LECTURE TO MEDICAL STUDENTS, Jan. 23, 1903.

Dietetics .

J.H.Kellogg, M.D.

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There is a great deal more to this question of Hydotherapy . Unfortunately, it has been the custom with doctors , the world over, to treat the individual's symptoms. If, for instance, a man has dropsy, the doctor looks at his book to find out what is good for dropsy, and gives this to the patient for dropsy. If a man has headache he is given something that his doctor supposes to be good for the headache. If he as too little hydrochloric acid, why, he is given some more hydrochloric acid. If he has no pepsin enough, then he is given some pig's pepsin. A doctor in St.Petersburg has recommended, for such cases, instead of giving pig's pepsin, the administering of some chemical substance, as, spirits of sea-salt . Another doctor collects dog's ~~pepsin~~ gastric juice through a tube like this (illustrating by diagram.) He collects several quarts of gastric juice from this tube. He recommends that a dog be kept in every family to furnish gastric juice, just as a cow is kept for the purpose of supplying milk to the family. He has this argument for his theory,--he says this gastric juice is much more powerful than ~~pepsin~~. Pepsin is only found on the ~~inside of the~~ lining membrane. There is a little pepsin there, but not much. When the product of the pig's stomach has been prepared in this way ,he says it has but a small amount of activity compared with the activity of the gastric juice of the dog. The hydrochloric acid that is produced in the laboratory has very little digestive power, or but little power to aid digestion when comparedd with the gastric juice that is formed in the laboratory of nature. Gastric juice is not hydrochlotic acid; it is an organic acid which contains chlorine, and when this combination is broken up, then the hyd5ochloric acid appears as a product, or residue; but the acid

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The chemists have been trying, all these years , to construct the higher forms of ~~organism~~ organic combinations, claiming that they could make alcohol and other things; and recently it has been announced that a German chemist has succeeded in making albumin. Now if he has accomplished that, I shall be very much surprised, because I have always been very sure that albumen cannot be constructed in a chemical laboratory-- out of original elements .. They first made marsh grash from original elements which were put together so as to make them. From that they went on to make alcohol; and then from alcohol, acetic acid was formed, a also various other substances were developed from alcohol. Now they claim to have been able to make alcohol; but nobody has yet succeeded in making sugar,--and if sugar could be made, I am doubtful whether a chemist would be ablw to make , without the aid of organic bodies, the wonderful modificatons which exist between the different sugars , all habing the same chemical composition, and yet having decidedly different properties. Who will account for that? Does chemistry account for the difference,for instance, between cane sugar and malt sugar,or between cane sugar and milk sugar--does it ? ("No.") Does chemistry account for the difference between dextrose ~~and~~ levulose ? ("No.") Or between dextrose and levulose,--does it explain why we should have a left-handed dextrose, or a right-handed levulose? ("No.") That seems ridiculous, but it has recently been announced in a French medical journal.

These are niceties and differences that ~~could~~ can be accounted for only through the operation of this wonderful principle of life. Chemists have been trying to account for them on chemical principles, but they cannot, and they have had to give it up, and now there is a very strong reversion of opinion, and the tide is turning against Darwin's and Haeckel's theories, and all that class of ideas in regard to accounting for the origin of species is being rapidly retired to the background, and the philosophy of those men no longer stands where it did fifteen or twenty years ago. Very few scientific men would now undertake to maintain the theory that man has gradually, by a process of evolution, developed from a lower beast. They are ready to admit that man has developed from a lower order of men to a higher order of men--and that is very clear; but none of them claim, at the present time, that man could have developed from a monkey. Nobody looks for the "missing link" any more. There was a time when men searched the forests with great interest, hoping that sooner or later they would find the "Missing link," the half-man, the individual between the gorilla and the man.. ~~There was a time when men searched the forests with great interest, hoping, sooner or later, they would find the "missing link~~ And more than once it was announced in the papers, some fifteen or twenty years ago, that at last the "missing link" had been discovered. We don't see such articles any more,--the "missing link" has disappeared forever.. But the world has been searched over; the forests of Africa have been explored, and men have searched from the Indian Ocean to the Atlantic ocean, but without success. So there is no hope of finding the missing link in the Dark Continent. The only place that has not been thoroughly explored is the South Pole. The North Pole has been nearly reached, but no "missing link" has been found. This theor has not borne the test of research and investigaton, and men are now ready to admit that the mystery of life can only be solved in one way,--and that is, by recognizing the existence of an Infinite Intelligence that is beyond and above man and who placed man on this planet ~~climate~~ when it was in a better state than it is at present. These principles are linked together, and if the chemists could ~~can~~ make albumin, which is the natural product of the living cell and if he can make all these organic substances which it is the special work of the living cell to make, he might hope to be able to find the secret of the cell itself, and to be able, by some fortunate combination of chemical agents, forces and conditions, to develop life.

I am sure you can hardly imagine, because you have not had such an experience, what a wonderful interest was created about twenty-five or six years ago, by the announcement of Professor Bastian, of England, that he had proved spontaneous generation. The Popular Science Monthly announced this discovery, and the world went wild over it. Then Professor Haecker came forward and developed the theory that the whole human race had been developed in accordance with Professor Bastian's ~~theory~~ discovery. The Professor claimed to have made this discovery by the use of chemical compounds, putting them into a little test-tube and boiling them in water for half an hour, after which he found life appearing, on examination of his tube,--and that proved it, because there was nothing but chemical compounds there, and now there were minute living organisms present, showing that these were the ultimate molecules of life.,--whereas we now know that they were simply bacteria. Professor Pasteur claimed that this was the case, and there was a great conflic between Professor Bastian and Professor Pastur. Professor Pastur claimed that if those tubes were sealed up and boiled for half an hour at a temperature of plored is the South Pole. The North Pole has been nearly reached, but no "missing link" has been found. This theor has not borne the test of research and investigaton, and men are now ready to admit that the mystery of life can only be solved in one way,--and that is, by recognizing the existence of an Infinite Intelligence that is beyond and above man and who placed man on this ~~climate~~ planet when it was in a better state than it is at present. These principles are linked together, and if the chemists ~~can~~ could make albumin, which is the natural product of the living cell and if he can make all these organic substances which it is the special work of the living cell to make, he might hope to be able to find the secret of the cell itself, and to be able, by some fortunate combination of chemical agents, forces and conditions, to develop life.

