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What is the Natural Food of Man?

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GOOD evening, Ladies and Gentlemen ! The subject we are to talk about to-night,is, What is the Natural Diet of Man ? We are not going to discuss this question so much from a vegetarian standpoint as from a higher and broader standpoint : If we read the first Chapter of Genesis and understand the purport and intent of that chapter, we shall not nneed to inquire further as to what is the natural diet for man, for we read that the diet which God gave to Adam,as the representative of the whole human family, consisted of fruits and herbs,--every herb bearing seed and every tree bearing fruit,in which is the seed thereof,--every one of these fruits and seeds were wholesome foods for man. On the other hand, the animals were given the herbs to eat. We call herbs or vegetables, herbaceous or vegetable foods; the seed-bearing part is distinguished from what is called the vegetable substances by the fact that it has neither twig nor root nor leaf nor bud nor flower. Those parts of plants which are composed of twigs or roots or buds or flowers are called vegetables, and the other parts are the seed-bearing parts--in other words fruits nuts and grains,--those were the original diet for man .

It is a very interesting fact that this original diet which the Bible prescribes for man as his natural diet--that this original diet which we find described in the first chapter of the Bible as the diet which God gave to Adam--it is a wonderfully interesting thing that we find that very diet to-day constituting the bill of fare of those animals which are nearest to man in their structure: The anthropoid apes,--the gorilla, the chimpanzee and the ourang outang--the so-called higher apes whose anatomy ~~is~~ so closely resembles the anatomy of man that it is difficult to distinguish the skull of a young monkey from the skull of an infant. Buffon, Cuvier, Sir Everard Home and other eminent comparative anatomists long ago pointed out the fact of this resemblance, and the fact that the teeth of man, his digestive apparatus, his hands, his mouth, his feet, and his whole anatomy and the functions of nutrition in man were absolutely identical with the same structures and functions of those animals which subsisted entirely upon fruits, grains and nuts. I might enter into this subject at length and spend several hours in discussing the question as to whether men should eat this, that or the other kind of food, but the question that I want to discuss to-night is, whether we should eat ~~raw~~ starch or ~~flesh-food~~ not. Many people have the idea that because we discard the use of flesh-foods that we must live on turneps, cabbages, carrots and other vegetables. People have the idea that a vegetarian is a vegetable-eater; it does mean that in a certain sense, but it does not mean that in the market sense,--it is not true in the market-sense, but it is true in the botanical sense.

Now if we study the structures and functions of the digestive apparatus of man, we find that it differs from that of some other animals; We find that his stomach is very simple in structure; that instead of having fourteen stomachs like the woodchuck, he has but one. The whale has from five to seven stomachs, the cow has four stomachs, and the same is true of the sheep and all the grazing animals or cud-chewing animals. But in man we have a very simple digestive apparagus, so that we know that his food must be of ~~rather~~ a simple character, for it is a universal law in the animal kingdom,--that a complicated digestive apparatus means a complicated diet. The reverse is also true,--that wherever you find an animal living upon a complicated diet, you will find that that animal has a complicated digestive apparatus to deal with that diet. So in animals that live on vegetation we find complicated stomachs and a long alimentary canal, --for instance, the sheep has an alimentary canal thirty times as long as his body, whereas a monkey has an alimentary canal only ten or twelve times as long as his body, and the same thing is true of human beings also. On the other hand, the lion, a flesheating animal has an alimentary canal only four to six times the length of his body; and there are some carnivorous animals whose alimentary canals are shorter still,--not because the food which the carnivorous animal eats is easier of digetion than any other food, but because it is simple--it is this one thing . Now the flesh of all land-animals is practically the same thing; the flesh of birds and the flesh of beasts is also practically the same thing. But when you come to sea-animals, it is a different thing. With land -animals, the skin of another animal is never eaten,--the skin and fur is always rejected; they pick the bones bare and leave the bones and the skin,--with the exception of the boa constrictor and a few other reptiles. But one fish swallows another, whole, for it has no claws with which to select the digestible and the indigestible parts; so when a whale swallows a fish, he swallows it whole, just as a man swallows an oyster. On the land the carnivorous animals have a very simple digestive apparatus, while the reverse is true of fish-eating sea -animals, because there is such a great variety of fishes,--some having horns and fins, and some with scales, and with such a vast number of bones inside of the fish . But the vegetable-eating animals of the sea have a simple digestive apparatus, because the sea-vegetables are very few and simple. But on the land, we have a great variety of vegetables of all sorts--woody vegetables, succulent vegetables, oily vegetables, stems, blossoms, etc. But in the sea there are but few vegetables and these are of a gelatinous character, so the vegetable -eating animal of the sea requires a very simple apparatus for digestion. I have some very interesting experiments which I am going to show you. In man, we have a very simple stomach, and that means a very simple diet,--there is no dodging that -- a simple stomach requires a simple fietary.

Now suppose we notice what are the principle food-elements which we require: The principle food-elements are, fats, albumen, starch, dextrine, and sugar. These are the principal food-elements. Now where do we find these food-elements? We find them in the vegetable kingdom. We are going to discard the flesh of animals for the present and consider it a foregone conclusion that man does not need to subsist upon animals. Nearly ninety-nine hundredths of the human race subsist upon the products of the vegetable kingdom and have nothing to do with flesh-food. Now the question is, Which one of these foods should constitute the principal and the most acceptable dietary of man? Fats and albumen are found in nuts,--we find abundance of fats and albumen in nuts--these are the two principal elements in nuts. In fruits we find dextrins and sugar,--fruits consist almost entirely of ~~fruits~~ dextrins and sugar dissolved in water. Nuts are hard and firm, consisting of fats and albumen, and contain very little water when they are fresh. Grains are composed of albumen and starch. So we see that in grains, we have fats lacking. In fruits, we have fats and albumen lacking.

Suppose we study these substances a little, in the form in which we find these substances here,--the principal ones and those upon which we most depend, are fats and albumen. Starch, dextrin and sugar all belong together. We are all familiar with fats: The fat is taken into the body and converted into force and energy and residual tissue, and accumulates in the skin and pads up behind the eyes, and makes little cushions and pads for the bones so we will be better looking, and so as to keep us warm in cold weather. So fats are very useful. Albumen goes to form the substance of the nerves and muscles, brains, and glands,--the living, acting structures are chiefly formed from the albumen and fat. Starch, dextrin and sugar belong to the same family,--there is another member--cellulose, or wood; the woody structure is made up of cellulose, so there are four members of the carbo-hydrate family--starch, dextrin, sugar and cellulose--which are different forms of the very same thing. These elements, when taken into the body, are useful for force production, and for heat -production, and for making fat,--but we will consider that further on. All these elements are found in the animal kingdom; and they are quite closely related--the starch, dextrin, sugar and cellulose being practically the same thing, as I have said. We find them in the plant in different forms, the starch and the cellulose being the stable forms, the insoluble or permanent forms-- while the dextrin and sugar are the soluble forms. Now the carbo-hydrates, which must be removed from one place to another, are in solution and can be carried off, but when retained, this substance appears in the form of starch or wood. So we find, for example, late in the Fall the maple tree appropriates the dextrin which is always found in the sap; it is carried down in the sap of the tree, as cold weather begins to come on, and it is converted into starch in the roots of the tree. In the Spring this starch is largely converted into sugar and is carried up into the top of the tree and converted into wood, in the form of leaves etc. While it is in transitu and on its way up, the farmer comes and bores a hole in the tree and puts in a spount and steals a part of the sugar in the form of sap which he converts into sugar after evaporating the water.. In the Fall there is plenty of time for the sap to go down into the roots of the tree where it is converted into starch. But in the Spring-time the tree or plant is in a hurry , and the sun's rays penetrate the earth and the warmth causes the roots to start up, and it gets a wonderful waking up,and the starch is converted into sugar , which in the form of sap is circulated in the tree and goes into the twigs and they put out leaves and buds. In a little while after the sap begins to circulate in the topf of the tree it begins to be bitter and to have the flavor of the tree , and the sugar has no longer its sweet taste, as it gets old ; its taste is spoiled, and there is no sugar taste at all. There are many trees beside the maple which heve the property of making sugar,--for instance, the hickory, the beech, the box and the elder; these and various other trees are making dextrine all the time . The same thing is true of the sorgum. The sorgum is cut when there is the most sugar in the stem; the stalks are then crushed, the water evaporated and the sugar made. The sorgum is like other trees in regard to the making of starch ,only it is made at the other end, and then converted into sap and circulated the other way. The same thing is true of the ear of corn : The sugar is circulated in the form of sap , and is brought into the ear and in the kernels. There is a stage in which the corn is said to be in the milk-stage ,and then there is a great deal of sugar and dextrin which has not been converted into starch,and the corn is then in the milk-stage and in the soluble form--it has not yet been reduced to the permanent form,so it is then very sweet. We used to have what we called "sweet-corn" but that corn didn't seem to be much sweeter than other corn when in the milk stage; there is about fifteen per cent. of sugar in the corn when it is in the green stage .--the stage when the ears were called "roasting ears . Now the point that I want to call attention to, is that we don't have much starch in corn until it is ripe ; but the dextrin and sugar are converted into starch and deposited in the kernel for future use .. The same thing is true of wheat: When the wheat is in the milk, there is some starch present as the wheat matures , but by-and-by the dextrin and sugar are all used up and converted into starch, and then there is but little sweetness in the kernel. Now, for what purpose is the starch deposited in the grain? For what purpose is it deposited in the kernel of corn and the kernel of wheat ? Is it for man to eat? That is the question/ we are going to consider; but we will now consider what use it is for the vegetable . In making every little kernel of wheat or corn, nature does a most wonderful thing . Every seed or kernel is a legacy passed down to the next generation,--it is a last will and testament, if you please well done up--the property is all done up and beautifully and closely sealed up in a little horny or glass case case. Nature always cans everything to be eaten in this manner, so the outside of the little kernel of wheat is glass; that is what makes the kernel so smooth. There must be some sand in the kernels in order to get a good crop of wheat , otherwise the wheat wouldn't have sand enough to enable it to stand up/; there must be some calcareous matter in the kernel to keep the water out and to protect it. So, in this manner, nature makes her last will and testament and seals it up. This property thus sealed up in the kernel is starch, and it is all the capital with which the little wheat-plant is going to start in life, and nature puts in everything necessary, the same as a mother puts up a basket of lunch for her boy or girl who goes to school: She puts in a piece of bread and butter and a piece of pie, and possibly a piece of Bologna sausage , and a lot of other things , and nowadays, to be really up to date, the mother ought to put in a dose of some digestive agent --pepsin or something of that kind --so that the indigestible things can be digested. But nature puts in the pepsin along with the starch,--it puts in a little juice to digest the starch, and this juice is called "diastase," and a little of this is put in every kernel of wheat,corn, barley or rye , and the purpose of it is, to digest or transform the starch. Then you take the kernel of wheat or corn from the stalk and put it into the ground: The old father or mother is now dead and gone ~~xxxx~~ and the little youngster lies beside its bundle--the germ of wheat or corn lies right by the side of the bundle of provisions which is attached to him; that bundle contains his breakfast,dinner and supper,--it is his whole property,--it is his legacy with which to start out in life , and while buried in the ground ,the sunlight and warmth reaches it and starts this diastase to work,and it digests some of the starch in this little bundle and converts it into sugar . The same thing happens in the roots f the maple tree in the Springtime --some of the starch is converted into sugar,and this sugar begins to feed the little plant -- this is the "nursing-bottle" if you please; it begins to build up the stem; for the stem must be fed in this manner until it gets up into the sunlight, because it is under the marvellous influence of the sunlight that the marvellous transformation takes place through the influence of the carbonic acid gas,the air, the water and the soil, and all the various substances which are are brought together by the sunlight to fall upon the plant --they are all combined into what we call starch,--and this is done by the sunlight, and it cannot be done until the stem reaches up to the light. So nature puts enough ~~nourishment~~ starch into the little bumdle to enable the plant to reach the light. If you bury it too deep it won't come up, because there is not materail enough in the seed to enable the plant to reach the light; its capital is used up before the time comes when the stem can use its apparatus. If a boy's father has put money enough in the bank for him to start off when he comes of age, and build a mill; but if he builds his mill on too large a scale, he will not have money enough left to build the machinery with which to run his mill, and if he has no machinery he must fail in business . Now if this little kernel of wheat or corn is buried in the ground two or three inches too deep, it grows the stem as high as it can until its store of nourishment is gone, and then it is "a goner" because it can't get up into the sunlight where it can receive help to manufacture dextrin and sugar upon which the stem lives and grows. The wood in our furnaces is always made of sugar and dextrin,--it is the very same thing .. The chemist has learned a great many of these ~~thingsx~~ interesting things, and he finds that it pays him. ~~to do so.~~ Dextrin is made out of starch by the Government: The manufacture of the mucilage of postage-stamps takes a little starch and adds some acid, and the acid and the starch are boiled together, and as the result, we have a gummy substance which is put onto our postage-stamps . The chemist converts the starch into sugar by boiling with an acid. Take some shavings and put in ~~some acid~~ a little sulphuric acid with it and and boil it, and you will convert it into sugar; you can convert sawdust into sugar in that way,- but that is not nature_s way of doing it . So we have this family of starch, dextrin sugar and cellulose,--all children of the same father. The dextrin and the sugar are the travelling members of the family, if you please, while the starch and the cellulose are the stationary members ,--they stay at home.

It is very reasonable that nature should make starch for the plant because that is something which cannot be dissolved and carried away: If nature should store away a little sugar instead of starch, it would be dissolved by water or carried off by a rain-storm, and rainwater would spoil the seed; but starch isinsoluble. But there is another thing about it : Starch is nonly insoluble, but it is unfermentable,--it cannot ferment; pure starch is absolutely unfermentable. I have some starch here,--this is pure starch. This is corn-starch; now if you take this starch and add some yeast to it,will it ferment? Not at all. You can't ferment cornstarch with yeast. Can you make raised bread of cornstarch with yeast? ("No.") And you can't make light biscuits of cornstarch and yeast,because there is nothing in the cornstarch that will ferment. In order to ferment, the starch must first be transformed,--and the brewer knows that, so he puts it into a warm room and puts it in a pile,and it gets warm of itself,because there is life and heat in it ,and it begins to heat up, and then the brewer shovels it over again and piles it over again and moistens it, and the grain of barley don't know but what it is in the ground, and it begins to grow ; it don't depend upon the soil for growth, for, as I have said it has a little legacy which it received from the old plant. About ten per cent.of the barley grain is converted into sugar, and the brewer dries the barley so it cannot grow any more, because that is as much sugar as he expects to get, and he dries ~~the~~ it and makes a decoction of it, and then he takes the decoction out and puts yeast into it,and then he gets a fermentation; he must put yeast in it before he gets fermentation,--he takes the decoction and puts yeast into it,and then he separates the solution, or "wort," as it is called, and then puts in yeast,and there is digestion,--he must have digestion before he has fermentation.

Now let us see about the digestion of starch in our own bodies: When you take starch into the mouth (I mean raw starch, and I have no raw starch here), the saliva would have no action upon it at all.; it wouldn't affect it any more than so much water , and then it goes down until it comes in contact qith the pancreatic juice below the stomach, and this fluid will soak through the woody shell which contains the granule of starch, dissolving it and digesting the starch; and this work the other digestive fluids would not do, any more than water,--and you might pour on these granules of starch pailful after pailful of watdr, and it would not dissolve them; it would dissolve sugar very quickly,but it would not dissolve ~~starch~~ raw starch. We have often made experiments in giving patients raw starch,--raw flour or raw starch in other forms, or corn-starch--in a test-meal, and at the end of the hour, after examining the test-meal, ~~and~~ we found that there was no sugar formed at all. But if we use cooked starch in a similar manner,we f find a different result; for instance, if we use cooked starch in the form of oatmeal mush, boiled rice, bread, browned rice or granose biscuit or any other cooked cereal food--we find then, that sugar is formed, and we find it in a proportion , sometimes, as high as ten or fifteen percent.of sugar formed in the stomach fluid,--that is, in a hundred grains of stomach fluid there would be ten to fifteen grains of sugar which is formed by the action of the saliva upon the starch.

I will make a little experiment here,that will help us to understand this , using these li tle tubes: Here is a bit of raisin,--we will add a little water to this raisin in this tube,--now I will shake it up and turn it out; I have dissolved out a li tle sugar from the raisin, and I will heat this over this alcohol flame a moment; now it begins to boil, and I will add a little of this blue solution; at first it makes it blue ,--you can see the change take place --it is no longer blue; it has become yellow; that is the test for sugar--this blue solution has become red,--that is the ttest for sugar; so we know there is sugar in the raisin. In like manner I might test dates,figs, and any other sweet fruit that we know of , and it would produce the same result. Cane sugar,however,will not produce that result,,--if we test starch in the same manner,it will not produce this result, and the same is true of cane-sugar ; it would behave just as starch does. Here is a little corn-starch and we will try the experiment with it,-- Now it is boiling well; now I will put in a little blue,--there is no change--it remains blue; so we will set that aside. I have some flour-starch here, and I will take a little in my mouth and chew it a moment , and then I will take a little water and rinse my mouth out ,and swallow this starch that I have chewed into this test-tube,instead of swallowing it into my stomach, for I don't believe in eating between meals . Abraham Lincoln was once challenged to lift a barrel of whiskey and drink out of the bung-hole, and he did so, although he was a temperance man, and then some one commenced berating him for drinking whiskey, and he spit the liquor that he had drinked out upon the floor,to convinve others that he was still true to his temperance principles.--Now we will heat this for a moment ,--here we have evidence of sugar ,when we apply the test,--it is a dark red color; I will hold it up in front of this napkin so that you can all see it --there is sugar here. A moment ago we tried the starch,and there was no sugar--just simply starch--there was not a particle of sugar there . Then I put it in my mouth a moment and bring it in contact with the saliva,and there is an abundance of sugar,--just the same as we had in the raisin that was sweet. Here we have evidence that the saliva does something to the sugar which has been cooked; but when the starch is rae, the saliva does nothing at all to it; the saliva cannot digest raw starch, but it digests cooked starch,-- it is by no means a simple process to convert starch into sugar--we might say, it is a "far cry," as some of the litterateurs would say--from starch to sugar; it is a long way off. Sometimes it is not a far cry, but a loud cry, when the baby gets the cholic when the raw starch which it has eaten was not converted into sugar, as it ought to have been. First, we have at the bottom here, starch, and it goes all the way up to sugar in the process of this change--it travels in an upward scale.

There are some thirty or forty different steps from starch to sugar,--starch is converted into one substance, and then another and then another, and so on until it comes to the stage called erythrodextrin, and then it goes on for several steps or stages more, and by-and-by it comes to achroödextrin; then it goes on a number of stages more until it comes to maltose, and then it climbs up several steps more and becomes levulose, the sweetest of sugar, and this is several steps above maltose. So from starch to amylodextrin there are several steps; from amylodextrin to erythrodextrin there are several steps, and from achroödextrin to maltose there are several steps more, and then there are several steps more to levulose; so it is a long ladder to climb in passing from starch to levulose which is the last stage of the digestion of starch; so starch, in the process of complete digestion, is converted into levulose which is sweeter than honey; it is the sweetest of sugars. So raw starch is converted in sugar by the process of digestion, or by cooking: If you chew a dry crust for a long time, it gets sweet; that sweetness is due to the formation of maltose --the crust is chewed until it becomes maltose. But no matter how long you may chew raw starch, it will never become sweet, but after it has become amylodextrin, erythrodextrin or achroödextrin, it will become sweet by chewing, and the length of time it must be chewed will depend upon which of these stages it has reached: if it is amylodextrin, it will take a long time for it to become sweet, because there still is a long porcess before complete digestion is reached ; if the stage of erythrodextrin has been reached, it will not take so long: if the stage of achroödextrin has been reached, it will become sweet in almost no time— that was the condition of browned starch that I tested a moment ago,-- it simply passed into my mouth, and directly we had some sugar,--we will try it again: Here is some of the starch that I have already shown you, and I will take some of it in my mouth, and I get it out again just as quick as I can,--it was so dry that it wasn't easy to get it out-- I will take some water to rinse it down into this tube,--that is the way a good many people eat their bread--they rinse it down, and I have rinsed this down into this tube; now we will test it and see whether we have any sugar here or not; when it boils a moment we will apply the test to it--now it is boiling; now I think you can see this reddish color. Now here is some raw starch,--some starch that has not been cooked,--now here is the blue and here is the red--here is sugar here--I just pass that into my mouth and take it out as quickly as possible and here is sugar. Now if, instead of being browned, it had been cooked only a little, we would not have had this result --it would have taken a long time for the change to have taken place, because the starch would have had to pass through all the different stages up to erythrodextrin and then from erythrodextrin to maltose, and from maltose to levulose it takes but an instant to pass, the change taking place as the maltose is passing through the mucous membrane and is being absorbed into the blood. The sweetness of the sugar is beyond our comprehension since the levulose is formed at the other end of the digestive process . You might wonder why all this gustatory pleasure is wasted on the "desert air" of the intestines , but we find, when we come to look into the matter, that it is not wasted, as I will show you later .

Now the food never remains ~~a long time~~ in the mouth long enough for the saliva to convert it into sugar; it remains in the mouth only long enough to be chewed and swallowed, and a small part of it only is transformed. In order that the whole of the starch shall be transformed, the saliva must have an opportunity to act upon it for a little time , and so nature allows the saliva a little time to act upon the starch in the stomach--it allows it about thirty or forty minutes, and then the action of peptic digestion begins. The saliva is an alkaline medium and requires that the contents of the stomach upon which it acts shall be alkaline . But the gastric juice is acid and this acidity paralyzes the saliva and renders it impossible for the saliva to act upon the starch; this is the case at the end of thirty or forty minutes after the starch has been taken into the stomach, when the gastric juice accumulates so that the conversion of starch into sugar by the action of the saliva can no longer take place; so that process must take place during that time. That is a large business for the saliva, when we consider how much starch we eat; for a day's rations on the average, of starch, is about sixteen ounces or one pound of starch--that is the average daily ration. I want you to get this point, if I can,--that the saliva is acting on sixteen ounces, or a pound of starch, on the average, every day, and must convert that starch into sugar,--in the stomach it is converted into maltose,--a portion of it--and then it passes into the intestines, where it is acted upon by the intestinal juice and some more of it is converted into maltose, and then it is acted upon by the pancreatic juice, and the balance converted into maltose, and the maltose passes through the mucous membrane to be absorbed into the blood, and while passing through the mucous membrane, it is converted into levulose.

Now you can readily see that if the starch is taken in such form that the starch has difficulty in converting it, that there might not be time enough for its work in this thirty minutes; if the starch is eaten raw, the saliva will not act upon it at all; and if it is only slightly cooked, or in the state of amylodextrin, then the saliva will act upon it but little . See what would happen if some of this partially cooked starch,--a little of this rice-- when this is mixed up it makes a beautiful paste for fastening paper on the wall,--it will make it stick first rate , and if any of you should take hold of it would be hard work for you to let go; if we should put this paste between the leaves of a book it would stick them ~~together~~ leaves together. Now I put this paste on this glass but I can hardly get rid of it ; it sticks, and it is in chunks, you see. Suppose I put these chunks into a pail of water and stir the water,--it would not dissolve them. Here is some oatmeal which is in about the same situation,--it is splendid paste--capital paste for putting paper on the wall, --but how am I going to get rid of it? (washing .) I can't get rid of it--it sticks. I will turn a little water on--I can't rinse it off, because the water don't dissolve it. I must continue pouring a stream of water on it for a long time before I can get it off,--it won't come off yet--it is capital paste, but it is very poor diet. Now when starch goes into the stomach in this condition , these chunks stick to the stomach walls just as they did to my hands; and do you wonder that you feel a heavy load on your stomach,--and, I suspect, a load on your conscience sometimes, for this food hangs back in the stomach till the stomach gets sour. Now, although this starch won't digest easily, it will readily ferment,--how long does it take to it to ferment if put in a warm place? ("About an hour.")

I have been washing my hands for some time, and I would like to have some one examine them and see if they are not sticky yet. (A lady:"They are very sticky.") It is no wonder that we have slow digestion, when we put into our stomachs such abominable things as mushes, oatmeal-mushes, cracked wheat, half-cooked rice--or quarter-cooked rice--that is, pasty rice--oatmeal gruel and that sort of stuff which was never intended to go into the stomach, and which are bound to make mischief in the stomach. I think the miseries of mush and rice are beyond almost any other kinds of foods which cause dyspepsia. People never suffer so much stomach misery from the use of meat as they do from the use of mushes and other similarly prepared farinaceous foods--kettle -cooked starches, as we might call them, for they are in the same condition as starch-foods which have been cooked in a kettle. The reason of this suffering from the use of partially cooked starch is, that it has been cooked into paste, and the paste forms into lumps in the stomach. The same thing is true of bread that is imperfectly cooked,--we will test this bread and see what is its condition. The good breadmaker says the bread must be baked so that when you rub it up, it will crumb. But that is not the case with this bread; this is not crumb when I rub it up,--it is a bullet--Look out over yonder! It will hurt you if it strikes you, because it is really a bullet, and such bullets as these, shot down into the stomach at the dinner-table are responsible for the pains and sufferings that have kept many people in bed for years and years and years. They might have recovered from the effects of Spanish or ~~Phillippine~~ Filipino bullets, but when this sort of bullets ~~but when~~ are rained into the stomach in a sort of Gatlin-gun discharges at the dinner-table, no wonder there is trouble. Now I will toss this over there among you, and you can see what sort of bullet it is--(throwing it.) It bounded clear back here.

now I wouldn't call that very good bread ,--why? Because when you eat such bread, it remains in the stomach in the form of bullets or chunks; I have a garbage - box at home, and I toss such bread as that into the garbage-box where it belongs. I will examine this again and see what it is like,--I will throw it in this basin of water ; now I am waiting to see if it is dissolved,--they don't seem to dissolve the least bit; I will leave these four bullets here in the basin a little time and see what disposition the water will make of them,--this bread makes splendid bullets. The breadmaker says "If the bread makes a dry crumb,then it is good bread." So this bread is not good bread; it should have been baked until you couldn't make bullets of it ; but it is impossible to make crumb of this bread,--it is bound to be bullets,--and so it is not good bread . Now take these bullets into the stomach and see how they are digested : The saliva can dissolve a little of the outside of this partially cooked starch or amylodextrin, but the gastric juice cannot digest it, because it cannot act upon starch. Here are these bullets that have been in this water all this time : I will throw one of them against the window pane: (throwing it .) It bounded back,--here it is; it is just as good a bullet as ever,--now I wiol throw it against the window pane as hard as I can--(throwing it.) Here is the bullet,--it didn't phase it at all--I will throw it again as hard as I can--(throwing it.) Here is the bullet,just as good as ever . Now I will pass this bullet round on a plate, and I would like to have you all examine it ,--it is a bullet that I made from this bread--and you may now have some bullets in your stomachs just like it --and it would be no wonder if you should dream of war and bloodshed with these bullets in your stomachs. (Laughter.)

