my observation.

In emptying the colon complete success may be inferred by the sour odor of the last portion expelled, indicating that it has but recently entered the colon from the small intestine.

In cases in which the colon is affected to a high degree, especially in cases of pernicious anemia and chronic catarrh of the colon, a large enema should be administered twice daily. Lactic acid may be added to the water used for the enema in the manner suggested, or soap may be used with the water, and, as the bowels have been emptied, the

colon may be washed out with one quart of a solution of lactic acid, a teaspoonful to the quart. The temperature of the lactic acid solution should be about that of the body so as to encourage its retention.

The best method of administering the enema is with the patient lying on the left side in Simm's position. This position encourages the filling of the cecum. In some cases the knee-chest position seems to be necessary. There is no danger of establishing the enema habit provided water is used at a temperature of 80° F. or below. In case a warm-water enema is necessary at first, the temperature should be gradually lowered.

In obstinate cases of colon disease, the patience of both physician and patient is often very severely tried before definite, permanent results are obtained; hence a variety of resources must be at hand for combating this difficulty. The following measures have all been tried and found helpful:

The Graduated Enema.— This consists in the administration of a large, warm enema first, and each day lessening the amount of water and lowering the temperature. This method is especially valuable in cases in which the warm enema has been resorted to for a long time and has become indispensable, because of the dilatation and weakening of the colon through the abusive treatment to which it has been subjected. Warm water is relaxing and debilitating; hence it is generally found necessary, when the warm enema is employed, to gradually increase the quantity as the colon becomes more and more relaxed and dilated. The effect of such an application is purely mechanical. The influence of the cool or cold enema is, however, very different. Here the mechanical solution and dislodgment of fecal matters is aided in a most important way by the stimulating influence of the cold water upon the muscular walls of the intestine. The quantity of water is gradually reduced to half a pint, and the temperature to ordinary pipe water temperature. When this point is reached, the enema can be in the majority of cases discarded.

The Retained Enema.—In some cases a movement of the bowels can be secured by introducing, to be retained, half a pint or a pint of water at 80° at night, or in the morning before breakfast. In some cases the enema should be given in this way both night and morning.

The Oil Enema.—In certain cases oil works better than water. One to two pints of linseed oil may be introduced into the bowel in place of water. Sometimes it is well to add an equal quantity of strong soap-suds. Sometimes the most efficient measure is found to be half a pint of warm oil introduced at night to be retained overnight. It is well to apply a bandage to prevent soiling of the bedding by the possible escape of some portion of the oil during sleep.

A harmless and very satisfactory measure which often proves more effective than any other is the introduction of half a pint to a pint of New Orleans molasses. It is necessary, of course, that the molasses should be warm so that it will flow through the syringe. A good plan for introducing it is to put it into a fountain syringe or douche apparatus after heating to a temperature of 110°, then attaching the tube leading from the fountain to the suction end of a strong Davidson syringe. This syringe and the rubber tubing should be warmed by immersing in boiling water just before use, so as to prevent cooling of the molasses in the tube. A plan which we have generally found more satisfactory is to add to a half pint of molasses an equal quantity of boiling water. This makes a mixture having a temperature of 110° to 112° by the time it reaches the bowel. At the Sanitarium we employ malt honey as preferable to cane-sugar for the reason that any portion of it absorbed into the blood may be utilized even though it has undergone no change in the intestine, whereas cane-sugar can not be utilized without an inverting ferment which is absent from the colon.

Saline laxatives and mineral waters and, so far as possible, saline enemas should be avoided; also calomel and the various vegetable laxatives. All of these leave the alimentary canal in an

irritated and congested state, with lowered vital resistance, and their continued use results ultimately in intestinal catarrh and other chronic mischiefs which are not easily overcome.

3. **Replacement of the Prolapsed Bowel.**—When the transverse colon is prolapsed to a high degree, it becomes folded upon itself in such a way as to produce a pseudo-stricture. This may be readily overcome by massage practiced in the proper manner. The method I employ is essentially that described in my work on massage. It is generally quite impossible to manipulate the abdominal contents with the hands applied externally. Some years ago the idea occurred to me to make the diaphragm serve the purpose of an internal hand. By making the patient execute vigorous movements of the diaphragm, first contracting the muscles as strongly as possible, then lifting the chest, so drawing the diaphragm and subjacent viscera as high as possible into the thorax, while at the same time cooperating with these movements with one or both hands placed upon the abdomen, the bowels may be easily replaced.

The method may be briefly described as follows: The patient lies upon the back with the head slightly raised and the feet drawn up close to the thighs and supported by a folded pillow placed beneath them. By this plan the pelvis is tilted as far upward as possible, thus perfectly relaxing the abdominal muscles. Standing at the patient's side facing the feet, the ulnar side of the hands with the fingers touching, is placed upon the abdomen just above the pubes. Firm pressure is made, and the patient is then asked to take a very deep breath, forcing down hard. While breathing out, the patient is asked to lift the chest as high as possible, and to draw in the abdominal muscles. While the patient executes this movement, the hands are crowded toward the spine as far as possible and lifted upward an inch or two. The patient is now instructed to hold the chest as high as possible and take another breath while holding the chest high, and to retain the chest as high as possible while breathing out. The patient takes a number of breaths in this fashion while the operator moves the hands upward a little with each expiration while steadily pressing backward. By this maneuver the abdominal contents are pulled and pushed up into the upper part of the abdominal cavity where they belong. At the same time the venous stasis which is excited in the great splanchnic area, has been relieved by the combined suction and compression effect of the strong expirator movement with the chest held high.

4. **Development of the Abdominal Muscles and Diaphragm.**—Since weakness of the abdominal muscles is one of the primary causes of this condition, as previously pointed out, the strengthening of these muscles is a matter of primary importance. During the last thirty years I have constantly made use of special exercises for this purpose, and have gradually developed a system largely compiled from various sources which I find most rapidly effective. The movements comprise two classes of exercises: First, exercises which are employed especially for the purpose of strengthing the muscles of the trunk and abdomen; and second, breathing exercises, the purpose of which is to unload the portal circulation by bringing to bear upon the splanchnic area the powerful aspirating effect of respiration, while at the same time compressing the viscera between the contracting diaphragm and the tense contracted abdominal muscles. Breathing exercises are also helpful as a means of exercising the abdominal muscles, and render great service in lifting the prolapsed viscera into position. These exercises are best given with the assistance of a skilled attendant, but the patient may be quickly trained to take the exercises without assistance.

Although some beneficial effects are almost immediately appreciated as the result of these exercises, the best results can not be expected until after they have been continued with gradually increasing vigor for three or four months. The series is graduated. In many cases only the very lightest exercises can be taken at first without discouraging the patient or actually injuring him. Muscles can become strong only by reconstruction and growth. It requires as

long to raise a crop of muscles as a crop of corn or potatoes at least. Few physicians appreciate the value of daily repeated graduated movements in these cases, because, results being expected too speedily, efforts are abandoned before there has been time for definite improvement.

I have in another place given a brief description of a system of movements which I have for many years employed, together with a series of graduated day's orders.

5. **Electrical Gymnastics.**— Appropriate applications of electricity constitute a most effective means of exercising muscular structures, especially in two classes of cases: First, those in which the muscles are only imperfectly or not at all controllable by the will of the patient; second, cases in which the muscular apparatus is intact, but the patient is too weak to take the amount of exercise required. The latter condition will be found in quite a large proportion of the cases of the class considered by this paper. This is especially true in cases of invalided women. The abdominal muscles are often found almost as flaccid and inactive as though composed of cloth. The amount of work which they can be induced to do is exceedingly small. In such cases the daily application of electricity in such a way as to secure vigorous contraction is a most important means of improving the nutrition of the muscle and promoting its development.

This form of exercise, which we have termed "electrical gymnastics," may be secured by galvanic, faradic, static, or sinusoidal currents. The galvanic is effective, but very painful. The faradic is also effective, and somewhat less painful. The static current may, with care, be employed in such a way as to secure very effective results; but by far the most convenient method of administering electrical gymnastics is by the sinusoidal current, produced by the apparatus first described by the writer in a paper read before the American Electro-Therapeutic Association, and published in the *Journal of the American Medical Association*, in 1893. Various electrical machines for applying the sinusoidal current have been placed upon the market, but so far as the writer knows there are none so effective as the original apparatus described in the paper referred to. The apparatus is simply a magneto-electric machine, which produces an alternating current which, when graphically represented, shows an alternate gradual rise and fall of current on either side of the neutral line. The apparatus was first used for generating a current for ringing the bells on a telephone circuit. It was in the course of a series of experiments with various forms of electrical currents that I had the good fortune to discover its peculiar characteristics. When properly applied, it secures very vigorous contraction of the muscles without pain.

6. **Improvement of the General Health** by various tonic hydriatic measures, by exposure to the actinic rays of the sun or the arc light, thermotherapy, and especially the outdoor life and exposure to cold air during sleep, are measures of the greatest importance in these cases. By improving the general nervous and muscular tone, the abdominal muscles are made to act more efficiently. The cold mitten friction, or cold towel rub, the rubbing sheet, and the shallow bath, are all measures of very great importance. The electric-light bath carried to the point of beginning perspiration, followed by a cold spray or other tonic measures, is very effective in causing a disappearance of the general symptoms of autointoxication when the exciting cause has been removed by suppressing the colon toxins. Swimming is an admirable exercise and hydriatic measure combined. The position of the head and chest in this movement, together with the motions executed by the arms and legs in swimming are excellent means of combating enteroptosis through weakness of the muscles of the abdomen and trunk. Exercising with the water bar is most excellent for the same purpose. Horseback riding and walking, particularly if care is taken to keep the chest high, are invaluable exercises.

One of the very best of all exercises is walking on tiptoe, carrying the chest high. This exercise contracts the abdominal muscles very vigorously. A good plan is to take two steps in the

ordinary way, then two steps on tiptoe, repeating this alternating movement while walking a half mile or more. For a feeble person the distance must be lessened, of course, at the beginning. Care must be taken to keep the chest high and to practice deep breathing during this and all other exercises.

Vibrotherapy is applicable to these cases, both as a palliative and as a curative measure. The application of vibrations to the back and abdomen is effective as a means of relieving the distress often experienced in these regions. Vibration of the feet is one of the best means of relieving vasomotor spasm, which is a reflex result of the visceral irritation growing out of enteroptosis and visceral congestion. The dumbbell vibrator, vibrating stool, the vibrating table, the vibrating chair, and other forms of vibrators render effective service in these cases. The vibrating chair and stool are also valuable means of combating constipation.

In certain cases in which the enema can not be tolerated because of tenesmus of the lower bowel, or for other reasons, it is justifiable to perform the operation of appendicostomy, thus providing for convenient and thoroughgoing irrigation of the entire colon. In cases in which we have employed this method the results have been most striking. In one case, that of a woman whose bronzed skin, emaciation, great weakness, and general cachectic appearance indicated profound autointoxication, the results have been marvelous. The patient was rendered a complete invalid for three years. She had such extensive ulceration of the rectum and lower colon that even half a pint of water gave rise to great tenesmus, with immediate expulsion, so that it was impossible to wash the colon out by enema. After the operation of appendicostomy the colon was irrigated with two or three gallons of water twice daily with the result that the bacterial count of the feces was within a week brought down from 4,620,000,000 to 840,000,000 per gram of dried material. The patient rapidly began to put on flesh. Appetite which had been wholly absent before, returned. The bronzed color of the skin disappeared, and within a few weeks the patient was on her feet and is to-day enjoying excellent health.

When the measures outlined are very thoroughly employed, there is comparatively little room left for surgery in dealing with these cases. Probably 99 cases out of 100 can be substantially relieved, and 95 cases can be counted as cured when the measures outlined are perseveringly employed. In many cases, it must be admitted, the regimen laid down and some of the special remedial measures employed, particularly special exercises, must be continued for a very long time, indeed in some cases in which the colon has become enormously dilated, and the abdominal muscles atrophied to a very great extent, particularly in persons considerably past middle life, it may be necessary for the patient to continue certain measures of treatment indefinitely. In a few cases the habitual use of the enema may be a necessity, the intestinal walls having become so attenuated that recovery of their tone is impossible. This mechanical emptying of the bowels need not be looked upon as a source of injury, or in any sense injurious, provided care is taken to use water at a temperature of 80° or lower, for an internal bath at such a temperature has a tonic effect the same as an external bath at the same temperature. This tonic effect is both general and local. Some water is left behind. This is absorbed and aids the kidneys in eliminating toxins from the body.

After having done all that can be done by the various physiologic measures suggested, there still remains a considerable number of cases which resist the measures employed. These are the cases for surgical treatment. In this class are included cases in which the cecum has become enormously dilated, some cases of extreme prolapse of the transverse colon, cases of mechanical obstruction from thickening of the bowel at the ileocecal valve, the hepatic flexure, or the sigmoid flexure, stricture from ulcer and other causes, and certain cases of extensive chronic ulceration of the colon which have resisted non-surgical measures.

When both the non-surgical and the surgical measures detailed in this paper

are faithfully brought to bear in the treatment of colon disease, there will certainly remain very few cases indeed which can not be relieved,—practically none except those which are hopelessly malignant; and in the successful treatment of colon disease we shall succeed in a multitude of cases in removing a factor in the production of malignant disease which is often overlooked.

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THE ANTITOXIC DIET

A Stereopticon Lecture on the Sanitarium Driveway, Battle Creek, Mich., Thursday, July 18, 1907, at 8: P. M.

by

J. H. Kellogg, M. D.

We are to talk tonight about the antitoxic diet, the antitoxic regimen, but first of all we have to become acquainted with the fact to which Bouchard called the attention of the world some twelve or fifteen years ago that the body is a factory of poisons. The body is a factory of poisons. Now, if you visit a cotton factory, you expect to see them sending out cotton, and as you see the carts going away carrying away the loads of cotton goods; when you visit a machine shop of some kind, you expect to see machinery. If you visit a pump factory, you expect to see pumps going out. The body is a factory of poisons, so we expect to see delivered from the body quantities of poisons in some form or another. These poisons, most of them, escape observation, so, until this fact was emphasized by Bouchard, we had no appreciation of the enormous quantities of poisons produced in the body and of the deadly character of these poisons; but Bouchard made experiments which made this very clear. He showed that there is poison in the breath, that there is poison in the sweat, that there are various poisons, some seven or eight poisons in the urinary secretion; that there are enormous quantities of poisons escaping from the bowels, through the liver--poisons are excreted from the body.

Now, let us consider some of these poisons. For instance, here is poisoned breath. We know perfectly well that if a number of people are shut up

together in a big room, it is not very long before the air of that room becomes unfit to breathe. If one breathes into a glass jar, for example, breathe a full breath into a glass jar, then let a lighted ~~xxxxxx~~ candle into that jar in which you have previously breathed, and it goes out. There is not enough oxygen there to support the life of the candle flame; so we know we are sending out ~~xxx~~ from our lungs continually a stream of poisons. Carbonic acid gas is one of these poisons, perhaps one of the wordt of them. The worst poison of the breath is what is sometimes called proud poison. This is the poison which accumulates in the air when a large number of people are brought together, and which gives the air a fusty odor, an offensive odor, which makes the smell in the bedroom which you notice when you come back into it after you have been out in the fresh air for a few minutes in the morning. In that unventilated bedroom in which you have been sleeping all night with the windows and the doors shut, you can not get pure to circulate there through those closed windows and doors. Two hundred and fifty years ago, in a great celebration, a little boy was fixed up to be a cupid. He had some golden wings patched on his shoulderblades, then he had his body all covered over with gold, with gold leaf, and the angel was very happy for a little while. He certainly looked very nice, and was perched up somewhere, but by and by the child began to show signs of discontent, became very uneasy. By and by he began to cry, and shortly he became so ill that the doctors were called, but in spite of all the doctors could do, the child died in about three hours and a half. So the little boy was killed. What killed him? Simply the retention within the body of the poisons which could not escape through the skin, which ordinarily do escape, because the gold leaf was impervious to these poisons. So the skin is continually pouring out poisons which are deadly. Now, the same thing is true of the urinary secretion.

Now the same thing is true of the urinary secretion. If the kidneys

do not act for a day and a half, two days and a half, two days and a third to be exact,--if the kidneys cease to act for two and one third days, death is almost certain to follow; because it only requires two and one third days for the poisons which are commonly eliminated by the kidneys to accumulate in such a quantity that the whole body will be destroyed by them. That is, the fatal dose will be accumulated in two days and one third, when the kidneys cease to act.

Now the same thing is true of the liver. When the liver ceases to act as it sometimes does, the poisons which it ought to eliminate, which it ought to pump out into the alimentary canal continually, through the bowel,--these poisons accumulate in the body, and as a result, death occurs in about a day and a half; for the liver is a more important organ than the kidneys. Now, the same thing is tmue of the mucous membrane of the intestine, the mucous membrane of the lungs. These pour out poisons; the mucous membrane of the stomach continually pours out poisons; the mucous membrane of the intestine is secreting poisons constantly. When a hypodermic injection of morphia is made beneath the skin in an anamal, within half an hour afterwards, half of the poison injected under the skin can be found in the stomach. One half of it is in the stomach; the stomach eliminates the poison; so it is particularly important when a person has been poisoned by opium, no matter whether it is done hypodermically, or however it is done, it is very important to wash the stomach out and to keep washing it out, because the stomach excretes poisons. Now, these poisons that I have been speaking about are normal poisons, they are poisons which are always produced by the body, and are the result of the natural body processes.

If, for example, we put into a stove some coal, some wood, or oil, or any other combustible material,--it may be corn, or bread, or potatoes, for all kinds of food may be used as fuel; everything which can be used as food may also be used as fuel. If we put into the stove any sort of fuel and burn it there,

we have poisons produced. Some of the poisons escape through the chimney in the form of poisonous gas. Smoke is poisonous; carbonic acid gas is poison. Other poisons fall down into the ash pit in the form of ashes, the solid poisons. So we have two kinds of poisons, solid and gaseous; so the fuel we put into the furnace is converted into poison.