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300°, no life would appear. I used to almost hold my breath until I got the Popul r Science Monthly, to see which one was coming out ahead. Pliny had a recipe for making rats,--I have in my library Pliny's Natural History, in half a dozen Volumes, and you would find them very interesting to look over. The recipe was, that if you will take a lot of old ~~rags~~ dirty, filthy rags and mix them up and put them away in a dark corner, and after six or eight weeks, if you examine them, you will find a number of little rats. He shows that various kinds of creatures are ~~or~~ generated in piles of dirt, mudholes and such things. So he believed in spontaneous generation, and from the time that Pliny advanced that theory to the present time, men have been trying to prove spontaneous generation ~~combustion~~. And Haecker's theory has been falling into ~~disrepute~~ decay since his time, and ~~since~~ at the present time, nobody maintains it.

We are talking about the great principle of life, and that is nothing more nor less than God himself at work --and this idea simplifies everything beautifully. There are no longer any mysteries when we recognize God as the explanation of the phenomena about us, -- there can then be no mystery. When we find that there is something we don't undestand at work, tht is not a mystry,--it is simply a new revelation of the power of God--of his infinite wisdom and power at work. So, instead of going about mystified and dazed, and full of perplexity, we are in an entirely different state of mind--we are in the state of mind that the prophet asks us to be when he says "Behold your God." This puts us in an entirely different state of mind from that of the man who goes about questioning How is this done? is it a chemical substance that is doing this? Is this thing doing his by itself or not? Is it natural or supernatural? " There is no such classificaton as "Supernatural." All is natural--and you may say, all is supernatural. It depends upon what you mean by natural and suprnatural. If you say all things that are within your comprehension are natural, and all things that are beyond your comprehension are supernatural, then you may say all things are suprnatural, for it is impossible ~~for you~~ to explain the smallest things, if we uddertake to seek the ultimate explanation. An object falls? Can anybody explain that ? Sometime ago I was talking with a doctor who wanted to come here and connect with the Sanitarium and take a course of medicine ~~mdine~~. I asked him if he was a Christian man. He said he was . I asked him if he believed the Bible. He said there were some things in the Bible that he hardly knew whether he believed or not. "Do you believe the miracles?" I asked. "Well there are some of them that I can undertsand,--for instance, the healing of the blind by the use of the moistened clay--I can believe that, because I can believe that there was something that was curative in the saliva or the clay--alkali or something that was beneficial to the eyes." "Then you understand how medicine cures the eyes do you? " "Yes." "Then will you explain to me how an astringent will relieve a congested eye ." "Why the astringent relieves the congestion and the eye is better." "But I can't understand why the astringent does this , and nothing else will do it ." "Why, the astringent comes in contact with the nerves of the eye, and they are excitdd and irritatd, and this causes the nerves to contract--they cause the vessels of the eye to contrat." "But how do the nerves know that the astringent is there,--and how did they know that they should not dilte instead of contracting? In short, how does the astringent produce this effet?" "Oh, we don't know that; we can't solve these ultimat problem ." So he was obliged to admit thatit was just as much a puzzle to him to know how medicine could cure the eye, as to know how Christ could cure the eye by simply touching it with a little ~~moist~~

clay moistened with saliva--one myst ry is as great as the other. When we come to the real problem, it is beyond our comprehension. So that thing is supernatural, when we take that view of it .

On the other hand, everything is natural when we recognize God as the the active power in nature,--as the one great force--as the one great power--as the one great worker--the one who does all the work--it is all one source of power and life and energy. When we recognize that fact, everything is natural . God is the power in all things ,--there is no such thing as natural and supernatural, because, whether it is simply the dropping of a piece of chalk on the table, or the falling of an apple to the ground, the growing of a kernel of corn in the ground, or whether it is a great planet bowling through space, or a volcanic eruption or a tidal wave or hurricane--it is all the same thing, for God is in the whole thing .. So everything is natural.

This view of things is a great comfort to me,--so much so that I hope it has taken possession of every one of you ., because this thought drives away all slavish fear. No one who has this thought needs to be afraid of God ; he needs not ~~to~~ be afraid of anything but himself, because God is always working in our behalf.; it is only our own will that gets in the way. But God's will is mightier than any other will. There is no will that can possibly interfere with God's plans for us but our own wills. God is mighty enough to subdue every ~~will~~ obstacle, and if our wills are in harmony with God's will, then we may be sure that the thing that we desire will be done .. If we have obstacles in our way, they are simply barricades to keep us from going into the wrong way and to keep us in the right road. As we are marching on our way, we suddenly find a fence across the way (Diagram) what does it mean? It means that there is a marsh or a precipice over there; it means that there is something dangerous over there, and that we should turn; that fence don't mean that there is no thoroughfare, but it means simply that there is a turn of the road . Then we go on in another direction, and then we find , pretty soon, there is another fence across the way. That don't mean that we are after the wrong object, but that there is another turn of the road. So we are continually ~~changi~~ turning almost momentarily. But these circumstances which arise, and of which we complain, are simply objects which are put up across our way, to prevent our getting into wrong ways and getting into trouble .

These are fundamental things with me, and they are things which are uppermost in my mind every hour of my life when I am not intently occupied with anything else. When I am resting, or taking breath from my work, these are the things that I am thinking about , because ~~theyare~~ they are the foundation on which I stand, and they are the only foundation that I can find for my feet. If it were not for these foundation stones of belief that we are talking about , I should be utterly disheartened, and ready to give up entirely, and start for the moon, or some other place--at any rate I would be ready to get off the earth. It is a great comfort to me to know that there is a will beyond ours that is interested in every little detail and act of our lives, and the only thing necessary to make my life an absolute success in every particular is to be in harmony with that will,--that will which knows all, which is in all amd IS all, and is controlling all things. Now are there any questions on that line of thought ?

Q. What about God's working in us in disease ?

A. Does that question trouble you?

Q. It used to, but it does not trouble me now,--there are others who have trouble here.

A. The question sometimes comes up for consideration and discussion. It troubled me for a long time. If any of you have had any difficulties there, tell me what they are, and I will know where to attack them.