Now see what happens when these bread bullets get in the stomach; they lie in the stomach in wads and heaps all over the stomach, sticking on the walls of the stomach just as they would stick on the fingers; they cannot digest, because the starch is a long way from the stage of amylodextrin to the stage of maltose; it has got to travel that whole road over in the short space of thirty minutes, but although that is a short space of time for the conversion of starch into sugar, yet it is time enough for the starch to ferment. Now I will show you a contrast: Here is some starch that has been thoroughly cooked. I have dropped a moistened bit of granose biscuit into this glass, and I will show you the difference in a moment; now you can see it swelling out,--here is some granola; I will put some into this glass and I will add a little water--now it is all soft. Now I will turn this from one glass to another. I will see if this is sticky, and I will see if I can make some more paste,--I will will do just as I did with the mush--I will rub it in my hands and do my best to make paste, and I will spend more time with it than I did with the oatmeal, and see if I can make some good sticky adhesive paste. Now watch this a moment and see what happens: (Washing the hands.) My hands are absolutely clean,--will some one come up and see if there is any stickiness on my hand? ("None at all.") You didn't have to use a napkin to wash your hand off after examining mine, as you did before? ("No, sir.") It required just a dip, and the paste was all gone. ("How is it with zweiback?") It is just the same with zweiback: I rub some of it in my hand and just one dip of water washes it clean; I have only dipped my hand in water and it is perfectly clean,--will this lady kindly examine and see how it is? ("Perfectly clean.") Now you see the difference between this paste in the stomach and the granola or the zwieback. When this well-cooked starch gets into the stomach, and comes in contact with the digestive fluid of the stomach it is reduced into small particles which are readily passed along into the intestines and the stomach becomes clean right away; the contents of the stomach are then homogeneous, and the fluids come in contact with every little particle, so that the food is easily digested. Here is some granola, and I will rub it in my hand as hard as I can, and then dip my hand in water,--it is clean as before. The same thing is true of gran nut, and similar preparations the starch has been cooked until it is brown,--it has gone through three different stages of digestion, and it is no longer paste--it has passed beyond the pasty stage. Paste is the first stage; in the next stage the starch is soluble; the next stage is achroödextrin, in which the starch is in the condition in which it cannot stick any more than sugar--it washes off just as quick as sugar will, and you know sugar does not stick.

Now I want to show you the difference clearly, that can be recognized between these different substances: For instance, I will put a little of this gran nut into ~~a glass~~ this glass; now I will add some water--I will fill this about half full of water. Now here is some granola,--I will put some water in also. Now I have some rice here, and I will put some rice in this glass--some paste, if you please. And here I have some oatmeal--our slimy friend--I confess I hate to touch it --I feel as though I had got hold of an oyster or something of that kind. It is hard to get it off,--it sticks like a life insurance agent, and I can't get rid of it. Here is a bullet which has been soaking for fifteen or twenty minutes--and I will pelt the window with it,--(throwing it.) Here it is, --it is still a good hard bullet. I believe it would kill a man if it was fired right at him at close range. Now we will throw it against the floor--(throwing it.) It has escaped from us, but we have some more,which are just as good. It is astonishing how adhesive these bullets are,--I will throw this bullet upon the floor as hard as I can--(throwing it.) It bounds up two or three feet from the floor ; I think with a little practice that it would bound up three feet . Now we have these various forms of starch soaking, in order to get rid of the solution. And here is the granola and here is the gran nut;here is some granola and here is some rice. Now we have tests by which we can recognize starch in its different forms: I will turn off a little of this starch-water. Here we have a substance which is a test for starch and when it is applied// to a substance,if there is starch present it will produce a blue color. Now I will hold up the napkin here--do you see this blue color--it is blue like indigo. ("Yes,sir.") Now we will put that down. Here is some oatmeal-water,--we will put some of that in here and see what it is like ,--it is as blue as indigo, you see.Now I will put that down. Here is some granola-water ,--the blueness has disappeared--it is a little blue--I will put in some more--that has disappeared; I put in three times as much here,--there is just a faint blue color that remains; it takes a large quantity of it . Now we will have some of this solution--this is gran-nut. Now please notice,--there is no blue at all; now it is purple instead of blue--it disappears, you see. I will try to get rid of some of these little particles f if I can--this is better; I wish you were near enough to see this beautiful purple color; I will put this side by side, and I think you can see; I still keep adding to the quantity here. Now I think if I hold the napkin up, you can see the difference between the two colors--one is blue and the other is purple. You can't get the blue color with this preparation of gran-nut,because there is no amylodextrin there; it has reached pretty nearly the top,--I will put in a large quantity--

more than I put in either of the others,--now I have a faintly purple color--slightly purple--I will put in a little more, and see if I can't get a little more purple. Now I think we have made this point clear enough,--can you see this rosy tint in this, and the purple in the other? ("Yes, sir.") That is because we have here, starch carried further in the process of digestion--it is nearly maltose; a large portion of this is a maltose, and a large proportion of it ready to become maltose, and it requires only a short operation of the digestive fluid to convert it. Now if I put some of this solution in a test-tube and boil it for a moment, and then apply the test to it, I would find a large quantity of sugar present,--just as, in testing the raisin, we found a large amount of sugar. This has almost reached the boiling point; it makes a blue color at first; in a moment you will see this blue color change; the blueness will entirely disappear--now it is a reddish orange; this is because there is a large proportion of sugar present; chemical analysis shows about about twenty-five percent of sugar in gran-nut, the conversion being so complete .

Now if we take this paste into the stomach in the form of oatmeal mush, it digests slowly, not only because it forms in an adhesive mass, adhering to the walls of the stomach and everything in reach, but because it has only been very slightly converted, and the saliva has so much work to do to convert this slightly cooked starch into maltose; whereas, if we have starch that has been cooked until it is browned,--achroödextrin--we have, instead of the diffuculty we have been complaining about, we have the starch quickly digested, and the sugar quickly formed, and the starch passing along for absorption in the lower part of the alimentary canal. The very same thing is true in reference to zwieback that is true of granola and granose. Here we have a little solution, a little water and a crust of zwieback ,--and the same thing is true of a crust of bread. We drop in a drop and shake it up and it disappears ; drop in another drop and shake it up and it produces a slightly purplish color; shake it up again and it disappears,--just as in the case of granola and gran-nut, whereas,in the case of the oatmeal and the starch, you remember it did not disappear. I will try it again, to show you the difference,--here is a solution--now I will put in a drop or two,--just a little--there it is--a permanent blue color; it remains blue all the time,because of the amylodextrin or imperfectly cooked starch.

So much for grains. But when you come to consider fruits, it is a very different thing: Here is an apple,--I will cut it open and apply some of this starch-test to the apple,--it does not become blue ; you would see a little purple toward the top, but there is no blueness to the apple ,because there is no starch ~~in~~ in it worth talking about. Now we will try this banana,and see what result we will get,--we will cut it open endwise so as to have a little more space; now we don't see any blue in the banana,--we see only a slight tinge of purple,--that is because there is dextrin there; there is no starch in the ripe banana and none in the apple. Here is a banana which is green on one end here /. Now if some of you are near enough by so you can compare the two ends--the end cut and the end not cut--do you see this little blue color in the center? There is starch in this banana,--this is a green banana; we would have the same result with a green apple. The green apple has no flavor; the green apple is almost indigestible and will give children cholic, this is not the most digestible of foods, but still it is digestible. We will apply the test to this cocoanut,--we find no starch in it, but we find a little dextrin; here is a little purple color, showing that there is a little dextrin in the cocoanut but there is no starch there.. The same is true of all kinds of nuts except the chestnut and walnut. Fruits don't contain starch. Nuts contain oils adn albumens, while fuits contain sugar and dextrin.

Now I will call your attention to a few interesting facts, and I will put down a few food-elements,--first, fats , albumen and starch--what was the starch converted into ? ("Dextrin.") and what else? ("Sugar.") Now there are really all the food elements--fats, starch, albumen, sugar,and, of course, salt, but that is in all foods,so we will leave that out. We have fats and albumen in what ? ("In nuts.") And we have dextrin and sugar in what ? (Fruits.) Dextrin and sugar is the same as starxh. Then are all the food-elements in nuts and fruits ? ("Yes,sir.") In other words, nuts and fruits put together make an absolutely perfect diet. Whereabouts do we find the starch and albumen? ("In grains.") Suppose then,we have grains, and /add nuts and fruits to them,--that would make a perfect diet,provided the starch was digested. If we had only fruits and grains, would make a perfect diet ? ("No,sir.") I will write "grains" here,--grains, albumen and starch. If we put fruits and geains together, we have albumen and starch in the form of dextrin and sugar in fruits, and albumen and starch in grains,--would that be a perfect diet ? ("No,sir.") What would be lacking? ("Fats.") Fruits and grains would not make a perfect diet, but fruits and nuts would make a perfect diet,--could we live on a diet of fruits and nuts? ("Yes,sir.") When can we eat grains in such shape as to produce dextrin and sugar ? ("In the milk stage.") Yes, we then have dextrin and sugar present,instead of having so much starch. So we may take fruits,grains and nuts and find in them all the elements we need for the body,and in a state prepared for prompt and easy digestion--especially in grains in the milk state and starch in the form of dextrin and sugar in fruits; here we have everything that is required for the nutrition of the body.

Now what is the objection to the use of starch?? In the first place we may say that it was not designed fer from the first that we should eat starch to any considerable extent, because our teeth are not constructed so as to chew it in the dry grain, but they are adapted to chew the grains in their unripe state, just as they are adapted to chew nuts and fruits. In the second place, starch in the raw state is not digestible in the stomach,--and that is the reason,by the way, that "cold-slaw" makes less trouble in the stomach than cooked cabbage. The old-fashioned New England "biled dinner" is pretty likely to make a row in the stomach; but the "cold-slaw" makes no trouble in the stomach, because it passes on through the stomach like so much shavings or saw-dust, because the starch is raw and cannot digest in the stomach,--and the stomach says, "It's no use trying to do anything with that." It is like a store-keeper who has a customer come in ,who is deaf and dumb--he knows there is no use in trying to do business with him,because he can't talk with him and can't communicate with him, so he simply passes him by. So,when the stomach finds the "cold-slaw" coming down,it pays no attention to it, but simply lets it pass right along. But if the cabbage is cooked , it will stay in the stomach a little while but the stomach cannot digest it readily, and so the starch ferments and sours in the stomach, the same as does partially cooked oatmeal--it sours in a few hours. I do not say that we should not eat starch, but if we are going to eat starch we should bring it first into the form of dextrin,--and when we have done that, we have brought it into a state in which nature gives it to us in the form of fruits and nuts . As I said, I am not saying that we should not eat starch,--it is raw starch that we should not eat it unless it is in the stage of achroödextrin, and then it is in the stage of fruits and nuts; it is then fit for human consumption.

When we come to the reason for the use of so much starch, and other unwholesome foods, it may be accounted for by the barren condition of the earth, the disappearance of so many fruit and nut trees from the earth, and because so many people live in countries unfavorable to the production of fruits and nuts. Some one recently asked me what the Esquimaux would do, if it were not for the fats or "blubber" that he eats? My answer to all such questions is, and has been, "I should advise him to move sough where he can find wholesome foods. Man's home is in a tropical country where there is an abundance of fruits and nuts. You will find an abundance of such fruits in Mexico,--for instance, the "sapote blanca", which is as sweet as honey; and the "chere amoyā," a fruit which is like honey in the beehive; then there us the "agua cata " the flesh of which is like the finest dairy butter witout the savor of cow or the presence of germs; then there is the "melone sapote," etc.--pine apples, a fruit as luscious as peaches ; they are a dollar apiece in Boston, and you can get them for ten cents in Mexico. In these tropical climates you can find abundance of luscious fruits in which are found starch in the form of dextrin and sugar--all digested. Nature intended us to take our starch almost completely digested, and never intended that we should take it in a raw, refractory state.

The evils which grow out of imperfectly cooked starch are almost innumerable. Starch eaten in that condition remains in the stomach for a long time and ferments and sours, and the acids formed irritate the mucous membrane and set up catarrh of the stomach and these sour contents pass down into the intestines, and set up irritation there, so we have gastric catarrh as the result, and we have gas in the stomach, and that results in the distension and dilatation of the stomach, and we have gastritis and other troubles from the absorption of acetic acid, and acetic acid is worse than alcohol in the production of a "gin Liver;" we have also cirrhosis of the liver and the formation of butyric acid and formic acid, and so the whole body is deranged. This trouble leads to the worse habit of meat-eating, for, in order to avoid these troubles, many people get in the habit of meat-eating. Many persons have acquired the habit of eating oatmeal and similar foods, and have become dyspeptic, and so they commence eating meat with their oatmeal and the difficulty is increased, the acidity of the stomach is increased, and they have gastric catarrh. When a person finds that he cannot eat oatmeal because it gives him such heaviness and distension of the stomach, he thinks the cereals don't agree with him--(and some doctors say they cause rheumatism) and so they commence eating meats, and these develop poisons,--he says, I must eat beefsteak because it sits easily in my stomach--" and so it does, because it does not bloat and sour the stomach, and is digested by the gastric juice without much difficulty. If he eats a combination of beefsteak and oatmeal, he is worse off than before, because without the meat the gastric juice kills the germs which prevent the oatmeal from digesting; but when he comes to eat beefsteak along with the oatmeal, the beefsteak absorbs the gastric juice so that it can no longer act as an antiseptic, and then the oatmeal begins to ferment, and so a combination of beefsteak with these imperfectly cooked cereals results in the worst kind of disorders, and so, little by little, the man drops off the oatmeal and similar foods, for the stomach gets so bad from the use of such foods as the inside of the loaf of bread, as it is the custom in some hotels to cut off the outside of the loaf, leaving a sort of whited sepulcher. Now the crust is the only part of the bread that it is possible to digest; the central portion contains millions of live germs, and when swallowed with beefsteak it is indigestible because there is yeast in it, and hence it rises in the stomach just as it rises in the bread-trough, and there are germs in there that sour it, just as it would have done in the ~~trough~~ bread-trough; so the dough is going to remain in the stomach for a long time--and the beefsteak requires several hours for digestion, and so fermentation is certain to take place, and the man finally eats nothing but beefsteak,with the other evil thing furnished at the average hotel.

And so we have become a meat-eating people --Americans as well as English, and the Australians who are the greatest meat "eaters; and we have come to the point where the American people have come to be recognized as a nation of dyspeptics,because of our excessive meat-eating, and our excessive use of uncooked cereals,--and it is uncooked cereals, in my opinion that are largely responsible for the extensive use of meats,--this and the manufacture of the so-called "breakfast-foods"with the advertisement that they are "ready for use when cooked fifteen minutes." Now it is impossible to prepare cereals for eating by kettle-cooking for any length of time,--or by steaming or boiling. They must be cooked dry, at a temperature of about 300°. There are three kinds of cooking of cereals,--kettle-cooking, oven-cooking and roasting. Kettle-cooking simply makes paste; oven-cooking is a great deal better,--the only proper cooking is the oven-cooking or roasting,in which the starch is cooked while it is dry,exposing it to a temperature of 300° --and that gives complete cooking. I am satisfied that the human race was never intended to eat dry starch. Monkeys cannot eat it because they have no cookstove. But we are in a situation in which we must accommodate ourselves to our difficulties--

or the emergency in which we find ourselves--born in a world in which there is comparatively very little that is wholesome; and we must make the best of it,--and in order to do that with starch, we must cook it until it is brown, and then it is in a form in which it is fit to eat .

DRESS-REFORM TALK, June 6,1900.

J.H.Kellogg,M.D.

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We are to take up this subject of Sress-Reform and consider it a little fartherthink it is important to have just this kind of a convention, and I wish we were getting more out of it . We are not getting much out of it ,because I think the weather is too warm. We talk about these principles,--they are all plain and simple and easy to be understood--and yet, when some one asks you about this subject, there is a great blankness in your mind,--there is a general vacuity in the mind--a great vacancy there, or a sort of vacuum. Now I am anxious that we shall get these things down in black and white, so that we may have a schedule or outline, so that the young man or woman who is lecturing on this subject will find a lot of hooks on which his ideas are hung so that he will not have to talk an hour or two before he comes to essential things. The purpose of this convention is, to sort of thresh the ground over and get at the facts pertaining to this subject in this way. If you are going out as a lecturer and can use and explain this instrument (the pneumograph),it will be worth a great deal, because it is the hardest thing in the world to make people believe the truth in regard to waist constriction. There were only two or three women here yesteddav who were really convinced of the truth concerning the influence of the belt. Most of you came here with tight dresses,and you couldn't take a deep breath. I don't believe there were more than two women here yesterday who would have dared to stand up and take a deep breath. Dr. Vinegar and Dr. Geisel passed the test, but I don't think there was any one else who would.

There are many ladies who are proposing to make a reform in dress who are themselves suffering from constriction of the waist,--and they have a right to breathe-- a woman has just as much right to breathe as a man. If you put a string around the lower part of the chest, it restricts the action of the entire chest; that fact appeared so plainly yesterday that I am anxious to impress it upon your minds. I see there are several here to-day who were not present yesterday, and so I will illustrate this principle again: I will put this string round here (Skeleton of the chest); you see it is very loose and ready to fall off, and yet you see the chest cannot expand. Now I will drop it off, and you see there is expansion there. Miss......., will you come up here a moment; put your hands down and see how little pressure will restrain the expansion of the chest where the string is tied. Now suppose a woman says, "I don't wear a tight dress,--I have no tight dress--I don't believe in tight dresses; my dress is simply as large as my body.)Mrs. Singer says it is impossible for one to breathe freely in anything but a night-dress.) Now put your hand down here, --now try your own chest, and you will see that it does the same thing.

Q. Do you mean to say that our dress should be so we shall breathe in this way all the time ?

A. No; that is voluntary ~~breathing~~ respiration; but the chest has that degree of mobility, because, when a person lies down, he breathes a certain quantity of air, and when he is running, he breathes seven times as much, and in order for the lungs to take in that much, the chest must be able to expand that much, and the clothing must be adapted to the necessity for expansion. ("The dress cannot hang on the abdomen.") No, it must hang on the shoulders ,--I am glad to see that you are getting some light, Mrs. Singer, for the fact is, we get such vague ideas upon this subject. Now Dr. Winegar, show us how to breathe normally. (Dr. Winegar comes forward.) She can breathe perfectly well,--what is the objection to this sash?? ("None; but the clothes should be made of light material,--people wear too heavy material.) Yes. ("But we can get past having anything round this part of the body.") Can't they wear a sash ? (Dr. Winegar: Yes,--but I don't think that is perfect, although the sash is as comfortable as anything that will go round you; you can breathe freely.) Anything will do that is not tight,--a woman has no more right to be tight than a man has. (Dr. Winegar: So far, every successful reform dress has been constructed so as to imitate the ordinary man's dress as far as possible, but that is a mistake; the only proper way would be to have the dress made in one piece, like the Grecian gown, the weight hanging from the shoulders; the difficulty is, that the skirt is buttoned onto the waist.) A man buttons his vest. (Dr. Winegar: I don't think man's dress is an ideal one either.) No, because the suspenders are a terrible nuisance: When a man wants to work hard he ties his suspenders round him. ("Coal-stokers never wear suspenders.") It seems to be impossible to wear clothes and be perfectly healthy,any way. Clothes are simply an evil: In the first place, it is a very dirty thing to wear clothes,--wearing clothes is a dirty habit; it accumulates the dirt that should be thrown off from the body at once; this dirt accumulates by means of the clothing,and is held in contact with the body,and the body absorbs it into the tissues , and it should be thrown out. In the second place, the clothing has no nerves,and cannot be regulated so as to suit changes of atmosphere and temperature. The temperature,for instance, changes five degrees, and the skin would adapt itself to it, but the clothing cannot do that . We perspire freely and there are more accumulations,--the clothing retains the moisture,there is excessive perspiration and evaporation, and we thus become chilled, and the result is, colds,sore throats, catarrhs, pneumonias,and general sickness and debility. Wearing clothes is one of the most unhealthy habitsof civilization that we are compelled to submit to.

Q. (Japanese lady:) I hear that in your country it is not the custom to go without shoes, and that it is not considered nice to do so,--but it is, in our country. Do you consider it unhealthy to wear clothing on the feet? and if so, why?

A. Yes, because we get debilitated, and our brains get weak, because the soles of the feet are great vasomotor centers connecting with the internal organs and the brain, so that the feet have an important relation to the internal organs. Here is a man whose pulse is paralyzed,--we apply cold water to the feet in order to contract the bloodvessels of the brain; we apply hot or cold to the soles of the feet and that will affect the bloodvessels of the brain and frequently relieve the difficulty. Wearing clothing on our feet causes ill health. In the Kneipp Institute at Würzhaven (?) even lords and ladies go about the streets barefooted and bareheaded. (Dr. Kress: I have noticed, while in Europe that some of the people go barefooted.) I think we must have a big pen constructed where we can turn patients loose in bathing-suits, and go barefooted in the sun, and have exercise. I believe that exercise in the open air would do more for them than lots of treatment. I believe there is room for such a place of exercise on one of our big lots.

Q. What do you think of linen mesh for underwear?

A. I think so much of it that I wear it summer and winter; it is called "The Diamond Mesh;" then the body is aerated all the time; in the winter you must wear wool on the outside for warmth; but it should not be put next to the body to absorb secretions, and the clothing should be frequently changed,--I can't bear to wear the same suit of underclothing two days in succession; it is bad enough to wear it one day. It seems absurd to say that wearing clothing is a very dirty and unhealthy practice, but it is such a habit that you have got to do works of supererogation in order to maintain a healthy condition,--such works, for instance, as taking a cold-bath every morning upon rising, and taking a warm-bath every night befoee going to bed--this would be a wonderful means of prolonging life, I think. I would like to be in Honolulu or somewhere else where I could go in and have a swim twice a day,-- I don't see how any one could get along without a bath-tub.

You should be able to describe this instrument, and show how it works,--who will come up and be tested? Dr. Pomara come over here and take a deep breath for us,--you have been wearing clothes so long that I suppose you have become thoroughly civilized. (Connecting Dr.P.with the pneumograph) Now breathe tranquilly and naturally,--this is abdominal or lower-chest respiration; and this is the upper-chest respiration: This is the man, and that is the civilized woman,--thisis the abdominal, and that is the upper-chest (referring to tracing.) This is the civilized woman--thoroughly civilized,sophisticated women--this is the abdominal and this is the chest ; this is the upper chest,and this is the lower-chest in man,--and it is just the reverse in woman. This instrument goes a little too fast. ¶ We are going to take up the matter of breathing and its relation to other functions. I think that generally the value and importance of breathing normally is not recognized as it should be. Breathing is something more than simply a respiratory function,--it is also a circulatory function. We have large blood-vessels going up into the ~~trunk~~ chest from the cavity of the trunk, and branches running into the different organs . Here is the cavity of the chest: When the chest is made larger by expansion,it has the effect to draw air in,and to draw blood in, and to draw lymph in. The thorax expands when the chest expands, and here are bloodvessels running upward and downward; and by inspiration the blood-pressure is diminished half an inch in the veins--we see it is a half an inch below zero; it is a negative pressure, and it results from the inflow of the blood into the chest; it is down-hill from the abdominal cavity into the chest, and the blood runs into the chest as water runs down hill. By the expansion of the chest the blood is sucked into the chest just as water is sucked into a cylinder pump when the piston is raised. Now there are two things which combine to produce that effect: the diaphragm goes downward, and that enlarges the size of the chest cavity, the sides of the chest enlarging also; the air comes in here, and the blood comes in below--the blood comes in to help fill the chest, the same as the air comes in to help fill the chest. At the same time, another thing happens, ~~at the same time~~: When the diaphragm comes down and enlarges the chest and so creates a suction in the chest-cavity, and while contracting outwardly, the diaphragm compresses the abdominal viscera. Suppose here is a rubber bag, and it is fixed,--suppose all the space here is filled up; then suppose there are other rubber-bags--one here, another here, and another here--and so on, so that the whole cavity is completely filled: Here is a rubber-bag full of fluid: The diaphragm contracts down here and compresses this rubber-bag-- now the blood in there must go somewhere, and of necessity it must overflow into the chest. When the diaphragm contracts, it makes a vacuum in the chest and there is a pressure in the abdomen; it is down-hill from the abdomen into the chest, and you might say that the pressure ~~capacity of the chest~~ is regulated by the diaphragm, and which rises at one of the teeter and lowers at the other end.,--it creates a pressure in the abdomen and lowers the pressure in the thorax; so it creates a condition which is in the highest degree advantageous for the flow of the blood toward the heart from the abdomen. Now what is true of the blood is equally trie of the lymph--an increased pressure in the badomen and a diminished pressure in the chest. The lymph is forced out of the abdomen into the chest, the pressure taking the air out,--it is like the action of a pump. When we raise the chest we diminish the pressure. I once had an experience in which this principle was illustrated,--it was a case of axillary tumor which I operated upon,--the axillary vein would collapse,and the blood was sucked in from the chest,--I could see that each time the chest-walls expanded, the jugular veins contracted.

The influence of this system of circulation is immense: We have, for the portal circulation,two sets of capillaries. (Illustrating by diagram.) Suppose here is the heart,and here is the blood going out from the heart. Here is the division into capillaries: and this represents the lungs. Here is the left heart,and here is the right heart; here is the blood distributed tto the general capillaries; it is then gathered up in large veins and carried to the right heart: from the right heart it is carried to the lungs,and from the lungs it is carried to the left heart. Some of the blood goes to the other organs--the spleen stomach,pancreas, intestines, gall-bladder and lymphatic glands--all these structures receive blood from the general circulation, also the mesenteric, splenic, and other vessels. This blood is gathered up and carried by the portal vein to the liver , and by the hepatic vein it gets into the general circulation.All these organs are in the abdomen. Here isthe set of capillaries that the blood has to pass through, to get to the organs; and in the liver there is another set of capillaries,and the blood passes through them before it gets into the general circulation. But the liver and all these organs are included in the abdominal viscera ,and the diaphragm squeezes the blood through and also makes a suction to draw the blood in. So there are two causes at work assisting the circulation of the abdominal viscera. I have been using this diagram for twenty-five years,and have found it decidedly useful. To illustrate the whole thing perfectly, we would have to draw a diagram representing still another system,--there is still another circulatory system which might be represented ,--(Diagram.) Here are the kidneys; and there is the special circulation,--the blood goes into the kidney--the blood in these veins is much purer blood than the kidney receives, so that must be made very pure; arterial, rather than venous blood gets into the kidney. This vein empties into the abdominal aorta. So we may draw this line across here,and say that everything below that point is influenced by the circulation,--everything below that point is influenced by the diaphragm: The diaphragm compresses these organs and soaks the blood out, and a vacuum is produced in the chest. Here is the liver, more liable to be congested than any other organ of the body;it is congested at every meal,--about half an inch thicker than it was before the meal. Every inspiration and expiration squeezes the liver between the abdominal walls in front and the diaphragm above. The abdominal muscles contract and the diaphragm is forced down and forced against the abdominal muscles which are contracted--the liver is squeezed between the two and thus emptied of its blood--and the same is true of the kidneys,pancreas and all the other internal organs.