The same thing is true of food. Food put into the body is burned by the process of wet combustion, not the dry, active combustion as we call the burning of fuel in a furnace, but a different kind of combustion, but just as real, just as complete, just as thoroughgoing combustion, exactly the same sort ultimately, because it consists in the combination of oxygen with combustible materials. This kind of combustion is going on in the body constantly, and as a result we have produced gaseous poisons which escape from the lungs, and solid poisons which escape through the mucous membrane of the skin, through the liver, kidneys, and the mucous membrane of the intestine. So we see that the body is, like the furnace, a factory of poisons, and we have constantly to deal with these poisons. Food is converted into poison.

Now, certain kinds of food elements produce poisons different from those produced by other food elements. Certain food elements produce very poisonous substances, and others produce less poisonous substances. We have for instance, three great food elements,--the carbohydrates, consisting of starch and sugar chiefly. Starch and sugar are carbohydrates. We may add also the fruit acids. Starch, sugar and fruit acids are the carbohydrates. Then we have fats which is allied to the carbohydrates, a carbonaceous substance which serves in the body a similar purpose to the carbohydrates, the sugar and the starch. Then we have a third, the proteids which correspond to the white of egg, the lean portion of meat. Now, those are the three food elements. These all produce poisons in the body, with this difference, however. Starch, sugar and fats, two of the

elements which compose the greater part of the food, are converted into a gaseous poison, a gaseous, poison carbonic acid gas which escapes through the lungs, and escapes with very great facility, very great ease. So the poisons produced by the carbohydrates, by starch and sugar,--a few of these poisons are poisons comparatively innocuous in character, comparatively innocent poisons. They are poisons that are comparatively harmless in their qualities, not more serious than the poisons formed by the burning of wood in the stove,--very simple in character, in fact. But the same is not true of the poisons produced from the burning of proteid in the body, the albumin, casein, fibrin,--proteid substances which we find in meats and eggs, and any other proteid foods. These poisons are of a very different character. When proteids are burned, the proteid does not escape from the lungs, at any rate, not very much of it. The majority of it escapes through the kidneys and the bowels. These poisons which escape through the kidneys are very deadly. They are so very deadly that some of them will kill a small animal in a very very small dose. I have seen a rabbit, for instance, killed by the injection under its skin into its veins of less than one ounce,-two tablespoonfuls of urine will kill a rabbit of ordinary size, two tablespoonfuls. A rabbit that weighs two pounds will be killed by the injection into its veins of two tablespoonfuls or one ounce of the urinary secretion. Now that shows how deadly it is. And the rabbit dies immediately, dies within two or three minutes. It dies as though it had been given a deadly dose of strychnia, or as though it had been given a deadly dose of morphia. It dies at once. So you see that it is a real thing, not a theoretical matter, but is a real thing, and it was by experiments of this sort that Bouchard proved that the body is constantly producing poisons. But these poisons are not the most serious poisons with which the body had to deal. While the body is itself producing poisons in the life processes in the work of the body, poisons are being produced just as the by-products

of ordinary combustion in the furnace; they are the products of work.

There are other poisons which are far more deadly in character, and these are the things that I want especially to talk to you about, although I may say one word or two more with reference to these poisons I have just been speaking of, the poisons produced by the burning up of starch and sugar. These are poisons which are comparatively harmless and are easily disposed of, whereas the poisons produced by the burning of proteids, and albumin, these poisons are hard to dispose of; and if proteids are taken in large amount, very serious damage may be done. I told you the other night about the experiments some one performed upon a dog or rabbits and other animals by cutting out the liver and joining the portal vein to the vena cava so that the liver is cut out of the circulation and the blood does not go through the liver any more. When this is done, the animal eats one meal of meat and dies at once. It dies in eight hours after eating a meal of flesh, and the reason is the liver is not able to deal with the poisons which are the result of eating this large amount of proteid. The very same thing might happen to a man whose liver was so badly crippled it was not able to do its ~~xxxx~~ ordinary work. In such a case, this man eating a large meal of meat might die at once from autointoxication; and in another case, a man whose liver was crippled perhaps by smoking, by the use of liquor, by the use of condiments, by the use of excessive quantities of proteids or meats, or in any other way, the man who had suffered for a long time from autointoxication until his liver was damaged, that man by eating meat daily might keep his liver in a continual state of over-work in doing its work properly, so that poisons are accumulating in the body and the man suffering from autointoxication in consequence. That man would feel as though he was under the influence of a drug. He would have a confused brain, perhaps a state of indecision, inability to make up his mind about things, headache, frequent attacks of sick headache, biliousness as it is sometimes called. Now, I have met a great number of people in just that con-

dition, and because they are eating an excess of proteid. This large amount of proteid more than the body can deal with produces larger quantities of poisons than the body can dispose of. This is a very important matter which has not been understood until comparatively recent times. It has not been appreciated even by physiologists--what an important thing the determination of the exact proportion of food elements is, and how important, especially, that we should not take an excess of proteid, because of the toxic character, the very toxic and pernicious character of the poisons produced by its burning in the body even when it is perfectly burned, and when it is not completely burned, still greater harm results. But now I am going to talk to you about some worse poisons which are produced in the body, poisons of a far more deadly character, and these are poisons which are not the natural result of the body processes, not the natural result of work, not the natural result of burning, of combustion in the body, but are the result of putrefactive processes taking place in the body under the influence of germs. M

Normally, the alimentary canal of man and of the higher animals contains no germs at all. Now we know this because a man is born into the world without germs in his alimentary canal. The things that man needs in his body for the carrying on of his perfect life are with him when he is born. The human machine when it enters the world is practically perfect, has everything it needs for its life in the world. It is only necessary to give it food, water, to give it air and proper exercise and it will life. Now the man is born, as I said, without germs, and he has no germs at all in his alimentary canal. The question has been settled by experiment. Nuttal and Thierfelder made some experiments with guinea-pigs which were born in such a way that they did not become contaminated; they were born by means of a surgical operation so that they were not contaminated with germs in any way, were shut up in glass cases, inclosed in

glass, kept perfectly sterile and continued to grow and thrive well for eight days. At the end of that time, they were killed, and not a germ was to be found in their bodies. So we know that animals can live at least eight days without germs. But Prof. Levin has been making some observations at Spitzbergen, and he finds there in that country where germs are less numerous than in this part of the world, and in tropical countries, that animals generally have no germs in their colons; that animals are generally entirely free from germs; that polar bears have no germs in their colons, and that the alimentary canals of white foxes and other Arctic animals are wholly free from germs of every sort. So we see animals can live without germs, and we may well believe that the human animal as well as other animals can live without germs, that germs are not a necessary adjunct as they were once supposed to be.

Now, Prof. Tissier and Prof. Escherich and other European investigators have been studying this question of germs in relation to the human alimentary canal, and they find that when we are born without germs, notwithstanding that, in a few hours germs enter the alimentary canal; but the germs which first enter the alimentary canal are harmless germs, germs which are entirely innocuous. They produce acid substances, and these acid substances are protective. The germs which first take possession of us, it seems, are beneficent organisms which have for their purpose to keep other harmful organisms out. They take possession. It is like the crop of wheat growing in the field that keeps out the weeds. If the wheat is not there, weeds will grow. These domestic germs, as Prof. Herter calls them, are found normally in the alimentary canal, are there for the purpose of keeping out the wild germs, the weeds, if you please, which get in and which grow and produce noxious substances, poisons. Now it seems that we are somewhat responsible for the introducing of these weeds; for the study of these wild germs by Prof. Herter of New York, and by other foreign investigators, has shown that

these wild germs grow naturally in flesh, and so naturally, so abundantly do they grow in flesh, that Prof. Herter calls them meat germs, for they are always found swarming in dead flesh, in beefsteak and in mutton chops, in all kinds of meat, but especiallyin fish, oysters, and all kinds of dead animal flesh they are found growing and in countless numbers; so in the eating of meat and flesh, we take them into our bodies, and there they grow and develop so they become domiciled there, they decompose, and we actually drive out the beneficent germs, the beneficent organisms which first take possession of our intestine and which are intended to keep out these wild and harmful germs. I am endeavoring to make this plain enough so you will understand more clearly the things I am going to say in a few minutes in relation to the antitoxic diet.

Now it is found by the study of these various germs in the alimentary canal that they differ in species. There is a very large number of them. Prof. Roger in his little work on the subject, publishes a list of 161 different kinds of germs which grow in the alimentary canal. Not growing all at once in the same alimentary canal, but in different persons these different ones are found, and many, many kinds, sometimes many scores of different kinds of germs are found growing at one and the same time, but generally a few kinds of germs dominate. Now all of these germs, this large number that has been pointed out, have been divided into two classes. There are two classes: one class that feeds upon starch and sugar, carbohydrates, and the other is the class that feeds upon meat, and upon eggs, and upon casein, upon proteids, in other words. One feeds upon carbohydrates, the other feeds upon fats and proteids. This class that feeds upon carbohydrates are called aerobes, that is lovers of air,--aerophiles, they are sometimes called, and ~~anaerophiles~~ because they love air and require air for their growth. These airobes are growing germs which always produce acids in their growth They produce acids. When some milk sours in the pantry, it is because some aerobes have

aerobes have gotten in from the air and have caused a change in the sugar of milk in the milk, and have converted that sugar of milk into milk acid or lactic acid; those are aerobes. And this prticular aerobe that grows in sour milk, that produces sour milk, is one of the useful germs that grow in our own alimentary canals, that is found there, one of the very earliest ones that is found is this sour milk germ, the milk-souring germ, the aerobe that sours milk. This was found by Prof. Escherich some twelve years ago, and found in the intestine of a very young infant. It is this which gives to the infant's bowel discharges this slightly sour odor; it is this particular germ, the same germ that sours milk; and it is very natural that it should be so, because the infant feeds upon milk; that is its first food; so this germ grows there, takes possession of the alimentary canal and it is a harmless germ and, you may say, a friendly or beneficent germ which domesticates itself, becomes tame, domesticated in the colon, and stays there, belongs there, and it is useful that it should grow there, because growing there, it will keep out other harmful germs.

Now, there is the other class of germs, so-called meat germs, which do not produce acids, and which are the cause of putrefaction. These are the germs which cause the rotting and decaying of meat. They are the putrefactive organism, so-called. Meat will not putrefy without their presence. If you take a piece of meat from a freshly killed animal and hang it up in the air on the top of a high mountain, it will not undergo decay; and there are some parts of the far West, you know, where the Indians used to cure their meat by hanging it up in the trees, or suspending it on poles, and the meat would dry and cure and would not decay. It was because these destructive, putrefactive organisms are not sufficiently abundant in that pure atmosphere of the West so that they can cause putrefaction. That is one reason why that is a good place to live, why it is a healthy place to live; and the same thing is true on the top of high mountains.

These germs are not there, so meat will not putrefy. Animals die, lie there, and do not undergo putrefaction. So this is a very interesting fact to know. But in warm and moist places, these organisms grow with great abundance; they flourish there, and the greater the heat and the greater the moisture, the more rapidly theygrow. So animals that die and are left in a warm, moist place, the flesh of the animal left in a warm moist place undergoes putrefaction very rapidly from the growth of these germs. Now these germs are very closely allied to the mold which grows upon the wall, and the yeast that grows on bread, and to fungi of all kinds. They are a fungus, parasitic plant, not animals, but a fungus, and a parasitic plant, and they grow with such enormous rapidity, develop with such enormous rapidity that an animal after an animal dies, within twenty-four hours its entire body is filled with these organisms. That is the reason why the flesh of an animal begins to have a taint, why it begins to smell, why an odor is present, an odor of putrefaction, so quickly after death,--it is because these organisms grow with such enormous rapidity that they fill the whole animal's body; all its tissues are swarming with these germs within twenty-four hours after death; and they are swarming into the various organs even before death when the animal dies slowly. These germs are found upon the skin constantly; they are found in the alimentary canal; so they rapidly pervade the entire flesh of the animal very quickly after death.

Here are the two classes, then: germs which produce acids, aerobes, friendly organisms, and the germs which produce putrefaction, the unfriendly organisms. These are the two kinds of germs which are found in the alimentary canal, and in a general way, these are two classes of germs that grow all about us, that are found in the air. Now this is an interesting thing. These two classes of germs are antagonistic. They are antagonistic. When the aerobes are growing--where they are growing, if they are growing abundantly and there is a sufficient-

ly large number of them, the anaerobes, the putrefactive organisms can not grow. Here is a pan ofmilk in which there are some aerobes, some acid-forming germs growing, and the milk sours. Beside it is a piece of beefsteak in which there is no sugar and hence nothing to support the life of the aerobes or acid-forming germs. The putrefactive germs are there; they came with the beefsteak when you got it from the butcher; it is filled with them. That is why it becomes soft; that is why it becomes tender, that is why it gets more toothsome, gets a higher flavor by being kept; that is why you like prime beef better than fresh beef-- because these putrefactive germs have grown and produced their putrefactive poisons to some degree, and have softened the beefsteak, so you like it better. That is the haut gout as the French call it. It is simply the flavor of putrefaction. The beefsteak, then, is there beside the milk. The milk sours, the beefsteak rots. If we put the beefsteak in the pan of milk, it will not rot. The milk will sour, but the beefsteak will not rot. So if you get in a hard place sometime, and want to keep your beefsteak, don't want it to rot and you haven't got any ice box, put it in the milk pan, and the milk will take care of it; but I should advise you not to do it. You would better use the sour milk without the beefsteak and let the beefsteak go to the dogs. It is a proper diet for dogs, for dogs have got stomachs, and livers and can deal with these poisons and enjoy a great deal better than human beings can, because their bodies are adapted to that kind of diet either by long heredity, through the influence of heridity, having become accustomed to it the weakest dogs having died off and the tough dogs having survived, they have gradually become accustomed to the meat diet and can stand it; but man has not yet become adapted in that way. At any rate, the civilized man has not.

Now, here are the two classes, then: these organisms, the aerobes, which sour milk, and the anaerobes which rot the meat, and they are antagonistic,

and they are so antagonistic that the aerobes can prevent the action of the anaerobes if they have a good chance--that,is, the acid-forming germs,--by producing acids which kill off the putrefactive germs and prevent their growth. Now, what happens outside the body happens in the body just as well. These putrefactive organisms which cause the decay of flesh outside the body in a warm moist place, if that flesh is put on the inside of the body, will do the same thing. I met a man sometime ag who had suffered from a great carbuncle, and he said one of the neighbors came in and told him if he would put a beefsteak poultice on it it would help it, and he said he put on a beefsteak poultice, but he said he could not stand it only for about twenty-four hours. I said, "Why, did it hurt?" Of course, I knew what the matter was. "No," he said, "it didn't hurt; it relieved the pain, but, dear me, I could not stand the smell." What was the matter? The meat was rotting. The meat was on the outside of his stomach. If that beefsteak had been on the inside of the stomach, the same thing would have been going on, for the inside of the stomach is no different from the outside of the stomach except it is warmer, and moister, only in one particular. If a man happens to have a good supply of gastric juice, of acid gastric juice, the acid juice would disinfect the beefsteak and kill those putrefactive germs so they could not grow, but if the ~~xxxxxx~~ man did not happen to have enough, to have a good supply of gastric juice or acid gastric juice, to do that, then what would happen? Suppose the man has had his stomach examined and the examination shows no gastric juice at all. That means if that man puts poison in his stomach it is going to rot there instead of ~~dixxx~~ digesting, and it will do it every time; it will rot on the inside of such a stomach just as it would rot on the outside, because there is no acid there to preserve it and to prevent that putrefaction; and that is what some of you have already discovered--that when you eat meat, you are bilious afterwards. Why are you bilious? Because there is something rotten inside. That is what it means every time. Whenever

you are bilious, whenever you have a bilious attack, it is something rotten. Now, you do not believe it? I will tell you how to test it. If you ever vomit when you are bilious, you know what is the situation down there in your stomach. You know what is the condition of things you vomited. You know what a horrible mass it was that came from your stomach,--rotten fetid, horrible, loathsome. Now, if you go to a doctor and the doctor gives you a dose of physic, you know the bowel discharges are horribly loathsome when you have had a bilious attack. Why, it is simply because there are things rotten there, rotten in the colon, rotten in the stomach, and this is the condition which produces that state of biliousness which is nothing more than the body being flooded with poisons. This is such an important and practical question I have to talk plainly to you about it, and this is a medical audience any way, so I feel I am allowed to speak frankly because it is a thing that is so important, exceedingly important, it is necessary we should understand about it. So when you are bilious, whenever you feel bilious, whenever you have got that awful taste in your mouth, whenever you have got that horrid odor in your breath, it is simply because these putrefactive organisms have gotten started somehow, and they have gotten the start of the other organisms. The unfriendly germs, the wild germs have come in, and the germs have gotten in and takenpossession of your body, and they have gotten the start of the ~~toxic~~ domestic germs, the friendly, acid forming germs, that things have become rotten and loathsome in your alimentary canal. The one hope for you is to get that state of things corrected. The only hope for you is to have your colon disinfected. That is what you do whenever your cellar or pantry gets foul; you disinfect it. You go to your doctor at home, and the doctor gives you a dose of calomel, and you feel better right away; your tongue cleans off, you feel better, and you know it does you good. I presume three quarters of you here have had that experience. Probably all the rest of you have been through that exper-