Q. I have heard it said that sickness is given to us because of some evil thing that has been done--

A. That is, as a penalty?

Q. Yes.

A. I once believed that, but then I was not sick all the time, and that surprised me. I saw some other fellows that I thought were worse than I was, and they were not sick at all. I thought I deserved to be sick, and I knew of other people who were well, but who I thought ought to be sick too. But I don't believe that now, and I am sure you don't. But we have had this preached into us, so to speak, in our childhood, and the whole religious sentiment of the civilized world is in sympathy with that idea, --that God is a vindictive being, and if man does not do things to suit him exactly, he will thresh him for it; that if a boy goes fishing on Sunday, he will be sure to be struck by lightning or drowned. And you will never read in a Sunday-School book of a boy who went fishing on Sunday, and caught a good long string of fish,--it works differently from that. So we are taught that God is vindictive , and that when a man is sick, it is because he has done something wrong, and that God is whipping him for it, and that it is proper for them to whip their children for doing wrong--to punish them as God punishes us; so , if the boy does something that the father thinks is wrong, the father ~~punishes~~ threshes him for it. Religious people (supposed to be Christian people) teach that that is the way that God deals with people .

But I want to say that I think that is the worst kind of paganism, and I never thoroughly, down deep in my heart could believe that. So long as I thought it was necessary to believe that, my faith was not sound,--I had serious doubts concerning God and the Christian religion, and I could not shake off those doubts. I could not see how a God of infinite mercy wisdom and pity could deal with people in that way. I knew I did not approve of parents dealing with their children in that way, and if my weak heart had sympathy enough in it to adopt a different, and more merciful plan, I couldn't see why God in his infinite mercy and wisdom should have a lower standard lower than mine ,--and I didn't believe that he had--and I never did believe it.

Now let us see what there is about God's working in disease : This belongs to what we ~~are~~ were talking about, because we were talking about fundamental principles,--all our work must be done according to principles. Let us go back to the beginnings of things. What is disease? What is the difference between the sick man and the ~~well man?~~ healthy man? ("Some of the natural functions are perverted.") There is some modification of the natural functions,-- ("In physiology, the idea was, that in disease, there was a sort of selfish growth of a cell that did not work in harmony with the other cells of the body.") I don't believe that theory, because it is not in harmony with my philosophy. When you have adopted a philosophy which you believe is sound , you must try everything by it , and don't believe anything that is ~~incon~~ not consistent with it. There is nothing that will give a man a sort of philosophical dyspepsia and indigestion generally, as to hold two or more beliefs in your mind, which are inconsistent with each other . The law of consistency is the fundamental law of logic. There must be a law of consistency followed, and things that we trust and believe in must be harmonious, and must be consistent with each other. There is but one process in health and disease. There is no such thing as one process in health and a different process in disease; there is only one process, and that is the vital process. In disease, the process is just the same as in health, only, in disease, the conditions are unfavorable. Let us see what we have in disease. Here is a man, for instance, with fever--toxic fever. Now the body makes heat in health, as well as in disease. What is the cause of fever? It may be that heat is being produced in an excessive degree, or it may be that heat is not being eliminated so rapidly as it should be. Or the cause may be a combination of troubles, as too great heat production and deficient heat elimination. We can also give a man a fever by putting too much clothes on him--wrapping him up too warm.,--we may put a man in a room with a temperature of 100° the same as the temperature of the body, and then we will bundle the man up with clothes--it would not be so very long before that man would ~~need~~ get an elevation of temperature, because he could not throw off the ~~heat~~ excessive heat. If a man were in a room at a temperature of 100° and without clothing, could he throw off the heat? ("Yes.") Yes,--he would radiate heat to the walls; but if you put too many clothes on him, they will interfere with the radiation of heat, because heat must be conducted to the surface of the clothes before it can be eliminated. Now this man has a rise of temperature,--is he sick? He is in a febrile condition; his temperature is above normal,--would you say that he was sick? It seems hard for you to say whether he is sick or not.. Why? Because the term "sickness" is not clearly defined. We generally call a man sick when he feels so bad and is so much discouraged that he goes to bed, and his ordinary vocations are interfered with, and his discomfort is so great that we say "he is sick." Did you ever hear a person say, "I don't know whether I am really sick or not ; I don't feel very well, and I don't know but I am going to be sick-- I am afraid I am going to be sick." He is sick already, isn't he ? ("Yes.") You see the line is not clearly defined as to whether a man is sick or not. (Illustrating by diagram.) The man who is sick is here. Here is the lowest point, and here is a line half-way between. When a man departs from this point, where he is thoroughly well, he may gradually get down to this point (diagram) but he still says he is well. When he gets down to this point he says he is sick. Then he gets sicker and sicker and sicker until he gets down to this point, and then he is dead. Now here is a line which divides between sickness and disease--it is a broad line like this. Here is a shadowy line--a sort of penumbra, as the astronomers say--in which you are neither sick nor well., but you don't feel just right. But this shadowy line indicates real sickness. If a man has so many clothes on that he has an elevation of temperature, that man is sick. Now what is the difference between that man and the ordinary sick man? ("A difference in degree.") The difference is in the cause,--take his clothes off and he will be well --remove the cause and he will be well.. The cause of the sickness is too much clothes. The sickness is an elevation of bodily temperature--a fever caused by clothes; take off the clothes, and the man will quickly become well.

Now while this seems to be different from the ordinary cases of disease, ~~but~~ the difference is not great, if any,--I don't know as I can say that there is any difference in this case .. The body makes the same struggle against clothes that it does against any other cause of disease --by making the body sweat, because there will be a disposition to lower the temperature by a lessening of heat production, so, by-and-by the patient will begin to sweat, and that would relieve the man, cooling him by evaporation, but this is prevented by clothing or a thick rubber coat, etc. But nature stops the trouble, as far as possible, when the temperature begins to rise, by stopping the heat when all the usual means fail. So this man must be regarded as a sick man.

Q. How is it, when a man takes exercise, and the body temperature is raised?

A. Exercise is a physiological thing,--it is something that is greatly needed, hence the rise of temperature caused by exercise is not ~~fatigui~~ exhausting to the man.