Now ,if respiration is interfered with,see what happens: If respiration is interfered with,so that the diaphragm does not exercise its contracting power,the liver and all the other organs would suffer in their functions. Here is the diaphragm attached to the lower border of the ribs,and rising away up into the chest. Now suppose the lower portion of the chest is held,so that it cannot expand,--can the diaphragm contract properly? Can it descend properly ? ("No.") It is impossible. (Diagram.) Suppose this is the chest of the average woman: Now in breathing,the chest is drawn out like this. Here is the diaphragm,--it rises up like this. Now in breathing, by the separating of the chest,the diaphragm is flattened,--it is flattened by its own traction and by the separation of the sides of the chest,--I have an outline here which illustrates that: (Diagram.) Here is the diaphragm at this point,and you can see , when the chest is empty,--here is the diaphragm when the chest is full. The checkered portions represents the expansion and enlargement of the chest . Here is the same thing in the chest when the waist is compressed,--the diaphragm cannot descend that much,--it cannot be straightened,because ~~the sides of the chest;~~ the sides of the chest are not separated,so the diaphragmatic movement is very weak. We can see then,how it is that when a waist is confined so that there is no chance for the full and complete emptying of the abdominal vessels of the portal circulation,--the liver cannot be completely emptied, and the stomach cannot be completely emptied--so that we have portal congestion,--there is not the proper movement of blood and the food will not be properly absorbed; the digestion is interfered with; the liver -action is interfered with,and all the functions are interfered with. We must remember that there is no such thing as an abdominal cavity and a separate pelvic cavity--it is all one ,and whatever happens to the stomach and liver will happen to all the pelvic organs; and whatever happens to these larger organs will happen to the smaller organs, to the mesenteric glands and all the other glands.

Now this is a matter,it seems to me, of far greater importance than a mere distortion of figure ,--an interference with respiration or the proper amount of air-supply. While a woman has rosy cheeks and plenty of blood and does not feel any necessity for air,you can't make her believe that there is anything about her clothing that interferes with her breathing,--"Why," she says, "if my breathing is interfered with, why don't I feel it? Why don't I get black in the face? Why don't I feel the need of air,if I am not breathing enough?" It is because,ordinarily,we require only about 24 or 25 cubic inches of air--about two-thirds of a pint of air at a breath by ordinary respiration. Now the woman who is tightly laced, has room for ordinary respiration; but when she gets into a church or other crowded place, she must have more oxygen, and hence she must breathe more,--but she can't ; so she faints away, and some one whispers "Cut her corset-strings." No one ever heard of any one's saying, "Rip open his vest," when a man had fainted." This means that women are committing a crime against themselves, also, that this is a fact which is generally understood and appreciated,--every one knows it ,and that is the reason they say, when a woman faints, ~~xxxxxxx~~ "Loosen her corset-strings." It is a confession, and even the small boy knows that when his mother or sister faints ,that there is something the matter with their dress. A small boy in school once wrote in his composition"If I was a ~~boy~~ girl I would rather be a boy, so I could run and holler and have a big diagram." His idea was, that girls are in a very unfortunate state physically, and all the men know it, and all the women know it,--and yet they are all the time trying to make believe that they don't. . Now isn't it strange that there is such a bondage and a slavery to conventionalism.

It is difficult to make women believe that they don't breathe enough, because they are unconscious of any lack of air,--but here are things taking place in the system which they are conscious of,-- the indigestion, the bad liver shown by the bad complexion, the dingy sclerotica, the dingy skin, the great need of cosmetics and the depression of spirits,--the hypopepsia which is so common in women--it is "hypo" in ~~men~~ women and "hyper" in men . Many women have hypopepsia, but few women have hyperpepsia. Now hypopepsia is due to this constant strangulation and anaesthetization and suffocation of the stomach so that it cannot make good healthy gastric juice. For this reason women suffer from lack of appetite,--and they are all the time doing something for it --and how can they do that, when their stomach is full of venous blood, and when the stomach and liver are scarcely ever well emptied of this stagnant blood. There are other mischiefs which arise from indigestion--for instance, women have gallstones four times as often as men. Nasal catarrh is much more commin in women than in men,--also gastric catarrh. I believe you ~~most~~ do not meet with many cases of gastric catarrh in men. (Dr. Kress: Very few.) We have cases of gastric catarrh very frequently in ~~men~~ women and very rarely in ~~women~~ men. This same catarrh is found in the liver and also in the duodenum,--we have many cases of intestinal catarrh. Congestion causes an inability to combat the germs present and always in contact with the mucous membrane,--vast numbers of ~~grms~~ germs are always in contact with the mucous membrane of the stomach and the intestines, and the alimentary canal.

We have been making experiments in the Laboratory by which we find that the moulds are not all killed by ordinary gastric juice. Two-tenths of one per cent. of hydrochloric acid, which is the maximum in hydrochloric acid, will not kill the ~~moulds~~ spores of the moulds, so that many germs pass through the stomach and get into the intestines. Babies are born without germs in the alimentary canal and the fecal matters which are passed from a young infant,--say twenty-four hours old--are entirely free from germs, because there is no decomposition taking place, ad and there is nothing offensive about it. It is a very curious thing,-- and I will mention it as a zoological fact (although I could not mention it in a public audience), and that is, that the cat keeps her little family of kittens clean by swallowing all their fecal matters; the mother is not sickened by it, because it is not a mass of filth and decomposing excreta.; it is free from grms and decomposition, so that there is nothing actually poisonous and destructive,--it is simply refuse, and nothing more than that.

Now the child exposed to contact with the air, and having improper food soon gets an infected alimentary canal. The only protection we have against germs is the mucous membrane and the bile. The colon-bacillus also gets into the alimentary canal,--and it is a deadly germ--it is capable of killing at any time, if it only gets loose in the body. Now take that germ, and the millions and millions of germs in fecal matters--and Dr. Bouchard found in certain cases, that one-half of the fecal matters was composed of living germs. Now with this great quantity of germs right in contact with the mucous membrane of the alimentary canal, why don't we die? Simply because the mucous membrane has power to defend itself against germs, and because the bile has power to suppress their growth, so they don't manufacture toxins in sufficient quantities to overwhelm us. Now we have deficiency of bile, gastric juice, etc., to do the work of antisepsis for the alimentary canal, and the mucous membrane becomes congested by the holding back of the venous blood, and then it loses its power of resistance.

Now let us see why the cells of a congested part lose their resistance: A cell is a sort of entity by itself: If you put a dog or cat under the influence of carbonic acid gas, and it dies very soon. Put a fish into a glass charged with carbonic acid gas, and he will quicker than if he were out of water; a fish will die very quickly in water charged with carbonic acid gas. Some four years ago I put some fish into fifty per cent. proof-spirits, and I found that they lived some little time; I put some fish in water containing about five per cent. alcohol, and they died very quickly,--in the fifty percent. alcohol they required a longer time to die. The reason of this was, that in putting them into pure alcohol, the vessels were all shut up, and the process of absorption ceased, so that the poison was not taken in; but under the influence of the five-per cent. alcohol, the circulation continued, and

~~they were poisoned by the alcohol~~

they are poisoned by alcohol. Animals die quickly when exposed to distilled water charged with carbonic acid gas, or carbonic acid-gas water, because they cannot get sufficient oxygen. Every one of the cells is just like a fish, fly or bird: It depends upon oxygen for life, and without oxygen it dies. Now if the portal circulation is allowed to fill up with venous blood, so that the gland-cells and the tissue-cells, the phg phagocytes and other ger cells which defend the body against germs,-- when these cells become saturated with carbonic acid gas, they are simply paralyzed by it; their activity is gone, and their natural functions are destroyed or temporarily suspended, so that the germs get the start of them. In oedematous cases, I have sometimes found, in doing a ligament operation, that if I happen to cut the veins, there is suppuration and swelling, so I take the greatest pains not to cut the veins, because if I don't cut the veins, I don't interfere with the circulation, the carbonic acid will be carried off and the oxygen brought in, and then the cells will have power to resist the action of germs,--and this is true of all the internal organs.

But when these organs become unable to resist the action of germs, we have catarrh, the mucous membrane lpses its power of resistance and so the germs make their habitat there. That is the reason we have sores in the mouth, or eczema, or decayed teeth,--it is because the cells have lost their power to resist the action of germs. So we have lowered resistance,--and nothing lowers the resistance of the cells more than a state of venous congestion resulting from deficient activity in breathing.

Then, excess of blood in certain parts results from deficient breathing, and this excess of blood causes an enlargement of the spleen and liver, as well as a host of other disturbances in the abdominal region. It is important to have these facts in mind so as to be able to let people see what an awful thing it is to interfere with the natural functions of the chest. The chest is the central engine of the body ;

its movements circulate the blood, introduces the air, and helps distribute it after it has been introduced. I think it would be well to sit down and formulate some of these things. I think at some time, we will take up the study of enteroptosis and the displacement of the abdominal viscera.

DRESS-REFORM TALK, July 7,1900.

J.H.Kellogg, M.D.

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(Explaining Chest-Skeleton.) Some years ago,I made some studies, in which I devised a little instrument for measuring the movements of inspiration and expiration. Here (referring to Chest-Skeleton) we have a diaphragm above and a diaphragm below the perineum. Here is the diaphragm above,which separates the lower trunk of the cavity from the chest. When the diaphragm falls, there is an abdominal bulging of the perineum. When a patient is wearing a plaster jacket emclosing the lower trunk, the perineum moves up and down fully an inch,in respiration, because there is no opportunity for outward bulging. I observed,in a case which I studied,that there was this movement of fully an inch of the perineum moving up up and down with each inspiration. When a woman has on a corset,it produces the same effect,--it increases the movement of the perineum.

Now what part do the abdominal muscles play in respiration? They are simply a reservoir of energy. They play the part of a rubber-band: Stretch a rubber band and then loosen it, and it returns to its former position. The rubber band does not voluntarily contract; it only contracts because it has been stretched. The abdominal muscles are not active,--there is the ordinary tone of the muscles,but there is no contraction; they are simply stretched by the intra-abdominal pressure, and then the natural elasticity of the abdominal muscles causes them to come back,and forces the diaphragm up during expiration; it is purely automatic, and does not tax the muscles; they stretch and spring back,as the force is released which operates the diaphragm.. Some one has suggested that in anesthesia, the abdominal muscles contract wit great vogor; but this cannot interfere with the automatic mechanism of respiration; we don't have this contraction in ordinary respiration: When the muscles contract with great vigor, this is an abnormal state of things; it is a condition in which nature is substituting this movement of the abdominal muscles for the purpose of helping out the condition,--it is because of some interference wit the automatic mechanism of the capillaries.

In ordinary respiration there is simply a stretching, or the placing of a strain upon the abdominal muscles, and withdrawing that strain. The abdominal muscles don't contract except as a piece of rubber contracts when it is stratched. So the abdominal muscles are only passively employed in respiration,--like a spring.

The idea is held by a good many, that respiration must be abdominal to be healthy. This idea appears absurd when we consider the organs f respiration,--that man has a chest containing lungs, and muscles attached to the ribs, and arranged in such a way as to have a leverage upon the ribs, with cartilages elastic and flexible, so that there may be work and change in the chest,--and yet, it is claimed that all the work must be done by the abdomen ! In respiration there is no active work done by the abdominal muscles at all. A number of years ago, I had this skeleton chest articulated: These ribs are connected by wire; and here is a wire attached to the fourth rib, by which it can be raised . This represents the scalenus muscles. Here are the muscles attached to the ribs. When I pull this wire, notice what happens in the chest. (Illustrating.) You can see that that will happen in the chest. Take a young person whose chest is flexible, and in taking a deep breath you can see that very thing. Now that is the thing that must happen, because the ribs are all attached together,--this is artificial, but you can see that it is a natural movement. Now see what actually occurs here,--there is a spreading out at the sides--see how the sides expand here; there is where the greatest movement is--the greatest movement is at the sides --at the lower sides--and why? Because the greatest freedom is there. Here the cartilages are short , and here they are long, so that the flexibility is greatest here, as they are not attached here. This skeleton teaches a lesson. The chest is the thing that is really active in respiration,--not the abdomen, but the chest is the active thing. We have another evidence of this fact,than the anatomical evidence--the relation of the ribs to the chest, the flexibility of the cartilages,and the movements of the chest,as illustrated by this artificial preparation--we have another evidence, and that is, that when you find a person breathing automatically, you will find this movement. When a person is breathing tranquilly, this movement is slight, but when a person takes seven times the amount of air into his lungs that he does when he is lying still, then there must be this greater action.

We have another evidence that the chest works,in respiration,--and that is, when we set a person actively to work,so that he needs air--seven times the ordinary amount of air--his lungs move with vigorous play,--they work like the handles of a pair of bellows,--I have found that a very good illustration. When I want to illustrate that principle in a lecture, I ask some one to go out and run up and down stairs and then come in and show us how to breathe. Nurse,won't you be good enough to go out and run up and down stairs two or three times ? If there were little boys and girls here, we could set them to running races and they would get all out of breath , and then we could use them for illustration. At one time we had a certain brother here who was from California,and some one had taught him to breathe abdominally,-- I think it was Eld. Scoles,--he told him it would do him good to breathe abdominally, and while I was lecturing on this subject,and taking the position that it was the chest and not the abdomen that does the work in breathing, he insisted that I was wrong,and that abdominal breathing is the proper method. I then asked him to go out and run up and down stairs two or three times, and then come in and show us how to breathe abdominally. He did so, and when he came in, he was breathing hard, and naturally. I said to him, "Now show us how to breathe abdominally, quick." He tried it once or twice without success, and said, "Please wait a moment, till I can get a breath." That told the whole story,--he had to wait till he could get a breath, in abdominal breathing--that is, diaphragmatic breathing; the diaphragm does the work, and the abdominal wall moves passively out and in. But when the term "abdominal breathing" was used twenty years ago, it meant what we now understand by full respiration, when we expand the ~~lower~~ whole chest.

We now recognize three kinds of breathing,--costal breathing, abdominal breathing, and full, or normal respiration. Full respiration has been confounded with diaphragmatic breathing, and some use it in the same way now. Sr. White speaks of abdominal breathing, but she means full breathing,--I know that, because I know how she breathes; she uses her ribs and chest freely in breathing. I have had occasion to examine her chest and lungs several times, and that is the way she breathes, as I know . She never wears corsets, and so she breathes naturally. In sleep, you will see the rising and falling of the abdomen, and no movements of the chest, in children,--but that is all that is needed during sleep. But when one must exercise, so as to require a large amount of air, then there is a play of the ribs and chest, but it is automatic,--it goes right on.

You must get this idea of normal breathing: In normal breathing there is a swelling out at the abdomen, the ribs begin to play and move out, making the trunk as large as possible at the waist. Now if you want to get a full breath when you are singing and want to sound a high note, or want to retain a tone for a long time, or prepare for high speaking ,or for the purpose of sending your voice a long distance,--you not only fill the lower part of the lungs but the chest, and then you raise your chest,holding the diaphragm down tightly,then raise the upper part of the chest and there is a little more room for air by the enlarging of the chest,and you fill that; that is normal full respiration; full respiration is a complete filling of the chest,--filling it as full as you can,--in the lower part, the upper part, and all around .

In regard to the different types of respiration. The old Physiologies used to teach that men breathe in one way and women breathe in another,--that a woman breathed with costal respiration,naturally, and that men breathe with abdominal respiration naturally. Some dozen years ago,I made a critical study of this question, and made many pneumographic tracings; I spent weeks and months in thiswork. In China-town,San Francisco, Cal. I ~~measured~~ took tracings of twenty or thirty Chinese women,who never wear tight clothing. I examined a number of Indian women in the ~~Uma~~ Yuma tribe where the women wear no clothing except a little bark skirt at the chest above the hips, so they were in a perfectly normal state so far as physical development is concerned,--and I found that the men and women breathed just alike. I applied the same test to dogs. This is the sort of movement you get (diagram) this mark indicates the movement of the chest in inspiration, and this, in expiration. When the instrument was applied to the upper part of the chest of a man,it made this sort of movement; and when it is applied to the waist it makes this sort of movement, making these excursions; when applied to the chest of a woman,it made this sort of movements, and when applied to a man, this sort of movements,--I will show you the method of taking a tracing in a moment--in other words, I found that the Indian women breathed just like the Indian men, and the civilized women who had never worn a corset breathed like the Indian men and women--they all breathed just alike. And I found that masculine and feminine dogs breathe just alike: The abdominal or lower respiration was marked, and in the costal respiration the movements were slight. I also found that a man in a corset breathes just like a woman in a corset. I made an application to a woman who had worn a corset and had reformed, and I found they breathed just like a man, only there was rather strong costal respirations, as well as strong abdominal respiration; the cartilages were flexible allowing of large excursions of the chest in breathing. Some doctors and music teachers teach that only the upper part of the lungs is to be used in breathing, but that is an error. (Diagram.) This is the costal breathing in a man, and this is the abdominal breathing,--that is, with the lower ~~part of the~~ chest. This is the breathing of a woman in a corset, and this is the breathing of a civilized woman who never wore a corset. The breathing of a woman in a corset is the reverse of that of a man. The breathing of a man in a corset is just like that of a woman in a corset,--and why should it not be ? This is the civilized woman who has worn a corset but has reformed; here the costal breathing is rather too pronounced. This is a tracing of Mrs. Annie Jennesse Miller, the great dress reformer,--this is a tracing I made of her breathing; I told her the use that we were going to make of it, and she was willing that I should take the tracing.

Now you can see the influence, not of corset-wearing but of constriction of the waist. Now I think I have shown clearly enough that woman naturally breathe just as men do.

Now see how the chest moves in breathing (illustrating by skeleton.) Now suppose a band is placed across the waist, just below the lower border of the ribs,--this is the way an ordinary woman breathes--she can't breathe, because the handles of the bellows are tied up, so it is impossible,--the ribs and muscles are all connected and cannot act independently; they are all connected with the sternum, and if there is not room for the lower points of the chest to separate, the sternum cannot rise. Now I will let go of this, and you will see what happens-- I see several of you are taking a deep breath when you see this going up. Now the poor woman who has bands around her body,--even though she says, "They are not tight--my clothes are only skin-tight; I am not constricted a bit; my clothes are only just comfortably tight,--just comfortably snug; they will slip up and down easily." Now we will have a "comfortable" band here, which will slip right up and down. (Making application to skeleton-chest; I will just put on a little rubber band, and that has not much power in it ; this rubber band causes just a simple restriction,--now see what a difference it makes. Now I will take the rubber band off,--now see the difference: Now I am going to apply it about four inches below the end of the sternum,--is that about the right place for the band? ("Lower than that.") Here? ("A little lower.")

It comes just below the floating ribs--just below the cartilages-- right over the floating ribs,--that is about the right place; now I am going to tie this up,--I am not going to make it tight--see how loose it is . A lady would say, "I can put my hand right under my belt,--there is plenty of room." They can always put their hands under their belts, because at that point the ribs yield readily, and ~~the~~ this is the universal expression,--it is difficult to make the dress stay on,--I must have some hooks to make ~~my dress~~ this stay on--it drops right off.-- well, there it is. Now there is no constriction; it is perfectly loose; but the whole chest is tied up when this band is comfortably adjusted; it is just as big as the body is, but it restrains these handles; it is just like tying together the handles of a pair of bellows, and it is impossible to expand the chest,--you can't raise the sternum unless you can stretch the ribs. Now I will just drop this off,--there it goes. Now I can prove that by examination right away,--who will come up and let me put this strap on them? (Dr. Thomason comes up.) Expand the chest as far as you can,--once more--once more, take a deep breath,--three holes, that is just about three inches. Now I am going to put this away down at the waist--there is no waist - line, normally--it is purely an artificial thing, isit not ? ("Yes.") Let's have some one who has ann established waist-line. (A lady comes up.) Here is the very point that I have been talking about,--there is the corner where the cartilage turns up--just about opposite this point. Now let's see how well the doctor can breathe,--take a deep breath,--we will mark it with a pencil. Now breathe all out,--now breathe in--that was a pretty good breath,--that is the distance--that is the respiratory movement. Now I will have the doctor put this belt on,--just put it on so that it will be comfortable snug--not too tight. No woman would call that tight. You see it does not change the form of the waste: The normal shape of the waist is elliptical. This is not tight,--you can take it up several inches; it would fall right off; I am sure no woman would admit that that was tight. Now let us see how much that will influence the breathing up here,--take a deep breath (Breathing out and in.) It is a little less than two holes. Now breathe in all you can,--it lacks a little of two holes. ,--it falls short three quarters of an inch; that is the chest measurement above--not below but above; now for the waist-measurement below (Breathing out and in.) It is a scant three-quarters of an inch. You will find these facts more interesting than a whole lot of talk,--23 inches. (Breathing in and out.) The waist expansion is just half an inch. We will take this belt off and make another measurement in the same place --four and a half inches; and only half an inch with a loose belt. Will this lady let me measure her waist,--28 inches. (Braathing.)Half an inch .

Now suppose we have that belt off: (Breathing.) Two inches. You see you can scarcely wear a belt at all without constriction. (Dr...... 5 years ago, "When I came here, I had always worn "union" garments, but Dr. Kellogg said a band was as bad as a corset, so I was put on "rest-cure" without bands or a belt, and I wore a chamber robe three weeks, and increased my waist-measure four inches in three weeks, and took nothing but "manual" massage and bath-room treatment..") It is next to impossible to make a reformer of a woman: Here is an apostle of dress-reform convicted of tight lacing,--one can be "tight" in dressing as well as in other ways--and I don't know but it is just about as bad in dress as in drink. I shall never forget the time I convicted Dr. Lindsay of tight lacing: She had been lecturing on Dress-Reform for many years, and one day I had her come down to my office. I applied the pneumograph, and I said, "Dr. Lindsay, you are certainly wearing a tight dress." "I, WEARING A TIGHT DRESS!" she fairly thundered out at me, for making the suggestion,--" never wore a tight dress in my life." I said, "You are wearing a tight dress this minute. I applied the tape-line, and she was only able to expand about half an inch in her ordinary clothes, and when she loosened her clothing she expanded her waist three inches. I remember a young lady who came here some fifteen or sixteen years ago, and I found that her waist didn't expand any with her tight dress on. After exchanging her very tight clothing for loose clothes, she was, in a few days, able to expand seven inches. The capacity for expansion here, is tremendous.

Here is Dr.......Let us see whether he is guilty of tight lacig-- 34 inches. (Breathing.) Two and a half. I don't think there is any tight lacing here; this is a pretty fair expansion.

Now is there some one who wants to come up here and show us a mode dress,--I want to see if you can expand your waists properly. Here is an audience of dress-reformers in a dress-reform institution, and I want to find a model dress here.. I was talking with a dress-reform lady the other day; her dress looked snug, and I said, "I am afraid you wear tight clothes." She said, "Yes; but I have gained ten pounds since I came here, and s my clothes are too tight." A dress fitting a Person weighing ninety pounds won't fit a person,weighing 100 pounds. . If you have a dress which fits you when weighing 140 pounds, it will be too tight when you weigh 150 pounds,-- and a dress that fitted you before breakfast may not fit you after breakfast. Dr........ do you feel more comfortable in your Japanese dress? XXXXXXXXXXXX (Dr......:"Yes,sir;but in our costume for women, women of fourteen and fifteen wear an extra string by which the dress is made short or long, and over it we wear a very wide strap,which is not very tight, but I would like to ask you whether , in your opinion,it would not interfere with respiration.") No, it wouldn't interfere, because it is so low down,--because it comes over the top of the bone. The Mexican women wear a very tight string round the body, falling between the stomach and the colon, so you never find the stomach prolapsed among them,but the colon is badly prolapsed. Dr. Winegar, will you come up and be measured--you are a great dress-reform apostle. (Dr.Winegar comes up.) Take a deep breath,--breathe out,--one-quarter of an inch. ("That is perfectly stiff,--it won't give a particle;measure just above that .") I will measure just above that . (Breathing.) Two inches,--that is better; so I don't think the doctor is very wicked--but a half an inch is pretty serious.

Q. What can be done about a belt? If the belt is large enough to expand your chest fully,it will fall off out of place, and a flexible belt is not fit to wear.

A. You can't have a belt tight enough to hold its place and be hygienic. I should think,on the whole, the cloth belt isthe best,making it so it will catch on the other clothing ,so as to keep its place.

I am sorry for the women folks,--they have so much trouble with their dresses. (Dr. Winegar: My clothing is loose, but it is an inconvenience to have clothing fastened together at this part of the body.) I think the clothing should be something like the Grecian gowns where there is no union there.) It is impossible to wear the ordinary belt without positive injury; Perhaps a sort of sash with a loose fold could be worn around the body without damage. ("That is not artistic.")

It is not necessary to have tight lacing in order to interfere with respiration: It is only necessary to have a band or guard about the lower part of the chest that says to respiration "Thus far shalt thou go,and no farther," so that there is no chance for expansion. This illustrates the idea that the sides of the chest are the handles of a breathing-bellows. Here is where the greatest movement is,--the lateral movement, and when the chest is thus tied up,its movement is crippled--it is crippled as much as a pair of bellows would be with the handles tied together: You can't do much with a pair of bellows by seizing them by the belly and trying to pumd air with them, when the handles are tied up;and so it is with the chest,when it is tied up, as I have described. To-morrow we will study the question, What are the injuries that arise from the interference of breathing caused by wearing the conventional dress?

DRESS-REFORM TALK, July 8, 1900.

J.H.Kellogg, M. D.

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Now let us all take a deep breath,--you and I--and the skeleton. (Explaining Chest-skeleton.) This graphically illustrates the movements of the chest. Now while taking a deep breath, let us put our hands to our sides and see how they expand. Now I want to call your attention to a very little, simple thing: I am going to put this little band here,--there is no tight-lacing here,--I have not drawn it in at all; I have allowed half an inch so as to leave plenty of room,--now see what happens--these are short breaths and shallow breaths. I want a little elastic rubber,--this rubber is very elastic and it has but little strength--now watch the effect of that little rubber band, and see what its effect is,--you see it restrains the movements of the chest here very greatly,--place your hand there and see how little force is required to prevent that movement. (A lady comes up.) You see,--it is because the fulcrum is behind, so to speak,--I will explain how that is: Here is the articulation right against the vertebrae,--the transverse process rests against the vertebrae; the end of the rib is working on the long arm of the lever--let this chair constitute the fulcrum, and here is the lever (Illustrating with chair.) By operating on the long end of this lever, I can lift a great weight on the other end. It takes only a little pressure at this end to control the other end, because there is a great purchase here: Now if this lever were one foot long at the other end and three feet long at this end, one pound here will lift three pounds there. Now suppose this part of the lever is one foot long, and the other part is ten feet long,--how many pounds at the short end will be raised by one pound at the other end? ("Ten.") We have that principle illustrated here,--a little restraint of the ends of the ribs is sufficient to entirely restrain the action of the chest.