CORRECTION

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ience. There are about six people here who have not taken calomel. All the rest of you have been put through that kind of a mill. You have been to your docter and been disinfected with calomel. Calomel is one of the best disinfectants for the alimentary canal that is known. A dose of calomel, or of corrosive sublimate,--one part of mercury and two of calomel. Bichlorid of mercury has two atoms of chlorin with one of mercury. That is all the difference. Calomel gets down into the colon, combines with a little salt down there, and probably makes a little corrosive sublimate, and that is what disinfects the alimentary canal; so the disinfecting of your hands with corrosive sublimate, and the disinfecting of your colon or intestine with calomel are probably one and the same thing. The chemical action taking place inside of the bodyproduces the very same thing that is used for external infection. If the calomel did not do any harm, that would be a nice thing to do. You could take your beefsteaks, your game, and fish with gamey flavor, or your deer, venison, fowls, with a gamey flavor that you like, and then take a dose of calomel and disinfect it all right. But unfortunately the calomel does harm. There is nothing of that kind that does not do more or less harm. Calomel is a mineral substance, and when it is taken into the intestine, some portion is absorbed, and that portion goes through the liver and makes work for the liver so it has to labor hard to deal with that calomel. Some of it may escape and get through the body; if it does, by and by ulceration of the gums will appear, the soft tissue around the teeth will begin to ulcerate, and the teeth will fall out. If you go on taking it day after day, every little while taking a dose of calomel, or blue mass, or blue pill, or some other preparation of mercury which are, as I said before, the very best means of disinfecting the alimentary canal that is known, the best kind of chemical disinfectant, nothing else equal to it, by and by your whole body will begin to suffer from calomel poisoning, for calomel is itself a poison; so it is a question

as to which you will choose, the toxin, the putrefactive poison, or the mineral poison; and it may be that between the two your body will get to be pretty badly wrecked, for if you have first the putrefactive poison and then the mineral poison, and then go on alternating first one then the other for an indefinite length of time, by and by the poor liver will be worn out between the two, and the whole body will fall into a state of ruin. So that is not the ideal way. Every doctor knows that. So every doctor that gives you a dose of calomel cautions you and says, "Don't take this unless you have to take it, because it is a two edged sword; it acts both ways. While it does you some good, it does you some harm also, and it is not a thing to be taken for a regular diet. If we could take calomel as easily as starch or sugar and it did not do us any more harm, we could go on taking these decomposable and decomposing foods, swallowing these putrefactive organisms, then taking the antidote immediately afterwards so we should not suffer from their overgrowth; but we know that calomel does harm, and not only calomel, but every other drug disinfectant that can be used does more or less harm, because the things that will kill germs will kill human beings. The things that will trouble a germ will trouble your stomach. The things that will damage these putrefactive organisms and prevent their growth, will destroy human life, and every other kind of animal life; so that is out of the question. We can not go on deluging our alimentary canals with these putrid materials and then swallowing calomel or any other drug afterwards. What are we going to do, then? What should we do? Knowing this, being forewarned, we must give some attention to the proper methods by which we can keep our alimentary canals clean. Of course, when we get our hands soiled, if we get our hands ever so dirty, we can wash them, and the hands are so constructed that even though we get them very dirty we can get them clean again without any particular injury; and yet the man who works constantly in foul things and unclean things with his uncovered hands, sooner or later he will suffer damage. By and by there will be a break-

dmm.ing out on the hand. You see soapmakers sometimes, butchers and various other classes of people who suffer from eruptions on the hands because of the character of their business. The grocer by handling sugar gets infested with mites. That is not such a very serious matter. The washer woman by continual-contact with soap and dirty clothes, dirty water, gets washerwoman's eruptions on her hands, washer woman's rash; it is nothing more nor less than eczema, and it is due to the growth of germs, to infection with these dirty germs. The very same thing is true of the stomach. The hands we can wash, but the stomach and intestines we can not wash so well; so in case of both the hands and the stomach, we should keep our hands as clean as we can, and keep our stomachs as clean as we can. It certainly is apparent, it seems to me, to everybody that if we want to avoid diseases arising from these putrefactive processes in the intestine, from the absorption of these poisons, if we want to do that we mmmk must take care to keep our stomachs clean.

I am not going to tell you tonight about what diseases arise from the infection of the stomach. Some of you know something of that already from your experience. But I am going to tell you particularly about the antitoxic diet, and I am going to throw a few pictures on the screen now , but I see my time is about up, but I want to explain a little more clearly the reason why certain articles of food are beneficial and others are harmful.

There are two kinds of germs, friendly and unfriendly germs, tame germs add wild germs, what you might call starch germs, starch-eating germs, and meat-eating germs; germs that form acids, and germs that form poisons. The poison-forming germs grow without air; the acid-forming germs require air. This is the colon. Here is a portion of the small intestine. The stomach is above. The alimentary canal is about thirty feet long. The lower part of the colon is five feet long. And there is a pouch at each end of the alimentary canal, the stomach at the upper end and the colon at the lower end. The food normally

remains in the stomach for a little time, long enough to be disinfected and reduced to liquid form; then it passes through the small intestine of which there are about twenty-five feet. There are twenty five feet of small intestine, and that is where the work of digestion is done. It finally reaches the colon down here, and from the ~~anus~~ intestine passes through the colon getting constantly more and more concentrated and drier as the liquidportion is absorbed, and finally it reaches this portion ready for discharge from the body. Now the food occupies in going from the stomach to the colon down here to the small intestine hx seven hours. It travels twenty-five feetin seven hours; that is, about three and a half feet an hour. The food remains then in the colon here, this part of the colon, the cecum and the ascending colon just up to the corner there, remains there fourteen hours. That is where the process of absorption chiefly takes place, is here. The digestive fluid is poured down into the sack-shaped cecum here, and remains there fourteen hours. The food travels in the colon only one or two feet in fourteen hours instead of three and a half feet an hour. And then the food occupies three hours in passing from the corner here through the transverse colon,--from this corner, the sigmoid flexure, to its exit from the body--three hours. Seven hours in the cecum, fourteen hours in the cecum and ascending colon, three hours in the remaining portion of the colon, making twenty-four hours in all. There are two parts, you see, here, quite distinct,--the small intestine where digestion takes place, and the cecum where absorption takes place. The rest of the alimentary canal may be called accessory. The small intestine digests the food, reduces it to a liquid form, and the large intestine, the first part of it absorbs the digested liquid food, and leaves the residue which is sent on then to be discharged from the body.

Now the small intestine contains air which has been swallowed with the food. So long as the small intestine contains air, then what kind of germs would

be likely to grow in the small intestine?--the acid-forming germs, or poison-forming germs? The acid-forming germs. Now remember that the friendly germs, the domestic germs, tame germs are healthy germs; that the acid-forming germs are the germs that naturally grow in the stomach and intestine; so the contents of the small intestine are naturally acid. Now, the large intestine has no air in it. There is no air in the large intestine. The air is all used up in the small intestine. The small amount of air that is swallowed with the food is absorbed, so a different kind of germs grow in the colon, and these are germs that grow without air. Which kind of germs are these?--the acid-forming germs, or the putrefactive germs? The putrefactive germs, you see, grow here in the large intestine. Now they do not grow here unless they have introduced there. They do not naturally belong here, and the baby, the young infant has none of these putrefactive organisms in his colon. The baby, the healthy baby has no putrefaction going on in its body at all, because it has these friendly, acid-forming germs, and one of them is an exception to the general rule, and is an acid-forming germ which grows without air and grows in the colon. Now that is the wonderful thing about it,--that the baby is provided with an anaerobe, with one particular germ which is an anaerobe or germ that grows without air; and yet, unlike almost all the rest of that class of germs, it forms acids, so that germ grows particularly in the colon and keeps out the anaerobes which form the poison. The baby is provided with that particular germ, but by and by the baby begins to eat cow's milk, and when the baby takes cow's milk, then some putrefactive organisms are introduced and the alimentary canal is infected; it is poisoned, so to speak, the baby is inoculated with putrefactive germs; its colon then begins to contain these putrefactive germs, but the colon germ from the cow is not so bad as many others. It is not really a putrefactive organism. There are others which come along with it, but it itself does not produce putrefaction; so even

after the baby takes cow's milk, putrefaction may not yet begin. By and by, when the baby comes to eat meat, then those putrefactive organisms with which the meat abounds are poured in in great quantity; then the child begins to have putrid stools, just the same sort of stools as a dog or a cat. The [illegible] of the dog, or the cat, or the lion are putrid, very loathsome, are horrible; while those of the sheep are not. And the same thing is true of a dog when fed on bread and milk; the same thing is true of a rabbit that does not eat flesh. And the same thing is true of the child that is not fed on flesh. When the child is fed on flesh it has putrid stools, and when it is not fed on flesh, but is fed on milk, or bread and milk, it does not have these putrid stools, because the germs which produce putrefaction are not growing.

The study of this subject has shown that the kinds of germs depends on the kind of food. If you feed an animal or a human being on food which is the right kind of food for encouraging the growth of one kind of germ, you will get that kind of germ. If you feed the animal food which is the best for supporting the life of another kind of germs, you will have that kind of germ. In other words, if you give the animal food which encourages the growth of or supports the life of acid-forming germs, it will be the acid forming germs that will be found in the animal. Now what kind of foods are favorable for the growth of the acid-forming germs? What kind of foods do the acid-forming germs live on?--Carbo-hydrates, starch and sugar. That is the kind which milk has got in it,--food which feeds the acid-forming germs, because it contains milk sugar. It also contains casein, and casein is capable of feeding the other kind of germs which grow in the intestine and the colon. Now, a lady told me a few minutes ago before I came out here, that she was in Philadelphia some time ago under the care of a great nerve specialist there, and he put her on a milk diet, and she said, "In a day and a half I was in such a terrible state I could not continue

the milk any longer." "What was the trouble?" "Why, I was so bilious, I suffered so terribly from headache that I simply could not stand it. I can not take milk; milk poisons me." Now, in that woman's case, the colon was so full of these putrefactive germs that attacked the casein, and the patient suffered from gast autointoxication from poisoning in spite of the fact tat there was some sugar of milk there. There were so few acid-forming germs there were not enough to destroy the putrefactive germs; so they had the start. That is the reason why a great many people can not take milk. They say, "I can not take milk; it makes me bilious right away." How manypeople are there here who can take milk, enjoy the use of milk, and it does not do them any harm? How many people are there here who never suffered anything at all from the use of milk, who think it agrees with you, and is perfectly harmless? I am surprised to see so small a number of hands. Certainly not one fourth of the people here are willing to raise their hands on that count. What shall we do about the rest? You are doubtful about it, or you know milk does you harm. Will you be kind enough to let me have a vote on the other side? Those of you who feel perfectly free, put up your hands and tell me you know from experience that milk gives you a headache, or a coated tongue, or inactive digestion, or biliousness, or some-thing else that makes you uncomfortable; that you feel that way when you take milk? Look at the hands. Certainly a quarter of the people here have raised their hands, and a great many more, I am sure would find the same thing to be true if you should make an investigation. Milk is a food that can go either way. Meat is a food that feeds putrefactive germs. Starch and sugar are foods which feed the acid-forming germs, the antagonistic germs; so milk is a food which feeds one or the other according to circumstances. If the acid forming germs are in the majority in the intestine, then if you take milk, the sugar of milk will encourage their growth and they will prevent the growth of putrefactive germs.

But if the acid-forming germs are not present in sufficient number, then the sugar of milk will be absorbed before it can ferment, and the casein which is left behind will feed the putrefactive germs so they will grow in it abundantly; then you will suffer from biliousness, headache, and all the other troubles which are connected with autointoxication.

Another thing I must tell you. While the small intestine contains these aerobes, acid-forming germs, if a person lives for a long time on a meat diet, or a diet which encourages the growth of putrefactive germs, these germs gradually work up the small intestine until they gradually work up to the gall-bladder, and get ip to the stomach, and we have sometimes cases here in which we have actually found them in the mouth. When they get up to the mouth, then there is that horrid taste in the mouthand rapid decay of the teeth, because it is the same kind of germs which cause decay of the teeth, the very same; and they will get into the gall-bladder and produce gallstones; and get into the liver, and sometimes make abscesses there, produce agreat variety of troubles which we will talk more fully about at another time.

What foods are there which we can enumerate which will encourage the acid-forming germs, and hence which we will call the antitoxic diet? All kinds of cereal foods, all kinds of flaked cereals. Cereals of every description because starch is the chief element in cereals; so cereals are all antitoxic foods. Second, all kinds of farinaceous foods, fegetables, in fact all kinds of vegetables, because all vegetables are poor in proteids, contain very, very few proteids. All kinds of fruits; Every sort of fruit is antitoxic, because fruit contains sugar, or acids, fruit acids, and both xxx xx of which are carbohydrates and feed the antitoxic germs, if you please. That is another way, in which we might distinguish these germs, if you please,--the antitoxic germs, and the toxic germs. The antitoxic germs which make acids which kill the toxic germs, or germs

of putrefaction. All kinds of cereals, then, all kinds of fruits, all kinds of fresh vegetables,--they are all antitoxic. Now, how about nuts? Nuts are intermediate. Nuts are like milk. And nuts contain a large amount of proteid, they contain a considerable amount of fat; they contain very little sugar; so it is possible for a person to take so large a quantity of fats that hy might suffer from autointoxication, from encouraging the growth of these other germs; but this advantage is enjoyed, however, by nuts, the fact that these germs do not attack vegetable proteids so easily as animal proteids. They feed very readily upon animal proteids, but vegetable proteids they do not attack so readily. So nuts will not decay. Here is a piece of meat that decays very quickly. Here is a nut of which the opposite is true; it does not decay so quickly as meat does. Now, what are the toxic foods? First of all, meat. Meat is the chief of all toxic foods because it already contains germs which produce the putrefaction, and which produce poisoning. If you are going to eat meat, then, you must always take pains to cook it very thoroughly. Raw or rare meat should never beex eaten at all, because it swarms with these germs that grow; but if you cook the meat thoroughly, then it will not putrefy in itself, but it may be attacked by the germs already there; or the portion which is not digested may find its way into the colon and there will be seized upon by the ~~infinitive~~ putrefactive germs already in the colon, so will go to feed the putrefaction and encourage its further development.

Eggs also must be reckoned, in particular the white of egg, because the white of egg is pure albumen and it is very likely to undergo decay, and especially the hard boiled egg, because the hard boiled egg will not be well chewed in the mouth; it will not be broken up fine enough; and those hard masses are very likely to find their way into the colon, and when in the colon, they will undergo putrefaction, and many persons notice that when they eat eggs, there

is a peculiarly offensive odor to the bowel discharges. That is due to the putrefaction of the white of egg; so the white of egg especially encourages putrefaction. The yolk of the egg does not encourage putrefaction in anything like the same degree. Milk, as I have already explained to you, is an important substance which may or may not encourage putrefaction, according to the condition of the alimentary canal.

Now there is another class of foods which are peticularly antitoxic, not only because they do not feed the putrefactive organisms, but because they contain friendly germs which destroy the toxic germs. And one of these is buttermilk. Buttermilk contains acid-forming ferments; so if you take butter milk into the intestines, into the stomach freely, this buttermilk introduces acid-forming germs which help to drive out the putrefactive germs which are there, and the same thing is true of kumyss, and of kefir, and of sour milk; and that explains the fact that sour milk is so widely used, especially among people of barbarous tribes. They generally use milk in a sour state; and in most European countries milk is more commonly used in a sour state than in the form of sweet milk. In the orient, in Bulgaria, Macedonia, Roumania, Servia, and all parts of Turkey, Asia Minor, Egypt and throughout that country, milk is used in the sour state. Prof. Metchnikoff of the Pasteur Institute, has been studying sour milks from different countries. He studied the germs found in buttermilk, the germs found in kumyss, the germs found in kefir, the germs found in leben in Egypt, and the Matzoon of Turkey, and the yoghourt of bulgaria, or yaghourt, as it is sometimes called,--studied all these different kinds of sour milk, and he found in the sour milk from Egypt, and in the sour milk from Turkey and Bulgaria, Asia Minor, a peculiar kind of germ, an acid forming germs that was different from any found in any xxxx other sour milk. He found a germ which was so hardy and so tough, so resistant that it produced an enormous quantity of acid, and produced the acid more rapidly than other germs. He found this germs would pro-

duce in one quart of milk a whole ounce of lactic acid; in one single quart of milk this germ will produce almost an ounce of lactic acid, pure lactic acid, which is certainly very extraordinary. It produces fifteen or twenty times as much lactic acid as any other germ which has ever been found. It also has another peculiar property; and that is, it will live not only in the small intestine, but in the large intestine also; so when it istaken in regularly, every day, for some time, it by and by drives out these putrefactive organisms from the colon just as the dogs drive the cows out of the garden, so to speak; the invading creatures drive out these wild organisms, these meat germs which remain there for months even after meat is no longer eaten; and these lactic acid germs from yoghourt are capable of remaining there for months after the person has stopped taking it. That is the only organism that will do that. That is the ferment known as the Bulgarian ferment. That is why we ask you to take yoghourt. The sourmilk or kumyss served upon the table is prepared from this Bulgarian ferment which I brought home with me from Paris a few weeks ago, and which we are now using in milk. An

Antitoxic foods, then, are--all cereals, including rice which is particularly antitoxic, the most antitoxic of all the cereals, and our friends from the South I am sure will be very glad to know that, for as fast as people find that out they will be eating more of your rice; and it certainly is one of the very best of all cereals. Malted cereals, dextrinized cereals come next. These are still more antitoxic than rice. Prof. Combe of Lausanne has shown that dextrinized cereals, that is toasted bread, toasted flakes of all sorts, all kinds of toasted cereal foods baked until they are brown, well baked potatoes, if you please, baked until brown, baked in the oven in their jackets,--those baked in fats are particularly hard to digest; a potato baked in that way is toxic, and not antitoxic food. Malted cereals come next, all sorts of malted cereals, be-

cause the malt in the malted cereals fix feeds the acid-forming germs very quickly and readily, and encourages its growth. Prof. Combe found that milk sugar was one of the best feeds for the acid-forming germ, and that is why milk sugar together with barley water is sometimes found such a splendid food for babies who are suffering from autointoxication as shown by looseness of the bowels and fetid stools. We have been experimenting with malt honey, and we find it is the very best antitoxic thing we have discovered so far. It is just as good as the sugar of milk, and I am not sure but it is better; but we find that two ounces of malt honey taken three times a day disinfect the alimentary canal to such a degree that in a case in which there had been several billions of germs to begin with, while taking the malt honey under the same conditions as before except with the addition of the malt honey, the number of germs was reduced to millions,--a thousand times less. This was found to be true in four persons upon whom the experiment was made, and I think this accounts in some degree for the good results we see from the use of this substitute for sugar.