Q. It will exhaust him if he keeps at it long enough,--and so with clothing, if he puts on too much.

A. We are talking about the body by itself. We are trying to get down to ultimate things., and clothing is artificial. Only so much clothing is necessary as will make the climate in which the body itself lives as near as possible to its natural climate. The climate in which the body lives is the climate within the clothing--that is, a temperature of 86° to 90°--we need to wear clothing enough to keep within that temperature, because at a temperature of 86° the body is perfectly safe without clothing,--so far as the health is concerned, the body is perfectly safe, at that temperature,--has ability to make heat enough and keep itself warm at a temperature of 86°. But when the temperature falls below that, then the loss of heat is greater than the body can supply. So we must wear clothing sufficient to bring the temperature inside of the cloting up to 86°. If we take warmer clothing than that, the bodily functions are interfered with, and the man is sick; but the body recovers as soon as the superfluous clothing is by-and-by the patient will begin to sweat, and that would relieve the man, cooling him by evaporation, but this is prevented by clothing or a thick rubber coat, etc. But nature stops the trouble, as far as possible, when the temperature begins to rise, by stopping the heat when all the usual means fail. So this man must be regarded as a sick man.

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Q. Is not the disease in direct ratio with the cause ?

A. Yes,--but we should take into consideration the condition of the man, for what will produce a certain effect in one man might not produce any effect in another man.

Now what is disease,--what is the real condition of disease? It is simply the vital functions operating in exactly the same way as in health, but failing to maintain the vital equilibrium,--disease is a failure, on the part of the body, to maintain the vital equilibrium. So long as the body can succeed in resisting the disturbing causes, and maintain the vital equilibrium; but when the defences of the body fail to protect it against these disturbing causes, then we say the person is sick. We don't recognize ourselves as being sick until after these disturbing causes are so great as to be serious. One young lady whom I examined, and found that she had aortal sclerosis, and mitral and other troubles, was entirely unconscious of this fact until she went into a mountainous region, and then she soon found that she was short of breath, especially on a warm day,--that was the first time that she discovered that she was sick she was sick; but she recovered. Now what helped her out ? Theheart increased in vigor and size until there was increased compensation,--until then, she was not really well. So long as there was compensation enough to make up for the deficiency, she was not really sick. Compensation was the thing that saved her from being sick. Now that principle of compensation applies to every function and every organ of the body. A man, for example, may be eating too much, yet so long as the stomach can make enough gastric juice to digest the excessive material taken into the stomach, and so long as the liver can do the extra work required of it , and so long as the kidneys are able to do their work of extra elimination, so long as the surplus waste can becarried off through the bowels withiut disturbance, and so long as sepsis can be maintained, the man suffers no inconvenience. So he can go on year after year gormandizing, eating twice as much as is necessary, and yet he suffers no inconvenience whatever. Why? They are not sick because of this vital compensation whichis present. They have the cause of sickness but they are not sick, because their compensation is sufficient to meet the causes of sickness. But by-and-by this vital capacity for compensation fails,--it is exhausted, and then the man says, "I don't believe that milk agrees with me; when I take it, it makes me bilious; I don't believe milk is healthy." He also suddenly discovers that potatoes don't agree with him,--and so of other things; and he finds fault ,claiming that they make him sick , but it is the overeating, the gormandizing, that uses up his power of compensation.

The same thing is true of the kidneys. While I was coming down on the train this morning , a couple of gentlemen were talking about smoking. One man said, "I stopped smoking fourteen years ago, and have not smoked any since ." The other man said, "I smoke three cigars removed. But the difficulty is, that when a man is very sick, we remove the cause, and the man remains sick for a time, because there has been such a serious disturbance of the bodily functions that it takes the body some time to adjust itself...You have heard of taking a man's thermal temperature, and what it is. It depends upon the body: If we keep a man covered up with clothing for a long time, so that the bodily functions become too greatly disturbed, and he would have a fever, lasting for some little time; it would last three or four days, and it is ~~last~~ very much like typhoid fever; it is like a man exposed to hot weather ; the man gets exercise to such an extent as causes fever exhaustion. The same thing happens to him---

Q. Is not the disease in direct ration with the cause ?

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Now these principles apply to all forms of disease, both chronic and acute. So long as the body is able to maintain its equilibrium, he is well. But when the equilibrium is destroyed, then we say "the man is sick." But the process is the same all the time,--is not that so? The process, so far as the body is concerned, is the same. What the cells are trying to do, is the same all the while,--is not a day. I used to smoke a good deal, but now I only smoke three cigars a day, and I think that will do me no injury, but I think it would injure me if I should stop entirely and stop suddenly, and I think I ought not to do it, and so I go on smoking, and I don't think it does me any harm at all.. One man admitted that it did him harm. He said it made him nervous,--so much so that he could not sleep; his heart felt bad; his digestion was disturbed, and he was satisfied that it did him harm, so he stopped. Now both these men were in the same conditon when using tobacco; tobacco was doing both men harm, but the compensaton of one man was sufficeb to maintain his body,--that is, his kidneys were able to eliminate poisons. You may know when a man's capacit to eliminate nicotine has reached its limit,--the odor of nicotine sticks to him and hangs on his breath---he is a nicotine nosegay--the odor hangs on his breath for twenty-four hours That man is in a conditon in which his kidneys cannot eliminate nicotine--the kidneys cannot eliminate it, and theliver cannot destroy it , and he is going to get all forms of mischief which are the result of the use of nicotine , beause nicotine is going to accumulate in his body until he gets the full effect of it --the disturbance of the heart, the tobacco amaurosis, and other troubles. But these troubles do not come in , so long as the liver and kidneys can dispose of the nicotine..

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So we see that God is doing the same thing for the body in disease as in health,--seeking to maintain the welfare of the body--seeking, in the individual cells to do the work that ought to be do[ne]. In disease there is nothing new, except in the operation of the normal defences of the body, and these are always at work. It is just necessary to keep us well ~~after~~ when we are well, as it is to cure us aft[er] we are sick. The action of the defensive forces of the body are ju[st] as necessary to keep us well, as to cure us when we are sick. Exercise raises the temperature; the accumulation of heat in a room raises the temperature ; the heat of the sun and various other forces have a tendency to raise the bodily temperature. So those functions of the body which serve to regulate the temperature, diminish heat pr[o]duction, etc.,are in operation every minute of our lives.. So when w[e] come to a condition of fever, it is only when these functions have failed to prform their work because they have been overtaxed--the burden is too heavy to lift, and they cannot accomplish their work, and there is then a diseased condition.