Now the thing that I want you to notice is this ,--that if there is any restraint at the lower part of the chest so that it cannot expand there, then it cannot expand anywhere. Why ? Because they are all fastened together. The movements of the ribs are made by the flexion of the cartilages,--there must be a change at that part between the ribs where they separate; the sternum is raised forward,so that when the lower part of the chest is restrained it does not simply prevent expansion at the lower part of the chest,but at the upper part of the chest at the same time . Some people think, " It makes no difference which part of the chest I use." Dr. Mays(?) some years ago advocated wearing corsets for women in order to prevent consumption , and he brings statistics ~~to prove~~ to prove that the wearing of corsets prevents consumption, and he says more men have consumption than women,and that the reason women don't have consumption is because they wear corsets,and the corsets compel them to breathe with the upper part of the chest,and thus prevent consumption. Now my theory is very different from that,--can any one suggest an explanation of the fact that more men have consumption than women? ("More exposure.") (Dr. Kress: Is it not true that women fail to breathe sufficiently at the upper portion of the chest?) That is what Dr. Mayes says,--and so he recommends corsets. (Dr. Winegar: May it not be that men are more dissipated, and are exposed to disease in other ways, and so their vitality is lowered and their resistance diminished?) Yes ,--and more men have pneumonia than women, because men are more exposed than women . Besides this, men are more likely to come in contact with those who have tuberculosis than women. Women stay at home more than men , so that they are less likely to get tuberculosis for that reason, -- unless her husband has it,--and if he has it , she gets it ,because,if a man gets tuberculosis, his wife is almost sure to have it . But the man who has little resistance is the man who habitually sits in his office or at his desk, or the lawyer poring over his books, or the alderman, who do not have sufficient physical exercise. Housekeepers have such exerzise as frequently going up and down stairs, which the sedentary business man does not have. Now the position of a man sitting down upon himself (Illustrating by position)--he is all doubled up and can scarcely breathe,--once in a while he will straighten up and take a long breath,--he puts his hand behind his head and takes a long breath,--and that is perfectly right ; that is what a dog or cat does. They reach out their paws and take as long and deep breaths as they can. That is an animal instinct within our bodies calling for more oxygen and air and so we make a forced expansion of the chest. If you will notice the pneumograph you will see that about every sixth breath makes a bigger wave of writing. I have noticed many times, that once in about dso often a person takes a deep breath. Now when a business man or professional man sits at his desk his lungs are cramped; he is not breathing enough; the air is stagnating in his lungs,--it is not circulating freely, and his bodily and local resistance is diminished. So I think we have reasons enough to account for the greater prevalence of tuberculosis in men than in women, without considering that women are less subject to disease than men because of wearing corsets,--it is not because their dress is healthy, but because men's occupations render them more liable to disease,--I am afraid Mrs. Kress will take issue with the Doctor upon this point.

Now while it is true that woman does expand the upper part of the chest more without a corset than when wearing one, she cannot expand so much, as a whole, and she cannot expand even the upper chest so much when wearing a corset as when she does not wear a corset. I will show you that Dr. Mayes' idea is false, except as regards ordinary tranquil respiration. (Illustrating by Chest-Skeleton.) This skeleton cannot take so deep a breath now. I want to try this on some man who is alive and let you see that the same thing is true,--will some one come forward who wears a belt? (A young man comes up.) ~~Three inches.~~ How much can you take that up? ("T ree notches.") That belt does not seem to restrain the movements of the lungs --it is very loose. Now a lady with a dress no tighter than that will say, "Just see how loose my dress is ,--you can put your hands right under my belt,--there is nothing tight about it." I don't know as there is, but we will see .,--I will put my tape line right round here --32 inches; n w take a deep breath. (Breathing.) Two inches,--that makes a consid rable difference- it has made three-quarters of an inch difference; and yet that belt, though loose, would interfere with the breathing to a slight degree. Now I am going to take a measurement at the top of the chest; you know then that these demonstrations at a school of health are worth more than a whole lecture , be cause the thing is proved right on the spot .. There is 34 inches,--take a deep breath. (Breathing.) Two and a half inches. Breathe out,--three and a half inches. Now I will put on that belt again. Now no one would ever accuse that belt of being tight. Men are sometimes tight, but in this case there is nothing to complain of on that score. Now take a deep breath. (Breating.) Tw and a fourth inches is the best that he can do.. Take a deep breath,-- two inches is t e best that he can do. Try and do better than that,--listen and hear the belt squeak. Now breathe out. (Breathing.) Two and a half inches this time . N w see this loose belt,--I can put my whole arm under it . You can see what a mistake it is to suppose you can wear a belt or anything else that is just the size of the body without interfering with the function of breathing . I will put this on some one who has a larger chest, so that there will be a little more pressure. (Another young man comes up.) Isn't that loose? ("Quite loose.") That is loose? (A lady: Yes, that is quite loose .)

I think you ladies would say that is loose enough for a thorough reform dress. ("Yes.") Now let us see how much expanse we can get here . Ladies will fairly gasp, when you tell them how big their dresses should be,--when I tell them they should be measured ,and then add two inches, in order to have the dress large enough; that two inches is for an extra breath--for going up and down stairs, etc. Now take a deep breath. (Breathing.) Just one inch,--you see how he expands his waist, and his heart is beating away at an awful rate--take a deep breath--just one inch. It is too tight. Now you wouldn't think that was making any contraction--32 1/2 inches take a deep breath--38 inches; that expands the chest an inch more; the belt is loose . You can all see that the restriction of the lower part of the chest restrains the upper part of the chest. It is true that this does not apply to ordinary respiration, because ordinarily we don't expand the full chest.

It is a strange idea in the minds of women,that it is necessary for a woman to have a small waist. Some years ago I read a paper before the American Medical Association , bearing upon this subject, and when I had finished, Dr. Opie,Professor of Gynecology in a Maryland Medical College, arose to criticize my remarks,--said he, "I am very much surprised at these remarks. My mother,and my sisters have taught me that it was an element of beauty in a woman,to have a small waist," and he ridiculed my statements and remarks; and I felt much relieved,when a lady doctor, a Professor in a medical school in Washington rose and took issue with the doctor and agreed with me . XXX XXXXXXX Woman has more liver and less heart than man in proportion to her size; the heart is the size of the fist,and a woman's fist is smaller than that of man, because it is the duty of the heart to back up the fist,--the fist cannot do anything without the heart. If a man has a large fist he has a large heart,--a large foot and a large hand are evidences of a large heart.

In women, the heart is smaller than that of men, because the amount of physical work is less. With this smaller heart, woman has a larger liver than man, in proportion to the size, and the abdominal viscera is also larger in women than in men; this is because of the function of motherhood: The mother nurses the child as well as herself, and she must digest for both herself and her child, and so, if you are going to compare the mother with a man, you must take the mother and the child together. The mother and the child really make one creature, because the child is fed by the mother's stomach, and the purification of the child's blood must be carried on by the mother's liver and the mother's kidneys. So the visceral organs,--kidneys, liver, spleen, pancreas and stomach--are all larger, in proportion to the size, in the woman, than in the man. I have given you my authority for this in my little pamphlet "The Influence of Dress."

The significance of this fact is very great, because, if these organs are all larger in woman than in man, in proportion to the size, since they all lie about the waist in the narrowest part of the body, it is very evident that the waist should be larger in woman than in man, because the organs lying about the waist are larger in woman, as I have stated. Now let's see where these organs are. (Referring to charts.) This picture is prepared so as to show the position of the internal organs in relation to the outside of the body: This is copied from Ziemssen, and is a proper representation of the exact relation of things,--this is an exact copy of the cut in Ziemssen's Anatomy. Here is the lower border of the ribs, and if you put a straight-edge right across here (at the lower border of the ribs) you will see that the colon, the liver, the stomach and the pancreas behind the stomach, and the spleen and both kidneys in front, are entirely above this line,--run a line along here, where the ribs connect with the chest--the lower border of the ribs--running a line from there, and the colon, the stomach, the liver, the pancreas, the intestines and the spleen all lie above the ribs. It is very important to know that and fact and the significance of it.

Now suppose we contract the waist a little ,bringing the sides of the ribs together a little bit,--what will happen in this space which is always completely filled? These organs which are occupying this space--these large,important, heavy,vital organs must go somewhere,--can they go upward? ("No.") No,--there is the sternum,the ribs, clavicles,collar-bones--there is a complete bony framework above,so that there is no chance for them to move up,--they sometimes do move up a little,because, when we have the ribs forced together in this way, it does force the upper chest up a little,--and I have seen the upper chest raised away up; the chest is quite flexible so that the sternum is forced up. Will this young man come up here a minute? (Young man comes up.) Now watch this young man a moment: Does this press out the upper part of the chest a little ? ("Yes.") There is a little raising of the organs,but there is not much chance for much movement; the only chance for considerable movement is downward.

Some time ago, I made a careful determination of just where all the different organs were ,and had a drawing made representing everything just as it was .; I have had them made in such a way that they come, one just opposite the other. I let this line fall upon both sides at once, and I want you to see this and tell me what organs can you see below the line. ("The colon, stomach,kidneys and part of the liver.") The stomach is not entirely below the line, but the greater part of it is. The other organs are above the line ,--how far above the line is the stomach ? ("Two inches.") How far below the line on the other side is the lower border of the stomach? ("Three or four inches.") I have seen it as much as six inches below . Here is the umbilicus,--this is the point which locates things ,--you see where it is on the other side. The body of the stomach is entirely below the umbilicus--three or four inches out of place--and I have seen the colon away down in the bottom of the pelvis. In doing laparotomies I always notice where the colon is , and I have sometimes followed the colon away down into the rectum,it was so terribly prolapsed. This is a matter of necessity in cases of constriction,--it could not be otherwise. I have seen cases in which the liver was pressed over against the other side ,and pressed up against the ribs and was full of furrows; it had been pressed so far over that the left lobe of the liver was turnedback and doubled over on itself . Twenty-five years ago, I was a pupil of Dr. Austin Flint in the Bellevue Hospital, New York, and he used to set us to taking diagnoses of hard cases in the hospital and determine, so far as we could, what was the matter with them. It fell to my lot one day, to examine a lady about 35 years of age There was quite a discussion as to what was the matter with her . I found a lump down on the right side by external examination; it was about as large as my fist, and it was moveable--I could move it all round. I concluded it could not be an ovarian tumor, it wasn't floating kidney, it was not a fibroid tumor, and it wasn't a cancer. The patient didn't look to be very sick,and I was perplexed,until finally an idea struck me, and I said to her, "Did you ever wear your clothes very tight,--" I didn't dare ask her if she laced . "Oh, yes," said she, "I tie my corset-strings to the bed-post every morning ." Then I made up my mind what was the matter with this woman, and I said to her, "This is a tight-lace fissure of the liver,--" there was a piece of the liver almost cut off. I then told the doctor that this woman had created a new fissure of the liver by tight-lacing and that the liver was almost cut off,--it was only hanging by a string; and he confirmed my diagnosis. I was telling this story some time ago while lecturing in Minneapolis,and when I had finishd my lecture, a lady came up to me and said "I have got that kind of liver; I used to do that very thing." She then desired me to examine her abdomen. I did so, and I found an ugly tumor where she had nearly cut her liver off.

An eminent German surgeon some years ago published an account of a case in which a woman had amputated a portion of her liver in that way, and that part of the liver died; it was so completely cut off that it mortified and gangrened, and I had to take it out in order to save her life. I have seen several cases reported in which women have actually cut off a piece of the liver by constriction of the waist. This is extreme constriction, of course. The conventional dress could not be charged with such damage as that. These are cases of extreme constriction by ladies who were afraid of being fat. Here is a case (referring to chart) which is copied from a photograph of a ballet dancer in Paris. When I was there, I bought a photograph of a woman who was a danseuse. Look at that waist and see what it is, compared with the width of the shoulders and hips. Now imagine, if you can, where her liver, kidneys and stomach are, --there is no room for them where they should be, and it is evident that they are dreadfully out of place. Now, it is that kind of constriction, --for instance, a woman wears a 26 inch corset when she is 24 years old. Then she is married and has children and gains flesh, --when she gets to be about forty she begins to gain in flesh, as most women do. She becomes fatter, but she won't change corsets, --she isn't going to get a bit bigger, so she sticks to the same sized corset. When she goes to her dressmaker, she says, "My size is so and so--26--" She wont allow herself to get any bigger. Her arms, legs and hips may get enormously big, but her waist shall not get a quarter of an inch bigger. The old Saracens did that same thing: They used to put a powerful brass over their stomachs with the idea that that would restrain them from getting fat; it was a broad breast -band rivetted so that ~~that~~ the waist could not grow any bigger. Little children practice that sort of thing in sport. When I was a boy I used to slip a cucumber into a bottle of water, and then watch the cucumber and see it assume the shape of the bottle, and this method of constricting the waist is the cucumber plan-- it is growing up into a corset. The mother puts her daughter into a corset and she grows up into it; a woman grows into the shape of her corset. You can always tell when a woman is wearing a corset, because her body acquires the shape of the fashionable corset. And you can tell when the fashion changes by the shape of the patients in your office.

Now a great many women have a misconception in regard to becoming fat, and injure themselves, when they are not aware of the damage they are doing themselves. A woman sometimes thinks she is getting very fat, when the trouble is that she does not stand straight. I never shall forget one woman who once walked into my office in this way (Illustrating.) She said, "You see what is the matter with me." Said I, "I don't see as there is anything the matter,--what is the matter with you?" "Why," said she, "can't you see what is the matter with me--I am too fat." "Oh, " I said, "I can correct that in five minutes." "Can you? I will give you a thousand dollars if you will do that."Said she, "You mean that you will cut something off "No," said, "I don't mean a surgical operation,--stand up here, and put your head back and look up at the ceiling; put your arms down as far as you can, bend back and look at the ceiling, and raise your chest. " She did so, and then I said "Look down." She looked down, and she could see her toes. She looked round the room as if she were looking to see if she couldn't see some big ugly lump of fat which had dropped off. You can see how absurd it is to carry the hips in front; they should be carried behind .

About all that is necessary, in a great majority of cases in which women wear their clothing tight so they won't look ungainly, or like "frights," is about the only thing necessary is to teach the woman how to stand--carrying the chest in front and the hips behind.

I might mention a case, as an illustration of the foolishness of the idea about the waist getting too big: There was a lady who had charge of the Cook County Hospital; she came here to visit the diet cases. She said to Mrs. Baker ,"Your nurses don't wear corsets." "No," she replied, "it is against the rules." "I am surprised at that," said the lady, "how do you manage to keep your stomachs down?" Now that woman had the idea that if she didn't put her foot on her stomach and keep it down, it would expand indefinitely,--that she must keep her eye on it and keep it down. That is what tight-lacing is doing,--and I suppose these women are troubled every day over that question--"How am I going to keep my stomach down?". That woman kept her stomach down. I saw one woman who kept her stomach down so far that it was six or eight inches below its normal place--it was almost underfoot. Women must be disabused of this idea that the chest has no right to expand, and that it is ungainly,and masculine, and awful, to have a large waist. Women must be made to understand, and to believe that it is natural for a woman to have a lager waist than a man; that it is not masculine for a woman to have a large waist , but that it is feminine,--but it will a great battle to make them believe that--but it is the truth.

I could give you another evidence: Some years ago, I made a study for several years,--and I improved every opportunity that I could get to examine ancient models. Whenever I went to Washington or New York,I measured all the old models that I could find ,--I measured seven or eight different masculine figures. It is difficult to find a perfect figure. I didn't find but seven or eight men who had the right figure,so that I could get a good idea of the waist-measure of men. I did the same thing with women, and found that, by taking the Venus de Milo as a model--and this is accepted all over the civilized world as the most perfect model in existence of the feminine figure--no artist ever undertakes to improve upon that--I found by measurement of that model, that the waist was 47.6 per cent.of the height. So that was the standard that we adopted: We had to have a coefficient, and we made one by simply comparing the waist-measurement with the height. Now suppose a lady's height is 60 inches,--the waist measure is 47.6 per cent.of that,--that is, almost half the height.

Q. Would the rule hold good in very tall and slender persons?

A. Of course I am speaking of the average woman. If a woman has very narrow hips,and is very tall , with very narrow shoulders, naturally the waist would be very narrow also, and the proportion would not be good.

I found, on the other hand, that the waist-measure of the average man,out of all the models that I found,and getting the average , was 45 and a fraction,per cent.of the height. I wanted to see if that was purely an ancietn peculiarity,or whether it is still found in living models; so for the last fifteen years, I have been measuring living models of primitive people. The first time I was down among the Yuma Indians , I got a letter from the Indian Commissioner,which introduced me to the Indian agents in all the Indian territories, and then I went down on the Indian Reservation at Old Fort Yuma,where there had been no attempt made to civilize them until that time: That was the last tribe of Indians in the United States then living in primitive simplicity, and the boys and girls of ten or twelve years, and from that down to the little babies were just as they were born, so far as clothing was concerned; they were running about in the bushes just as they were born, as healthy and as innocent as kittens or squirrels. The women wore a bark apron in front and another behind, and these garments were tied with a string just above the hips, but the string was not tight. The garment in the rear was arranged like a bustle,--it seems that I had discovered the origin of the bustle. The men wore still less clothing,--a "G-cloth", a garment about the size of a pocket-handkerchief tied about the loins. They were hardy, strong and vigorous, and lived on pumpkins, beans and seeds. It was interesting, at night, to see the squaws preparing the evening meal, which consisted of beans, seeds and a great circle of yellow pumpkins ranked around a fire. A squaw kept turning the pumpkins so that they would be equally roasted all around . This food was delicious, and something like the "St. John's bread". The seeds, which were only about the size of mustard seeds, were thrown into a pan of live coals and parched,--they swelled up almost as big aspeas, and were very sweet and toothsme.

Q. How did they parch them?

A. The seeds were perfectly dry when thrown into the pan of live coals, and they were tossed into the air with the coals, and the squaw who had charge of them ,kept throwing the seeds and coals into the air so rapidly that the seeds were all nicely parched, and not a single one of them burned.

Those Indians were bright, intelligent people : I measured a number of them , and got a number of pneumographic tracings, which I have lost in some way. But I found that those women breathed just as civilized men breathe, and just as the lower animals breathe,--the lower part of the chest expanding more than the upper part there is more room there for expansion, beause the cartilages here are longer and more flexible than others, and the lower ribs are not joined. So the greater part of the expansion of the chest is at the sides, where there is the greatest flexibility. The average was 55 percent of the height, but two or three of the women were quite fat. Some time after that, I tried it again--I was there five years later, and I found that the Indians had made great progress in civilization: The women wore dresses, and the men were pantaloons, and the girls wore shoes and stockings,--and I believe they all had catarrhs, and coughs, and colds; and they ate government beef and had water-brash, and were quite sickly looking,--nevertheless some of them were comparatively healthy. I asked the Sister Superior (Sister Alphonse) to procure me a young squaw, as the subject of some pneumographaphic tracings. She did so, and I took the young squaw into the Mission. Mrs. S.M.Baker was with me, and ~~Mess Mrs. S.M.Baker was with me~~, and Mrs. Foy was there, and Mrs. Kellogg, also, I think,--they were there, so they could verify the statement in regard to these waist-measurements; and I was very much delighted when I found that the proportions were exactly the proportions of the Venus de Milo,--this squaw had the same perfect proportions and figure of the Venus de Milo--and tha that was the wild woman in the woods; and you will find such women in women in Egypt and Arabia,--in fact I have had an opportunity to see persons of a good many nationalities,--Nubinas, Copts, Native Egyptians,--persons from away up on the upper Nile--I took their measurements. I took twenty measurements, and of that twenty measurements, the average was exactly the proportions of the Venus de Milo,--those were the proportions of these twenty native women who had never worn the ordinary civilixed dress, but had always worn a simple piece of cloth wrapped around them--I found the average proportion of those women was exactly that of the venus de Milo. So you see how careful those ancient artists were to represent the exact truth. Among primitive people, they had not degenerated, and had the same proportions as had the people who lived two or three thousand years ago.

Now is there any reason a woman should undertake, by artificial means to change her form, or her proportions? Is there any ~~reason~~ reason why a woman's form should be put into an inflexible mould, or belt, or waist-band which says to expansion of the chest, "Thus far shalt thou go, and no farther?" It seems to me that that is a crime against nature, against God, and against womanhood, and against the race, and that we ought to cry out against it, and women particularly ought to be extremely wrought up about it,--and that we all ought to be stirred up about this thing.

Before we go any farther, suppose we make a few observations here, making a few measurements. (A young man comes up.) I want to see whether this young man's vest is too tight. (Breathing.) Thirty-eight inches. (Breathing.) An inch and a half. You have not had very active occupation for some time? ("No.") It would be a good thing to cultivate lung-expansion. I have had but little chance to cultivate my lungs. I was brought up in the printing business; thirty-seven years ago I was in the Review and Herald ~~office~~ printing-office, as a "printer's devil," and I remained there several years,--I stayed there till I commenced teaching school; and from school-teaching into a medical college, and from the medical college I came ~~to~~ into the Sanitarium, and I have lived indoors all my life-time. About fifteen years ago I made up my mind that I was not going to live very long, and others said they thought I would not. I would walk down town, and had only about strength enough to get back, I was so weakly. I then went to work to develope my muscles. I found that my lung-capacity was only 150 cubic inches,--and that is very small. After five years, I found that my lung capacity was 180, and I felt pretty good,--the normal amount being , on the average, 200. Afterwards I raised it to 200, and the other day I found that it was 225, so I have got it a little above the average at fifty years of age,--although you could hardly expect much lung-expansion after the age of forty-two or forty-three. If your lung-capacity is small and growing smaller, you are going down hill, and you should expand your lungs as much as possible,--four, five or six inches if you can. (Another young man comes up.) Take a deep breath,--five inches. That is a wonderful difference,--it means so much better lung-capacity; it means that much better prospect for longevity. Now Mrs..... will you come up and be measured? ("I have a conventional dress.") That is the reason I called you up. This is the regulation size,--just twenty-four inches. (Breathing.) Twenty-six . (Breathing.) Two and a half inches. That is not so very bad; I don't think there is very much waist -constriction, and I don't think you will say that a person who can expand two and a half inches is suffering very seriously from constriction. It might be that greater ~~play~~ looseness would produce greater play for lung-activity,--but we don't always require that.

Of course a woman don't want to live in a bag; she wants some sort of shape. I remember, some years ago, when we had some dress-reformers in the city, and people laughed at them, and said they looked like bags ~~hung~~ on broomsticks. (Another lady comes up.) I wonder if this belt has any influence on the chest-expansion. (Breathing.) Twenty six inches. Now take a deep breath,--just one inch. Take a deep breath--just exactly one inch. Now I don't think that belt feels tight,--I don't think there is any one here who would call this belt tight at all --may be ~~there is a tight belt~~ the belt underneath is tight,however .; I expect, in this case, the root of the evil is deeper down: I think there should be sme reform here . It is very interesting to see how much these dress-reformers have to be reformed. (Another lady comes up.) You have been in schools of health, so I suppose we will find that you are a model. (Breathing.) Twenty-eight inches. Now watch my fingers and see how much they move. (Breathing.) A good quarter of an inch. (Laughter.) Now you have no idea how much evil there is in a "belt that is not tight." This does not seem to be tight at all. I wish you would form yourselves into a committee of the whole and invesrigate yourselves, -- you would be astonished to see how much mischief you doing with a dress that you think is perfectly wholesome.

Suppose a woman's dressmaker made her dress just as large as the woman was--a skin-fit, and no constriction,--she would think she had gone to the extreme of dress-ethics. In the morning that dress is just a fit. But just as soon as she begins to exercise, she gets bigger, because she has to have more air. Then, when she takes her breakfast, she is bigger still,--there is a woman and a breakfast, and a woman plus a breakfast is bigger than a woman alone , and the dress is not large enough-- especially if the breakfast is a good sized one . After dinner, the woman is still larger, but it is the same dress all the time . Now see what must necessarily happen,--but we will take this up at another time . A mouthful of food comes into the stomach, but the waist is away in, so that there is not room for the food, but it crowds in and makes room. I another mouthful, and so there is another little wedge put in between the waist and stomach, and as mouthful after mouthful of the meal comes down into the stomach, it is like driving a wedge into a log, forcing the stomach down, because the waist cannot expand and make room for it, it must go down; so there is really the beginning of enteroptosis--that is the way it comes: There wouldn't be any prolapse of the stomach, if there were not this wedging down from eating and drinking, and the weighting, and waist constriction --all these things are constantly forcing the stomach down.

Now I will make a few figures, and we will see how large a woman's waist ought to be, being 47.6 per cent. of the height--that is practically 48 per cent of the height--nearly one-half of the height. Now let us see how much that would be for a woman five feet or sixty inches high: Multiply 60 inches by 47.6 per cent., and we have 28.5 for the waist-measure; that is the Venus de Milo measurement, also that of the Nubian belle, and the Yuma squaw. Here is a woman five feet, four inches or 64 inches tall; multiplying, we find that the waist-measure should be 30 1/2 inches. It is well to keep these things in mind. Suppose a woman says to you, "My height is five feet, six inches,--what should be my waist measure--

Q. Is this expansion measurement?

A. No,--it is natural measurement,--when the body is at rest. Suppose the woman is five feet, two inches or 62 inches tall--multiplying by 47.6, we have 29.5 inches [redacted] and for 64 inches, 30,1/2-so the waist-measure is practically an inch for every two inches in height, or a half-inch for every inch in height.

Now what should be the waist-measure of a woman who is five feet high? ("28 1/2.") If a lady is five feet, four inches high what should be her waist-measure? (" "30.5.") How much do you add for each inch of height? ("Half an inch.") Now, if a woman is five feet high, and her waist-measure is 28 1/2 inches, what should be the size of her dress? ("Thirty inches.") Yes; that allows for expansion, if she has a normal waist.. Will this lady tell us what her height is ?

(Five feet,five inches.") What is your waist-measure? (""Twenty-seven inches.") It ought to be thirty-one,--four inches short; this is something serious: It means four inches short in lung-capacity or breathing-capacity. Now there should be great freedom of movement at the waist-line; there should be room for movement there when we are in a hurry. A lady soon has a large waist after adopting a proper diet and clothing. A gentleman once threatened to sue me for damages for having spoiled his wife's dresses for her,because her waist had increased so much in size while she was here. (To a lady:) What is your height? ("Five feet,two inches.") What is your waist-measure? ("Thirty inches.") It ought to be 29 1/2 inches,--so you are half an inch above the standard--and that is a good thing. Sometimes ladies are slender,--but we are all the time talking about the average woman; if the woman is tall and slender, we take that into account. (To a lady.) What is your height? ("Five feet,eight.") What is your waist-measure? ("Twenty-four. ") It should be 38 1/2--your waist-measurement is 8 1/2 inches short,--that means a great deficiency of vital power and resistance.