But it is not necessary to use malt honey. You can not always get malt honey. Then bees' honey I believe will answer just as well. I do not see any reason why bees' honey would not serve exactly as good a purpose. Some people do not like it. You can not eat it quite so freely, and it has some flavors some people do not like. It must be certainly believed that the sugar of fruits, the sweet juices of fruits must be in every way as good as malt honey, and probably even better. The juice of raisins, the sugar of raisins or prunes, or figs, of all these sweet fruits, of sweet apples, all of these sweet juices must be mentioned as being to a very high degree beneficial and helpful in disinfecting the alimentary canal through promoting the growth of these friendly organisms, or acid-forming germs. This probably accounts for the great success of the grape cure in cases of biliousness and chronic autointoxication,--feeding

upon grapes entirely for a week or two, or grapes with a little crust of bread in addition; eating ten or twelve pounds of grapes, but never swallow the skins or seeds--ten or twelve pounds of grapes a day. This has been found to be one of the very best methods of cure for autointoxication. I think other fruits might serve just the same purpose provided there is sugar and starch present to encourage the growth of these germs.

The antitoxic diet, then, consists of cereals, fruit, fruit-juices, of all kinds of fresh vegetables, buttermilk, sour milk, yoghourt, and everything which contains the lactic acid ferment. The toxic foods are meats of all kinds, eggs especially the whites of eggs--not so much the yolk of the egg, though it is somewhat toxic, and milk in some cases. I must add also that animal fats according to experiments made by Combe and others,--animal fats are highly toxic and encourage the growth of these unfriendly organisms, the putrefactive germs. The only exception is butter, and cow's butter, when thoroughly sterilized; and this is only a partial exception. Cream, for persons who can not take milk, is found to be still better, more easily digested, and less toxic than butter, but it is only for those cases who have no difficulty in digesting cream.

Next time, a week from tonight, or sometime next week at any rate, I will tell you about the diseases which result from chronic autointoxication, and I think you will be convinced, when I get through talking, as I am thoroughly convinced, that a large share of all the chronic maladies from which people suffer and that means a large share of all people suffering from chronic maladies, and that means nearly all of you, are suffering from chronic autointoxication.
A bad taste in the mouth is one of the prominent symptoms, and the coated tongue, and that can hardly fail to indicate autointoxication to some degree.

I am glad to announce that we have Prof. Fisher with us, the head of the political science department at Yale. He is going to be with us a week or two and

I am sure you will all be glad to hear from him on any subject he is likely to talk to us about. Prof. Fisher is heading one of the most important health movements in the country at the present time as chairman of the Committee of One Hundred, the purpose of which is to secure the organization and maintenance of a bureau of health in the national government, and I am sure you will be glad to hear from Prof. Fisher about this bureau of health which I believe to be one of the most important projects before the public at the present time.

HEALTH PERILS IN THE UNITED STATES.

A Lecture at the Sanitarium Driveway, Battle Creek, Mich., Monday, July 29, 1907, at 8:00 P. M. By,

Prof. Irving Fisher, and J. H. Kellogg, M.D.

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Prof. Irving Fisher. Ladies and Gentlemen: This I think is the third time within a week I have addressed you, and I feel that you must certainly be very patient to come and listen a third time. I shall not detain you tonight, however, because Dr. Kellogg knows so much more on the subject than I do that I shall merely introduce him.

It is astonishing to me to see the interest that is growing in this country today in health, and what I would like to call the economics of health; to see the number of people who are beginning to realize that the health conditions in this country are very far from what they ought to be. You know when the Cuban war was finished, one of the first fruits of that war was the cleaning of Havana, and, as a consequence, the improvement of health conditions both in Cuba and in the United States. The death rate in Havana was cut in two inside of two years. We know that through the efforts of Colonel Waring,

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of New York City, the death rate from malaria was reduced there in a very short time simply through cleaning the streets.

We are beginning to realize,--that is, an increasing number of people, though as yet only an infinitesimal fraction, are increasingly realizing that it is bad economy to save money in cleaning streets, or gathering garbage, or building sewers when the result of that penny-wise economy is the increase in typhoid fever, in tuberculosis, and in all the other conditions that come from over-crowding and bad sanitation in our cities today. I think the time will come when people will look upon present conditions, even in our very best cities in this country, as quite as barbarous, to them, as the conditions in Havana were to us at the close of the Spanish war; or, as, a century ago, were the conditions in Copenhagen when there had been no street cleaning for a generation. And it was said that sometimes, in the filth of the streets, the horses would be mired up to their bodies. It is no wonder that in such places the average duration of life was inside of twenty years, and sometimes as low as fifteen years.

We have very few trustworthy vital statistics going back 200 years. But those we have show that the mortality in urban districts was something frightful and, as I think I said a few nights ago when I last spoke to you, the death rate in London in the plague years, 200 years ago, was nearly one in two; more than one in three of the population. Certainly we have improved our urban conditions since then. We have decreased the death rate and increased the average duration of life.

On the surface, therefore, the world is going forward. Dr. Kellogg, however, tells us that this is only a surface indication, and that we ought not to measure our progress or retrogression by the ages in the average duration of life, but in the ages in the number of centennarians, or of very old people, in

a community; and this number, he contends, is constantly decreasing. I think it is a fair question whether statistics will bear his theory out, or the theory that we are really improving; and it is that question which is implied in the subject tonight.

Are we deteriorating or are we improving? Certain it is that the improvement is not altogether what it seems to be, for the increase in the duration of life is largely due to the prolongation of the lives of infants and, very often, of the lives of weakling infants who under the stress of natural competition, natural selection, would have been weeded out. It is therefore a question whether the race is really better off in consequence of the added length of years to average life, an increase from 35 to 42 in the United States; or is worse off because of the prolongation of weak lives. It is also certain that the death rate in adult years today is greater than it was a few years ago. As Sir Lauder-Brunton said, who is interested in this problem in England, in a letter written to me as president of the Committee of One Hundred, too much stress has been laid upon the question whether we are degenerating, as compared with the question whether we are making the best of our opportunities; and of this I am perfectly sure--that there is room for improvement to the extent of something like 100% in all our living conditions; that there is room for an improvement of 100% in the average duration of life; that there is room for an improvement of 100% in the average physical capacity for work; that there is room for an improvement of 100% in the happiness and usefulness of the average life in the community.

Whether, then, or not we are going forward or going backward, we certainly ought, for reasons of economy, to exploit this margin of possible improvement. As my colleague at Yale, Professor Norton, in a brilliant paper read before the American Association for the Advancement of Science a year ago, said,

1,500,000 persons must die in the United States during the next twelve months, equivalent to an army of persons constantly sick, 4,000,000 persons constantly sick, and over 5,000,000 homes, consisting of 25,000,000 persons, will be more or less wretched by mortality and sickness.

We look with horror on the black plague of the middle ages. The black waste was but a passing cloud compared with the white waste visitation. Of the people living today, over eight million will die of tuberculosis, and the federal government does not lift a hand to help them. This paper was the source of the Committee of One Hundred concerning which I told you a week ago, and is entitled, "The Economic Advisability of Inaugurating a National Department of Health." Referring to the contrast between the activities of our government in health matters pertaining to man and in health matters pertaining to animals, he says;--

"The Department of Agriculture spends seven million dollars on plant health and animal health every year, but Congress does not directly appropriate one cent for promoting the physical wellbeing of babies. Thousands have been expended in stamping out cholera among swine, but not one dollar was ever voted for eradicating pneumonia among human beings. Hundreds of thousands are consumed in saving the lives of elm trees from the attacks of beetles, and warning farmers against blights affecting potato plants; in importing Sicilian bugs to fertilize fig blossoms in California; in ostracising various species of weeds from the ranks of useful plants, and in exterminating parasitic growths that appear on fruit-trees. In fact, the department of Agriculture has expended during the last ten years over sixty millions of dollars; but not a wheel of the government was ever set in motion for the elevation of cure of the heart or kidney which will carry off six millions of our population. Eight millions will perish with pneumonia, and the ignorant parent accepts it with the resig-

nation of the Hindu who, in the midst of indescribable filth, constantly awaits the date of the cholera."

In Great Britain there was a few years ago a parliamentary investigation into the physical deterioration of the British army soldier, and it was found that the British soldier, at the time of the Boer war, was unable to come up to the standard in height; and it was necessary to reduce that standard in order to get enough soldiers. The question arose, Is the British race deteriorating? It was thought of sufficient importance for a parliamentary investigation, and as a result of the investigation, many views were brought out pro and con. On the whole it seemed to me that those who believe as Dr. Kellogg does, that the Anglo-Saxon race is deteriorating, have the best of it. They certainly had the better menin the argument, and attention was called to the fact that the soldiers of today are the children of the working men of the factories of the last generation who were brought up under those unhygienic conditions for which the factory acts, as you know, were passed.

When the factory system first came into Great Britain, not only was child labor used, and woman labor, but man labor was used to the extent of thirteen hours a day, and that was regarded as good economy; and when those scandals, as they were called, came out, the English people thought they must, out of reasons of humanity, reduce the number of hours in the factory work; but the economists, I am ashamed to say,--the economists, the men in my profession, said, "No, it is good economy to work these men as long as they will work; supply and demand will take care of that." They were surprised, as was the general public, including those who organized the movement for shorter hours, when, in consequence of reducing the hours from thirteen to twelve, from twelve to eleven, from eleven to ten,--it was found with every change that the employer got more work out of his workmen. In other words, it was bad economy to run

the human machinery hard, just as it is bad economy to run iron machinery hard. And no owner of a factory would think that he ought never to stop the wheels of his machinery long enough to grease them. He found out it was necessary to stop the wheels of his machinery long enough to grease them. So he found out it was necessary to stop the wheels of the human machinery long enough to feed them. It is still a question whether the working hours can not be reduced. In fact, I don't regard it a question. I have been collecting statistics on the subject now for some years, and I have observed the experiments which have been made with the eight hour day as distinguished from our present ten hour day which is almost universal in our factories, and with the nine hour day, and even with the seven hour day; and I have no hesitancy in saying that certainly, in many cases--I will not say in all,--in many cases the reduction in the working hours from ten to nine, and in some cases from nine to eight, and in a few cases from eight to seven and a half or seven hours has resulted in increased economy, if only sufficient time was given for the physiologic readjustments to take place in the workmen. In one foundry in France, for instance, it was found when workmen were originally working eleven hours a day, by successive experiments, the reduction was made to ten, to nine, to eight, and to seven and a half,--it was found that they got theirbest work out of a seven and a half hour day; although it took some six months before the increased efficiency of the workmen was found. Think of it,--a workman can do more in a French foundry in seven and a half hours a day than in eleven. What waste, then, what waste it is, even from the standpoint of the product of that factory, to have a work day which is unphysiologic ! And I believe that one of the greatest reforms that we need in this country and in all countries is to find the physiologic working day in our factories. And I believe that one of the health perils in this country is due to the unphysiologic working day in our

factories, and to an unphysiologic noonhour in our factories. In a factory in paris it was found that by increasing the length of the noonhour from one to two, the efficiency was greatly increased. In one of our factories in New Haven, it was found that by having a lunch club organized, so that the working girls could go out to that club and have a little recreationand fresh air, even though the noon hour was not increased, that they did better work in the afternoon in consequence.

One of our health perils, then, is connected with the factory system, with an unphysiologic working day, and with child labor. We are having now in many parts of the country the same difficulty that was experienced in England a century ago. And while there is much to be said on both sides of the child labor problem, and while those enthusiasts who are pushing for child labor reform have undoubtedly made exaggerated statements, it is true, nevertheless, that this problem should be faced in a sane and serious way, and solved by means of proper vital statistics and physiologic studies.

Another health peril comes in in connection with our school system. President G. Stanley Hall, who has made a greater study than any other living man, I suppose, of the subject of school hygiene, and of adolescence in general, the development of boys and girls, has come to the conclusion that there is altogether too much pressure in our school. Our school hours are too long. They devote too much time to putting something into the mind of the child, and too little time in letting that mind and the brain behind that mind develop to its proper maturity and powers.

We have a number of other problems and perils, The one which I would specially mention is the drug peril. That you heard about the other evening from a very talented speaker, so far as it applies to alcohol; and it certainly

is a problem far wider than the problem of alcohol. You have also heard about that from the lips of Dr. Kellogg frequently.

These three perils,--the factory peril, the school peril, and the poison peril, are three of our greatest health perils undoubtedly; and when the public understand how much can be gained by a proper solution of these three problems and of the other health problems of the country, we may expect the race to at any rate hold its own. We have, as Prof. Ray.Lancaster says in his great book, "The Kingdom of Man",--we have come to the parting of the ways. The human race has made a kingdom for itself. It is the only animal which has conquered Nature so far as to make an artificial environment. It has established the use of houses, clothing, cooking, and revolutionized all the environment under which we live. As a consequence it has, with the good, brought in a great deal that is bad. It has invented alcohol; it has invented other poisons; it has in its housing conditions introduced bad sanitation, bad air. The tenement house problem comes out of that invention. So all of these great inventions that have produced what we call civilization tend also to produce deterioration. The problem before us is, Can we retain our civilization without going back to barbarism and at the same time prevent deterioration? Professor Ray Lancaster says yes, we can, but it is a question whether we will.

So Professor Metchnikoff, of Paris, in his book, "The Nature of Man," points out that the only solution for the human race, if the nature of man is going to attain perfection similar to the end of a race horse obtaining perfection, through careful breeding, we must apply science; and applying science involves not only scientific discoveries, but their actual utilization. As Mr. Moody said, "Conversion is not knowledge." The application of science is not the mere formulation of the science. To illustrate what Mr. Moody meant, he said in one of his inimitable lectures at Yale, "If I come down to New Haven

station and get on a train thinking I am going to New York, and somebody comes along and says, 'Mr. Moody, this train goes to Boston,' I have knowledge then, but that ~~xxxxx xxxxxxx~~ does not prevent me from going in the wrong direction. Conversion" he said, "consists in grabbing my bag, getting out of that train, getting into the other train that goes in the right direction." And so, when we come to the parting of the ways, as Professor Ray Lancaster says, it is not enough for us merely to knowthat one way is the right way and the other way is the wrong way; it is important that we should shun the wrong way and take the right way. (Applause.)

Dr. Kellogg. Ladies and gentlemen: I am sure you have all been impressed by what you have heard here tonight. Professor Fisher speaks to you with authority. He does not speak what somebody has told him, or what he imagines, or what he thinks; but he has been telling you what he knows. When a professor of political economy knows something, he knows it; he has the facts to back it up. The little boy said, "What my mother says is so even if it aint so"; but when a professor of political economy speaks, we generally believe it is true, that what he says has statistics behind it, has science behind it, because he represents a professorship of science which he must base upon facts just the same as astronomy, mathematics and every other science has to have its foundation. So a professor of political science has to have something besides mere opinions; and he has been telling you that there are perils; and I was thinking as he was speaking here upon this question, ~~it xxxx~~ which it seems to me is one of the most important questions we can possibly consider, what is the greatest peril of all which threatens the physical health of the American people? And it seems to me it can be summed up better in a little incident than in any other way, in telling you a little incident which occurred here some time ago. A man came here from Chicago and brought his wife, and he had only been married a mon

a month or two, possibly six months--only very recently, and hex brought his young wife in, and as he came in he was looking very unhappy, wretched, and disconcerted, and he says, "Doctor, here is my wife; you see what is the matter with her." "Well," I said, "What do you think is the matter?" He said, "Doctor, she is a produce of modern civilization"; so I proceeded to find out what modern civilization had done for this woman; and I discovered she was certainly a very wretched woman, really a veritable wreck. I have in my library a book by a noted writer,whichis entitled, "The Cause and Cure of Civilization." This author considers civilization as a diseased condition. Now, I don't go quite so far as that. Civiliation has done wonders for this world. I am sure none of us would want to go back to barbarism; but while wonderful things have been done; while wonderful advances have been made; while the human race has been, year by year, climbing up upon higher ideas of knowledge, and the acquirement and practical application of knowledge, we have all the time been dragging along with us, and developing and inventing things which are positively destructive, so there is a sort of dry rot among usx which, it seems to me, as Professor Fisher has intimated to you, is destined to destroy the race unless we can exterminate it.

Now, we are waking up to the fact that there is something the matter with our fruit-trees, and in nearly every state we have laws which compel farmers to spray their fruit-trees with something that will kill the scale, or the yellows, or some other parasite that is attacking the fruit-trees; and the Professor has been telling you how much money the United States is expending--aomost five millions of dollars every year in fighting plant diseases of various sorts in the United States,--nearly five millions of dollars a year.

But how much attention is being given by the natuonal government to

the investigation of the causes of disease of human beings, and to the extermination of things which are infecting human beings?