Now how about these conditions which are producing these alexins and other substances produced by certain conditions of disease? He[re] we have just the same thing. Different conditons produce differen[t] actions on the part of the body.. The reason these alexins are produced in disease, is, they are caused by elevation of temperature because of certain poisons in the blood,an[d] the reaction of the tissues against these poisons produces these al[ex]ins; and if these poisons are introduced under any conditons,--for instance, if you take diphtheria poison and inject it into a he[althy] person ,and it will prodce the same kind of germs. Diphtheria g[erms] introduce great masses of blood,--and won't that cause an elevatio[n] of temperature ? ("Yes.")

Some years ago, I experimented with some rabbits: I took the urine of a patient with a temperature of 103°, and injected a rabbit with it, and it was surprising to see how rapidly his temperature rose. By the end of the experiment, the temperature of the rabbit had risen three or four degrees. By this raising of temperature a volume of poison was eliminated through the urine, and this was the evidence that the poisons were the things that produced this functional disturbance. So it is not the diphtheria that the body is fighting--it is the poisons produced by the diphtheria germ, and that poison introduced into the body in any other way would be met by the body in the same way. Here is a person with diphtheria: take some of the serum of this man, and inject it into another man, and he will have fever--he will develop antitoxins in the body. That is the philosophy of antitoxin injection. Is there not a reaction from the injection of tuberculin? ("Yes.") It is not the disease, but the poisons which are the cause of the disease. The more we study this in different diseases, the more we will find it illustrated in a practical way. The thing that always arises is this,--that the body, in disease, does exactly the same thing as in health, but under crippled conditions, and conditions under which it fails to accomplish its purpose.

Q. What about benign tumors?

A. There is always an irritation of some sort....When we have bacteria introduced, we have leucocytosis, and that means increased blood and blood-cells--that means a continuous growth; I think that is the foundation of that .

Q. How abut warts?

A. There is a man in Germany who claims to have discovered the fact that warts are due to germs. I don't know whether this has been recognized by the text-books or not ., but it is announced in the medical journals. I am sure it will be discovered, some time, because warts are catching ..They sometimes appear and disappear in a very curious way.

LECTURES TO MEDICAL STUDENTS, Jan. 29, 1903.

Dietetics.

J. H. Kellogg, M. D.

---X---

We have, to-day, the great question of food. Next to air and water, the greatest of all questions of a hygienic character, is food. The most imperative demand of the body is for air; the second is for water, and the third is for food.

The question, What is a food, is one which has been ~~greatly~~ discussed,--perhaps more ~~discussed~~ than any other question in physiology; and it may be said that the question had not been thoroughly settled until within the last twelve or fifteen years. Because of the difference in views as to what was the nature of food, or for lack of an authoritative and thoroughly recognized definition of a food, there have been ~~all sorts of~~ most serious errors committed. Most erroneous opinions have been expressed, and mistaken views presented by scientific men, which have produced a vast deal of mischief. So it is very important that we should discuss this question thoroughly, and become fully persuaded as to what is a food.

Some of the earlier definitions of food might be briefly noticed. Food has been stated as being any substance which can repair tissues, or which can be utilized by the body in any way. This definition led to much confusion, and more because of the fact that the science of nutrition has not been well understood. Many things were supposed to be utilized which were not utilized by the body.

Some thirty-five years ago, Dr. Hammond made a series of experiments by which he thought he demonstrated that tobacco, tea and coffee are foods, because they were, to some degree utilized by the body in such a way as to lessen its expenditures. He claimed by his experiments to have shown that, while living on a spare diet, his weight diminished less rapidly when he used tea and coffee, or tobacco than it did when he did not use them. So he maintained that the body utilized tea, coffee, and tobacco, and that in that way the bodily tissues were in some way economized.

This theory ~~was~~ has been maintained for the last thirty years or more, being based largely upon Hammond's experiments, and the experiments of other investigators who had obtained the same results . Hammond showed that the amount of CO_2 thrown off from the body ~~Hammond~~ was diminished in these cases, also that there was a diminution of the excretions under the influence of alcohol, tea, and coffee.. It was claimed that these substances, while they were not a food , ~~they~~ were economizers of food, or "sparing substances," as they had been called; that they lessened the activity of the waste~~s~~ processes of the body, and so, were actually beneficial.

Twenty years ago, the argument was strongly made by an eminent English ~~[illegible]~~ physiologist ~~Hanson~~ (?) ~~of England,~~ and numerous others, that alcohol was a very important food. because it lessened waste. I ~~did not then know very much about physiology, only from what I had read, not being an original investigator for lack of opportunity to do so, but~~ I made the argument ~~at once,~~ that if alcohol lessens ~~vitality~~ vital activity, it ~~was~~ is an enemy to the body and not a friend; for what we desire ~~was~~ is normal activity of the body; and that if alcohol is beneficial to the body, the activity of the body should not be diminished; ~~or that if these substances lessen the activities of the body, that is the reason we do not want them~~; that ~~this lessening of~~ if these substances lessen the activities of the body, it ~~was~~ is doubtless due to the storing of waste substances within the body rather than to an economizing of the vital forces.

Another definition of food which has been strongly urged, and upon which Professor Atwater seemed to rely, was, that "Food is any substance which will oxidize in the body,-- that food is any substance which is reparatory of the tissues or aids in building ~~the~~ new tissues, or which may be a source of energy to the body~~--that such a substance is a food~~. Now he takes the ground that any substance which is oxidized in the body is a source of energy. Of course that could be easily proven, because, if a substance is oxidized in the body, it gives rise to heat, and heat is energy; and anything which aids in the generation of heat within the body, ~~would~~ adds to the sum total of ~~heat~~ the heat of the body, and hence must be a source of energy. Consequently, if we accept that definition, we must admit that alcohol is a good food, because it is oxidized within the body; there is no doubt about that.

So, starting out with this definition, Professor Atwater undertook, a few years ago, by calorimeter experiments, to prove that alcohol is a food. ~~But the Professor's premises are wrong. He argues in this way~~ And if we admit his definition of food,--that any substance which ~~will~~ contribute to the ~~rebuilding or repair of the tissues, or which~~ is a source of energy in the body, is a food-~~if we admit that to be a proper definition of food,~~ then we must admit that alcohol is a food. But the Professor's premises are wrong. He argues in this way: "Foods are oxidized within the body; hence, any substance which is oxidized within the body is a food." Is that good logic? "No." "All foods are oxidized within the body. Alcohol is oxidized in the body, hence alcohol is a food." Is that logical? Is that all right? Certainly not.