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Q. Would not that added eight and a half inches render the form unsymmetrical?)

A. We will see. (Measuring lady.) You can see that this young lady is not out of proportion,with the added eight and a half inches. Here is a young lady three or four inches taller, with a waist vive inches smaller,--you can see that she would be out of proportion with the addition of five inches. I have seen casesin which the waists grew four or five inches in a few months. (A lady. When I came to the Sanitarium my waist gained five inches in five months.) You were a champion swimmer,--your waist-measure increased five inches ,in a normal dress? ("Yes.") (Measuring and comparing measurements.) Miss Holder can stand the addition of eight inches all right, if she would take a course of health-culture; she would be larger every way,--she would have a larger heart, larger chest-capacity, and liver-capacity, and more brain- capacity, and would be a larger woman every way. Larger brain means larger vital capacity. Miss Singer, don't you feel as though you had more endurance, and more strength and vigor for the five inches that you have gained? ("Yes.") Larger waist means larger life, larger endurance, and greater vigor in every way,--that is, if it is a real gain in the size of the waist. (A lady: I have gained I have increased about two inches in waist-measure, but I have lost it.) There must be some loss of vigor of muscles in such a case, and also a little dropping of the viscera. I know a young lady whose waist-measure was once 30 inches, and now it is 24; she has lost six inches, and her physique is now changed; She is not so strong and vigorous as she was then. The waist changes more or less with the addition or subtraction of fat.

STUDENTS' CLINIC, July 2,1900.

Electricity.

J.H.KELLOGG, M.D.

What is a sinusoidal current? It is a current made up of sinuses (Explaining by diagram.) We have several kinds of sinusoidal current, -- a perfect sinusoidal current islike that,--it increases or diminishes at an equal rate all the time . The positive is where the current enters; th negative is where it goes out .. As the current enters and slowly builds up, it will be a little less irritating than the negative where the break occurs.,--this kind of current would be less irritating than the Faradic current --and this current would be less irritating still. (Diagram.) Why is that? The electrical stimulation depends upon what ? On the change of the electrical state: The greater the change, and the more sudden the change, the greater will be the electrical stimulation. Now in the sinusoidal current the change is uniform. Here is the zero point; and here is the maximum on one side, and there is the maximum on the other side.. Now the change is gradual,--it gradually rises to the maximum;then it falls to zero; then it gradually rises to the maximum, then it gradually falls to zero, and so it goes on; but the change is very gradual; and this gradual change renders the sinusoidal current but very little irritating; that is the wonderful property of this current .

Perhaps the history of this current will interest you : . I believe I had the honor of discovering this current about sixteen years ago. I had been developing different branches of our work, , and I made up my mind to develop the electrical branch; so I ~~made up my mind~~ investigated the static, faradic and galvanic currents, and I thought I would investigate the so-called dynamic current. So I got together all kinds of apparatus or machinery, and among others a machine for ringing bells on the telephone circuit called "The Telephone Generator," and in making use of this, I was astonished to find that when you take hold of the sponges your arms won't jerk,--the current was produced without sensation--and you had no prickling sensation such as you get from the galvanic current or the faradic current,--you simply got motion; you could apply it internally and externally: The patient would lie on the table shaking, and yet feeling no sensation. I found that it was a very curious thing, so I wrote an account of it . After using it for several years, I called Dr. Massey's attention to it (that was some twelve or fifteen years ago.) He was quite an electrician, but he knew nothing about this current. He had been in Paris and studied with Apostoli, and I invited him to come here and post me on Apostoli's method, I afterwards studied with Apostoli, and showed this to him, but he couldn't understand it. Then I wrote an account of it and read the paper before the American Medical Association in Cincinnati some ten years ago. Three or four years later, d'Arsonval, of Paris came out with the discovery of a new current that he called "The Sinusoidal Current;" and I saw his paper and tracings, and Mr. Dow and myself went to work and made an electrograph, or apparatus by which we could make a tracing. We made a tracing, and found that my apparatus gave the same tracing that his did, and then I knew why the current had its peculiar properties. D'Arsonval used his current only at high speed; his apparatus was entirely different from mine: It was made in such a way that the alternations were made with very great rapidity--at the rate of twenty or thirty-thousand alternations to the minute. And I noticed this thing in this current, that when it came up to twenty or thirty-thousand alternations to the minute, it was absolutely painless--it then became painless and continued so from that point. Then I experimented on getting higher speed and got thirty or forty-thousand alternations a minute, but it was almost painless. This is one of the most interesting and useful electrical appliances that we have. The galvanic current, of course, is the most important and useful because it is fundamental, but the sinusoidal current is next in value. The faradic current is of very little value, except as an irritant; it is a very good irritant, and on that account is sometimes useful. A very rapid sinusoidal current is used for nerve-effects; it produces no sensation when applied to the skin, if it is properly applied--unless the current is very greatly increased in volume. It can be applied in such a way as to produce powerful nerve-effects upon the sensory nerves without producing any sensation upon the skin,--for example, apply it over the eye, and you can see great waves of light; ~~and also~~ there is great stimulation of the optic nerve without sensation. It also stimulates the auditory nerve without sensation. It is far more efficient for producing analgesic effects than any other electrical means; it is far superior to static electricity for this purpose. We may have twenty or thirty-thousand alternations a minute, and that speed is sufficient. Now the high tension current is simply a sinusoidal current which goes up very high--how many alternations a minute? Four billion alternations per second: it may be carried up as high as that,--though ordinarily I don't give more than seven hundred million alternations per second--but even that is beyond comprehension. Here is a discharging-rod of a static machine, and an alternating current,--when a spark passes, how long does it take it to pass? A twenty-thousandth of a second, and while you see that spark passing, there is as many as a hundred movements back and forth: It is the same thing as though I had two jars of water, and they are freely connected by a large opening. Now I raise this jar and set the water to oscillating, and the water here will go over to the other side, and oscillate several times before coming to an equilibrium. Pick up a pail of water and set it down and it oscillates several times before coming to an equilibrium. Now suppose we had a large free open water passage from one of these jars to ~~another~~ the other, and then tip a one of them,--the water would rise higher in one pail than in the other, and there would be these oscillations, until by-and - by the waterwould settle down to an equilibrium/. That is what happens with the discharging-rod of a static machine,--one side gets full--on which side does it accumulate ? ("The positive.") The prime conductor,--here is the negative and here is the positive; this gets full of electricity and then rushes over here and this isfull and the other is empty, and some of it goes back, and so it oscillates back and forth until an equilibrium is established. It takes about a hundred movements of that kind, and the whole thing takes place in the twenty-thousandth part of a second.

We speak of electricity as a fluid, but it is not a fluid,--it is movement. The static current is an alternating current, an alternation taking place in the twenty-thoudandth partof a second, and a hundred movements take place in that time; multiply twenty-thousand by one hundred and you have two millions,--this is the ordinary static machine. Now wit the special high-tension apparatus, the tension israised very much higher than with the static machine, and the consequence is that thee oscillations take place much more quickly than with the other apparatus. Hertz has shown that these oscillations may amount to four bilion in a second, by making conditions as perfect as possible. Now in making these oscillations rapidly, we have very high tension and very small storage, so make the oscillations rapidly and the distance travelled small.

The rapidly oscillating current is useful for nerve-effects. When we want to use muscular effects, we use the full strength of the machine, perhaps, and the slowly moving current. Suppose the current moves rapidly, suppose the alternations are five hundred per second, what will be the effect, when applied to a muscle? ("It will produce muscular contraction.") What kind of muscular contraction? ("Clonic contractions.") Would they contract several times? ("I think it would contract once, and then relax)

It would if you put on the electrode and kept it on,--but suppose you put it in and kept it on--we will apply a galvanic current to the muscle and close it, and you get a contraction,--does the muscle remain contracted? ("I think it makes one contraction.") It makes one contraction. Now here is a current which alternates, and as it alternates, the electrical state is continually changed,--now it is positive, and now it is negative, and each alternation changes the electric state, hence each alternation should, do what ? ("Make a muscular contraction.") Each alternation should make a single muscular contraction.

Now suppose, in making these alternations at the rate of three or four thousand a minute--your electrical current running at the rate of three or four thousand a minute--what kind of contraction would you get ("The muscle would get tired out .") Why? Because the make and the break would be so rapid that the muscle would not have time to recognize the stimulus,--how rapid must the alternations be before you get to the point where the muscle will no longer recognize the single continuous stimulus? ("About thirty.") That is about as high as you could go. Figure up the time in which a muscular contraction takes place, and you can find how many of these you can get in a second . It is interesting to know that this agrees fairly well with what we know of the storm of impulses sent down from a muscle all the time. Here is a man with ankle-clonus,--I will lift up his toe, and it begins to vibrate,--now how fast will the toe move in ankle-clonus? ("Six or seven times to the second.") That is about the natural rate; I have never measured it faster than seven.

Now see what you can do by the use of electricity, in reference to exercise of the muscles: You apply the sinusoidal current to make the muscle contract vigorously, and suppose you can make it contract five times a second,--how many would that be in a minute ? ("Three hundred.") Now you want to make the abdominal muscles and the muscles of the spine exercise,--how long would it take a man lying down, to raise hishead or legs three hundred times? And when you apply the sinusoidal current you can make those muscles contract 300 times a minute , or 600 times a minute; but the muscle is not now working under the stimulus of nerve - energy, and perhaps it will not develop as much under the influence of electricity as if it had done that amount of work under the influence of the brain, still you can see the enormous advantage you have by this means of exercise.

What is the effect of contraction of the muscles upon the blood-circulation? ("It increases it .") Is the amount of blood greater or less in the muscle, when the muscle is contracted? ("Less.") What is the condition of the arteries? ("More arterial blood, when the muscle is contracted.") There is hyperaemia of the ~~muscle~~ vein when ~~it~~ the muscle is contracted.

DR. PAULSON: But there is less blood travelling through the muscle when it is contracted,--it travels through it at less speed.

XXXXXXXXXXXXX That is why we should not keep the muscles rigid in exercise, because the muscle becomes asphyxiated; there is not so much blood flowing through the muscle when on a tension as there is when relaxed.

DR. KELLOGG: The arterial circulation is more active during muscular action than when the muscle is at rest,--we are talking about the venous part of it now ..

Now the point is, whether a muscle can be completely emptied: I don't suppose it would be emptied at every relaxation; but this is all that is necessary: When a muscle contracts, there is a tension, which prevents the movement of the blood along the veins; and the moment the muscles relax the veins fill again, so it would not interfere with the circulation of the blood; contraction excites circulation, and with relaxation there is a chance for the blood to move on. (Illustrating and explaining by diagram.) So contraction encourages lymph circulation, as well as venous circulation.

Now the practical use of the sinusoidal current is this: We use the rapid current for pain; it is especially useful for pelvic pains and coccygodynia, spinal pains and gastralgia, and for paresthesia of the lumbar ganglia of the abdominal sympathetic. The application of the slow sinusoidal current is perhaps of still greater value than the rapid current, because we have heat and several other means of relieving pain; but as a means of exercise par excellence, it is far ahead of anything else that we can employ, except voluntary exercise. By voluntary exercise, however, we can get the maximum contraction of the muscles; we can get a stronger contraction of the muscles by the stimulus of the will than by any other means. The will has power to get more work out of the muscles than we can get out of them in any other way. So the sinusoidal current must not be looked upon as a perfect substitute for voluntary exercise, because the will can get more work out of the muscles than electricity can, and the muscles get tired quicker through the impulse of the sinusoidal current than by the exercise of the will. But when it comes to passive exercise, the sinusoidal current is far superior to every other means of producing passive exercise, and is absolutely indispensable. We can get contraction by a slow interruption of the galvanic current, and by the static current, but it is painful and the patient don't like it, and very nervous patients won't take it; but in the sinusoidal current, you have a current by means of which you can get exercise without sensation and pain, and the patient sees his arms jerking and his muscles contracting, and it amuses him, and on this account it is a very valuable measure .

Here is a patient (illustrating and explaining by diagram),--here is the pubic bone,and here is the sternum,and here are the rectus muscles, and here are the oblique muscles at the side, down here. Now the electrodes must be applied in such a way as to get a contraction of these muscles, and also of these muscles: Now how will we get a contraction of these muscles. The best method is to apply the electrode near the large muscles,--but one of the advantages of the sinusoidal current is, that you don't have to be so particular about localizing it, as you do with the other currents; it seems to have such dispersing power,and at the same time such interpenetrating power that you get a contraction without being particular to localize it; but it is necessary to apply the large electrodes over the rectus muscles and the other behind, so as to get a contraction,--or if you apply the small sponge, you must,later, apply one sponge here, and the other over there,in order to get the desired result.

Now I think we will deal with the galvanic current for a moment; (Diagram.) Suppose we have here a positive pole, and here a negative pole. Suppose this is the electrode. Suppose we apply it to the body to produce the change in a nerve known as electrotonus. Now if the current isincreased in intensity, what change does doesit produce in these fields? There is a neutral point,--now if the current isincreased in intensity, what isthe effect of it ? (Ans.not understood.) As the area increases,the intensity increases,--this refers to difference in surface application. Now the question is, Gow far down does this current penetrate? Suppose this is the pole,--we will locate it in one direction-this is the surface ; this is spread out in each direction. Suppose this extends inward,--this extends inward also. Suppose we consider the shape of ~~this area~~

of this area brought under the influence of the electric current internally. Suppose this is the trunk,-- we place the electrode here,and another electrode there,--now what is the shape of the electrical field ? ("The hour-glass.") Any different opinion? (Various answers.) Here is the skin which has a resistance three hundred times that of the rest of the body,--it takes three hundred times as strong a current to go through the skin as through the rest of the body,--because the rest of the body iswater, and the skin is horn.. Now when you get a current strong enough to go through the skin,see what that current would do. Now if the body were all skin, the current would go straight through, --but the body is not all skin, and when the current goes through the ~~time~~ skin,it has three hundred times as much power as is necessary to go through the rest of the body---and what does it do? ("Spreads through the whole body.") Yes,--and the whole body is the conducting medium. Now suppose we take three points/here, and suppose all the electricity goes through these three points,--what would be true of one point would be true of the whole. Now through the whole body we will say it comes down to this point, and centers here. Now here is an electrode and here is an electrode: I will put the red one here,and the ~~red~~ there one here and the white one here . Now we will start with this red one--it comes down here,,--it sends out these others,which are intermediate. Here is another line (diagram); it sends out one line down here and anoher one over there, and still another one down here,--those are the lines which come from the red. Now take the white ones, and it will do the same thing . Now wee will take the blue (drawing lines) ;we must have another line here; I think we can all see that there are more lines across are the center than there are anywhere else. I will make it more apparent,--we will leave out the peripheral lines. Here is a red line,--this pole sends a line over there,--and this pole sends out a line down here . It is true that lines are sent out from all these points,and spread out, but the more they are spread out,the more attenuated they become; but these lines will cross more in the center than in any other place,--more lines will cross in the center,provided the electrodes are of the same size ,--practically it amounts to the same thing, and the lines of force will cross in the center Is that right, Dr. Read? (Dr. Read: Yes,--I agree to that.) Here we have a man with a trouble inside of his body--right in the center of his body,--how would we expect to affect it with electricity? We would have a little electrode on each side, or a good large one here ,because the electricity is going to disperse through his body,--then there is another reason,--because the amount of electricity that you can get into the body depends upon the amount that you can get through the skin. Now if you have an electrode that is this size ,--how many milliamperes can you get with an electrode of this size? Eight to ten, probably,--but it would be very painful,--say four to six; more than that would be very painful. Then you want to get a current in the center of the body,--you must have forty to eighty milliamperes,to have it amount to anything, because you have got to fill the body. Suppose the electrode will carry 45 milliamperes of current for four square inches,--how much larger area for 80 milliamperes ? (Eight square inches.") Eight inches square. But my observation is, that it will require a much larger electrode than that,--that if you use 80 milliamperes,you want an electrode for a foot square in order to be comfortable to the patient. If you had a clay electrode you could get along with an electrode of this size ,because the contact is so perfect, but the ordinary electrode must be a foot square. So it depends upon the fitting of the electrode to the skin; if you have an electrode that fits, you have the whole surface. A sponge electrode would not be good, because a dry sponge is no conductor at all--it is only the water. So you must determine the size of the electrode by the quality of the electrode.

Suppose we had a case in which the organ upon which you want to act is about two inches below the surface,--suppose we want to act upon the spinal chord; suppose it is a very fat man, and the spinal chord lies about two inches below the surface,--suppose it isthree times as far from the spinal chord to the abdominal skin as it is to the dorsal skin--what would you do? You wouldn't use electrodes of the same size; you want to focus your current to the spinal chord, you must have a small electrode. If you want a considerable volume of current (diagram)--here you have it; now you have the current concentrated on the spinal chord. Now suppose it is the liver, and you want to concentrate the current,--what would you do? Put an electrode over the liver which is about as big as the liver,--and then what? We would have a large electrode on the other side, because we want to concentrate the current in the liver itself.

Q. I don't understand where the neutral point would be?

A. Right in the middle of the liver; so you will have the greatest vortex of forces right in the middle of the liver itself. There is as much current going out in the vicinity of this field as there is in this, but it is not so concentrated. Here is a way to test this thing: Here is an electrode which is two inches square, and applied to the back, here is another electrode on the abdomen, which is a foot square, and you put the current through a foot square,--where would the patient feel the pain? ("In the back.") Why? ("Because the current is concentrated there.") Yes. Now the idea is, to follow that in: Here it is a quarter of an inch below the skin, where the nerves are,--now the idea is to follow that down into the tissue,--there would be more pain at this point than this, because the current is concentrated here,--and it is just as true beneath the skin--and it is true of all the area here,--one current is larger than the other. I think thisis important, because electricity, as commonly used, amounts to almost nothing, the currents are so very small. The usual direction in books is, to have a small sponge passed down the spine, but I ddn't think that amounts to anything. About twenty-five years ago, I took a post-graduate course of electricity with Dr. George M. Beard. He didn't say anything about the value of electricity to me till I was going away, and then , what he said impressed me very much,--said he, "When you come to use electricity in thetreatment of a patient,it is important that the patient shall have faith in it ;if he doesn't have faith in it,it does not do him any good."

When you use electricity in a scientific way, and use large currents,you will have wonderful effects. Years ago,I used to see patients tip over under electric treatments, and I would have to pick them up,--but I soon learned to look out. When I would use too large currents,they would sometimes excite contraction of the bloodvessels of the brain and the patient would faint away., so I learned to be cautious: You couldn't tell what was going on until you applied milliamperes. I found , by the application of forty milliamperes applied to the back of the neck and over the lumbar ganglia of the abdominal sympathetic, and solar plexus, that in three minutes saliva came out of the patient's mouth,--the salivary glands and also the digestive glands were all excited to activity; I have not applied anything to the salivary glands,but to the sympathetic system. Here is the lumbar ganglia and solar plexus,which have control over the stomach and intestines, and when currents are applied to the front and rear,the body isbetween the currents, and the current has to go through these ganglia,--you cannot apply a current to the back of the neck,and the other in front--the current can't go from one electrode to the other without going through the great sympahetic ganglias.. That is the reason we apply the galvanic current in this way.--

Q. Where is the positive pole?

A. It is above. It is a rule in the application of the galvanic current, to have the positive pole applied to the head, so that the current will travel from the head; but I think it is better to reverse the thing, and have the negative above and the positive below. There is no inconvenience in applying a large electrode; and if you want to influence the nutrition of the spine, you will apply an electrode four inches in diameter along the spine, and apply a large electrode in front. Suppose you apply the electrode to the spine (Illustrating by diagram.) Here is the anterior and here is the posterior--now apply the electrode here--the whole length of the spine--the four-inch electrode. Now suppose you apply it in front--the electrode over the abdomen,--now see what we can get there :you see we are applying the electrode to the stomach instead of the spine--how will you get over this ? ("Apply the large electrode.") Yes. You want the electrode in front just as long as the one behind--just as long, and four times as wide ;then you get the electricity converging at the spine . Now we must prepare the cross-sections here: Suppose the cross-section of this is 12 inches, and the cross-section of that is four inches; that would bring the focus in here (diagram.), taking the cross-section above the two. Suppose we want to apply the electricity to the lumbar ganglia of the abdominal sympathetic,--you will have the electrode behind, six inches wide, and in front, about twelve inches wide, because we have the thickness of the vertebrae, the sympathetic ganglia lying under the vertebrae. This matter of the size of the electrodes is one of importance, as it enables us to apply the electrode where want it...You see how you can apply it to the head: There is a certain area in the head that you want to influence; you put on a large electrode somewhere,--it makes but little difference where,--if it is near the surface of the brain, put on a small electrode at that point. If it is the nose that you want to influence,--if the end of the nasal cavity is congested, you apply the electrode over the face, applying the large electrode behind and the small one in front.

The static and faradic currents don't penetrate much and the currents are very irritating. But the sinusoidal current seems to select the nerve-trunks to travel on, and I think that is the reason that if you apply this current to the head, you get a powerful stimulation of the optic nerve, and I will show you another reason when you make your experiments in the other room. The fact is generally recognized that the static and faradic currents act chiefly upon the surface. You must make your application over the motor point. Now these motor points are generally near the edges of the muscles, so, if you don't know where the motor points are, simply select the edge of the muscle; if you select the edge of the muscle, you can get the effect, even if you don't have the motor point. Now here is a point that I think-- this is another heresy that I have been foisting upon the public for some time back, but I believe in it very thoroughly,--and that is, that in faradic electricity and electricity that is irritating and exciting, including, perhaps, the galavic electricity,--that these currents act upon the internal organs in precisely the same way that water acts,--through reflex influence. We know that the galvanic current is irritating; we know that it affects the vasomotor nerves; we know that the faradic current irritates the sensory nerves; we know what friction or percussion will do, and what mustard will do--it will produce an irritation upon the skin, and we know what effects will be produced with the internal part connected with it... There are many irritants: water is a thermic irritant, and electricity is a local irritant, and I believe the influence of electricity is largely due to the irritation that is going on. This being true, in ~~the appli-~~

making applications to the viscera, we must make them to the cutaneous area which is reflexly connected with the viscera. Here is a man suffering from gastralgia, --we know that electricity applied over the hypogastrium (epigastrium?) will relieve it. It is generally claimed that if we apply electricity to relieve pain--if we apply the faradic current to relieve pain, just as strong a current should be applied as the patient can bear, provided it is a neuralgic pain. But suppose it is an inflammation: Don't apply the current at all.. If you have pain, but no inflammation, and you apply a faradic current, you should apply it so as to produce the strongest kind of irritation,--the stronger the irritation is, the better effect you can get. If you have got an inflammation, it acts as an irritant, and you have the same effect as if you applied friction.

I think the real foundation for the application of electricity for visceral effects, is the same foundation that we have for hydriatic effects,--in the geography of the skin. There are two ways of producing effects with water,--one through the circulation, and the other throug the nerves. In electricuty we have two ways,--one by ~~ele~~ reflex effects, the electricity being considered as an electrical or ~~molar~~ molecular irritant, and consequently electricity is applied simply as a physical agent passing through the body, using the body as a conductor. So we have two methods in electricity by which we can get effects,--one by which the internal organs are directly influenced, and the other, by which they are reflexly influenced.

ADDRESS TO MEDICAL CLASS-STUDENTS, April 27, 1900.

J. H. Kellogg, M. D.

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Typhoid Fever,--Indications :

1. To increase vital resistance.

2. ,, Combat the bacillus.

(a.) Limiting the growth,

(b.) Destroying the bacillus.

(c.) Eliminating toxins.

3. ,, Sustain vital resistance.

4. ,, Precent lesions and complications.

5. Symptomatic treatment to prevent pain and discomfort.

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What is the best thing for increasing vital resistance promptly? General cold applications to the skin. The cold bath should be a short one--a few seconds, or a few minutes--10, 12, to fifteen. A cold bath that is followed by immediate reaction will increase vital resistance, and increase vital work. But when a cold bath is prolonged until reaction is suppressed, is depressing, and will not increase vital resistance.. That is a general principle which you can remember, and which will help you. But no cold application, whether for a minute, ten seconds or fifteen minutes, will increase vital resistance unless followed by a prompt and complete reaction. An increased vital resistance consumes the body by increasing oxidation, and while we increase the vital activities, we may, at the same time be using up the vital resources, and so the ultimate effect would be to weaken the patient, and we often find patients getting weak under the influence of too long cold-baths. We often find a cold-bath of thirty seconds too long; we often have to get it down to two or three seconds,so as not to decrease the substance of the patient. while increasing his vital activity.

What is another thing that will increase vital resistance ? Cool the air, and lower the temperature of the room as far as we can, so that the temperature will not get too high; have the temperature of the room about 60°: that is important.

Q. Is this before the disease has set in, or afterwards?

A. This is without reference to that,--we are simply surveying the whole thing: we are talking about methods by which we can increase vital resistance at any time. The manner of bath and the kind of bath would be regulated by the disease ; a cold bath is useful at any time, and it is useful in all diseases; the temperature of the room should be cool--we might say cool air, instead of temperature of the room.