Now, you will find out before you have been here very long--I haven't time to tell you about it all tonight,--that every man who swallows a mouthful of beefsteak, as beefsteak is now put on the market, is swallowing a multitude of parasites, and a multitude of parisites that are just as infectious, that are just as damaging to the man as the horrible scale is to the tree. We fight the scale that is killing the tree, but the parasites atteking the man we pay no attention to at all. You go down to the butcher shop and you buy your beefsteak without asking any questions excepting, is it tender? Is it tender? You do not ask what it is that makes it tender; you do not ask anything more about it. You only want to know whether it is toothsome. That is all you ask. Now, every man can not have a microscopt to inspect his beefsteak; every man can not have a sanitary inspector to be looking around, smelling about, inspecting the slaughter shop to find out whether it is a fit place to kill animals in, or whether animals are killed when they are diseased, or not; so you do not know anything about it. The flesh of the animal you are eating may have been just ready to die of Brights disease of the kidneys, or of cancer of the liver, or some other thing, and you don't know anything about it; but somebody ought to know. If you are going to eat animals, you ought to know they are healthy. But the ordinary man does not question that at all. Meat, meat is a thing you can tell less about, after the animal has been slaughtered and is in a state of advanced putrefaction, very often,--you can tell almost nothing about it by looking at it; and when the cook gets it all fixed up and put on the table, you don't know anything about the condition of it when it came from the slaughter shop. A man in Chicago had some turkeys that had been dead over a year and ought to have been

buried a long time before but had been neglected, and the man didn't know what in the world to do with them. A restaurant keeper came in and said, "Sell them to me; I will take them." He said, "Can your guests eat such things as those?" "Oh, yes," he said, "I simply put a little extra pepper in and they go all right."

Now without any national bureau or any national department by means of which everything pertaining to human health, to what we are going to eat, to all conditions of life that prevail,--without such a department, we are going to go right on just as we are going, with chronic diseases increasing. We have national laws about quarantine, and national laws to keep cholera out, and the c consequence of keeping cholera out is that the feeble folks that would be killed off by cholera are kept alive; and these feeble folks intermarry, and they help to raise the average longevity by adding a few more years to the life of a few people; but they actually cut down the stamina of the race; and so the thing is going on.

We have national laws against the public enemies of health and life; but there are private enemies of life. The things which come to us at the dinner table; the things that assail us in the streets as we go along, sometimes the dust that is swept up, as the Professor has been telling you about the neglect of cleaning the streets, and the habits of life which prevail that men are addicted to who do not know anything about the harm they are doing themselves,--that these things are tending to break down the constitution of the race so that the number of old people is diminishing. I think there isn't any doubt about it. Certainly it is true in England that there are only one tenth as many old people in England today as there are in Ireland; and there is a far smaller number in Ireland than there is to be found in Hungary. So we find the countries where people have the simplest habits,of life, the longevity is greatest; the people

are hardiest and toughest. As an evidence that civilization does something to weaken the race, I might mention an incident that occurred at the first peace conference at the Hague some years ago. It was proposed that dum dum bullets should be prohibited--bullets that rend and tear after they get inside of the body of an animal or human being,~~in warfare~~,-dum dum bullets should be prohibited ,--bullets that explode after they get inside and tear everything to pieces, that such bullets should be prohibited in warfare. What country do you think was the first one, and, I might say, almost the only one, to protest against the prohibition of dumdum bullets? That was the English government. Now, you would not think that. The protest came from London that is supposed to be the very center of civilization; and the English government said, "We can not deal with our savages; we have so many savage tribes under our control we can not deal with them without dumdum bullets", and one of them told a storyabout how he saw a savage starting away off at a little distance, perhaps two or three hundred feet, to make ~~an~~ a char e upon an officer. He raised his knife and started for that officer, made a charge upon him. There were six men who leveled their revolvers at that man, put their bullets through him, but he kept right on with the charge. Bullet after bullet went straight through his body, but he went on with the charge, put his knife through the officer, and killed him, then he fell dead himself. So they said it takes dumdum bullets to stop a savage. Ordinary bullets won't do it. That is because savages are so tough, hardy, vigorous that they can not be killed in ordinary ways.

What is the difference between these savages and civilized man? They were willing to fight civilized men with ordinary bullets, but the savage must have dumdum bullets to kill him. The toughness, hardiness, vigor and endurance of these native men, the civilized man knows nothing at all about. Look around and see what a puny lot we are. Perhaps you will say we are not fair specimens here; bu

here; but go out in the world wherever you like, and you don't find any better looking folks than we are here. I am always bragging of my good looking patients. The fact is, the whole world is sick. If you don't believe it, just look at the newspapers, just look at the drugstores and see how the medical colleges are multiplying and how the doctors are multiplying. We have in the United States at the present time about one doctor for every 300 or 400 people, and doctors are increasing all the time, and sick people too. Some people put those two facts together. Now, I am not saying that they ought to go together at all; but the sick people are increasing, so the doctors are present.

Now, the thing Professor Fisher has been talking to you about here in his previous talks, and the thing he is making ~~antxpartix~~ it appear here tonight I think, is to impress upon your minds the need of a national bureau of health. Now, this idea is not a new one at all. Prof. Fisher will tell you that he has been told by a very prominent physician, one of the best known physicians, a well known physician all through the United States and in all civilized countries of the earth. He had a letter from him a short time ago saying that the American Medical Association,--the greatest medical association in the world,--the greatest association that ever existed, numbering 35,000 members--this great medical association of 35,000 members,--the most learned physicians and the most eminent professional men in the United States--that this body has been working for more than twenty-five years to secure a national bureau of health. Prof. Fisher will tell you that, and I know that to be the case. WhenI was a member of the Michigan State Board of Health, some twenty-five years ago, we were continually making ~~a~~ the most earnest efforts; our board was continually sending a delegate to some convention somewhere, or to Washington to make a plea for a national bureau of health, or a national board of health, a national deparment of health. Now, we have got a national department of healt,

but it acts only in emergencies. President Roosevelt is a national department of health. The pork packers down in Chicago found that out some time ago, but you see it was only because President Roosevelt was a wide awake man. He saw the need of something being done, so he simply made himself into a department of health. There wasn't anybody else to do it; there was no national department that had ay right to do that thing; there was nobody in the world that could take that thing up and investigate it but President Roosevelt himself; and there was no way in which that thing could be done ave by the President himself putting his hand upon it and saying, "I am going to do this thing because I want to do it." He hadn't any precedent behind him, but he simply laid hold of ; and if his investigation had not shown up the tremendous evils it did, he would have been a laughing stock; he would have been considered as an intermedler, and would have been hooted at and laughed at; but the thing succeeded because of the evil things that were turned up.

Now, what we want is a bureau of health, or a national department of health. A bureau I think can be obtained, and I believe a bureau is the thing that is expected to be obtained--a bureau of health which will do that thing systematically; which will have its agents on hand everywhere where the health of the public is imperiled, watching for every opportunity to do something, to lay hold of some evil that is threatening the lives and the health of men and women. Now, I am sure half of you would be at home today, attending to your business and goingright on with your affairs, your families and your business if it were not for the fact that this thing is so much neglected. If we had had a national department of health, a national bureau of health for the last fifty years, and they had been doing their duty, at least half of you would not be her; probably not any of you would be here. This institution perhaps would

not have existed at all, because the great spread of certain diseases is due to this national neglect. This is getting to be a dangerous country to live in. And one of the great dangers grows out of the fact that our cities are increasing; the population is crowding into the cities. In some of our states, in New York, I think, half the population are in the cities. In western states that is not true; it is not true in Michigan; in Illinois it is not true, but it comes pretty near it. Pretty nearly half the entire population of Illinois is in the City of Chicago. They have about two millions of people there, and about five millions in the whole state of Illinois.

Here is one disease that is getting to be almost universal. About half the invalids, I might say, are suffering from it; and that is a disease known as colitis. Colitis, as many of you may not know, the disease known as colitis is an infectious disease; it is a contagious disease; it is a disease that is caught, that people get from one another; it is communicated. Prof. Combe, of Lausanne, has recently called attention to that thing. It is spreading all over Europe. Twenty-five years ago it was very little known, but now it is breaking out everywhere, and is found in the cities. Professor Combe shows that the people from the country do not have it, but the people who live in the cities--a large share of them have it, and they catch it, it is communicated in various ways. One way in which it is communicated is this: cattle grazing upon the land that has been fertilizedwith sewage and other refuse gets infected; then when these animals eat these germs which have been taken in with their food, they spread all through their bodies. Then when you come to eat the flesh of the animals, you swallow these parasites that have come from other diseased people, and have spread in this way into the animal flesh; so it is spread everywhere where animal flesh is eaten.

If we are going to eat meat, we ought to eat h althy meat; we don't want to eat meat that has been kept till it is rotten, till these germs have had a chance to grow, and grow, and grow. We want to know about health, and it is proposed to have a department of health that will study all these questions, that will find out whether we are right upon some of these questions of diet, or whether we are wrong; to find out who is right and who is wrong; to tell us how much we ought to eat of this element, how much we ought to eat of that element, and how much we ought to eat of the other element--to take hold of these great questions of the adulteration of food, of the question of medicines and drugs, and of the diseased conditions of animals and other things of that sort in a systematical study.

Now, scientific men are waking up to see the importance of this thing, and they have come to recognize it as so important that one of the first physicians in the United States, in fact, the very first physician in the United States, Prof. Welch, of Johns Hopkins University, was the first man that was willing to have his name put down on this Committee of One Hundred to study this question. Professor Welch was the first man. There wasn't another man on that committee but Prof. Welch, a professor of pathology, who studies the causes of disease and the consequences of disease. That is his business, his profession; and he is recognized as the foremost physician in the United States today--a man who is known all over the world. Prof. Welch says, "Yes, I will give my time to it; I will give the time necessary to study that thing, and to help that thing along; we ought to do it; it is a thing that needs to be done: Now, is it going to help Prof. Welch any? Is he going to make any money out of it? No. The more disease he stops, the less business he will have, because he lives on disease, on pathology, and on the consequences of disease. The more sick people there are, the better business for him.

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Now, here is Professor Fisher too, who gives some of his time to it. Why, he has given his vacation, his summer vacation, to working as hard as he can work during his summer vacation, instead of recruiting for next winter's work, has got his secretary out here with him, and is working as hard as he can work to get people interested in this thing. How much pay does he get for it? He doesn't get a cent for it; doesn't even get his traveling expenses; doesn't even get his board. I don't know whether he even gets any thanks or not. I hope we will give him some before we get through here tonight.

So there are ninety-eight other men, men of high standing, with one exception, on this committee, who are giving their time and doing their utmost to promote this good cause. Now, my friends, we ought to be thankful that the time has come when scientific men--not people who are looked upon as cranks like me, but men of science, men who stand in high positions, are recognizing the need of looking into this thing, and doing something. Now, I think that the greatest possible blessing that could come to these United States is to have a national bureau of health that will expend the money necessary, that will employ the experts necessary to study this question; and when we once can get the United States government to working at it, then we can depend upon it something can be done; for the United States does things in a splendid way. There is no country in the world that does things so splendidly as this country does; and when we get after that thing and get interested in it, we will begin to do things. You know we have been so interested in business, we have been so interested in agriculture, we have been so interested in commercial pursuits that this matter of health has been overlooked.

But now, our professors of political economy, whose duty it is to study the conditions of society, are taking this question up; and those who live by the sickness of the country, upon the disease of the country, have

become so horrified by the spectacle before them of the great race going down hill, of diseases multiplying year af by year, that they say it is their duty as altruists, as men who love their fellows,--it is their duty to disregard their interests; it is their duty to disregard their selfish, financial interests, to disregard them, and to turn about and give their time and thought to an effort to save their fellows.

Let us take hold of this thing, my friends, and take aninterest in it. I want to ask how many people here tonight will do their best to interest your congressmen, your representatives and senators in the United States congress,--that you will endeavor to interest them in favoring the proper bill when it comes before congress, for the establishment of a bureau of health. Those of you who are willing to do that, please put up your hands? I would like to see how many hands are up. I am glad to look over the audience here and see that about half the hands are raised. I suppose some of these ladies think they haven't any particular influence, so they don't care to vote. But I dare say you will exercise excellent influence, nevertheless, that may be very effective.

Now I am going to ask something more. About half of you have shown that you are interested, that you are willing to talk for this thing. You are willing to put in a good word for it when you get a chance, and I wonder if there is not somebody here who is willing to do a little more. It is necessary to use money in this thing until the United States Government have gotten hold of it, until the thing is launched--it is necessary to have some money. President Roosevelt said, "We will have a bureau of health just as soon s the public demands it; just as soon as there is a public demand for it we will have it." President Roosevelt says that thing. We will have a bureau of health when the people want it. He said, "I want it; I will be glad to have it." Of course

he does, because he is a bureau of health himself; he has already been working at it, and he would be glad to work at it some more, and he would have been glad to have kept it going. The bureau of health will go right on doing what he has been doing, and doing it a great deal more. Now there has got to be a public sentiment created. The bureau has got to come from the people. This is a Republican government, and the government comes from the people themselves. Now, it is necessary that public spirited people should show an interest in this thing, should take hold of it and do something, and here is a chance for us right here. You could not find a more Republican audience, I suppose, anywhere in the United States than is to be found right here. Here are people from thirty-five or forty different states, Republican people, and the things you can carry home from this place will be of tremendous aid in helping this thing along. I suppose this thing is going to spread out pretty soon all through the United States if a little movement can be obtained, and the result will be that the newsppapers of the whole United States will be just simply taking this thing up and telling the people about it and educating every home. It only needs a little money, just a small amount. The United States is spending five million dollars every year for pigs. We wan't to spend a little for the babies. A million babies that are in health today are going to die just because their mothers do not knowhow to take care of them. If we had a national bureau of health, we could put a little circular into every single home that would tell the mother how to feed her baby, how to sterilize milk, how to counteract the bad effects of sterilized milk. It is worth as much to knowthat as it is to know the other thing; for sterilized milk is not altogether good, and the doctors sometimes say, "Don't use it." Now, the simplest thing in the world to counteract all that is just to put a little lemon-juice in, a few drops of lemon-juice init. A tablespoonful of lemon-juice a day will save a baby from

the bad effects of ricketts and other things that come from ordinary sterilized milk. How much money would it take to tell that to every mother in the United States? It wouldn't take very much money; it wouldn't take but a little. Four thousand dollars would tell every woman in the United States about it; that is, it would put it into every single newspaper in the United States,--one insertion in every weekly newspaper.

Now, you see, there is only one thing that needs to be told; but there are at least fifty things that need to be told the people, and it would take $200,000 to do it, for you would have to do it fifty-two weeks a year. Two hundred thousand dollars would put this question of the ~~pmk~~ national bureau of health before the people fifty times a year. It would appear every single week for a whole year in every newspaper in the whole United States. And that is only one twenty-fifth part of what the United States government spends for pigs, of what it spent for pigs last year--think of it--think of it--what it means for the babies. If we can save half of that million of babies, aren't they worth the effort? And it is not only the babies, but it is the people who are going to die. Six million, the Professor told you here, of heart disease, and eight million of pneumonia, and eight million--ten per cent--every tenth person of our country is going to die of pneumonia. Bring it right home to ourselves, what it means. Every tenth person in this audience is going to die of pneumonia; and of ~~those~~ who are alive, every tenth person is goiing to die of ~~Kri~~ tuberculosis; and a whole lot are going to die of Bright's disease, and of ~~Cancer~~, and some more of other maladies all of which are preventable, almost entirely preventable by proper knowledge.

Now, I am talking too long. What we want is some money. That is one thing we want--some money. I am glad to see we have your good will. Now, we

want a little cash to back this good will up, to help to tell the people of this thing, and get everybody to talking to their senators and congressmen, and s stirring up politicians to do things. Politicians are awfully xxxgxx good to do things when they find the people with them generally, and you can not get them to do things no matter how needed they are, unless they feel the people are behind them and going to back them up. I want to know who there is here who will give five hundred dollars to help along this good cause. I believe one gentleman has already subscribed one thousand dollars. One man has already subscribed a thousand dollars; he wants to invest a thousand dollarsin this bureau of health. We have got to put perhaps, half a million dollars into it before we can get the thing started; but after getting it started, the United States government will put millions in it every year. This is a tree that has got to be planted, but if it is planted, the government will take care of it, but we have got to plant it, and letx us see if we can not do something toward it tonight. Let us see if we can not make a beginning, put a little money into it. There is one thousand dollars already. We want to get a thousand dollars here tonight, to add to that thousand dollars, and that will set the ball to rolling. With this thousand dollars, Prof. Fisher can do a whole lot of begging and get a whole lot more, you see; so every dollar will perhaps mean ten, and so the thing will multiply itself. Is there somebody here who will give five hundred dollars to help this along? If there isn't anybody ready with five hundred dollars--I see several people whose pockets seem to be very plethoric, almost sticking out with greenbacks, bills and coin. Five hundred dollars would do a lot of good. I don't know any way we can do any more good than with that five hundred dollars. A great statesman of the East, I think, said some little time ago that one of theproblems that xxx troubling the people are troubling themselves a very great deal about

nowadays is how to civilize the heathen. He said that is not the thing that is most serious; the most serious question is how to get the heathenism out of civilization. And one of the heathenish things is the way we are killing people orr in our bad conditions of lice. Let us take hold of this thigg and be the pioneers in this great movement. I would like to see the Battle Creek Sanitarium send the second thousand dollars, and I am willing to lift all I can on that thousand dollars; and I wonder if there is not somebody here who will give us five hundred. If anybody wants to do it but is too bashful to speak about it, just come and see me after the meeting is over. We will have it done privately so your left hand won't know what your right hand is doing. In that way it wan't do it. Who will give two hundred dollars? Two hundred dollars is a small sum; it is only the price of a horse, and a poor horse at that; and that two hundred dollars, I will guarantee, will save a whole lot of lives. I will guarantee that that two hundred dollars invested in this kind of a cause will get more opportunities of saving life than in any other way in which you can invest it. This is a pioneer thing, starting a new thing that won't be started unless we and other people like us will do it. Somebody has got to go down into his pockets and start thig thing. Isn't there somebody here who will give two hundred dollars? I know a lot of folks here who could draw their check for two hundred dollars and they would not know it tomorrow at all. I saw a lady getting up, and I thought she was going to do it. Now, who is it will give two hundred dollars. I think I see a lady whispering to her husband there that he better do it. I am sure it would be a good thing to do. Isn't there anybody that wants to help a good ause along? I am not asking you to help Professor Fisher.