DR. THOMASON: ~~According to this logic, you~~ one might as well say, "A dog is a four-legged animal; therefore every four-legged animal is a dog."

~~DR. KELLOGG: Yes.~~ Or you might say, "All birds are bipeds.

Man is a biped. Therefore man is a bird." ~~Or~~, "Birds are bilaterally symmetrical. An earthworm is bilaterally symmetrical. Therefore ~~a bird is~~ an earthworm is a bird. Two things that are equal to the same thing are equal to each other, therefore man is an earthworm." That is exactly Professor Atwater's reasoning. He says, "All foods are oxidized in the body. Alcohol is oxidized in the body. Hence, alcohol is a food." Is not that exactly parallel with the reasoning by which ~~I have~~ we may prove a man to be a bird ~~and an~~ or a worm? You can prove any number of absurd things in that way. Evidently Professor Atwater has not been well trained in logic, or he would not make such a syllogism. The trouble with his syllogism is, that the major premise does not include the minor premise. The major premise must include the minor premise in order that the conclusion shall be correct. Take this syllogism: Major, All birds are bipeds. Minor, Man is a biped." But you see man belongs to an entirely different class from birds. We may say "All birds are bipeds. A sparrow is a bird. Hence a sparrow is a biped. Here the minor premise is included in the major, hence the syllogism is sound.

~~There is something else to be said upon this point,--and it is a very important consideration.~~ This question of alcohol and its food-value is a question which you will meet out in the world. Doctors will say, "This patient is very weak; we must give him something nourishing. Alcohol is a good food. It can be easily assimilated and easily oxidized, and this patient needs some easily assimilable food; so he needs alcohol." We must go into this question in a thoroughgoing way so as to be sure to be able to answer any question that can come up.

One of the reforms that needs to be urged and promulgated in the world at the present time, is to combat this terrible error that is spread abroad in the world--that alcohol is a good food. ~~Professor Atwater believed that, and he has spent thousands of dollars to prove it. But his efforts have~~ failed ~~collapsed on this very point.~~ Prof Atwater ~~He~~ showed that alcohol yields energy to the body by its oxidation in the body, ~~--that the amount of heat thrown off in the body was increased when alcohol was taken,--he didn't show that exactly--he showed that~~ and that when a man ~~was~~ is at work there ~~was~~ is a less amount ofbody waste, when he ~~took~~ takes alcohol than when he ~~did not~~. works without alcohol.

Now the idea that alcohol is a food because it economizes ~~the wastes of the body,~~ the burning up of the body tissues by contributing something to the heat of the body, is a very great error. If it is true that alcohol is a food because it is oxidized in the body, the same would be true of iron filings, strychnia, morphine, and a variety of other things which are swallowed; anything ~~else~~ which could be oxidized in the body would be a food, according to that reasoning. If a man should swallow some iron filings into his stomach, it would be oxidized if it remained there long enough. ~~I once heard of a man who swallowed a jack-knife, and he had an operation performed, and the blade was~~ almost ~~entirely rusted away-- there was only a small fragment left. Now there had been some heat communicated to the body by this means,--the iron and the pocket-knife were foods--but they were very indigestible food; still iron is a food, according to Prof. Atwater's idea. When~~ strychnia is taken into the ~~body~~ body it undergoes oxidation. Quinine and other substances, while passing through the body, ~~come in contact with the red cells which are loaded with oxygen, and undergo oxidation so that they appear in the excretions in a different form than that in which they were taken into the body--in other words, they~~ are oxidized.

So the mere fact that a substance is oxidized in the body does not put it into the category of foods. ~~The fact~~ To hold since that by the use of these substances, the tissues are spared somewhat, ~~the fact~~ that since alcohol is oxidized in the body, and some heat is produced in consequence-- ~~the fact that the tissues don't burn so rapidly when alcohol is taken,~~ and hence, that alcohol is directly a food, is a mistake; ~~--~~but it is ~~incidentally~~ indirectly a food, in that it economizes or spares food.

Now if ~~this is true of~~ alcohol, that is a food— the same thing is true of clothes-- clothes are food, because the clothes retain the heat of the body and so lessen the amount of consumption of the tissues. ~~So~~ The farmers, as a matter of economy have warm barns for their cattle and horses, to ~~they~~ keep them warm, and thus lessen the amount of waste; ~~so you~~ we are ~~had better take~~ good care ~~of your horses and cattle~~. So ~~Professor Atwater is~~ Prof. Atwater's compelled, by ~~his~~ definition of foods, ~~to~~ include ~~xxxx~~ barns, clothes, sheds, and many other things, ~~in his definition of "foods"~~ which are not so convenient to swallow as alcohol. ~~Really we must believe that this~~ great effort to prove alcohol to be a food grows out of prejudice and a leaning toward alcohol or a liking for alcohol, or a prejudice based upon the idea that whatever satisfies a very general desire or a very widespread want must be a physiological thing. That argument has been made very extensively. Some twenty-five or thirty years ago, the argument was made by physiologists that alcohol, tea and coffee satisfy a universal need, and hence they must have some use in the body, so physiologists set to work to find out what this use is. It is claimed that alcohol is a food because it aids some of the vital processes. That has sometimes been made a definition of food--that it is a substance which repairs tissue-wastes, or ~~in some way~~ in some way aids the vital processes.