Now we want to combat bacillus: In the first place, we want to check the growth of the bacillus. Where is the bacillus located,in the early part of the disease? (In the lymphatic structures.) Yes,it is located in the mesenteric glands and the lymphatic structures:it is not lying loose in the alimentary canal,--it is in the tissues. Now what would be likely to encourage the growth of that bacillus while it was in the tissues? ("Heat,--moisture.") Would not a state of passive congestion be likely to encourage the bacillus? ("Yes.") Why? (Different answers.) Because there is stagnation of the fluid. When we have fresh serum, we have a fluid that contains bactericidal substances called "Alexins;" they are in the blood,or serum,when fresh. But when the blood remains for some time in one part, the alexins are all consumed and used up, and so the serum would become a good culture medium for germs to grow in. Brieger, some years ago,pointed out the interesting fact that the bacillus of scarlet fever manufactures its toxins out of the normal leucomaines or toxins of the body. So,if we have a large amount of serum gathered into a part, and it remains there for some time, the serum loses its bactericidal power, and the creatin and creatinin, and other xanthine bodies contained in the serum, would, by the action of the bacillus, converted into typho-toxins, the peculiar toxines of this disease. So, if we can lessen the passive congestion of the lymphatic structures, that would lessen the activity of the disease,--and what will do that? What would a cold abdominal compress do? ("Cause contraction of the bloodvessels.") How would you best accomplish that ? ("By a cold compress.") Yes ("And we would not leave it on longer than three minutes perhaps.) Suppose we had a patient in the beginning stage of the disease, when the temperature is not high, but is moving right on,--it is obstinate, so that the patient is not likely to get chilled. ("I would not have it on so long that the patient would fail to react,--that is, until it was blue.") You would not put it on long enough to chill the patient ? ("No.") But you would change it every two or three minutes before it got warm? ("Yes.") Let us see if any one has a different idea. (("A heating compress?") Well, so far as limiting the growth of the bacillusis is concerned, there is no doubt but what a cold compress, by limiting the blood-supply, is the best . But is there not some other way by which we can combat the bacillus and limit its growth; one way is to lessen the blood-supply,--what other way have we ?--that is, to eat up the bacilli and carry some of them off . ("I should think enemas and cathartics would be useful in getting rid of them and removing decomposing material from the bowels..") I am glad you have spoken of that,-- we will get to it, but we want to consider the cold -compress. Now we cannot practice hydrotherapy in a desultory way and at the same time be scientific; we have got to be clear-headed in this thing, and know what we are about, and why we do things; we have got to look down and see what process actually at work; we will see a dilation in the mesenteric gland, and the blood is stagnated, and the bacillus is growing: We put on a cold compress and that will limit the blood-supply and produce less favorable conditions for the growth of the bacillus. Now is there any other way of combatting the growth of the bacillus? We want to increase the circulation of blood; we want more blood passing through the part, but we don't want so much blood passing into the part, because when the blood stagnates, it loses its xxxxx xxxxx fighting power; the blood is the healing power in the body, and it does its work in one part and then goes on in its march through the body, and this march must be kept up, and the blood must not be allowed to stagnate .: now how can we keep up this march of the blood through these structures? ("By the application of hot and cold water.") We don't want much hot water,--we want a little, however--what else? ("Short cold-bath.") We are talking about the cold compress--how will we mane the cold compress in such a way as to get an increased movement of the blood so as to combat passive congestion, increasing the movement of the blood through the part ? ("Remove it occasionally.") It is the frequently renewed heating-compress; we must change the compress just before it gets warm; we will allow it to get warm enough to keep up the action of the skin, and that will keep up the movement of the blood through the mesenteric glands, so we will say, "a xxxxxxxxx frequently renewed heating compress." What will be the temperature of the compress? ("About 60°".) That is right; how soon shall we change it ? ("When it gets warm.") Yes, you want to change it when it gets warm, and not half an hour or an hour after it gets warm.; it gets warm sooner when the patient's temperature is very high. That would maintain the tone of the lymphatic structures and the internal structures and the fat structures, and the blood will keep marching through and we will have active movement of the vessels. Is there anything else that can be done by way of fighting the bacillus? ("Lowering the temperature, etc.")

That is doubtful; perhaps it aids a little, but the blood is so rapidly distributed throughout the body that I don't know whether we should lower the temperature much,--and then the question would be, whether the lowered temperature would encourage or discourage the growth of the bacillus; it is a question whether the lowering of the temperature would limit the growth of the bacillus or not,--I cannot tell. But this is true,--that there is a nervous excitation, the same as when we put a cold application to the skin,--we excite the bloodvessels of the related structures, and when the bloodvessels are excited, the tone of all the tissues is raised: all the cells in that vicinity are excited--all those that under are under the influence of the nervous system--they are all excited, so that there is increased activity of the parts,--to illustrate: Here is a patient suffering from abdominal pain,--we put on a cold application, and that cold application has the effect to cause contraction of the blood vessels in that part which is congested--we will suppose it is a congested ovary, and we apply an ice-bag over the ovary,--would you do that to relieve ovarian pain? We might, if it was an inflammation, but you would not ordinarily be likely to succeed very well, by this means, unless you did something else at the same time . The cold application which we make, while it excites the bloodvessels, excites the nerves at the same time; but the nerves are already too much excited, so the pain is increased. We don't apply cold when we have great pain; we depend upon heat for the relief of pain,--the same reflex which excites the bloodvessels excites the nerves of the part, and so increases their sensibility,--I wonder how many understand that . You will find this in pleuritic pains and abdominal pains, and especially in pelvic pains, you will find that a cold application increases the pain, and the reason is, that there is a sort of nerve-fluction, as well as a blood-fluction.

Now this excitation of the nerves is what we want. The cells, under the influence of toxins produced by the bacillus, are benumbed; they are intoxicated and paralyzed under the influence of these toxins,--and isn't that where the sloughing of the pyrous patches takes place, and where the ulceration takes place--- It is because the parts are stupefied and lose their fighting power.

Now we want to keep these cells up to their maximum fighting power, and the application of cold wakes them up. We see this in a man under the influence of opium,--his breathing is reduced down to four in a minute, and a mere flutter of the pulse: Now put ice-water on that man's back, and the effect of that application will be to awaken cardiac activity and respiratory activity, and it excites the nerves of the part. In the same way we excite the cells, and, through them, the muscles are excited, and the movement increased. In the same way, when we put cold upon the skin, we set up a train of reflex influences. It is not simply the blood vessels that are excited, but also the cells and tissues of the part .. That is the reason a cold application increases vital work. A cold application to the whole surface increases the vital work of the whole body,--and so a cold application to the skin will increase its vital work and activity, bringing the cells into contact with the bacillus so as effectually to resist it. We want a work done in the lymphatic glands and other places where the bacilli are located, which will kill them, and so the more frequently we can put on a cold application without benumbing the skin limiting the force of the inward reflexes set up, the better it will be for the patient, because every time we put on a cold application, those cells are wakened up to renewed activity, just as a sleeping man is awakened and set to work and excited to activity. If we renew the application too often we will chill the parts and lessen the reflex, and thus defeat their very purpose. Now what is the first thing?--this should be written,"The Cold Abdominal Compress Frequently Renewed."

There is another thing that we can do in reference to limiting the growth of the bacillus,--and that is , to shut off the sort of material up upon which the bacillus feeds,--in other words, to regulate the patient's diet by cutting off his meat-supply, his beef-tea, chicken-broth,oysters and such things. A short time ago, after I got home from Wisconsin,one of our nurses who had been down in W. Virginia in quarantine when yellow fever was expected there, and there were a number of typhoid fever cases in the neighborhood, also one or two cases of yellow fever. She told me that the doctors told the people that they must not eat meat, because they would be more likely to catch typhoid fever and yellow fever if they did so.: so no one ate meat, and the butcher's shop was shut up. That was interesting: the doctors had found out by observation that people who ate meat were likely to get typhoid fever, so they cut off those supplies. Now what substitute would you use for the purpose of discouraging these pathogenic symptoms? (Fruit-juices.") Yes; there is nothing better than grape-juice for this purpose. I was noticing in a medical journal a short time ago, that Dr...... prescribed grape-juice in the treatment of this class of diseases, reporting that his success was very satisfactory. All kinds of fruit juices are to be recommended,-is there anything else that you would recommend? ("Charcoal tablets.") Well, that is not such a bad thing. Bouchard recommended charcoal,because it disinfected fecal matters,so that the toxins were nearly all destroyed. ("How about yellow charcoal.") It is not so good as some other forms of charcoal,still it might be used, sometimes. I think charcoal obtained from cereals is the best.

Now while the bacillus is found at work in the tissues, it starts in the intestines, and from there they work their way into the tissues, so it is important to get the intestines emptied thoroughly, and to use the purest foods,--and I should say, in reference to foods, that the best would be browned starch roasted rice, granola and similar foods are the proper foods for typhoid fever; I might say that toasted cereals and fruits and fruit-juices are really the best foods for these cases. Now what would you suggest as a means of emptying the bowels thoroughly? ("A large enema.") Has any one any other suggestion to make ? ("A dose of salts.") But we must remember that these matters accumulate in the colon,--they remain there until the liquid parts are absorbed, and then the residue is cast out of the body. Now if we give the patient a dose of salts, what is the condition of the mucous membrane ? ("Congested.") Yes,--and a dose of salts produces a liquid stool,--and why? Because the mucous membrane is dilated and congested, and the serum is poured out into the intestine. Are salts bactericidal? ("No.") Salts bring a large amount of serum into the small intestine, but do not kill germs; they simply flush some of them away ; it does not destroy them, but leaves most of them behind, and paralyzes the bloodvessels and the cells and a quantity of serum is poured out in which germs grow. I have yet to be convinced that there is any advantage to be gained in giving salts. I can see that it would weaken the organism and leave behind a stasis of fluid in which germs can develop. Suppose that instead of ging salts we give fruit-juices,--can typhoid fever germs grow in fruit-juices? ("No.") No ; fruit is laxative, and if we can render the intestinal tract acid by the use of fruit-juices, we shall limit the growth of the bacilli much better than we can by a dose of salts. By the "old-fashioned way", doctors said, in cases of cholera, "We must purge the patient, because there are germs in the intestines.";" as the patient was purged nearly to death, in old times,--but that is all done away with now. A gra great many doctors don't think of giving any laxative at all in cholera; they simply administer large enemas. The microbes are getting as far down into the colon as it is possible : Now if we give the patient large enemas, and at the same time give the patient large quantities of fluids, it seems to me we are doing about all we can do for the purpose of emptying the intestines. Sometimes the patient suffers from insomnia, and we give him a dose of salts, and that is very effitual; doctors often give salts in such cases, and that draws the blood away from the brain, and the whole portal circulation is involved, and great portal congestion is produced.. I have been ~~given~~ in the habit of giving a dose of salts from the force of habit because it is considered the proper thing to do before operating upon abdominal cases, and I am not sure whether it helps or hinders them. I have seen cases in which patients had a hard struggle to get over the effects of a dose of salts, having an inability to digest anything, also nu nausea, etc., and I have made up my mind that I will have nothing more to do with salts if I can help it . I am satisfied that it would be better to introduce sulphate of magnesia into the colon,--or some other excitant-- would have better effects than a dose of salts and letting them travel the whole length of the alimentary canal; there is no harm in giving salts per rectum, and I think we might have good results; but I prefer giving the patient a dose of sulphate ff magnesia dissolved in water, and a soap enema will answer just as well, and to be retained until the bowels move .

Now I suggest that you go over these main heads which are written down here and study them thoroughly, and in doing so you will be astonished to find how many things can be remedied by very simple means, and how few remedies you need, as you go on in the study of typhoid fever.

(Recapitulation.) "Limitation of toxins,--" how are toxins destroyed? By the cold-bath, by increasing oxidation,--the cold-bath improves the movement of the blood, and so increases the aborption of oxygen through the body, and increases the use of the oxygen in the tissues; so the cold-bath is everything that is necessary without increasing oxidation,--How are toxins destroyed? ("By oxidation.") Cold increases vital activity of all the organs, and it increases the activity of the thyroid gland, the supra-renal glands and all the poison-destroying substances in the body If you study typhoid fever and get all there is in it, and know how to deal with it, you can deal with all the other fevers,--and you can deal with almost all acute diseases if you take one disease and analyze it thoroughly, it will open the way to the treatment of every other malady.

The elimination of toxins will be accompanied by increased activity of the liver, skin and kidneys and bowels,--and what will do that? ("Cold-Bath.") The cold-bath is good for the purpose of exciting all these glands, but we must have another thing besides the cold-bath, because the poisons must be dissolved in order to be carried out.-- what is it? ("Water-drinking.") Yes,--anything else? ("Breathing - exercises.") Suppose the patient can't drink,--then what? ("Enema.") Yes, that is very important,--give him an enema ay least once a day. Let the patient drink as much water as he can, during the day, and if he can't drink enough, give him an enema. Is it the business of the stomach to aborb? ("No.") That is a new fact which has recently been discovered,--that the stomach absorbes very little,--the stomach contracts and unloads the water into the intestines.. Is the stomach as active as it ought to be in typhoid fever? ("No.") Is not dilatation of the stomach one of the complications which we have in typhoid fever? ("Yes.") That is one of the complications that we have in typhoid fever, and it will be likely to be increased or aggravated by making the patient drink great quantities of water, when the stomach does not absorb water,--we must not do that; so if the patient finds that there is water splashing round in his stomach, there is no use of giving him any more. What is the great absorbent organ of the body ? ("The colon.") If the stomach can unload the water into the small intestines, it is all right, because it will be absorbed by the small intestines and by the colon . Bouchard has pointed out the fact that most patients who have typhoid fever have dilated stomachs, and that is the reason why we ought not to still further dilate the stomach by overwhelming it with water which cannot be absorbed.. So the enema is very important in these cases, and it should be employed every day, once a day at least, and it is better to have it twice a day, and the temperature should be 70° to 80°, so that it will lower the temperature of the body and accelerate the movement of the blood through the parts and at the same time the water is absorbed----

Q. Do you think the blood will neutralize the toxins?

A. The serum of the blood will do that .; but these alexins are manufactured by the poison-destroying glands. The serum of the blood is a sort of reservoir into which the cells pour their bactericidal substances; but suppose we give the patient beef-tea,--we will neutralize the bactericidal power that is in the serum...

Now let us see how we will sustain the vital resources : First, by rest; second, We must give the patient proper food to support his resources. We must not forget to feed our typhoid fever patient. What elements does the typhoid fever patient need to especially sustain his resources? ("Carbonaceous elements.") Would you say, carbo-hydrates or ~~carbo~~ hyfro-carbons? ("Carbo-hydrates.") Why not hydrocarbons? ("There is not sufficient power to digest those foods .") Why not give him mushes? Because they are not thoroughly cooked,--they are only cooked enough to ferment. Does raw starch ferment? ("No.") No, it will not ferment any more than a stick of wood or a grain of wheat: it must first be partially digested before it will ferment. Some of you know by experience that graham bread is harder to make than ordinary bread; it is likely to be heavy,--and why? Because the digestive ferment part in the bran,--the diastase--converts some of the starch into dextrin, and dextrin is heavy; you wouldn't put yeast in it,--if you should make a paste of it and put yeast in it, it wouldn't rise, because the starch has been dextrinized,- -it has been reduced to the stage of amylodextrin; it wouldn't rise, but it would ferment very quickly, but raw starch won't ferment, but it takes it a long time to digest. Has the typhoid fever patient a superabundance of saliva? ("No.") He has a slow stomach and very little saliva, and partially cooked starch-food when taken into the stomach, is likely to remain there a long time, and it is likely to ferment. So we should give the patient his starch in as nearly a digested state as possible,--and that would be in a browned state--converted into achroödextrin, or carried still further--to maltose. Trommer's malt, "Maltine" or similar preparations would be good,--any of these malt extracts which can be purchased in the stores are good but not the best.

Another thing may be done, by which the patient's vital resources are raised,--and that is, to keep him from using up his energies,- I should have mentioned that the sugar of fruit juices is the best of all, --it is levulose, and levulose is the form in which starch is finally found when finally digested,--when the process of digestion is completed. When there is a diseased mucous membrane, would that interfere with digestion in any way? ("Yes.") How? ("It would interfere with the changing of the levulose.") Yes; the final change takes place while the food is being absorbed and going through the intestinal mucous membrane. The saliva and the pancreatic juice convert starch into maltose, and that process can go no further, so the final change takes place while the maltose is passing through the mucous membrane. Pavy has shown that when the maltose or glucose are converted ~~the~~ into levulose they are then converted back again,--the intestinal juice has power to do that . We have sugar in the form of levulose in the grape, but when the grape is made into the raisin, and the raisin stands until it gets crystallized, then the levulose has been transformed into glucose. What is the difference in the chemical composition of levulose and glucose ? ("The formula is the same .") What is the essential difference between the two?--the ~~acecstatic~~ difference is , that one turns to the right and the other turns to the left--but which is the most easily oxidized,-- levulose or dextrose? ("Levulose.") Yes; its chemical organization is such that its radical can be separated from it more easily and readily than that that of dextrose. The incompletely oxidized portion of the molecules in glucose is in the center of it,,while in levulose it is on one side, so the radical is more loosely combined; hence levulose is much more easily oxidized than dextrose. When ordinary cane sugar is exposed to the light, the light gradually acting upon it, will gradually change it into lev-ulose; and if you take cane sugar and boil it with some acid , ~~and~~ it will be gradually converted into levulose ~~and~~ or glucose. Honey, which contains levulose, if it stands until it is crystallized or candied, the levulose will be converted into dextrose or into glucose . Now in the intestine, the reverse of this takes place,--the glucose and the maltose are changed into levulose while passing through the intestinal mucous membrane Now if this membrane is diseased, this change is not easily effected,--so, would it be wise to take our carbo-hydrates in the form of levulose, if we can get it ? ("Yes."). It is beautiful to know that we have levulose in abundance in sweet grapes, and the juices of sweet fruits furnish us with one of the most perfect ~~fuods~~ form of foods for the typhoid-fever patient which we can get; the sugar of sweet grapes is in the most assimilable form, and ready for immediate use.

Q. How about milk and kumyss?

A. They are wholesome, because they render the intestine acid, and interfere with the action of the bacillus. Lactose is also a good carbo-hydrate.

"To prevent lesions and complications" We will rapidly run these over. First we will consider lesions of the digestive organs. These are gastrointestinal irritations, --we will say, "irritations of the stomach--" dilatation of the stomach: there is sometimes enormous dilatation, so that the patient vomits because of the overflow of the stomach. We have gastric irritation, gastric dilatation, with ulceration, tympanitis, inflammation of the bile-ducts, --and what else do we have? We have appendicitis; that is another complication, --but that is about all that we need to stop to talk about. What complication do we have in the respiratory organs? ("Pneumonia.") We have bronchial pneumonia, lobar pneumonia, laryngitis, bronchitis, dyspnoea, hypostatic congestion, --and what else? ("Ulceration of the larynx?") Yes; that is a consequence of the laryngitis. We also have myocarditis, arthritis, phlebitis, --anything else? in relation to the respiratory apparatus? Rhombosis. Now the liver-system: ("Meningitis, headaches, neuritis.") What kind of neuritis? ("Peripheral.") Multiple.; we also have sclerosis, apoplexy, hemiplegia, hysteria, epilepsy, contraction of the muscles. And then we have ataxic symptoms; we have various symptoms which indicate a ~~xxxxxx~~ nervous irritation of the general nerve-centers, brain and spinal chord.

Now we will say the bones and muscles first, --("Osteo-myelitis,

Pyurine (?)
arthritis? (".....degeneration of the muscles.) And abscess of the muscles and of the genito-urinary organs, suppurating kidney, pyelitis, and pyurine (?) nephritis, orchitis, ovaritis, haematocele, etc. There are also complications of the kidneys.

"Relief of pain and discomfort:" The first stage is what ? (Headache.") What else? ("Nausea.") Anorexia, elevation of temperature,--what else? ("General malaise.") Yes, but we have that all the way through the disease ; constipation islikely to be present. This is the first stage,--what do we have in the second stage ? A high fever. ("It is stationery.") What do we also have ? ("A high temperature.") There are many symptoms that do not indicate treatment; what we are getting at is, symptoms that indicate something to be done,--for instance we don't do anything for the pulse, but we ought to examine it ,so as to see what is going on,--but we do something for the temperature,--what else? ("Tympanitis.") That is in the third stage. I think it would be well to look at typhoid fever in five different stages,--perhaps you are now looking at it in three stages: The first stage is the onset; second, the disease becomes stationary; the next stage is the inflammation and the--(not understood); the fourth stage is the decline, and the fifth stage is convalescence.. Study the clinical march of this disease through its different stages, and I think you will find, when you get through, that you can accomplish everything necessary with a very few and simple means, and you will be surprised to see how much you can accomplish with a cold-bath, a cold compress and a few other simple measures, then take up these various conditions and see how easily you can deal with them.

LECTURE TO MEDICAL CLASS STUDENTS, May 8,1900.

J.H.Kellogg, M. D. no 12

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Typhoid Fever,--Symptoms and Treatment.

Vital Resistance,--to increase.

Bacillus,---to destroy

Vital Resources --to preserve.

Lesions and complications.

Distressing symptoms.

You may write on the blackboard things which you think should be done in different conditions of typhoid fever.--How would you increase vital resistance? Supose we had a typhoid fever patient in bed: We will keep him there and keep him still--how will we increase the vital resistance? ("A short cold application.") Yes; this increases vital work; it does not supply vital energy with which to work,but it simply rouses or stirs up the body to work, and in that way it increases its vital resistance,,--it is the same thing as when ,in the midst of a battle, a captain rushes out in front of his men, swings his sword over his head and shouts to his men to rush upon the enemy--to "Charge!"And then with three great cheers they all charge. That is what cold water is for; it calls upon the whole body to charge--it stirs up the whole body to charge upon the enemy,hence cold water is the thing that increases vital resistance. In every disease that you have to treat,you must remember that cold water must come in. For years and years I have used hot-water treatment giving patients fomentations for their pains,, and they would faint away every day; and I said, "Well,it takes time; the process is going on and the patient is growing better, but it don't show it." By-and-by those patients would get tired and disgusted and go home. When they had been home a week or two, they would feel better, and they would find out that their treatment had done them good . Now if I had known enough to have given those patients a short cold treatment once or twice a day in addition to the treatment that I was giving them, their improvement would have been more marked and rapid; but in those days, I didn't understand these physiological processes, and the nature of the battle in the body as I do now; that is the important thing that we didn't know twenty years ago,--we didn't know what kind of a battle was going on in the body in disease; we didn't know what disease was. We said "Disease is abnormal vital action." That is all right so far as it goes, but we didn't know anything about germs and the toxins that the body is trying to get rid of, so we didn't know the best things to be done. But now the thing is all plain and simple, and hydrotherapy comes to the front as the one thing that will do more than anything else in the world to raise vital resistance. Now will some one tell us what we ought to do for this patient?? ("Short cold applications.") Yes,--how can they be made ? ("Spray." "Cold friction." Scotch douche.") Would you use spray for typhoid fever ? ("No.") Write down "Cold - Short;" now let us see what "cold short" might be. ("A sponge. Wet hand rub.") How would you give the sponge? ("The water would be quite cold, and let the water evaporate, and sponge parts of the body at different times; I wouldn't sponge one part too long; I would mop a part of the body and let it evaporate; I would give it very short, and I would take great pains to get a reaction by rubbing.") Yes, it is reaction that we want for vital resistance. Now in regard to evaporation: Slow cooling always hinders reaction, and reaction is the thing we want for the purpose of increasing vital resistance,--how would you do the sponging for that purpose ? ("I would begin with an arm and keep the rest of the body covered, and I would sponge and dry the arm with some kind of friction,and then cover up the arm; that would increase the reaction; I would be careful not to expose too much of the body.") Remember we are looking over the whole disease, and considering all the different conditions in which we want to increase vital resistance. We sometimes find a condition in typhoid fever when we need to make a special effort to increase vital resistance--what would that condition be ? ("It might be in the convalescent state of fevers.") Yes, but suppose the patient were in a state of collapse ? ("Sponging.") The only way you could do that , would be to have your sponge well wrung out of very cold water, so that it is only moistened--it should not be very wet--just moist--and applied to the skin with a good deal of force, and followed by rubbing,--just mop it over and rub it afterwards; that is very much like the wet-hand rub--you simply use the sponge to carry the water,instead of your hand; but the friction -mit carries the water right along,so it is better than the hand.; apply the water and then put on the towel and then rub; then make another application,put on the towel and rub again,--but that is not useful in all conditions of typhoid fever.; write down "Sponging." (There are many things to learn about what we are going over, and if you are thinking hard about it,you will get a profitable course of instruction, otherwise you will be losing your time . If you are thinking hard about it, you will learn some things here that you could not learn in any other way.) Sponging is one way to increase vital resistance,--what else? ("Mitten-friction.") Would that be good in this condition : Suppose the patient has a high fever,and his skin is hot, and you had made your application two or three times a day,--you would have a reaction already, so you wouldn't use the mitten-friction nor the sponge-bath,would you? ("No,sir."). What else? ("Wet-sheet rub.") Yes; with a towel you could regulate,very exactly, the amount of water applied, and the rubbing would be outside of the towel,and you wouldn't chill the patient by slow evaporation,because he would be protected by the towel; and when you get through, you would take off the towel and cover the patient . That rule would be applicable to almost every case of typhoid fever.. What is another thing to be done ? ("Wet hand rub.") Yes, that is always applicable, and it is a splendid thing in typhoid fever . When would we use these short cold applications in typhoid fever? We would use them, in the first place, when we were employing no other cold applications; and in the second place, when there was a special indication that there was a failure of vital resistance, and when we could not employ a very cold application,--we might say, we would use these short cold applications always, when we are not using other cold applications. Now supposing we were using a cold -bath--if we were using the Brandt bath, we wouldn't need these other applications, because when he is in this bath the patient is rubbed all the time he is in the bath. Suppose you were using the graduated -bath of Bouchard,--would you need these applications? ("No, sir.") Cold applications should be made three times a day in typhoid fever for the purpose of stimulating the vital resistance of the patient,--and frequently oftener than that . Suppose we use the graduated bath once in four hours,--would we need these short cold applications ? ("No, sir.") Supposing we were using the prolonged neutral bath, and the patient was so feeble that he could not react, and yet he has a high temperature, --would you want to use the cold-bath ? ("He might not react.") He would not react to a short cold-bath? ("He might not, if he was very feeble.") Suppose his temperature was low, so that he had to use hot baths,--then what,--suppose the patient had but little power to react,--what kind of bath would you give him? ("I would give him a hot application.") Then what? ("Give him a short cold-bath and vigorous application with very little water.") What kind of temperature? ("Moderate temperature.") The less power your patient has to react, the colder must be the water, and the less in amount--have the water very cold and but little of it .

If the patient's flesh is cold and blue, rub him in ice-water with the hand,--dip the hand in ice-water and then give the parts a vigorous rubbing: there is a little film of ice-water in your hand, and the patient gets that impression, which is followed up by the impression of your hand,--or you might squeeze the cloth dry and then rub the patient--but you wouldn't do it when the skin is hot, because it would stimulate circulatory reaction. Suppose you had a patient with typhoid fever and pneumonia and the skin is cold,--what would be one of the first things to be done? ("A short hot-bath of some kind.") Yes,--get the blood to the surface, congesting the skin.; a hot blanket pack would be a good thing for a bad patient. For a patient with a temperature of 104° and lungs very much congested, and feeling very badly, what would you do next? ("Apply cold.") What kind? ("I think we might apply a bath.") Wouldn't it take too long to get round to that? ("Sponge.") You make a hot application when the skin is cold, and if you make a cold application after that, it must be made immediately afterwards,--could you suggest something more? ("Wet-sheet rub..") Lay the wet-sheet round the patient? ("Yes.") You might do that, but I think the wet-sheet pack would be better,--it would be capital, wrapping the patient up well, so as to allow the blood to accumulate in the skin, and that will keep the blood in the skin; you can apply the wet-sheet rub and the pack, but the hot-blanket pack followed by the wet-sheet pack would be good, because this congests the skin and keeps it congested; but the sheet must be wrung very dry, the water being about 60°, and the patient must be wrapped up warm, and be sure that he warms up right quick; the alternate would be the wet-sheet rub--("How long would you keep him in there?") Till you find that the temperature begins to come up, and then take off the pack. ("How much would it lower the temperature, when followed by a cold sheet?") It depends upon the amount of water in the sheet,--if there were two pounds of water in the sheet and the patient weighed 146 pounds,you would lower the patient's temperature one degree, the temperature of the water being 75°; there would be an increase of heat production, but there would be some evaporation, and that might be enough to balance the increased heat production--there will be an increase of heat-production when the skin is cold, but the trouble is in reference to the retention of heat. Getting the heat out of the surface would probably lower the patient's temperature --and perhaps that is as much as you should attempt at one bath. If you haven't reaction you should repeat the pack; ~~the important thing is to get the blood fixed in the skin;~~ the important thing is to get the blood fixed in the skin. You can take your choice as to the number of these applications,--according to the conditions--it must be two or three times a day.