Professor Fisher: I hesitated to say anything in regard to the finan-

cial side of the Committee of One Hundred. The other night I had not spoken with Dr. Kellogg in regard to it, and my trip here to the Battle Creek Sanitarium was not connected with this at all. I came here to bring my mother. But it is quite true, as Dr. Kellogg has said, that I am putting a good deal of my vacation into this work, and a great many other members of the committee are doing it also. I want to tell you what we intend to do, what the organization is for doing, and what the money will be used for. No member of the Committee of One Hundred is using a cent for himself. We have not thought it proper that any member should be salaried, even those who are putting practically all their time on it and shall continue to do so necessarily for a year or two; but ~~there is~~ it is necessary that there should be pay for the clerical expenses, and the clerical expenses will run up to the hundreds of thousands of dollars at least, and perhaps into the millions. When the national bureau of health is established, it ought to expend, before it is finished, if it does anything on the basis of what the other departments are doing, one hundred millions of dollars a year; and before that is established, the Committee of One Hundred, in order to arouse public sentiment on the subject, will need to expend the necessary money for educating the public. It requires two hundred thousand dollars a year for the mere expense of putting a weekly statement in all the newspapers of the land through what is called the boiler plate system. That is being used by some other organizations which are doing charitable work, and will have to be used by the Committee of One Hundred, two hundred thousand dollars for that one item alone. We have a finance committee now which is about to circularize the country by dividing up the country, locating in each town a local committee; and when Dr. Kellogg and I were talking this over, he, a member of the Committee of One Hundred, suggested that we have here in the Battle Creek Sanitarium people representing all parts of the United States, and

they can help the Committee of One Hundred immensely in establishing local committees there in your own town wherever you come from; and there will be, I hope, within a year, established a local committee for the Committee of One Hundred to circularize that town, in order to get public subscriptions from the town to help this work along, and also to enable the Committee of One Hundred to have a mailing list to which to send circulars educating the public sentiment on this question. You have heard enough about it to know the importance of it, so I need not tell you what that kind of education will do; but I merely want to tell you how this circularization will be effected. The bills for postage, and for stenographers, and for assistants, and for making the plate for the newspapers will amount to several hundreds of thousands of dollars a year. Then a research committee, with Prof. Westbrook, of the University of Minneapolis at the head, has been established to make researches on what is being done in France, Germany, England and other countries, and what is necessary to be done in this country for this work. That research committee will require several hundred thousand dollars a year. Then there is a legislative committee the chairman of which will require a stenographer to help to draw bills, as well as requiring a good deal of money to pay for expert advice in ~~framing~~ framing those bills. He himself is giving up a large part of his summer vacation and a vacation trip in Canada in order to take up the framing of these bills; so that our finance committee, and our research committee, our two committees on pub icity, and a committee on legislation, with other committees that will be established, the clerical work that will be required will run up to a great many hundreds of thousands of dollars a year. I don't dare say what I think it will be, but I think it will be apt to be over a million dollars. At present, we have collected no funds

at all except it has been one or two persons, and the Committee of One Hundred themselves have been asked to help. There have been a few subscriptions of one thousand dollars, and that is what I was hoping we might duplicate here, if some of those here at this institution would see the importance of it, as others who have been approached have seen it. I do not doubt that Dr. Kellogg will be glad to present this matter to any one who would like to consider, first, whether he would like to give large sums like that.

I wished to make this statement in order that you would understand that the Committee of One Hundred want this money only for actual expenses involved, and not for any remuneration to members of the Committee themselves, none of them having any such remuneration. I hope you will excuse me for making so long a statement.

Dr. Kellogg: Now you understand about it. Only just a few years ago a woman was captured by some brigands in Macedonia, and it only took a day or two, or two or three days to raise seventy-five thousand dollars to deliver that one woman. Now here is a thing that is intended to save millions of people; and certainly we ought to be interested in making some small contributions. A thousand dollars sinks into insignificance when you think of what it means, especially in the beginning of a great work of this sort. Isn't there somebody here who will give one hundred dollars? I will give one hundred dollars myself. Our good friend, Mr. Cornwell, who is always ready to help us out, says he will give two hundred dollars. Let us make it five hundred dollars before we quit here in the next two or three minutes. Let us see if we can not make up a thousand dollars by one hundred dollar subscriptions. Our good friend, Mr. Linn, gives us one hundred dollars. That makes three hundred dollars. Let us have a few more. We are getting along lively now. Is there somebody else? We are going to open a one hundred

thousand dollar subscription list here, and we will have it passed around. Is there somebody wants to give twenty-five dollars, or ten dollars? Shall we have a committee is appointed to circulate a subscription to solicit funds to help along this great work and good cause? All in favor of this motion say Aye. Opposed, no. It is unanimously carried. Now, I want to know if you don't want to give a vote of thanks to Professor Fisher for coming out here and telling us about this thing and getting us interested in it, and for giving us these three excellent addresses.

Voice: I move a rising vote of thanks be given.

Voices: Second themotion.

Dr. Kellogg: It is moved and seconded that we give Prof. Fisher a rising vote of thanks as an expression of our appreciation of his interest and of his excellent lectures which he has given us here. All in favor of this please rise. I see the vote is unanimous.

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THE SANITARIUM SYSTEM

A Stereopticon Lecture at the Sanitarium Gymnasium, Thursday, August 8, 1907,

At 8:00 P. M., By,

J. H. Kellogg, M. D.

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Ladies and Gentlemen: Thirty-one years ago there stood upon this spot a small, two-story wooden building, a farmhouse which had been converted into a water cure by putting on an addition behind in which there were a few bathtubs, and a big tank. That was the Battle Creek Sanitarium at the beginning. Ten years before that time work had been begun in this little farmhouse in the treatment of the sick by means of water and the application of certain dietetic rules, but without very much science. The water was applied empirically after crude methods, without any scientific regulation, for there were no scientific physicians connected with the place. Nevertheless a great many people got well. The change of diet from an infectious, and disease-producing diet to a simple natural dietary worked great results. That thing alone was sufficient to accomplish a cure in quite a good many cases. The application of water, hot and cold, also effected cures in many cases, because in a great many instances all the patient needed was relief of pain somewhere with an improved circulation of the blood in some way; so these very simple measures, unscientific as they were, empirical as they were, resulted in such a number of cures that a considerable number of people came.

When I took charge of this establishment as it was thirty-one years ago, there were twelve patients; no, there were twenty patients, but eight of

of them left the next day because they heard a young fellow had come here to take charge of the place. They hadn't any confidence in the boy that came here to look after the thing. So eight people left the next day. The twelve people stayed by and got well, and some more came, and within a year there were 100 here. So the institution has gone on growing ever since.

Now, I undertook thirty-one years ago to organize a system, and it has come to be known now as the Battle Creek Sanitarium System--the work we have been doing here, myself and my colleagues,--we have gradually built up a system, not by new discovery, for there have been no great discoveries made here, but by organization, by bringing together all known methods and measures of treatment which are effective in a natural way, which work in harmony with natural principles.

Now, the first foundation principle of this system is that Nature cures. A great scientist said that more than sixty years ago, nearly seventy-five years ago. Deitl, the famous pupil of the great Roquetanski, one of the greatest of his pupils, said, "Nature creates and maintains, therefore she must be able to heal." Isn't that a reasonable proposition? • "Nature creates and maintains." Suppose we have here a little baby boy that weighs five pounds. Twenty years later he weighs 150 pounds. Upstairs we have a man thirty years old who weighs 525 pounds. He is growing smaller, however, every day, and I hope we will get him down to about 300 pounds by and by. Now, Nature has changed that person from a five pound boy to a 500 pound man. The creative process has gone on by which this boy has been enlarged. It is a creation as much as the first creation of the world, as the beginning of things. Every man is a creation; every living thing about us is a creation. Nature creates. Now, it takes the same power to take care of a man after making him as it did to make him. It takes the very same power to keep a man alive as it did to make

him alive in the first place; for we haven't the power to live automatically or independently. We live only by the continual pouring into us of a stream of life. Without that continually incoming stream we must die, because we are expending life, we are expending energy every moment of our lives. A candle that is continually burning will by and by burn out. The body is always burning; that is why we are warm; that is why the flesh feels warm--because there is a burning going on inside; and this burning is a consuming; so there must be a continual pouring in of energy; and we get this energy from the forces of Nature, and it comes to us from the food we eat, from the air we breathe, and the water we drink. So Nature creates and maintains.

Now, the same power that creates and maintains must be able to heal. That is the dictum of Deitl, one of the greatest medical men of the last century; perhaps the greatest medical man who lived within the last 100 years, Virchow, of Berlin, the man who wrote that epoch making book, "Cellular Pathology" that laid the foundation of all our modern science of histology and pathology,--Virchow said that disease is not an entity that takes possession of the body; it is not a parasite which invades the body and fastens itself upon it. Disease is simply an exhibition of the process by which Nature carries on the vital functions under altered or abnormal conditions. Disease is simply an exhibition of the process by which Nature carries on the vital activities of the body under altered conditions. That is all there is about disease. It is not a parasite that fastens itself upon the body; it is not an entity that takes possession of it. That was the old idea. But it is simply an abnormal behavior of the body because of the obstacles against which it has to labor.

Now, here is a man walking along the street, and he walks straight, and he walks steadily; and we say that man is walking in a very stately, dig-

nified way. That man comes to a lot of obstructions. There has been a fire, perhaps, and the street is full of all sorts of things--bureaus, bedsteads, sofas, feather beds and all kinds of things that have been tumbled into the street. You see that man can not walk in a dignified way over those obstructions. He has got to pick his way around, and climb over, sometimes on all fours, clambering through this mass of obstruction. Now, that is what Nature has to do when she labors under the difficulties that we impose upon her, if we load the body down with burdens. The man who smokes is putting an obstacle in the way of Nature; the woman who drinks tea and coffee is putting an obstacle in the way of Nature; the man whose alimentary canal is filled with toxic germs, microorganisms that manufacture poisons that are poured into his body continually, that are overworking the liver, and overworking the kidneys, that fill the skin with poisons and coloring matters that infect his brain,--that man living in that condition can not behave naturally, he can not think straight; he sits down in his countinr room at his desk, and his brain is clouded and confused. He meets a man, and he says "Good Morning" in such a short, curt way that his friend thinks he is mad at him; so he makes enemies instead of friends. He finds his business all going wrong.

I remember a man some time ago who owned a brewery worth a million dollars, he said, and I found him lamenting very much one day,--"Oh, I am a fool, I am a fool." "Why, what is the matter?" I said. "Why," he said, "I discharged my foreman the other day; I got mad and swore at him, and he quit as quick as that. I paid that man ten thousand dollars a year, and I could not get him back for twenty thousand. I was just a big fool." "What made you do it?" "Just simply because my stomach was out of order. There wasn't any sense in it. He hadn't done anything." Now, that is the difficulty, you see. The machine goes wrong; the physical machine goes wrong; the heart behaves badly

and everything is going wrong when the body has been put into a condition where the machinery can not work in an orderly way; and that is disease.

So, as I said, the fundamental principle of this institution, the Battle Creek Sanitarium System, is that Nature cures. When we say Nature cures, we mean nothing more nor less than that God cures. Nature creates, we say. There is only one Creator--God, the great Power behind all things; all intelligent men and women recognize that this great Power--that there is a Power behind, and that Power behind all created things is God. The Christian calls that Power God. The scientist calls it the Unknowable. The agnostic says, the Unknowable. Bunge says, the thing that exists in itself; the infinite, the non-relative, and so on--a great number of terms are used. The scientist does not like to use the sacred word; so he fixes up some term to represent it; but it all means the same thing; it means simply God. God is the Power behind it; so when we say Nature cures, we mean God cures. That is one of the processes of the divine Power that keeps everything in order, that keeps the great astronomical clock ticking steadily; that keeps our bodies going while we sleep; that keeps the heart beating and the lungs respirating. All this we know from the standpoint of science. We know that the Power behind all things in Nature,--this same God, is working within our bodies. That is the Power that heals.

Now, we must co-operate with that Power, and the first thing to be done in co-operating is to remove the causes. Doctors can not cure; medicines can not cure; baths can not cure. Why think of it--putting creative power into a bottle and putting a cork in it! It would not stay there. The Power that can heal a man--creative power,--you can not fasten it up in a bottle. It would burst the bottle quick. You can not imagine that there is such a thing as a healing, creating power in a bath-tub. Bath-tubs never heal anybody.

Baths tubs can not create anything. It takes the same power to heal that it takes to create, and the thing that creates is able to heal; the thing that heals is creative. So, as I said, there is no power in the bath-tub to cure. Doctors can not cure. A doctor can not cure a man any more than he can build a man out of clay--not any better. It is just as impossible to make a man out of clay as it is for a doctor to cure a man. What are doctors for, then? Doctors are only to point out the way, to lead the way; doctors are only to help remove obstacles; doctors are only to show people how they have themselves been putting obstacles in the way.

So this institution, for the last thirty years at least, has been working on that foundation--that there is a Power that heals, as well as creates, and that that Power is working in the body and ready to heal every man that can be healed, provided he will get the obstacles out of the way, and the work of the doctor is simply to remove obstacles. Baths help; diet helps--is the greatest of all helps, perhaps; outdoor exercise helps; a great variety of things help; but the necessary thing is to remove obstacles.

Now, the first thing to be done, then, in beginning the management of a case, the first thing to be done is to find out what is the matter with the man. Now, we will have the lights out, and have some pictures here, and we will go a little into the details of the Battle Creek method. The first thing is to find out what is the matter. I remember some time ago I was examining a man, and I examined his lungs, and his heart, and his liver, found something the matter everywhere, and he said, "Well, Doctor, I guess you will have to put in a whole new set of works for me." That is generally true of the chronic invalid. The chronic invalid has something the matter everywhere. A lady said to me the other day, "Doctor, what do you think is the name of my

disease?" I said, "There is only one name that will cover it." "Now, what is that?" "It is total depravity." I was obliged to tell her she was suffering from total depravity, total physical depravity, and I took the pains to do it. So the chronic invalid has something the matter almost everywhere, and on that account we must examine him everywhere, and make a thoroughgoing examination. The majority of people that come here to the Sanitarium have never taken the trouble to have a thoroughgoing examination. When they go to see their home doctor, they say, "Now, Doctor, you know all about me; you know what I want; give me a little something for my liver. I am in a hurry, and haven't got time to stop this morning." So the doctor never gets a chance to look thoroughly into the case. Business is always pressing; social duties are calling, so the patient has never had a real, thoroughgoing examination.

When a patient arrives at the Sanitarium he is first introduced to the medical office. The medical office is a part of my office. I have a room where I dictate to a stenographer,--another room where I talk to people; then there are three other rooms, one of which has a lady, a trained nurse, and the other a doctor or two; the first the ladies' medical office, and the second the men's medical office; then there is a waiting room. Those five rooms are my department of the institution, and the first thing when the patient enters the men's medical office, if it is a man, or the ladies' medical office if it is a lady,--the patient is asked a few general questions so as to ascertain something about the general nature of his case, and then arrangements are made for him with reference to the examination. It is explained to him about our various departments, and about the general program of the institution; and he goes off generally forgetting almost all that has been said to him, for there is so much about it. Some little books are put into his hands, and he can read,

but he almost always forgets to read those; so he has to be told all over the next day. But we will suppose this patient has gotten full instruction, and he understands it all, keeps it all in mind, and he goes out. The next day he comes back at twelve o'clock, and has his blood examined. He has a little bit of blood taken from the tip of the finger, or from the lobe of the ear, and that blood is examined, first with reference to the coloring matter. The coloring matter gives an idea of the color of the blood,--not of the quantity, but of the quality of the blood, and some other general ideas with reference to the quality. A little portion of this blood is taken over to the laboratory and carefully counted; the number of blood-cells in a cubic millimeter are counted. A millimeter is 1/1000 of a meter. A meter is a little more than a yard, and a cubic millimeter is simply a cubic thousandth of a meter, or a cubic 25th part of an inch. The report of this is made out on a blank, and the number of red cells is counted, and the number of white cells is counted, and the amount of coloring matter in proportion to the number of cells, so that the quality of the cell may be determined. And other things are determined about the blood. The specific gravity is determined, if we find it necessary, and the alkalinity of the blood. If malarial infection or anything of that sort is suspected, the blood is examined still further for parasites which may have infected the blood-cells; and if there is any suspicion of infection of any other sort, then some portion of the blood is taken by the bacteriologist and a culture is made so as to determine whether there are any bacteria there, or microbes, and if so, of what sort. Also the blood-pressure is determined. I must say a word more about the blood-pressure. This is the examination made in the laboratory where an expert is counting the blood-cells. It requires very careful study, about an hour, to make the differential count of the blood, because there are different kinds of cells in the blood, and the different kind

kinds must be individually counted. Here is the report that is made with reference to the blood. Here is the number of blood-cells. In this case, you see, there are one million 150,000 blood-cells, and that is not enough. This patient was a gentleman, and he should have had five million blood-cells. Men are entitled to a little more than women, you see. A woman has four million, five hundred thousand; but this man only had one million, 150,000. That is only about a quarter of what he should have. The blood is the great capital of the body. It is the most important element, the vital capital--the blood. The blood is the life. The Bible says that. The blood is the life; the blood is the healing power of the body; the healing power of the body is in the blood; so it is very important to have an abundance of blood, to have the blood 100% in quantity and quality; and one who has only 23% is 77% deficient, and at so much discount. Ten per cent discount of the blood is a serious matter. Twenty-five per cent discount, is a very serious matter; but 75% discount is a very, very serious matter. We have one poor lady here at the present time whose blood has only ten per cent of the number of blood-cells it ought to have. The quality of the blood, the coloring matter is 45%, so that is nearly twice as good as normal; so the coloring matter is about 200%. And that is the reason why this lady is able to live. The blood-cells, while they are so few in quantity, are very extra good ones, so they are able to count for more than 23%. But she must have more.