Sir William Roberts, of England, once set out to prove alcohol to be a food, by experiments upon ~~digestion and~~ the influence of alcohol upon digestion. But to his surprise he found that alcohol not only does not aid digestion ~~but hinders it ; that~~ when ~~alcohol was~~ present in digestible proteids in the proportion of one per cent , ~~(2) they was the same thing~~--the digestive process was very much hindered. ~~The process of salivary digestion was hindered by the acids present and which were connected with the alcohol. The~~ Salivary digestion was hindered by the acids present and which were connected with the alcohol and proteid ~~proteid~~ digestion was hindered by the presence of alcohol, which lessens the catalytic activity of pepsin, and precipitates the pepsin when present in ~~large quantity~~ considerable quantity. ~~So those experiments seemed to fail. But, in~~stead of admitting his failure, Professor Roberts claimed to have made a new discovery, just ~~exactly~~ suited to the emergency, ~~We often notice discoveries of that kind. His discovery was, that the great trouble that we are suffering from at the present time, and in these modern times, is, that the~~ from which that modern improvements ~~made~~ in cookery have rendered our food so digestible that we are in great danger from an undue acceleration of nutrition, ~~as he puts it~~; that we need something to slow down the digestive process, ~~and so, for this purpose, alcohol comes in as the savior of the race , by putting the brakes on to the wheels of the digestive process; that we are running too fast.~~ and that alcohol, by putting ~~on~~ the brakes onto the wheels of the digestive process, slows down the modern stomach, so that it can adapt itself to modern cookery. Of course his premises are wrong. The probability is, that modern cookery, on the whole, lessens the digestibility of foods, ~~--and I am not certain that the modern appetite is so extraordinary that the modern~~ tendency is to extreme nutrition-- ~~especially in this country--for the majority are too thin,~~ and not too fat. It ~~may be that in~~ England ~~that~~ the opposite is true, as they

~~seem to be more plump than Americans are,--it may be because they eat five times a day, some of them, and some eat six or seven times a day--and some seem to be lunching all the time.~~

So we see that Prof. Atwatr's definition of "food" is not a correct one. In order for ~~food to supply energy to the body in order for~~ a substance to be considered a food--it must be capable of supplying energy to the body at the right time and in the right way. Professor Bunge has pointed out this fact. Alcohol may be oxidized in the stomach, or in the liver, or in the blood, for all we know, and it may be oxidized in its passage through the tissues; but we have no evidence that this can be utilized by the body.

Suppose we consider some of the contrasts between alcohol and what we know to be a food .--such as bread, apples, potatoes ~~, and other things readily recognized as a food,--let us notice some of the differences.~~ (1) In the first place, ~~alcohol,~~ when alcohol is used continuously, the body acquires a tolerance for it, so that it takes more and more alcohol to produce the same effect that it had at when first taken. ~~Now~~ This is not ~~that~~ true of apples, potatoes, ~~etc.~~ bread, etc. ~~These articles have the same effect when the same quantity is taken, day after day,~~ The same quantity of food possess the same properties and produce the same effects the last time they are taken as the first time .. But this is not true of alcohol; it acts just as other drugs act.

2. Another ~~A third~~ important difference is the fact that when a person uses alcohol habitually, he soon gets a tremendous craving for it , so that he wants more and more of it, and ~~can't get along~~ without it . ~~Now no one has a craving for bread, so that they feel that they must have it~~ , ~~and more and more of it, or be all~~ he feels all unstrung and unnerved and unfit for business, ~~, they a mean can get along without bread.~~ One does

not crave bread, nor potatoes nor fruits, nor any particular article of food in this manner. One craves food, but it is not a wild, insane craving that cannot be satisfied. ~~it is only a moderate demand, which is a sufficient hint to us that our systems require something of that sort. But that is not the sort of craving that the victim of drink has~~ .

3. A third peculiarity of alcohol, in which it differs decidedly from a food, is the fact that when it is withdrawn, one immediately suffers very distressing effects. A man may have no food for half a day or a day, or many days, and yet he may go on with his work as usual without much discomfort,--and some have fasted forty days and forty nights. ~~I have tried the experiment of losing meals, but this does not impair my work,--I can get along without the meals--I don't feel as though I must go into the kitchen and get something to eat or I can't live.~~ But when alcohol is suddenly withdrawn from the habitual alcohol user, ~~drinker~~ and his nerves are all unstrung; he is utterly unable to work--he is sick; but after drinking a glass of grog, he is a transformed man, and is able to go on with his regular duties. In this respect, alcohol is entirely different from a food. ~~Alcohol behaves~~ it ~~like a narcotic,--it is a narcotic, and it produces narcotic effects. When taken in considerable quantity--not in such very large quantity either--for instance, if he takes~~ a couple ~~of ounces of alcohol, diluting~~ ed ~~it, , it will produce decidedly narcotic effects,~~ and ~~and if he takes~~ a very large dose, ~~he will become~~ produce ~~absolutely insensible.~~ It ~~Now if one should eat a certain variety of potatoes, and should become insensible~~ exhilarating by eating one, and if he should become unconscious after eating two or three , we would say "There is poison in those potatoes." We don't stop to think how monstrously absurd is this claim for alcohol that it is a food, from the fact that it shows, even when taken in small quantity, such untoward effects.

a couple of ounces of alcohol diluted, will produce decidedly narcotic effects, and a very large dose will cause absolute insensibility

4. By careful experiments it has been shown that alcohol is a narcotic, even in small doses . ~~and the effect of alcohol as we see , in common use, is to produce narcotic effects~~. ~~We find~~ A man dead drunk in the gutter, ~~he~~ is unconscious that he is cold, miserable, and in danger of death. Some time ago, ~~as I was passing down the street,~~ I saw a span of horses and a wagon coming ~~along who~~ seemed ~~to be~~ down the street app without a driver; and ~~as~~ they were passing by me, I was tempted to stop the ~~horses;~~ but I saw there was a man lying in the bottom of the wagon. He had arranged his blankets and cushions so as to make himself comfortable, and he was trusting to his horses to take him home. ~~So I thought probably his horses were used to it, and understood the matter as well as the man did --and probably better, and there was no use of interfering with the arrangement.~~ I ~~have~~ never heard that anything happened to the man, so I concluded that he got home all right. Now this man was unconscious simply from a glass or two of grog. If he had dinner at a hotel, and had immediately become unconscious, there would have been an uproar in that town; they would have said, "There is poison in ~~that food~~ in the pot," but in this case there was poison in the bottle .

5. ~~Here is another fact , which is important , that in every~~ d in every dose of alcohol--no matter how large or how small--~~even in doses of a dram it can be shown that alcohol is a poison--that alcohol is a narcotic; that it~~ lessens muscular ~~and nervous activity and~~ power. The man who takes a glass of alcohol or grog, thinks he can lift more than he could before he took it, but when he tries, he finds that he can't . ~~His brain is confused; he can~~ Though make a voluble ~~speech~~ speech, ~~but~~ it will not be a ~~convincing one~~ .