There is another thing that increases vital resistance. (" Prolonged application.") Put down some other baths--slow applications without the limitation of "short-" simply, "cold." A short cold application is used in certain conditions, and we have other kinds of cold . ("Brandt bath, graduated bath the cooling-pack, the cold compress and the ~~enema~~ cold enema, cold-water drinking, cold air, etc.") Yes,--and in some cases of fever, cold affusion.

Now, to destroy bacillus : We have enema, water-drinking, neutral bath,and the heating-compress,--four things by which to combat bacillus. One thing to do is to prevent the growth of bacillus,--and that will be, how? By relieving passive congestion, and by depriving it of food; the second thing would be to destroy bacillus--how would you destroy the bacillus? By increasing leucotycosis,--and what does that ? ("Blood-action.") ("Short cold application.") ("Increased circulation.") Increased circulation,--where? ("In the glands.")

What will do that? ("The abdominal compress.") We have already put these things down,--that is the beautiful thing--when we can deal with all these complications by means of so few things. The next thing will be to eliminate toxins,--what is the best thing to do that?("The enema.") Yes, that encourages the elimination of toxins through the kidneys,--what else ? ("Water-drinking.") That also encourages elimination,--what else? ("The neutral bath.") Why do you not suggest the hot-bath? Because that encourages ~~elimination~~ removal outwardly instead of inwardly; we depend upon the kidneys to remove toxins, so it is better not to use the hot bath for that purpose. Many times we use the hot-bath to encourage elimination, but in this case we don't. We use the neutral-bath because we don't want to increase the fever; the neutral-bath is a few degrees below the temperature of the body, hence it lowers the temperature if it is prolonged, and increases elimination through the kidneys by absorbing water.

There is another thing that is to be done,--and that is , to destroy toxins. We have considered four things, but there were really only two things to be considered,--the bacillus and the toxins--to hinder the growth of the bacillus, and to eliminate and destroy the toxins; it is easy to remember that . How are toxins destroyed in the body? By oxidation and by antitoxins. Antitoxins are made by special organs,--will cold applications increase the action of these organs ? ("Yes.") We have the short cold baths, and the long cold baths, and they increase the destruction of toxins by increasing oxidation and by increasing the activity of the antitoxin-making glands.

Let us take up the next thing,--Vital resources and how to preserve them--and that is, rest, and food, and what else ? ("Lower the temperature.") Yes, that is important,--what are some of the things necessary for lowering the temperature ? Let us see if there is anything necessary more than we have written down on the blackboard? (Reading, "Brandt-bath, wet-sheet pack, enema, water-drinking, compresses, neutral bath," etc.) Do we need anything else ? ("No.") We might use the wet-sheet rub in bed, --but we have that here,--everything is here that is necessary for lowering the temperature. Now a question of practical interest would be: When should we make an effort to lower the temperature? When the skin of the patient is hot and dry; then we use the cold baths to lower the temperature.. If the patient is sweating, shall we try to lower the temperature by cold baths? ("No.") What then? ("Give him plenty of water, and enemas.") What kind of bath would we give him? ("A neutral bath.") Would a neutral bath be better than a cold bath? ("Yes.") Suppose the temperature of the patient were about 102° or 103°, what would be the temperature of the bath? ("About 96.") I want you to get hold of all these things; you won't get hold of all of them in any book,--not even in my "Hydrotherapy," because if everything were there, it would be a book as large as Webster's Dictionary; but the Principles are there, and you can work them out .

Q. In what way is the neutral bath so useful in eliminating Poisons?

A. Because ~~by this means~~ the water is absorbed through the skin by the prolonged neutral bath, and somehow it acts upon the kidneys with a great deal of power to encourage their activity..

Now, in reference to lowering the temperature: We have here everything that is necessary for lowering the temperature. The great thing in fever is to retain heat and not diminish heat elimination; the most important thing is to increase heat-elimination; it is not so important to lessen heat-production as it is to increase heat elimination. That is where doctors make the mistake of employing antipyrin and similar agents to lessen heat-production, for at the same time that it lessens heat pro-

production, it lessens all the vital processes of the body: such an agent diminishes oxidation: it diminishes glandular activity in elimination: it lessens the power of the leucocytes to fight the bacillus: it lessens phagocytosis, and so lessens every vital process by which nature is contending with the disease ,--they are all diminished by antipyrin or any other antithermic agent. So there is this awful error concerning medicinal antipyretic agents,--that they lessen all the vital energies of the body. Cold water increases heat production, but at the same time ,it increases heat elimination; it at the same time increases oxidation and all the processes by which the disease is inhibited and the disease-producing agent destroyed. Now you see the difference between these things. The important thing is to increase heat elimination, to bring the blood to the surface and keep it in the surface, and cool it after it gets to the surface .

Now when shall we apply the cold-bath? It depends upon the period of the disease: If it is early in the disease,--say when the temperature is up to 102° --you can apply the cold-bath as long as the patient can stand it .. It is the custom not to apply the cold bath until the patient's temperature gets up to 102°; but why do we sit idly by, while the enemy is getting his forces ready and fortifying himself,--why do we wait so long before beginning our attack upon him? I don't believe in that theory; I believe the proper thing to do in such cases, is to begin right off , as soon as the man is commencing to be sick, because he has got all his strength and vigor and can make a good fight ; so you can then apply good cold baths to him to rouse up his fighting capacities, and while the disease is young and the patient has strength and vigor, we will try and strangle the disease , and prevent its getting a strong foothold. So, in the beginning of the disease, while the temperature is low, you would use the short cold bath would you not ? ("Yes,--No. 1.") Yes; short cold baths, the wet-sheet rub, affusions and similar methods that bring out strong vital resistance, without to any extent removing the heat. We want to develop the vital resistance, and then there is a tendency to increase heat-production,--and there is plenty of room for doing that; it wouldn't do any harm at the start, because there is still a pretty good heat elimination, so we may use such measures as a wet-sheet pack, wet-sheet rub, etc. There is a good temperature for the wet-sheet pack in the beginning of the disease --just one good pack--and you might let the patient get warm enough to sweat a little; continue the enema and the water-drinking; set the patient to drinking water,--let him drink a gallon a day, if he can--and give him the graduated bath (not the graduating bath, but the graduated bath.) Just as soon as we find that a patient has a fever, we should use the cold bath, and the nature of that will depend upon the intensity of the heat.

Now, when the temperature is high, which one of the cold-baths is best for lowering the temperature? ("The graduated bath.") What is the next best? ("The neutral bath.") I am inclined to think the cooling-pack should be put at the head of the list. The experience of invalids will show that the cooling-pack ~~will~~ produces more marked effects than the cold-bath in lowering temperature, and its effects are more permanent. The lowering of the temperature continues after the cold bath; when you give the Brandt-bath, for instance, the temperature is not lowered to its maximum limit immediately after the bath, but continues to fall. Now in the cooling pack, the falling of the temperature continues for a longer time than it does after the Brandt bath or after the graduated bath, because the maximum effect is reached while the patient is still in those baths, but in the cooling-pack it is not so. How would you apply the cooling-pack for reducing temperature? The water would be 60°; put ~~th~~ the patient in, and in seven or eight minutes,--as soon as the patient begins to warm up, and as soon as the reaction begins--take him out, and put him in another sheet; it will be ten or twelve minutes before he begins to warm up again (it will take a longer time than the previous application), when you see the sheet is beginning to warm up, take the patient out and put him in another sheet. The fourth time, it will probably be thirty minutes before you will find that the pack is warm; but you will continue these applications until the patient does not warm up,--until the patient shivers. Repeat your cold pack until your patient does not warm up,--until he begins to shiver; then you will at once take off the pack and give the patient a vigorous rubbing and warm up the surface of the body, and you will have a very decided fall of temperature; and in this manner you will know just when to stop. Why does the patient shiver? ("Because the blood is chilled.") The shivering indicates that the temperature of the blood has been lowered. We are not trying to cool the patient's skin, but his blood, and you keep taking away the heat until by-and-by you reach the point where the blood itself will be cool, because you have reached the point where heat elimination has exceeded heat-production; you get the start of heat production and then the temperature of the patient will fall, and then he will begin to shiver, and that is the time to stop your bath and rub up your patient and get him warm. In the Brandt-bath the patient's lips get blue, and he is uncomfortable and wants to get out, because it is a terrible ordeal for the patient to go through who has not been accustomed to cold water treatment; but in the graduated bath you rub the patient to keep up the reaction in the skin, and it takes good hard work to do it --("Keeping up the hyperaemia of the skin?") Yes; and in the graduated bath, as the temperature of the water lowers, rub the patient to keep up a reaction, and when you get it down to 80° to 85°, you have got to rub the patient all the time to keep up the reaction. The danger of the cold-bath and of the graduated-bath is, that the bloodvessels will contract, --and

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if they do, the bath will do no good, because the blood does not come near the surface. When you apply the wet-sheet pack the sheet warms up, ad the skin will be heated by the reaction; the skin is warmed by the reaction and filled with blood, and the evaporation cools off the skin all the while: as soon as the reaction is strong, the skin is filled with blood; the skin becomes much more hyperaemic in the bath than in the pack; the skin is full of blood, and the blood is right there ready to be cooled, and so a good reaction takes place again, and there is another cooling,--and you can dose it; and you can not only dose it, but you know when you have got enough by the length of time required for the body to warm up the sheet,--and this indicates that you are getting the advantage; while in the Brandt bath you hardly know what is happening until afterwards. But in the wet cooling-pack you have the thing under perfect control all the time, and you know what is going on, and when to stop, and I think, on the whole, this is the method par excellence for cooling patients in fever; it is practical and always perfect in its application.

Q. Is the power to eliminate increased by this bath?

A. The wet-sheet pack,--yes; because there is absorption of water taking place in the pack all the time; just as soon as reaction takes place and the capillaries are swelled out, the lymphatics become active and move the fluid along, just the same as the neutral bath does, because the wet-sheet pack is cool; pretty soon it approaches the temperature of the body, and then it is neutral. You don't leave it on very long, but so long as its temperature is below that of the body, the temperature of the body is moving inward; it is only when it is above the temperature of the body that it comes outward. Now suppose your patient has a tendency not to warm up in the cooling-pack, the skin-circulation is not very good,--put your hand under the blankets and rub him

him and get the blood to the surface where it can be cooling.

We will leave these things on the black-board, and to-morrow I think we will finish up. The very same measures that increase vital resistance answer for almost any other indication,--that is the beauty of this system of treatment .

STUDENTS' CLINIC, June 17,1900.

J.H.Kellogg, M.D.

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By looking at the Chart you can tell what sort of man you are. Here is a Chart which has a strong expression on it . See what that means; examine these lines and see what they mean. This black line is away down below: we see at once that this is a very feeble person; there are no muscles up to the average; the total strength is only 50% of the normal,--that is, only a little over a thousand pounds-- 1257 pounds, when it should be 2700 pounds; in this case we know we have a very feeble person to deal with .

Now let us see what are the best muscles: The muscles of the thigh are the strongest. I think women get strong thigh muscles by being obliged to manage their ugly skirts. I find that the thigh-muscles of women are stronger than those of men ,in proportion to their general strength. Here is a figure that is good; the lung-capacity is 200,-- just double the average. The strength of the diaphragm--the inspiratory capacity is 40%; that is above the average ,--what would that indicate-- what kind of person? ("Strong.") The total strength is only 1200. ("Pretty strong.") Yes; but being reduced by sickness,or being confined for sme little time, the general strength has depreciated; but the lung-capacity is good. There is hope for that person, because the vital capacity is high. This shows the value of coefficients,--here is the vital efficiency--the coefficient goes up to 300--three times the average.; that is a splendid showing. So we know, the moment we look at that Chart,that the patient is in a feeble state, but that there is great hope in such a case, and we are not surprised to find that in four months the patient has gained a strength of from 1200 pounds to 2300 pounds-- so this patient doubled her strength in four months . I have known such a doubling to take place in six or eight weeks by a course of graduated exercise. Here we have quite a symmetrical Chart. These coefficients are relative, but we notice that they are all above the normal, with one exception; they are all coming nearer to a straight line, which is the desirable thing.

Now I think we can see the importance of having a chart,--but we will go into that question at another time .

There are three great things to be accomplished by exercise: first, to obtain symmetry. Symmetry is to be obtained, not by bringing down strong points, but by bringing up weak ones. The oculist sometimes findsone muscle a little too strong, so they bringsdown the strong muscle so as to make the muscles even. That would be like tying up the right arm because it is stronger than the left; that is the principle of operations on the eye for asthenopia,--for the purpose of making strong muscles weak. It is easier to make strong muscles weak than to make weak muscles strong. The true principle is to strengthen the weak muscles so that they will catch up with the strong ones, and this is done by exercise; exercise does not break down the strong muscles, but builds up the weak ones. We secure symmetry by developing the weak muscles.

Now there is one thing in connection with the taking of exercise which is the most important of all things,--and that is the development of the respiratory power. It is of far greater importance for a man to develop his respiratory power than to develop his biceps power, or the power of his triceps,--it is of vastly greater importance to develope the lung capacity. Why? Because a person's breathing depends upon muscular action; it is automatic, and yet it depends upon the strength of the muscles. The strength of a trap depends upon the strength of the spring. Now every respiratory motion is like the spring of a trap. The breathing process is not like the swinging of a pendulum: each ~~expiratio~~ inspiration records the output of energy; every inspiratory effort requires a special impulse sent out from certain centers in the medulla oblongata, and every expiratory effort requires a special impulse sent out by another center, so it is not automatic like the swinging of a pendulum. We sometimes see patients hold their breath; sometimes patients get into a state of coma and forget to breathe, and in that case the centers are, to a certain degree paralyzed or benummed, and the patient don't breathe until the carbonic acid gas accumulates so that he gets blue in the face, and then he takes a deep breath,--for a long time there will be no movement, and then a deep breath,--a long pause and then another deep breath. That is because the nerve-centers are so stupefied that ordinary stimuli don't act with proper force. But when there is energy stored up in the inspiratory muscles and the expiratory muscles, and when the "button is touched" the energy is put forth. You see energy is brought into the blood. Now if these muscles are twice as strong at one time as at another time, there will be twice the vigor used in bringing in the air. The amount of air taken into the lungs does not depends so much upon the size of the chest as it does upon the strength of the inspiratory muscles. Breathing, as I have said, don't depend so much upon the size of the lungs as it does upon the strength of the respiratory ~~capacity.~~ muscles. You ask me for the proof of that,--that is easy: What is the capacity of the lungs ? (Various answers.) It depends upon the height; here it is in litres,--~~14~~ 1.14 for a person 58 inches in height, and 1.66 for a person 67 inches in height; but suppose the total lung - capacity is 300 cubic inches--just about a gallon. How much is left in when we breathe out as hard as we can? ("One hundred cubic inches.") And how much in ordinary breathing ? ("Two hundred.") So we have about two hundred, of the maximum of tidal air. Our lung-capacity is four times what we ordinarily use. Now since we have four times the amount we ordinarily use, then the amount of air that we ordinarily use depends more upon the inspiratory power of the muscles than it does upon the size of the lungs; because one man may have a lung-capacity of 400 and another a lung-capacity of 200, and the man with the lung-capacity of 200 cubic inches may be breathing out more air than the other. I remember one great big fellow,--and how much do you suppose his tidal air was ? ("Fifteen, perhaps.") Eight cubic inches; that was all he could possibly breathe out and in. He had had emphysema until his lung-cells had broken down and his lung-contracting power was les lost, so he had to use the pumping-ai air apparatus.

Here is a man who is very feeble,--what is the lung-capacity of a very feeble patient? His total lung-capacity would probably be not more than 75 cubic inches; but let him get stronger, and it will be different, because in getting the air into the lungs, we have to lift the ribs and stretch the cartilages and stretch the cartilages and bend them, and things must be strained and stretched like inflating a rubber bag. In b breathing out, we simply let the air escape, but in breathing in,, we have to compress the lungs by means of muscular contraction. Then the question of chest-capacity, in dealing with sick people, is not nearly so important as to know the amount of tidal air or the amount of air a man is capable of passing in and out; so the dimensions of the chest are not so important a matter as the strength of the muscles. That is the reason why, in making the coefficient, I have taken the chest strength into consideration. The respiratory coefficient is obtained by multiplying the lung-capacity in litres--that is called the vital capacity. Now instead of doing that, I combine that with the strength of the chest, multiplying the lung-capacity in litres by the respirator strength in kilograms, so as to know, not only what the lung-capacity is but what the strength is. Why is that necessary? Because a person might make one prodigious effort to fill his lungs and show a great lung-capacity, but unless his muscles were strong, he couldn't keep it up; such a person might not be able to run a hundred rods,--and if he could, he might not be able to keep up that rate of breathing. The horse that is able to win in a mile-race is not the horse with the longest legs nor the nimblest legs, nor the strongest muscles, but it is the horse with the largest respiratory capacity,--that is to say: With chronic invalids and other patients, a great deal depends upon respiratory capacity. A person with good respiratory capacity has a foundation for regular treatment for increasing the movement of blood in his body and the movement of matter in his body which will reconstruct his body and cure him of chronic disease, whereas a man who has not good lung-capacity could not do that. So this hollow respiratory capacity is an immensely important indicator of what a person has got to deal with, and a matter of the first importance is to give the patient such exercise as will give him respiratory capacity. The lungs is a great pump; it pumps the air and blood both in and out. When we draw air into the upper part of the body we draw blood into the lower part; raising the chest draws blood into the chest, and it is then brought into the heart. At the same time, this pumping movement has a wonderful effect upon the viscera: By this movement the diaphragm comes down upon the liver and gives it a healthy squeeze forcing the blood out, the abdominal muscles at the same time keeping up the deep breathing. At every relaxation, more blood rushes in. At every movement of the lungs the viscera are compressed and relaxed so that the blood is allowed to move along. The movement of the blood is also a pumping process. This process aids the movement of the food out of the stomach,--it helps the peristaltic wave all ~~along~~ the way down the alimentary canal.

The breathing must be of such a character as to excite ~~the~~ respiratory activity. A person might sit down and exercise his limbs until he had tremendous muscles,--he might have tremendous biceps,and yet his lung-capacity might not be improved at all,--is not that so, Dr. Hastings ? ("I know the case of a man whose names is Dowd,who went to California for the benefit of his lungs, although he had immense pectoral muscles and thigh muscles.") He can take hold of a bar with his little finger,and draw himself up and put his chin over it. This was done by the use of light weights; that was his theory of development,--long continued work and light work,--but this did not develop his lung-capacity. He had a marvellous muscular development,--with consumption; he went to California to die. Now if this man had taken exercise that would have developed his respiratory muscles, he would have kept his lungs in a healthy state,and would have avoided consumption. It is more important to have splendid respiratory muscles than any other kind of well developed muscles; a man might be without legs or arms and still be a healthy man and live long if he has splendid respiratory muscles.

I think this is a very important point,because it brings up a very practical question: What kind of exercise should the patient have ? If we can't put him in a gymnasium, as we wish to do, we can have him jump up and down in a corner till he is out of breath, or until he is breathing hard, and it will do him more good than any kind of training which does not ~~develope~~ excite the lungs . This exercise should be of such a character as to produce a demand for air and increase the activity of the lungs. When a person feels a little out of breath, what does it mean? Physiologically,it means two things: Congestion of the lungs,and accumulation of poison in the blood. If a feeble man ~~walks~~ hops up and down in a room or in his office, he will show the results after a while ;

but if he is a strong man, it won't affect him. If he is a feeble man, he will breathe in this way: (Illustrating.) That shows dyspnoea,--he has to make an effort to breathe; so to make such a man hop up and down a few times, he will breathe like this: (Illustrating.) That indicates right away that he has feeble respiratory muscles; he tires of it in a short time. Such a person exercises the voluntary muscles in order to help the involuntary muscles. Now if we give a man exercises to strengthen the breathing muscles --that help him to breathe vigorously-so that the vigor of his breathing-muscles is increased, --the effect will be, that that man will all the time breathe with greater depth; the amount of tidal air will be increased.

Claude Bernard made some experiments on students in the de Joinville Academy, on some boys; that was twenty-five years ago: He tested their breathing capacity when asleep, when lying down, when sitting down, and while at work; he put them through ordinary gymnastic exercises for six months, and then he took their tidal air again, and then he took it when they were asleep to determine the natural rate of breathing, because at other times they didn't breathe natural--when he asked them to breathe natural they would take a great deep breath, which they couldn't keep up. You can't get persons to breathe natural when you ask them to do so; so when I want to determine that, I ~~feel~~ tell the person I want to feel of his pulse, and while doing so, I watch his chest and count his breathing, and when he is not paying attention to me, he breathes naturally. The Professor found that after taking these breathing capacity of these boys before their gymnastic training and afterwards, that it (that is, the automatic breathing) was doubled by exercise. Our life is the amount of air we breathe. The difference between a ~~manix~~ frog's life and a bird's life is the breathing. The bird is pretty nearly all chest, while the frog's chest capacity is limited to a little sac; he has no chest, and he swallows air just as we drink water; he gets his bag full of wind, and then he goes back into the mud and stays there for half an hour, and don't mind it because his liver is so sluggish; and when he is frozen up for two or three months he gets along very comfortably, because he has enough oxygen stored up to enable him to remain frozen up for that length of time.

Now Persons of sedentary habits and feeble respiration live like frogs in a stagnant Pool: Their thinking is done in a sort of slimy medium, while an active person who breathes strong and vigorous, is like a bird. The bird's bones are hollow, so he almost luterally breathes to the very tips of his toes, and as he works his wings, the air is worked all through his body. Nature makes his bones hollow, for greater lightness and takes advantage of that for breathing purposes, for the bird's bones are connected with his lungs, in the strongest birds. So if we increase the amount of tidal air that a man can breathe automatically we increase his chances for life: All his vital processes are put on a higher level, and all his life-functions are energized. So the thing to do is to give the person exercise of some sort that will make him a little out of breath and increase his breathing-power form day to day so that he will be able to take vigorous exercise without getting out of breath. We may make a person row, ride the bicycle, or take any kind of exercise which will make him work hard enough to get out of breath and breathe hard: such exercise will be better for him than certain kinds of work in the gymnasium that do not bring his muscles into play in such a way as to make him feel that he needs more air.

Another point in reference to the developmen of the respiratory muscles, is, that the muscles must be used--that is, we must do something which will set the respiratory muscles--we must do something which will produce a strain of the muscles. When one breathes in this way, (illustrating), he is not strengthening his respiratory muscles much; more increase of the strength of the respiratory muscles will be secured by very vigorous movements of the lungs because the voluntary muscles are brought into play, and the cartilages are bent and stretched and the muscles are worked harder than usual. But, in order to strengthen these muscles, the patient must exercise so that they will be held to a strain while holding his breath--he must be made to do some sort of work or exercise which will make it necessary for him to momentarily stop breathing--in other words, the respiratory muscles must be fixed. One might bend his finger back and forth without getting much work out of it; but suppose he takes hold and pulls with it,--he is then getting work out of it ; if I pull with it as hard as I can, I am getting the maximum amount of work out of it ; in order that a muscle shall grow, we must make it do its maximum work, because nature will not make muscles grow when there is no necessity for it; if there is no necessity for a muscle's being larger, nature will not make it larger; so in order that a muscle shall be made larger and stronger, we must work it up to its utmost capacity; that is a natural physiological law,--that if we neglect to use an organ, it will waste away. Cut a nerve so that the muscle is not used, and it will degenerate and disappear,--and why? Because, even when we are asleep, there is an automatic mechanism by which the muscles work: There is a volley of impulses being sent down all the while, which maintain the muscle-tone which is going on continually. Now, if we expect this to be done,--if we expect this muscle-tone to be maintained, we must maintain the organization of the nervous system: If we cut a nerve, it must be repaired, otherwise there will be degeneration. In order to get the full capacity of a muscle, we must fix it.

We must not ~~simply~~ use the muscles of the lungs by simply breathing out and in (illustrating.) . Suppose I want to use,--I the muscles of my hand and arm to its full capacity: I pull on a weight that is fixed and heaby,--I put all my might on it,--now I have used my muscles to their full capacity. Now how are you going to do that with the lung-muscles? You must take some exercise which will fix the chest-muscles. There is a very curious fact about this principle of strain,--I will ask you to make a little experiment here: Take hold of your fore-arms in this way (illustrating.) Now bend your fingers,--do you feel the muscles moving; bend the whole hand,--bend the thumb as well as the hand--bend the thumb and the wrist; now bend all the muscles of the hand,-now see how the muscles of the forearm contract. Put your hand up on the forearm--you don't feel any special exercise of the muscles up there unless you bend the arm. Now take your pencils between the thumb and finger of the other hand,and take hold of that forearm. Now pinch the pencil lightly,--you can all feel the muscles moving. Now put your hand up farther,--pinch the pencil lig tly--you don't feel any movement; keep your hand on the arm and pinch the pencil real hard,--now you can feel the muscles of the arm contract. Now put your hand on the chest--on the pectoral muscles and pinch the pencil hard; keep pinching; put your hand aver towards the arm; pinch harder--harder--now you can feel the pectoral muscles come up. Now put your hand on your back opposite that side: Now pinch hard--harder still--now I can feel these muscles contract--how many can feel the muscles of the back contract? (Hands raised.) Did you ever know before that you had to use your back-muscles when you undertake to pinch a thing. If your back was broken or the muscles paralyzed, you would have to use your teeth for this purpose,--here is a man with a piece of tough beefsteak to carve,--he presses the knife hard and clenches his teeth. You might think he was voracious because he uses his teeth, but it is not for that reason that he sets his teeth;it is for the same reason that he sets his teeth when he is cracking a nut with the nutcrackers. Here is a lady who is going to church; as she steps our of her house she is putting on her gloves; at the same time, she is talking with a friend. Now she is walking along; her glove begins to stick, and she has to pull hard, and at the same time, she has to stop talking; you can't pull on the finger of a glove when it is tight, and keep on talking--the jaws are set by the effort of pulling on the glove. When a man is cracking a nut and talking, he has to stop talking if the nut is a hard one. So the lady starting for church, ~~and~~ while walking along, she is pulling on her glove; but the glove sticks, and she stops; just the minute she begins to pull on one of the tight fingers of the glove, every muscle is set by the effort, and she stops because she can't go on,--that is a strain. Why can't the man talk while he is cracking the hard nut? Because he can't breathe: Every muscle is set,--the respiratory muscles are set, and the muscles of the back are set, and he can't breathe, so he can't talk; there is air in his lungs, but the respiratory muscles are set, and so there can be no voice.