Now, here are the white cells. These white cells, which are normally about 7,000, are only 3,000; so they are less than half, only forty per cent of what there should be, of the white cells. The white cells are the body defenders. It is the white cells that fight off the germs for the body. That is what they are for. The red cells carry oxygen, and this patient has only 23% of red cells,-

23% of red cells when she ought to have 100% and she is short of breath. She can not walk but a little ways. This patient is breathing fast all the while, because he has only a quarter as many blood-cells as she ought to have, so her breathing operations are interfered with. Oxygen is carried into the lungs by the movements of the chest, but the oxygen must be picked up by the red cells, and carried all through the blood. The oxygen makes the blood red, and if these red cells are deficient in oxygen, the whole body is deprived of oxygen. The white cells, as I said, defend the body from germs in this battle. They are continually fighting at a great disadvantage in this case, working at a great disadvantage when there are only 40% of what there ought to be. This is a case in which the army has been decimated. Sixty per cent of all the soldiers have been killed off, and only forty per cent of the original army remains, and of course, they can not fight so well as the whole army could. A personwhose blood is down like that is very much exposed to attacks of disease. If he gets pneumonia, he is certain to die of it; if he gets Bright's diseuse, he is certain to die of that; because he hasn't blood enough to fight it off.

This shows the blood itself. Here are the arasites down here. This is the way they lookunder the microscope when they have been colored; and here are the other kinds of cells--white cells of avrious sorts. Here are the cells that fight off the microbes and bacteria. These cells are also good germ fighters Here are other cells that have other functions in the body. These large cells that you see are very interesting bodies; they are what are called the macrophags, and these are the cells that remove debris from the body. If you have an ankle sprained or swollen up, these cells come along and gnaw off the hard tissue there. These cells, if you inject a little indigo into the blood, you will find these cells are filled with those little particles of

indigo. They are the scavengers of the body. It is their duty to move up and down through the blood-vessels and gather up the debris of the body. They are scavengers. For instance, if a person has received into his blood some malarial parasites , the white cells if they are strong enough, kill the parasites, and these are some of the cells that have gathered up those dead bodies and carried them off. Sometimes the red cells die, and one of these big cells will swallow one of those little ones and in that way carry off this dead body, eat it up after while. That is all very interesting and beneficent, but there is another story about these cells which it is important to know. Here is a man who drinks alcohol. Alcohol damages his brain cells, and muscle cells, and heart cells--damages the tissue. By and by these brain cells get so badly damaged that these cells come along and recognize those tissues as being of no use in the body, so they attack them and eat them up, destroy them; and that makes fatty degeneration of the heart. When a man's hair gets gray, it is because some of these cells have gotten hungry, gotten up into his hair, and carried off the coloring matter. These cells here have stolen up into the inside of the little tube in the hair, and gnawed away the coloring matter, and carried it off; and in that way the hair loses its color. In the same way they attack the brain. When a man's brain is under the influence of alcohol, tea, coffee, or opium, or tobacco, or other things that damage the tissues for a long, long time, by and by the cells become so damaged, that these scavengers attack them and remove them. They attack the brain-cells, and that makes paresis, and it makes certain forms of insanicy; makes paralysis. When a man gets locomotor ataxia, it is because some of these cells have been attacked in some portion of the spinal cord. When a man gets paralyziz in the lower extremities, that is because some of these cells have been invading the spinal cord and caused degeneration of the cord.

CORRECTION

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Now, it is probable that the thing which above all others causes these scavengers to go to work in the body in this abnormal way, attacking the body itself, just the same as policement that are intended to protect the body but turn upon the city, and go to setting fire to the houses and destrgying the buildings,--that is exactly what these scavengers do. The thing that produces this condition more than any other is the absorption of toxic matters into the alimentary canal. The man who neglects to chew his beefsteak, for example,--the beefsteak goes down into the stomach undigested, gets into the colon, lies there, undergoes putrefaction, and the poisons are absorbed into the body, and these poisons paralyze the cells, the tissues, until the scavengers are called to act upon them.

I saw some years ago out west a cow on her last legs, and I saw a hawk perched upon her back, eating her back bone, eating her flesh while she was still alive. I dare say that an hour or so after ward she fell to the ground and never rose again, but became a prey to hawks and other beasts, scavengers that are waiting for such an opportunity. If a man abuses his body by wrong habits to the point where the tissues, the fibers of the body have lost their power to defend themselves, then these scavengers will attack them. Metchnikoff, of Paris, the eminent successor of Pasteur at the Pasteur Institute, discovered this. When I met Metchnikoff last March or April, he showed me about his laboratory, and I saw the very places where the experimerts are made--the little tanks in which the curious little creatures with which the experiments were made were swimming about. I found Metchnikoff a very delightful gentleman. I will show you his picture some of these days, and tell you some of the things he has discovered, by which the attacks of the macrophags can be kept off. It is these macrophags that cause old age, that bring wrinkles in the skin, that cause cataracts in the eye; that cause deafness in the ear, and the faltering step, the wasting of the tissues, the feeble brain of

old age; and they are the result of hardening of the arteries; these all are due more or less to the action of these scavengers.

Now, in the examination, you see, the patient's heart is examined. Here are the lungs, which are of greatest importance, and these are carefully gone over; and the heart, the location of the heart, the location of the lungs; and the doctor listens to the breating, and notices in each part of the lungs to see if the lung extends down as far as it ought to on either side; and the heart itself is inspected, its location is ascertained. Here is the left heart, here the right heart, here are the valves of the heart located in different places throughout the chest; here is one valve; here is another valve; down here is another; so the doctor listens to all the different places until he finds the various conditions of the heart; examines the different valves here so as to know if they are all intact. Here are the different valves--the tricusped valve, the mitral valve, the semilunar valves, the aortic valve-- he examines them all. So the doctor finally gets a knowledge of the condition of the heart. Then the blood-pressure--that is taken on the first day, examined for the purpose of determining the condition of the arterial walls. Here you see an artery which has been cut across, and this shows the wall of the artery, and this is the center of the artery. By means of the blood-pressure instrument, we can ascertain whether the artery is being closed up or not. Here is an artery in which the walls are thickened. This patient is suffering from arteriosclerosis. You see, this is like a water pipe being filled up with sediment. The walls became thickened inside of the opening so that the size of the opening has decreased in size. When the heart has to force the blood through these smaller openings, more power is required, so the pressure is raised; the pump has to work at higher pressure, and that is what is called

arteriosclerosis. This shows some arteries that have undergone this change. Instead of being the smooth arteries of health, you see, these sacks are formed, aneurisms are formed, weak spots, calcareous, chalky depocits, so that by and by the vessels become so brittle that they burst; then the patient has apoplexy. That is the beginning of apoplexy; so it is an exceedingly important thing to know just where a person's blood-pressure stands. The normal blood-pressure is 105. The lower limit is 90. The upper limit is 145. As a person grows old, the blood-pressure naturally rises. In typhoid fever the blood-pressure falls. I am glad to say my blood-pressure is still 105. I hope it won't be more than 105 for forty or fifty years yet; but I examined a young lady the other day who is less than forty years old--thirty-five years of age, and she had a blood-pressure of 160. That means that young lady is a good deal older than I am. I am 55, and she was thirty-five according to the record, but as a matter of fact, she is at least thirty or forty or fifty years older than I am, because her blood-vessels are older; and an eminent French physiologist has very well said that a man is as old as his arteries. When the arteries are old, the man is old, because the arteries feed the tissues, carry the blood which is the life of the body, and the arteries are the means of supplying nutriment to all the body, and when the arteries grow old, the nutrition is cut off, the arteries are filled up, and such arteries are exactly in the condition San Francisco was in when the earthquake came--it upset the water pipes so they could not put out the fire. Now, it is exactly the same thing. Disease is a fire burning in the body, and the blood is the water that puts out the fire; and when the blood-vessels are clogged up and chalky, the fire will burn, and it can not be put out. Then the tissues are starved, because the blood can not be carried to them,--the nourishing, healing, blood.

Here is the blood-pressure being taken by an instrument known as the sphygmomanometer. This matter of the blood-pressure has been studied for the last twenty-five years with a great deal of interest. I think I have purchased every instrument that has been invented, pretty nearly, for the study of the blood-pressure, and it is only within the last few years that really practical instruments that were accurate, and would give the same results on the same patient in repeated examinations, have been perfected; but now we have such instruments, and there have been made in this institution more than 15,000 such examinations of blood-pressure, and with very great profit to the physician and the patient. We found here a blood-pressure of 200 in a lady the other day; and last year we found a patient with a blood-pressure of 240. This lady was very much discouraged because she had very important work to do. She was a very prominent literary woman, well known all over the United States, and she had work she wanted to do, books to write, and very important interests she wished to look after; and she said, "Well, am I so old?" "Yes, you are old." "How old?" "Seventy-five or 80 years old." "Oh, but I can't die yet; I must do my work." But it is not too late to get young again. The arteries are not yet chalky. They were hard but not chalky; so now we are doing something for that patient, and in the course of nine months I was glad to see this patient's blood-pressure down to 124. She was almost a young woman. When I was east a few weeks ago, I met this lady, and found her carrying on a very large work, doing a tremendous amount of work, and doing it very easily. It is a great satisfaction to know she was getting on so well, and the blood-pressure was down. When this lady found out what her condition was, she said, "What shall I do to mend this?" I told her what to do, and when I met her the other day, although I had not seen her for a year, she was doing everything right up to the scratch. She is living for low blood-pressure.

Now, the reason why so many people die of apoplexy, the reason why so many senators drop off all of a sudden; the reason why so many men prominent in public life fall at their posts so suddenly is high blood-pressure more often than anything else. High blood-pressure kills in two ways: it wears the heart out so the man drops dead on the street sometimes when he is hurrying to catch a train or a streetcar--his heart is worn out; or a blood-vessel bursts in the brain because the pressure is so high, in order to overcome the obstruction of the blood-vessels, the brittle blood-vessels will not hold against the pressure; so they burst. A healthy blood-vessel is able to resist fifty times the ordinary pressure of the blood; but when the blood-vessel is changed by disease so that it becomes almost as brittle as a bit of fat tissue,--such blood-vessels have very little power to resist the pressure, and the run may be anough to produce apoplexy, or even less exertion than that.

This is an instrument called the sphygmograph, by which the blood is studied, so we are able to get the form of the pulse. This is really the man's actual hand writing; and every person's pulse makes its own writing. That will be a good way to detect criminals, sometime--get the man's pulse tracings, and then get it again. He would have the same type of pulse tracing. However, there would be a variation according to how much exercise he had been taking and his state of mind, so that it might not be equal to the Bertillon system for detecting criminals; but you can tell very much about it, as you see here, by these tracings. Here is a sphygmographic tracing of a persons under different conditions. Here is a case of a pulse of aortic degeneration; the aorta is worn out. Here is another kind of pulse, a low pressure pulse--diacritic. Here is the pulse of low tension. Here is a high pressure pulse. A person who has very high blood-pressure will have that kind of pulse; and a person with low pressure will have this kind of pulse; and a person whose

blood-pressure is low will have this kind of pulse. This is the pulse of a person almost ready to die with arteriosclerosis and degeneration of the arteries.

This is the laboratory where these researches are made. Here you see another view of the laboratory, and the laboratory table, and the bacteriologist, Dr. Nelson, at work at the microscope, making a study of these specimens which are found in these tissues here. If any of you wish to see this work going on, you can get Mr. McCarty, the chaperonne of the institution, to take you over there and show you; and here is the big incubator in which the little test-tubes in which are specimens of germs from different patients, are put in to grow over night; then they are examined the next morning to see what they look like. Their form of growing tells what they are. You might have a handful of different kinds of seeds, and you could not tell, unless you were experts in seeds, what they were. But if you plant them, and the plants come up, you can tell what the seeds are. That is the case with the germs in the mouth. Take a drop of saliva and plant it, and see the germs growing, and we can tell what they are. There are many hundreds of different kinds of germs. When they are planted in this way and allowed to grow in different kinds of food material, we are able to tell just what they are. This is a cover glass preparation of sputum of a person who had influenza, a person who had la grippe, and a little sputum, expectorated matter, has been put on a slide; and these black spots are the germs, or little collections of germs. These are colored with various kinds of coloring matters. A wonderful property of these germs is that the different kinds of germs take different kinds of coloring matter. Some of them take the coloring matters and hold them, and others give the coloring matters up very easily, so they can be washed out again with acids or alkalis; so the different kinds of germs can be dis-

tinguished very largely by the different coloring matters which they absorb.

Here are some other germs, you see. Here are some of those macrophags swarming out into the hair. When one of those blood-cells gets into the tissues, it spreads out and looks like this,--just like a great octopus; it reaches out arms in various directions. Here is the coloring matter of the hair--little black specks of brown specks that give it its color; and this macrophag is reaching out its arm, stealing it away. Then it reaches in, finds another hair, and it goes on through the hair until it goes through this coloring matter and carries it off down the tube. That is the way it steals it. Here is the same thing entering in through the brain.

This is the brain of a woman one hundred years old. That is what made the brain old. These cells are attacking the brain cells. Prof. Metchnikoff, of Paris, saw ~~saw~~ those pictures actually taking place, and they are in his book. Here is another, a case of a man ninety years old. This shows the cells invading the tubules of the kidney in this way, you see. This is the same process going on in all parts of the body when old age has become apparent. We will try to explain to you what is going on here. This is taking a test breakfast; that is rather stealing the test breakfast after the patient has swallowed it. A man complained the other day that after he got his breakfast, a man came along and robbed him of it. After the test breakfast has been taken over to the laboratory, it is subjected to a great variety of tests. Each breakfast is put into a filter and filtered, and the clear solution is caught in these vessels here. Then these are subjected to a great variety of tests. It takes from three to five hours to examine a single specimen. It is only by taking a large number together that it is possible to do it. Several can be carried along together, and in that way, time is

somewhat economized. This is what you can see every day over in the laboratory. So that is going on every day. Specimens are taken out, a small quantity is put in one of these little crucibles, then they are evaporated over a sand bath; then they are put into a calcium flame; here they have been calcined, as you see, been burned; then this residue istaken from these dishes and subjected to other processes, dissolved in other little dishes, then subjected to the most careful assay, just as a bit of ore will be assayed to ascertain the amount of sand and sulpher in it, and the final result is recorded; there is a record made of all the different quantities, upon the chart here. The actual acidity, the calculated acidity, the amount of free hydrochloric acid, the acid which is combined with albumin, the neutral acidity, the neutral chlorin, the sugar that is present, and the coefficients of protein digestion, carbohydrate digestion, and all these different things are recorded upon the chart; and if the case is normal, the line will run within these limits across the chart. This was a normal case. If a person has hyperacidity, it will run away up here. If a person has hypoacidity, a deficiency of gastric power, it will run away down here. Sometimes you find a line running almost straight across the top down here. That means the stomach is almost entirely out of business. Here is a case of that sort in which you see these figures are very low. However, there was one saving grace; this patient had some combined chlorin, showing that there was some chlorin formed; but this chlorin was neutral; it was of no account, although it was neutralized by ammonia. Ammonia was formed in excess, and this is combined with the chlorin instead of the chlorin combining with the food, entering into the process of digestion. Here we have the stomach. The doctor makes a careful examination to locate the stomach, and the liver, and the gall-bladder, to see if there is any trouble

there. Last week I found a case in which there was tenderness about the gall-bladder, had been repeated attacks of gallstones, and the lady had come all the way from China to come here to the Sanitarium to be examined; and I found that this patient gave very strong indications of gallstones; so we made a little incision in the side, and found there a gall-bladder completely filled with gallstones; so we had to remove the gall-bladder completely, because it was useless, no longer of any value. Here you see the stomach in its normal location. This gives you an idea of what the stomach looks like, when the skin is off, so to speak, when you look inside and see the muscles here, these tough, large, tubular muscles, and the transverse muscles, the oblique muscles, the muscles which cause the stomach to contract, to move the food on toward the pylorus. Here are the glands that make the gastric juice in the stomach, and other different kinds of glands. Here is a stomach that had become the seat of cancer which had thickened the walls, you see. This is a case which is on exhibition in the Royal Museum of London; but I have met several cases very much like it. The cancer had contracted the stomach here so it was almost in two parts. I have seen cases just about the same as that. Sometimes the stomach is so bad that it must be removed. Here is one in which there was a serious obstruction, you see. Here is the case of a gentleman who was here last November,--a case very similar to this--the cancer was not quite so large, but it occupied this portion of the stomach, and the disease had extended some distance down; so we had to remove a part of the stomach, had to remove it from that point over to here. This gentleman called on me the other day, and said he had gained forty pounds in flesh. We have got his stomach, the greater part of it, in a bottle, but he is getting along without it better than with it. A lady was here a week or two ago who has doubled in eight, although I re-

moved about two thirds of her stomach a year and a half ago. She was a very poor, scrawny skeleton when I first saw her, but she has quite recovered, so you see it is possible to live without the stomach. So it is particularly important to know the condition of the stomach. In either of these cases, if the condition had been neglected just a little longer, the case would have been entirely hopeless; but by careful examination the doctor discovered a little lump which indicated a growth, and investigation of the stomach fluid, showed it was probably cancer, and the operation performed for the lady and the gentleman in these cases, has given them many years to life.

In the study that is made at the laboratory of the digestive apparatus, one of the most important of all is the study of the alimentary residue, the remains, the excreta. The fecal examination is, I think, one of the most important examinations made in this institution, because this gives us the ultimate result of the process of digestion. The gastric examination is made at the end of an hour. The food is taken into the stomach, a special kind, one particular kind of cereal food; at the end of an hour this is removed, and carefully examined, and this gives an idea of what the stomach can do; but that is only a very small part of the whole digestive apparatus; there is the pancreas, the liver, twenty-five feet of small intestine, the intestinal juice, the pancreatic juice; then there is the colon and other organs acting upon the food; and we know nothing about what takes place there; but this is an examination of the alimentary residue, the feces, and this shows one of the results of it here. A portion is diluted, and is planted in a clear, transparent jelly, and put into an incubator over night--that is a place that is kept warm, the same temperature as an ordinary egg incubator, and on the same principle-- kept there at one hundred degrees for twelve hours, or twenty-four hours; then it is

inspected. Every one of those little specks is a colony of germs. Where each one of these specks is now, there was just one germ, and it has grown until it can be almost seen with the naked eye--can be seen with the naked eye; and these are counted under the microscope; and knowing the exact amount of material, and knowing the surface here, and the surface that is counted under the microscope;--knowing their relation, it is easy to make an estimate. The normal number of germs found, as you see them here, is only about 25 to 50 million. That is a lot--in fifteen grains, in a gram, or a quarter of a teaspoonful of fecal matter,--25 to 50 millions. You see, each one of these was a germ the day before, and it has now grown into a colony, and the shape of these colonies, the form of them, and the rapidity of their growth are indications as to their character. Now, we find this number mounting up very fast, from 25 to 50 millions, to as many billions--a thousand times as many; and this is the way these germs look under the microscope. The blue ones are the anaerobes, the poison-forming germs, and the red ones are the harmless germs. These red ones are the friendly germs, most of them, and the blue ones are the unfriendly germs--the germs that make poisons. I shall show you one of these days some of the germs obtained from meat, and you will see those germs obtained from meat, from ordinary meat, are blue. It is the most fruitful source of these germs. In a single morsel of meat there are many billions, indeed, of germs--so many the bacteriologist told me the other day, he was unable to estimate the number, it was so absolutely enormous he could not possibly estimate them,--beyond anything that can be found here in these human secretions.

Now, we can tell at once, by making an examination in this way, whether the friendly germs predominate or the unfriendly. There should be very few blue, and great numbers of red. When there are great numbers of blue ones,

we know that person has been suffering from autointoxication; poisons are being formed in enormous numbers. This is an indication of the proportions in which they are found normally in the body. For instance, there will be found fifty thousand in a millimeter in the stomach; but in the duodenum there are less than in the stomach, because the gastric juice destroys the germs so their number is reduced as the food passes along down the small intestine, through the duodenum, the jejunum, the ileum, the number continually rises until when it reaches the large intestine, the number is at the maximum. At the large intestine, the number steadily goes down, and when it reaches the rectum, the number is the lowest; that is, it is restored to about the sane number as in the duodenum. So you see they grow in the intestines. This is the ordinary condition; but this is not the condition of health. In the condition of health, the formation of acids that takes place in the small intestine here kills off these enemies of the body, these parasitic organisms, so that they are greatly diminished.

Now, see the effect of fasting. You have heard a great deal about the good results of fasting, and this experiment made u on a dog by Roger shows the effect of fasting, shows how fasting relieves biliousness and various other symptoms. When a person is fasting, there are no germs in the stomach at all, and there are none in the duodenum, or in the jejunum; and there are very few in the ileum; it is only when we come to the cecum that the germs begin to rise and reach the maximum, but falling again at the rectum so there are scarcely any germs there at all. The cecum, then, is the hold of every unclean and hateful germ, you might say. And that is why appendicitis is so very common. When these germs are in the intestine, they easily find their way into the appendix which is found to abound in germs more than any other part of the ali-

mentary canal except the cecum; but it is right down in the bottom of the cecum, and the germs are continually dropping into it; and in the appendix they sometimes set up irritation, and an inflammation, and we have appendicitis. A great many attacks are not really appendicitis after all.

This shows the work that is being carried on in the investigation of these micro-organisms in the laboratory; shows the large number that are being developed there, and put through the test.

Just a few words with reference to the causes of it. Here you see the cecum; here is the small intestine attached; here is the transverse colon, here the descending colon, here the sigmoid flexure, and here the rectum. We have learned that in the small intestine, the germs gradually increase in number until they get to the colon--the descending colon, the sigmoid flexure, and the rectum. In the colon they increase in the lower part, because here in the cecum the food is retained for fourteen hours, while absorption is going on, which gives the germs ample opportunity for growth and development; so in auto-intoxication this is the headquarters of that difficulty. The colon is easily proven to be one of the most common of all the sources of body intoxication, the real headquarters of the disease. Here is a dilated cecum; here is the appendix lying under it, out of place, prolapsed, and here is the prolapsed transverse colon. The descending colon is all right, but in such a colon as that the excreta is ~~kuxy~~ retained for an abnormal length of time; decomposition takes place. Here is just such a case as that you see. We had such a case in the operating room yesterday, in which the colon was away down at the bottom, instead of being here where it belongs. This is a diagram of a case I encountered some little time ago; and in this case the colon was so much distended that I was obliged to cut off the small intestine here and attach it over there so as to make a shortcut, instead of allowing the large intestine to be

filled with this decomposing, festering mass.

This is a presentation of the urinary chart, and shows the same plan; gives you the same plan for presenting the results of the analysis that are given on the stomach. This examination makes out twenty-seven different things in relation to the body. It not only tells how the kidneys are, whether there is anything the matter with the kidneys, and if so what is the matter; but it gives information concerning the tissues, what is going on in the tissues; what is going on in the liver, what is going on in the pancreas; and the test that is made that we call our three-day research, enables us to tell everything that is going on in the body pretty much, that is, of a general character. It gives the facts in relation to the action of the liver, of the pancreas, of the intestine, of the kidneys, and all these various organs, but in order that this information should be exact, it is necessary that the patient should be taking definite food, because the character of the food regulates almost absolutely the character of the fecal materials, and the character of the urine. This depends upon the character of the food, so the food must be carefully calculated; we must know the amount of protein; and it is better to know the amount of carbohydrates, and the amount of fat, although this is not so important. The essential thing is to know the amount of protein that is absolutely important, and we must also know the character of the food so as to know what influence the food may have upon the formation of bacteria; so it must be a sterilized meal, and we must not add any bacteria, because if we take meat, for example, we should not know whether the bacteria came from the meat or from something else.

Here is the examination of the fecal residues going on in another laboratory. Here is where the bacteria are being spread out so that there can be a careful examination. Here is the incubator, and here are various processes of the urinary and fecal investigation going on; and as I said before, you are

welcome to go over to the laboratory and see this work. This is a picture of uric acid crystals which sometimes form in the body, in the joints, in connection with urate of soda; and that is gout. Some poisons are deposited in various other parts of the body and produce there various disorders which many of you are suffering with, particularly headaches, neuralgias, and various skin affections.

But now the examination is not complete. When we have made these investigations we have been talking about--and I have shown you how much paine is taken to find out what is the matter of every man and woman that comes to this institution,--that does not complete all these bacteriological and microscopical, and chemical researches. The examination of the physique is a matter of no small importance. For instance, this diagram, copied from Zeimssen, the great German anatomist, shows you the position of the great principal internal organs of the body. Here are the lungs; here is the stomach away up in the chest, and the lower border of it comes up to the free rib, you see. Here is the top of the stomach, and here is the bottom of it, lying considerably above the lower border of the very lowest ribs, you see. A lady said to me the other day, "Oh, Doctor, I have got such a pain." "Where?" "Oh, Doctor, in my stomach." And she put her hand away down here; and I found sure enough, her stomach was there. But there was a good reason for it. She had been wearing her clothes too tight and the stomach had gotten away down. Compare the location of this stomach with the stomachin the normal person. There it is, above the ribs; here it is almost entirely below the ribs. The liver is projecting below the ribs on this side; here it is above the ribs. The organs on this side are almost entirely below the ribs. Here you see the stomach, liver, two kidneys, also below the ribs; here is the right kidney, here the left

kidney; here are the bowels crowded down here, and the colon. The colon ought to be up above the lower border of the ribs as it is here; and you see here also the stomach, pancreas, spleen, kidneys are all above the ribs. But when the waist is constricted by bands, the abdominal muscles are weakened by neglect to develop them, by sitting in a rocking chair, or at a desk leaning over, or something so that the abdominal muscles are constantly relaxed, the result is prolapse of those organs, and that is enteroptosis. This gives you an idea of the natural form. Here is the human form as it ought to be. You see here is the masculine outline, and here is the feminine outline; here are the abnormal and the normal compared. Here is the outline of a healthy woman--a concave line behind, and a convex line in front; but this is the conventional woman, with a very straight back, and a broken in front. The stomach is crowded out of place and that makes more room here, you see, and makes a bulging figure. You see this figure is by no means equal to this one in grace of outline and beauty. Did you ever notice that the undraped figures copied by artists, whether in marble or on canvass, always follow this type instead of that? You never saw this type followed by an artist. The artists are always careful to get for a model woman a woman xxxxxxxx whose clothing has been loose so as to give her body an opportunity to develop. The artist is very particular that his model should have a good figure; but his wife must have a fashionable dress, must follow the fashion. Her figure is not so very important.

This shows what it does to the skeleton. This is the normal skeleton, and this is the abnormal one. We find a great many deformities these days,--nothing so bad as that except on the fashion plate. The fashion plates are doing real mischief by establishing wrong ideals, by vitiating the ideals of the American figure. Here you see the normal figure. Here is the large waist. No artist would dare to make small waists such as the fashion plates show.

The fashion plates that show the outside of the dress, you see, show the small waists. You see in the case of this woman, there is no calculation for a stomach or liver, and things of that sort; they are left out entirely. The fashion makers don't know anything about these things, and they make no provision for them. Here is another. The lady sees that advertisement, looks it over, and decides she must get herself down to that form as nearly as she can. The Venus di Medici, and the Venus di Milo have this sort of figure. What right has some commercial fellow in Paris to say what outline the woman's body should have? --the human form divine? We laugh at the Chinese woman and feel sorry for her because she binds her feet and gets them out of shape; we smile at the hideous appearance of the flatheaded Indians of the Northwest; and we are amused at the grotesque appearance of some of the natives of the Congo who file off their teeth, put rings in their noses and their under lips and upper lips, and so produce enormous deformities; but we are doing the same thing in a worse way when we encourage our American women to deform the central portions of their bodies which are really the vital spot.

Here we have gathered together more vital organs than in any other part of the body save the head. Here is the great abdominal brain, just at the breast line; here are the liver, pancreas, spleen, kidneys--all these vital organs are at the very point where the pressure is applied. So women have gallstones four times as often as men, because they abuse their livers more than men, not by bad eating, not by smoking or alcohol, but by compression.

Now, we endeavor to ascertain what the man actually is. We make a measure of his dynamic capacity. We have a machine we have spent many years in perfecting, our universal dynamometer. I sat up a great many nights until the morning light came, to make that; but finally we got it perfected,--a machine

by which we are able to measure the actual strength of each of the principle groups of muscles in the body--thirty of them. Then we add it all up and find what is the sum total of the man's strength. The average man is able to lift about 5000 pounds. The average woman is able to lift just about half that--about 2400 pounds. This man, you see, is taking his test. And the record will be made upon a chart, and here is the first record. In this particular case, shown by this black line; here is the second record, shown by the blue line. You see this point, one of the weakest points has become one of the strongest points. Here is another very weak point which has gone away up. Here is this weak point that didn't receive proper~~xxxxx~~ attention. The man neglected to carry out his prescription. Here is another weak point that has not risen at all, has actually gotten a little lower. The prescription given to him was such as to enable him to bring up the weak points and get a symmetrical body. Here are the coefficients which indicate the relation of the strength to the height, the strength to the weight, and the strength to the breathing capacity, etc. Here we have strength also for endurance. By means of special instruments, we can test the endurance.

This is Mosso's ergograph. We have other instruments now perfected to employ with other muscles. Prof. Fisher had an instrument working somewhat on the principle of this at Yale University, at Yale Gymnasium, by which he made a comparison between the endurance of meat eaters, and the endurance of our non-meat eaters here at the Sanitarium, and you heard him tell you the other evening how the Sanitarium boys, our doctors and nurses and bath men, the Sanitarium men here, young men, some of them older men, one over fifty years of age, subjected themselves to the same tests to which he afterwards subjected the Yale young men, and their performances were very much better, and endurance very much

greater. Out of the athletes at Yale, none of them were able to exhibit such great endurance as were some of the young men employed in our bath-rooms here; in fact, one of our doctors, who has been a sedentary man all his life, was able to hold out his arms much longer than any of the athletes at Yale. He was not nearly so strong, but he had more endurance, and endurance is the thing that we want rather than brute strength. Endurance is the thing that enables a man to fight disease, that enables a man to live long upon the earth, to endure the attacks of disease, and death-dealing agencies. It is endurance, not great strength; for many athletes have shown themselves to be short lived, and the best statistics that have been brought forward do not show that athletes live only a little longer than the average man. They do live a little longer, but not very much longer, and many athletes die early; so brute strength alone does not insure long life; but it is another quality, a quality of xxxxx pureblood, and freedom from poisons. That is the thing that constitutes manhood--freedom from toxins, because the thingx that kills us finally is the accumulation of poisons in the body; so the thing we want to fight against continually is this accumulation of poisons.

After these general various tests have been made, by which we can find out the condition of the body, the amount of vital stamina, the amount of endurance, the amount of efficiency of each organ of the body, the kidneys, the liver and other organs, the eye, ear, nose and throat are examined by a specialist in that department; then the patient knows what is the matter with him. But last of all, at least one of the important features to be considered is the teeth. And we have a dental department over which Dr. Vince presides, and a careful examination is made of the teeth by a man who is very skilled in his profession; and this examination of the teeth, I consider very important; that has not been considered, perhaps, so much as it ought to have been. But

we now know what we did not know before. We know that these germs that are growing in the mouth, attached to the teeth and pour down into the stomach and the intestines; and when we undertake to clear the stomach and intestines of these invading germs which are making poisons, producing various disorders, when we do this, we must take care of the mouth as well as the rest of the alimentary canal. We never can get the stomach and intestines free from pus-forming germs when there are pus forming germs on the gums, lacerated gums in the mouth. Persons suffering from Riggs' disease--the gums are lacerated, and pus is continually being poured out; these organisms find their way into the stomach and produce gastric catarrh, infection of the intestines, and very grave mischief. When the teeth are colored with slime, discolored and show decay is going on, germs are being formed there which get down into the body, into the intestines and grow and multiply in enormous numbers, and we never can cure intestinal autointoxication unless we cure the mouth and keep it clean. The teeth must be polished so that when the hand is rubbed across the teeth you can hear them sing. The teeth make a musical sound when you rub them, and they are perfectly clean and polished. They should be polished so that they feel perfectly smooth to the tongue; then there is no place for germs to adhere, and this process of autointoxication will not have an opportunity to begin in the mouth, thus sowing seed in the whole alimentary canal. We are just installing a dental nurse whose duty it will be to go over the teeth with a little polishing stick and powder, dentifrice, for those who feel they need help and instruction in those matters.

The examination of the nose and throat is also important, because it is found that the germs that grow up there in the nose or the throat, oxxaxxx find their way down into the throat, then into the alimentary canal, xxx so that

person who has an offensive discharge from the nose, is swallowing these discharges into the throat, into the stomach over night, and is thus infecting himself.

Examination of the nerves is also an important feature, and examination of the reflex. Here is a man who was being tested to see how long it takes him to think. Here is a little instrument that records down to one one hundredth of a second and less than that, the length of time required to think. A touch is made upon the finger, and when that touch is felt, the signal is given over here. This signal, by means of his finger, is able to record the difference in time between the touch here, and the signal here; and it may be a very small fraction of a second. It may be .12 or .15 of a second, or it may be a whole second or even more, according to the condition of the nervous system.

Here is another examination in the neurological department,--electricity applied to see what is the condition of the muscles and the nerves. This is very important. The tendon reflexes are being tested here. These give important information concerning the condition of the nerves and the nerve centers, some pictures of which you see here. Here is a healthy nerve cell. Here is a part of the wonderful machinery of the brain, looks very much like a central telephone office. These are actualk cells seen in the brain, with this arrangement of different layers; only there are millions of them crowded thickly together instead of being spread out as you see them here. Here are some branches that have been destroyed so that they have lost their efficiency, have lost their capacity for communicating with one another through these little buds which are for the purpose of communication--contact globules, as they are sometimes termed. They look like old trees in the forest that have become

ruined with ages of storms; and these cells have been through storms of alcoholic infection, tobacco,intoxication, and other forms of intoxication--intoxication from the absorption of poisons from the intestine, until the cells of the body degenerate; and that is the way old age is produced in the brain. These buds have been gnawed off by the macrophage, those cells we were considering a little while ago.

Here is the X ray examination by means of which we are able to look inside the body without making an opening. It is one of the greatest blessings that has come to the medical profession, to humanity in the last 25 years--is the discovery of this X ray by means of which we are able to determine not only the facts in relation to the bones, but the facts in relation to the heart. It can be seen, and its location and size determined. Many organs can be made out with a great deal of accuracy, even the position of the stomach, and the form of the stomach by means of the X ray. It is really a very magic method of infestigation.

Now, I think we have pretty nearly finished an account of the methods of investigation, xxdxxxxrxxixxaxxaxxx carried on here to find out what is the matter with the patient. And I suppose some of you think it is a little tedious, getting through this investigation. It requires the co-operation of a good many men, not only the doctor who takes the history, but of a corps of chemists. I would like to have every one of you go across the road to the laboratories there along with Mr. McCarty. He will take you in and see the things that are going on there; he does this regularly every day at certain hours. You can make an appointment at the medical office, and Mr. McCarty will call for you and show you across the road, and there you will see a dozen or more of expert persons hard at work all the time, every day, even until nine or ten o'clock at night, in making out the chemical, microscopical and bacterio-

logical researches that are necessary to enable us to get a complete view of the whole condition of the body. It is only by the co-operation of the laboratory men, experts in these various directions; and these folks know the last word of science in relation to physical conditions.

Now, the next time I will tell you what the Battle Creek System undertakes to do for a man; how these morbid conditions that are discovered--how we undertake to cure them; and the general principles of work upon which the thing is done; and I hope to be able to tell you some things that will be of use to you at home as well as here at the Sanitarium.

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