Now in order that the respiratory muscles shall be strengthened and developed, it is necessary that one shall take such exercise as will set these muscles. You get more exercise of the respiratory muscles in cracking a nut than you do in sweeping a room, because in cracking the nut you set the muscles, and the moment the muscles are set, there is a pull on them. When you lift something, you hold your breath --you can't lift without holding your breath. When you lift, you fill your lungs,-- and why? Because you know you must wait awhile before you can get another breath; before you lift, you take a breath and get ready, because you know it will be some time before you can get another breath. No one would ever attempt to lift when his lungs were empty: You take a deep breath, then you hold your breath and make your lift. Now, while your lungs are full of air and you are making the lift, you strain the muscles and get vigor. But the muscles must be brought under a strain before you get the maximum amount of work out of the lungs. We get much exercise that don't amount to much: Artificial respiration increases the tidal air, but does not increase the strength of the respiratory muscles much. It is only by exercise that brings the muscles into play that muscular vigor is increased, but that has nothing like the effect in developing the muscles of the chest that a strain has. If you pull yourself up by a bar, you can't talk.. Did you ever try to sing a song or whistle while you were hanging on a bar? You can't do it, because the chest-muscles are continually fixed while you hang there. This kind of exercise is excellent for the chest, for it develops the chest by fixing the muscles of the chest, and compels the development of the respiratory muscles; but that does not give us flexibility of the chest. Nothing develops the strength of the muscles like fixing the muscles; a strain-movement is the thing for that--I don't mean such a strain as is injurious; I mean such a strain as pinching something hard enough to make you hold your breath; by "strain" I don't mean overdoing the muscles: Physiologically, a strain means the simple lifting of a weight, or making an exercise of some sort such as makes it necessary to hold the breath,--that is a strain.

Now we have first, to increase the strength of the respiratory muscles by this means--the strain. Then we must have flexibility of these muscles. Many athletes can make a tremendous effort with the muscles of the legs and arms, but have little strength of the ~~respiratory~~ chest-muscles. Such exercises as running and rowing develops the flexibility of the chest, and the ability to keep up that movement for a long time depends upon the ability to expand the chest; so we need those active movements which will cause the full expansion of the chest, and as complete an emptying of the chest as possible, so as to allow of the entrance of a large amount of air.

Now what kind of exercise shall this be ? It is a general idea, I think, that there are certain respiratory exercises, such as arm-raising, chest exercises and trunk exercises,etc.,that bring into play the chest, shoulders and arms--that such exercises are especially valuable as respiratory exercises. They are of some value, , because they develop the extra muscles of respiration, but I think they are of comparatively small value. The exercises which are of greatest value and of absolute importance are exercises which will create a need for air and will increase the automatic respiratory movement. I think the reason for this is clear enough. Let us make a little experiment here : Now ,for a breathing exercise, consisting of simply breathing as fully as we can with our arms akimbo and hips firm,--now let us breathe until we get tired. (General breathing-exercise.) Put in hard work. In five minutes we would be tired out,--why? Because it is an unnecessary exercise, because there is no need for more air. Now here is a boy who has been running a mile--two miles, five miles, or ten miles, and his lungs are going like that all the time, but they are not tired. Did you ever hear of a boy giving up running because his lungs were tired? It is the heart that gets tired, but not the lungs. The bicycle-rider does not give up a race because his lungs are tired out,--it is his legs and heart that give out . A boy stops running because his legs and heart get tired, but his lungs don't give out. When one is chopping, walking fast or bicyclicle riding etc.,, the lungs keep up a steady pumping for hours, and don't get tired out. But the heart and lungs get full of extra blood and it can't get out,and there is congestion of the lungs, and sometimes the person will spit blood. Why don't the lungs get tired out by exercise? Because there is an automatic play of the lungs:There is a divine voice speaking to the lungs, and when God speaks, there is something done: At every inspiratory movement there is a voice saying to the lungs, "Breathe, -" "Draw in air;" and at every expiration, there is a voice which says "Force the air out," and so the lungs go on with their work automatically, because there is a divinely implanted instinct in the medulla, recognizing the need of air. Under a human impulse, the brain says to the muscles of the lungs, "Contract," when there is no need of contraction, and that contraction comes in from without; that is the human will instead of the divine will which is acting upon the lungs,--that is the difference. While speaking over at the College at one time, I was recommending full respiration, and was explaining the method,-first expanding the abdomen, then the sides, and then the upper part of the chest--and when I had finished, a man said, "I think you are entirely wrong: I used to breathe in that way; but about a year ago, a man taught me how to use abdominal respiration, and since that time, I have been ~~using~~ practicing abdominal respiration, and I am much improved by it." I then asked him to show us how to breathe, first going out of the room and running up and down stairs a few times and then come in and come right up on the platform and show us how to breathe. He did so, and I asked him to show us at once how we ought to breathe, and he said, "Just wait a moment till I can get a breath." That settled it,--he had to get a breath before he could breathe abdominally, ~~while~~ claiming that abdominal breathing was natural breathing. While he was gone, I told the audience that I was going to ask God to tell us how to breathe; and when this man came in, he was breathing in the natural way,--the divine will was controlling his breathing, and in order to breathe abdominally, he had to stop that control and interfere with the natural method, which was involuntary, in order to do the thing voluntarily. So I proved, by this means, that that sort of breathing was wicked breathing,--that it was profane to breathe abdominally because he could not hold his breath long enough to do it; that settled that question. Then I asked a little boy to come up and show us how to breathe, telling the audience that he knew how to breathe, and didn't have to have a man tell him how to breathe,--that God told him how to breathe. So I had him go out and take exercise first, after which, I asked him to show us how to breathe, and he took splendid breaths without any hesitation, breathing with his whole trunk. Now the man, after his exercise, couldn't control his respiration at first,--he was breathing in the natural way, and he couldn't stop it; he wanted to breathe abdominally but he couldn't stop the natural movement within him, and he had to wait till he got over his need for air before he could master his involuntary breathing and breathe by the voluntary method. The difference in the breathing is, that one impulse is from within, and the other is from without.

In your breathing exercises you take a deep, full respiration, and it is a hard and tiresome and tedious thing to do, because there is no impulse from within; but when the impulse comes from within, which is due to the need for air, which has been created by exercising the muscles, then deep breathing is as easy as can be,--it is simply the automatic play of the lungs. So I think you can all see that the proper thing for the body is respiratory exercise,--which is the kind of exercise that creates a demand for oxygen. When this need is supplied, the body will take care of itself, and the lungs will take care of themselves, and the respiratory organs will see that the lungs expand in such a way as to take in ~~obtain~~ the proper amount of air.

What we need to do in this, as well as in all our work, is to coöperate with God, the great Intelligence that dwells within us, regulating all our functions; that we have only to find out how nature, or God, works, and then coöperate with him; that if we coöperate with nature, we shall do our work right.

Q. How do you measure exedcise by foot-pounds?

A. We take it this way : That a man walking at the rate of three miles an hour, is doing the work of lifting himself perpendicularly through one-twentieth of that ~~a ace~~ distance,--working out the method of Angus Smith (I think it was he,)-- A man walking a mile in twenty minutes is doing mechanical work equivalent to lifting the weight of hisbody one-twentieth that distance . Then, if a man walked twenty miles a day, at the rate of three miles an hour, he would have done the same amount of work that he would have done by lifting himself perpendicularly one mile,--that he would have done the same amount of work that he would do by climbing a perpendicular rope a mile long . But I presume one would rather walk the twenty miles at three miles an hour than to climb the rope- perpendicular rope a mile long . Now we will have a little clinic

Here is a patient suffering from hypopepsia. The analysis shows stomach fluid, 36; that is about one-sixth of what it should be , and not a particle of free hydrochloric acid; combined chlorine, 34; that shows that there is only about one-sixth of the normal stomach-work done ,--and 180,000 germs, 98,000 aerobes, and 30,000 anaerobes. There is a considerable quantity of mucus in the stomach fluid, and no yeast. So we see that the acid formation is due to the microbes and not to yeast. Milk is coagulated by acid-forming germs. The coefficient of proteid digestion is 99,--almost normal. The coefficient of starch is ~~88~~ almost normal also -86,--it is 1.78 (?) as compared with the normal, ~~starch, 86~~. The motility is one. The scattered residue is about twice as large as it should be, and the stomach contents just about normal.

Now let us see what is the matter: It is not dilatation of the stomach because the ~~contents of the~~ stomach-contents are about normal; and yet be presence of germs shows that the food remains in the stomach too long--the stomach should be prolapsed. Fermentation does not take place in the stomach unless the food remains in the stomach more than five hours; but here is fermentation and putrefaction. We have mucus, --that indicates catarrh; that acts in the way of infection; we are likely to have catarrh present when there is no hydrochloric acid present; that shows an inactive state of the glands which make gastric juice. The digestion of starch is excellent--and that is what we might expect to find: When the hydrochloric acid is low, starch digestion is high. That shows that the acid-formation interferes with starch digestion. Paulo has shown, however, that there is a considerable amount of starch digestion when hydrochloric acid is added; and recently, Schafer calls attention to the fact that starch digestion is improved by the addition of hydrochlotic acid,--that after hydrochloric acid is added to the farinaceous contents of the stomach, the digestion of starch actually improves a little. Another interesting thing to which Schafer calls attention, is, that the presence of albumen with starch prevents the pernicious influence of hydrochloric acid,--in other words, that acid albumen, while it gives a reaction, does not interfere with the action of the ptyalin upon the starch; that the physiological ~~effect~~ interference of hydrochloric acid with the action of ptyalin is prevented by the presence of albumen--that the acids and acid combinations are taken up the albumen instead of the ptyalin; that when there is albumen present --meat, for instance-- ~~with meat or similar foods,~~ the hydrochloric acid is taken up by that, and does not interfere with the action of the saliva upon starch--in other words, meat is a protection against hydrochloric acid. That is a new point that I was very glad to find in Schafer's latest work, on Physiology, and helps a little in our practical dealing with cases in which organic acids are strong enough to interfere with the action of saliva upon starch.

But this patient has good digestion, so we would not forbid acid fruits,--what should be our diet-prescription then? We want to prescribe something that will encourage the formation of hydrochloric acid,--what kind of food-substances will do that ? ("Dry food.") Paulow at one time made this interesting experiment: He made a fistula in a dog's stomach; he had the dog in a cage, and put food into his stomach without his tasting it, seeing it nor smelling it, and there was no digestion; but he found that by simply letting the dog smell of the food before putting it in his stomach, the gastric juice of the stomach was poured out in abundance,--the flow of gastric juice was caused by the smell of the food. ("I know a person who has no taste nor smell.") He probably has not much digestion either; he is probably a dyspeptic. ("Then you believe in a person's smelling of his food, in order to good digestion?") This simply indicates the fact that our food should be appetizing and savory; if the patient says "My food is insipid, and I have no appetite," we should do something to overcome that difficulty,--it is just as necessary to have food palatable as it is to have it digestible. One of the most indigestible qualities of food is insipidness: Insipidness of food will prevent the formation of gastric juice,--what you might call its refractability will prevent its digestion. If the food is usually insipid, it does not promote the formation of gastric juice, and there will be no proper digestion; but the reverse is the case with palatable food. So we don't have to resort to mustard, pepper or any other unwholesome thing for the purpose of stimulating the appetite: Nature has given us, in our foods, all the flavors we want; there are flavors put by nature in our foods which are paramount, and above all others in promoting the flow of digestive fluids, by taste Sweetness. — How a little sugar in the mouth will cause the saliva to flow, ~~by taste Sweetness~~ --you can produce an abundant flow of saliva by putting a little sugar in your mouth, so nature has arranged it that, if you take into your mouth food without flavor, such, for instance, as a piece of dry bread--and chew it a little while, the saliva converts a little of the starch into sugar, and this promotes the flow of more saliva and the formation of more gastric juice: The intention is, that the saliva shall digest enough starch in to sugar in the mouth to develop an abundant flow of saliva and gastric juice to digest the food that is coming in.

What is another thing that is necessary to prompt digestion ? ("The food should be well cooked.") The food should contain proteids, or nitrogenous substances, because a nitrogenous substance is a peptogen,--it is an invitation to the stomach to make gastric juice. If we take nothing but starch into the stomach, no gastric juice will be formed, because it would have no effect. So, if a boy swallows a penny, no gastric juice will be formed, because a penny is not digestible,--and so of woolen pledgets or sawdust; but if one swallows white of egg, lean meat , or nuts, which contain albumen, or any other form of albumen, the stomach recognizes right away that there is a proteid there . How the stomach recognizes these different food-elements we don't know , but it is probable that the nitrogenous elements are recognized chiefly by the salts which are associated with them--the phosphatic salts--meat, for example: Wash meat until you wash the salts all out of it ,and there is no flavor to it , and then it is almost indigestible; it is almost like india-rubber, and the stomach will recognize it as a foreign body. The salts of meat are powerful peptogens. The same thing is true of leguminous foods; they should be cooked in such a manner as to preserve their salts. It is a mistake to parboil beans till their flavor is gone and then cook them and salt them. Beans contain salts, which are necessary to advertise to the stomach the fact that beans have come, and that beans need a large amount of hydrochloric acid to digest the casein of the beans. The same thing istrue of nuts of all kinds, as well as of albumen and the white of eggs; they contain salts which are necessary to notify the stomach of the kind of food that is coming, so that the right kind and amount of digestive fluid may be produced. Nature has a good deal of "gumption,--" nature always does the sensible thing.

Now we may find something different to what we have guessed at here. On looking at the abdomen, I should say the stomach was dilated,--why? Because the abdominal walls are flaccid; we find the border of the stomach at a low point, and at the same time find the abdominal wall relaxed, and the probability is that we have dilatation of the stomach. The abdominal walls, I would say, are distended. When we have dilatation of the stomach we have dilatation of the colon with it; but the same thing which causes the muscular walls to relax, or dilate, allows the colon to dilate also; so we have thissuspicion in connection with the dilatation of the stomach. Now let the patient drink. Now if we can find the water, we can find the stomach. (Moving stomach.) We want to get a splash--I got a splash a moment ago down here; that showed a prolapse of the stomach; the shape of the abdomen shows that the stomach is dilated--dilatation and prolapse combined. Here is another indication of prolapse of the stomach: Let the patient lie on the left side, with the knees well drawn up; turn the patient over, well on the face: We see here that there is a relax of the abdominal muscles and prolapse,--the enteroptosis is very marked. (To the patient:) Take a deep breath,--I can feel the kidney down here. Now we will have the patient stand up.

The patient must have proteids. But you say "the patient cannot digest proteids,--let the patient eat milk." But the patient says, "I have taken milk, and I can't eat it,--it makes me bilious." Some doctors recommend cheese; but the patients stomach has germs enough already without eating cheese, which is swarming with them,--still, if the patient couldn't get any other nitrogenous food, she would better eat cheese than not to have any nitrogenous food ; you might be in such straits that you couldn't get anything else, and cheese is better than nothing,--but it should be well boiled as a precaution against germs,--and it is well to take another precaution: Take a little soda with it, and this will neutralize the tyrotoxicon butyric acid etc., so it won't be quite so bad. Stew the cheese fifteen or twenty minutes. This method is largely used in England and Italy. I notice that Mr. Williams, a prominent writer on cookery , in England, recommends the method of boiling cheese and adding soda.

This bulge indicates enteroptosis, so there is no question about it. Thispatient must have an abdominal supporter--you have a supporter? ("Yes.") Do you feel better while wearing it ? ("Yes.") Did you feel the need of supporting yourself by your hands before you used the supporter? ("Yes. ") What did you do for it ? ("Made a bandage out of cloth.") What effect did that have? ("I could walk lots better while using it .") When you supported yourself with your hands, did you notice that it helped you ? ("Yes, when I was walking about.") You found that when you supported yourself, you could go about ? ("Yes.") What does this do? ("It lifts it up.") And more than that,--it holds it still: The thing that gives pain is the swaying of the viscera about . When I lift it up, it gives pain. Suppose the body were swinging at every movement,--the viscera swings with it, like the boughs of a tree which sways in the wind; everything is stirred up, and there is no peace. This is sore? Now I press here--now notice this: I want to examine this kidney,--take a deep breath. Here is the kidney away down here.--here is a floating kidney right here . It hurts here, but it does not hurt everywhere: Does this hurt you? ("No.") You might know by the patient's expression that it did not hurt. Does this hurt you? ("No.") Does this hurt you? ("Yes.") That is involuntary--the muscles contract, and she cannot help herself; and when the soreness is very great, in many cases the muscles are contracted and drawn in to hold the viscera still. Now, a half an inch away from there, it does not hurt.; I move out a half an inch and press just as far in,--does that hurt? ("No.") Now I move a finger's breadth; now I move down a half an inch; now I go down a little further,--that doesn't hurt; now I move up a little bit--here is the lumbar ganglia on the right side. Now I will find the sub-unmbilical Point--does that hurt? ("Yes.") It hurts there, but not quite as much as on the sides. Now notice the floating kidney. Now we will fit on the abdominal supporter.

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TALKS AT BANQUET OF CHRISTIAN ENDEAVOR CONVENTION,

At the Sanitarium Gymnasium, Thursday, June 30, 1920, Battle Creek, Mich., 7 P. M.

Dr. C. C. Hubbell, Chairman.

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The Chairman: Dr. Kellogg, Members of the Christian Endeavor Convention, and Friends: Tonight we have begun our convention in the most pleasant way I ever heard of, and I think you will all agree with that statement of mine. Some time ago our genial secretary, Mr. Shaw, of Boston, came to Battle Creek and succeeded in interesting Dr. Kellogg even more than he was already interested in the Christian Endeavor, and as the result, tonight we are the recipients of the greatest hospitality of Dr. Kellogg and the Battle Creek Sanitarium society, (Applause). --one of the youngest societies in the entire State of Michigan. If they do everything else the way they have served this banquet, so beautifully, I am sure you will say they will be a banner society in the near future. It is our privilege now to have a greeting from our genial host, Dr. Kellogg. Battle Creek is the health mecca of America, and Dr. Kellogg is the man that has made it the mecca; and I am sure before he gives you his greeting, you want to give him yours. Let us greet Dr. Kellogg. (Loud applause.)

Dr. J. H. Kellogg: Friends, after such an introduction I always feel exceedingly small, so I will get up on this chair to let you see how smallI am. Some time ago a man came into my office, and he wanted to see Dr. Kellogg, and I was introducted to him. He said, "Are you Dr. Kellogg?" and he looked down at me. "Yes, that is what they call me here." "Dear me, I supposed you were a larger man." "Oh, no," I said, "I am a very small potato." What do you think he said to comfort me? He said, "That's a fact." (Laughter). And I always think of that when I have had such a grandiloquent introduction as I have had here. I want to tell you at once that whatever there is here in the Sanitarium that is good or that is great or that is worth while, or whatever there is in Battle Creek that has grown out of these things and this institution, is not due to me at all, but it is due to the principles that this institution represents. And it is because of these principles; and I am very glad that we have met here tonight, and because of your presence. I assure you we feel it an honor, speaking in my own behalf and in behalf of the Sanitarium, the Christian Endeavor society and the management of the institution,--we feel that we are honored in having this society here with us this evening; and we are glad of an opportunity to meet you; and as I have been looking around here while you have been eating, I have been saying to myself, "I wonder how they like our animal diet." You know, a doctor some time ago told a lady that she must live on animal diet for a couple of weeks. He came around after a few days and asked her how she was getting along. "Oh, first rate, Doctor," she said; "I get along very well with the corn and the oats, but the hay is something awful." (Laughter). Now, I think there are a good many people have the impression that Battle Creek people, and Sanitarium people at least, live mostly on shavings, hay, stubble and some things of that sort. We claim to live pretty high here. We generally live on the sixth floor, but this time have come down here so we would have room enough to accommodate you all; and we are certainly very glad to have you here.

I don't know of anybody in the world we are more delighted to entertain than a Christian Endeavor society. I like the Endeavor society not only because it endeavors, but because it does something more than endeavor; it actually does things. And that is what we hope our Endeavor society will do. I didn't like one remark your chairman made here this evening when he said that Mr. Shaw succeeded in interesting me in the Christian Endeavor movement. Now, I hardly think that is true. I think that I laid hold of him and persuaded him to help us organize a Christian Endeavor society here in the Sanitarium.

Now, isn't that a fact, Mr. Shaw?

Mr. Shaw: That's right.

Dr. Kellogg: I got him into my automobile, and carried him all around the country and labored with him some little time to stay here a while and help us organize a Christian Endeavor society. But it was his coming here that was the great opportunity for us, I am sure; and when we saw Mr. Shaw, I had a talk with him, and we made up our minds this was exactly what we wanted here at the Battle Creek Sanitarium. You know the Battle Creek Sanitarium is an undenominational institution. We are Christian here, but wsixdax we do not belong to any church. That is, we are sort of odd fellows; we believe in the great Christian principles, the foundation principles of the gospel and of Christianity, but we are sort of independents, and the people who come here are of all denominations, and the people that work here are of alldenominations; so we can not have a church here exactly, but the Christian Endeavor society exactly fills the bill here, and we welcome it very heartily as the thing to help us maintain what we want to maintain in this place--a thoroughly Christian atmosphere. As I said a moment ago, nothing could delight us more than to entertain Christian Endeavorers. As I was looking about, I noticed a gentleman here shaking his salt cellar, and it reminded me of the story of a Methodist pastor who told it to me some time ago. He said a friend of his, a Methodist preacher, visited a school, and he wanted to impress upon the students of the school the value of Methodist preachers in particular--preachers in general, of course, but Methodist preachers in particular; so he told them that story about the salt of the earth, you know, and he wanted wanted to make it apply properly, so he asked a few questions. "Now," he said, "what little boy here will tell me what salt is good for?" And one little fellow said, "Salt is good to eat." And a little girl put up her hands and she said, "Salt is good to keep good victuals from spoiling." He thought that the time had come now to introduce his point, and he said, "Won't you tell what Methodist preachers are good for?" And they all shouted out with one voice, "to keep good victuals from spoiling." (Laughter). Now we think our victuals are pretty good, at any rate they are good to keep folks from spoiling, and to help spoiled people to get into a good condition again; but I can not imagine any way in which our food can be promoted to better advantage than into Christian Endeavorers.

We are glad to have you here with us, as I said before, and we wish you great success in your meeting here, and we hope one of these days you will graft on a health plank to your movement. I can not imagine a better thing that could be done, for that is one of the things that needs to be done just now,--is to save the world from going down physically. Men need salvation from physical ruin and destruction as well as from moral ruin and destruction. There is a close connection between those two things, and I think the time will come, as I said before, when your whole society will get really interested in health and efficiency. You have doubtless all of you already noticed that you have a department in your paper on health and efficiency; and our good friend, Mr. Horace Fletcher has something to do with it; and the father of your movement, Dr. Clark, has become a fletcherite, which is a very good thing for everybody to di; he has taken to chewing his food, and he says it has wonderfully increased his efficiency; and of course you and I want to follow Father Clark; and besides, he is going to come here next fall and make us a nice visit, and then we are going to finish converting him, so he will become an efficient Sanitarium disciple; then we expect he will go out to convert all of you and get you into our Sanitarium ways of living. But I must not take more of your time. I feel so grateful for your presence here, and we give you a most cordial welcome. (Loud applause).

The Chairman: I want to assure Dr. Kellogg that we have discussed the principles that have been here before us with interest and with pleasure; and it is my great pleasure now to have my good friend, one of the best ~~xxxxxx~~ beloved men in Michigan, Major Cole, give a word of appreciation to Dr. Kellogg and the Sanitarium.

Major James H. Cole: I was never so glad as I am tonight that my initials are J. H.--the same as this man's. ~~IxxHxxKxxxx~~ J. H. K.--he ought to be King. J. H. Cole--that is my name, but if this hot weather continues, I will be Peat. My friend Shaw and I, in rooms adjoining down at the hotel, were talking about supper, about dinner, and wondering what we better do. I am so glad we didn't take supper down town. I feel that my name is Cole, but I think it ought to be changed to that of a firm in Chicago, brothers there, whole druggists, by the name of Fuller and Fuller. Yes, I am full. I am glad I have been sitting beside the Mayor of the City too, a lawyer; and after I get to heaven the first person I want to shake hands with is a lawyer--Joseph of Arimathea. When they forsook the body of our Lord, and the nation rejected him and the church rejected him, and by and by his body was taken down, it was a lawyer, Joseph of Arimathea, that went and took care of the body of our blessed Lord; so I am glad to sit by a lawyer. I told that to a lawyer, a judge of ours, in our town, and he says, "Why, that is the way all the lawyers have been ever since." I said, "This is not your regular day for lying is it?" Well, this is a delightful banquet. All of you that enjoyed what is on that program, say, Amen. (Chorus of voices: Amen, Amen.) Isn't it fine? I keep smacking my lips at the good things I have tasted of tonight. But I have heard of this institution again and again, and my precious daughter that you stood and prayed for so sweetly and beautifully a year ago at the Endeavor gathering--I thank you,--she is not well yet, but hundreds of times I have thought of this Sanitarium and wondered--this dear man you have heard from,--if possibly they could not bring this dear girl back to health and strength again.

I can imagine why this man has stayed here twenty-two years as pastor of this church. If you have such food as you are having tonight here, and such a nice gathering, it is a delightful spot. I am glad that I am here. I won't keep on talking much longer, because I am afraid I will be in the same position as a preacher down in Pittsburg. At the Sunday-School convention, one evening after several speakers had got through, there was an old traveling preacher came in at ten o'clock to speak, and the audience kept diminishing. Well, he got up and wiped the perspiration off his forehead, and he says, "I, I, I have been a traveling preacher for twenty-five years, but if there is anything I hate it is a traveling congregation."

I must repeat what I have said before when we have gotten together. My brother told what this institution was here, on account of the different denominations represented; as I have told xxx some of you before, my father was a Methodist minister; and my mother was a right angled, horizontal, perpendicular Presbyterian (Voice: Amen!)--don't shout so loud; you will scare the Methodists. (Laughter). My oldest brother was a Baptist minister, my wife a Congregationalist--why don't you Congregationalists say, Amen? (Voices: Amen). I have relatives who are Episcopalians; but I am what Dr. Kellogg is tonight; I am a Presby-Congre-Bapti-mixture. Aren't you glad we are mixed? I can not help it; for this banquet, and the privilege of being here tonight, and the joy that fills my soul, as well as the good things xx that have filled my stomach-- I can not, dear friends,--I can not help saying I wish all of you would join in just singing xxx "All Hail the Power of Jesus' Name" together. (Song).

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v-7-1-10.