And renders the ~~muscles~~ ~~the~~ muscles weak & unsteady:

6. Alcohol diminishes muscular activity as well as power.

A valuable speech, it will not be a con- ... running over

6. Alcohol dminishes muscular ~~powers as well as~~ activity; it ~~renders the muscles weak and unsteady~~.

The ~~7.~~ Alcohol ~~It~~ lessens the accuracy of brain and nerve activity. ~~one's~~ brain is ~~not well balanced, and~~ confused. The muscles become unsteady, and the brain becomes unsteady also, and though one can make

~~8.~~ 7. Alcohol lessens CO_2 production. ¶ Let us compare these points a little. Food increases muscular power within half an hour, whereas, alcohol when taken, diminishes muscular power immediately. Now if alcohol were a food, muscular energy would be increased when alcohol was taken; instead of that, when a dose of alcohol is taken, muscular power is diminished. Some time ago I gave a man two ounces of brandy, and found that his lifting capacity as estimated by my Universal Dynamometer had diminished two-fifths. He was able to lift over five thousand pounds before taking the brandy, but he was only able to lift a little over three thousand pounds after taking the alcohol. ~~so his lifting power was diminished about one third after taking two ounces of brandy. We find the same thing true~~ ~~in regard to CO_2 production.~~ We also find that the production of CO_2 is diminished by the use of alcohol.

9. The ninth peculiarity of alcohol is the fact that while it diminishes heat and lowers temperature, food increases temperature; and as we would naturally suppose ~~that~~ we would find the production of CO_2 increased by the use of food, and diminished by the use of alcohol. The man who is very cold, takes alcohol, and thinks he is warm enough, but really he is colder than he was before. ~~and~~ heat production is diminished. Alcohol is recommended as an antipyretic. ~~When I was a student with Professor Flint in the Bellevue Hospital, New York, he gave regular prescriptions of alcohol and milk to persons suffering from typhoid fever--milk punch, which was in all the great hospitals~~

 ~~I was~~ surprised t ~~find in our late war with Spain~~

I was surprised to find that in the Spanish-American war (~~the war of this country with Spain)~~ the soldiers suffer~~ed~~ ing ~~greatly~~ from typhoid fever in camp, were ~~as I asked one of the army surgeons how they~~ treated ~~such cases, and he said, "We give them~~ with milk punch. ~~Some years ago, alcohol and brandy were used in fevers, and they are still used as a~~ remedy in the London hospitals, in fever cases, and finally the punch-bills of the London hospitals became so large tht the newspapers began ro call attention to it, and the hospitals which had the biggest punch bills ~~who~~ were supposed to be the hospitals where the doctors treated the most of these cases,--and it was supposed that the doctors themselves drank considerable punch, and finally there was a sort of rivalry in the hospitals as to which should have the smallest punch bills.. Finally the "temperance hospitals came round. Dr. Edwards showed that fever patients got along just as well without alcohol as with it . Unfortunately hydrotherapy was never introduced into the temperance hospitals in London. I find that they know nothing about hydrotherapy. They never use a cold bath in typhoid fever, and that when alcohol is withdrawn some other drug is substituted,--strychnia, quinine or some other drug. So the patients in the hospitals have never had a fair chance. The supposition is, that alcohol sustains the heart. The Professor says, "If we find that a patient's pulse is quick give him alcohol. Ifthe pulsatons don't diminish rapidly enough, give him alcohol. Kepp on giving alcohol,--give two ounces an hour, and repeat, until the pulse comes down, and when you have given him enough, the pulse will shortly come down,--it will be slowed up by the paralyzing effect of the alcohol, which weakens the heart--the heart becomes weakened to such a degree tht the pulse will be slowed by the narcotic effect

~~of the alcohol upon the nerve-centers.~~ So this view does not prove ~~that alcohol is a food. Alcohol does not strengthen the heart,~~--it has a directly ~~opposite effect~~. So we must find some other reason for the use of alcohol. It actually diminishes muscular power, and it diminishes the power of the nerve-centers, ~~as well as of the tissues~~.

So it may be said of alcohol, that it is a poison within the body; that there is no particular in which it acts as a food; It is oxidized in the body, but only in the same way as other drugs and poisons are oxidized; ~~and~~ it lessens the activity of every tissue wih which it comes in contact; and is not essential to any bodily function whatever.

~~Q. Does it not increase absorption in the stomach?~~

~~A. Alcohol itself is absorbed to a small extent from the stomach, and from the mucous membranes.~~

Q. I have heard that rubbing it on the outside produces a good result.

A: It is not necessary to apply it; but this is sometimes used as a method of slowing the cooling of the skin. If we apply watr to the skin, it cools it very slowly,--so slowly th-t the skin becomes chilled. If you apply alcohol, it evaporates very rapidy, and the cooling is so rapid that you can rub the skin while the cooling is taking place. If you apply watr to the skin, and rub the skin while the water is slowly evaporating, it takes a long time; but if you apply alcohol or vinegar, it promotes evaporation. Alcohol is useful simply for the purpose of cooling the skin so as to tone the blood-vessels; at the same time you rub the skin full of blood. By rubbing the skin, it removes the surplus heat of the skin by evaporation of the alcohol, while the circulaion of the blood is maintained by the rubbing..

Q. Is it not claimedthat it hardens the skin?

A. ~~It is used, with the idea, I think, th-t it hardens the skin.~~

but ~~this hardenig only applies to the dead cells, but~~ could not apply to ~~the living cells~~.

10. ~~There is another particular in which alcohol differs from food,-- and that is, that~~ alcohol is very rapidly oxidzed in the body, whereas f. food is very slowly oxidized within the body. There are many other points of difference between alcohol and food, but these are ten of the most important points, in which there is not a single particular in which alcohol and food are alike . ~~When a man takes alcohol, there is a reaction following its use by which~~ he ~~a man feels weakened, but the reverse is the case with foods.~~

~~Now what is~~ A food ~~?~~ is a substance which can enter the ~~sub~~ structures of the body--it is a substance which can be ~~assimilated~~ -- ~~a food is a substance which can be~~ digested, absorbed and assimilated into the body, ~~and that is al you need to say about it.~~ (Illustrating by diagram.) Here is the nucleus, the spongio-plasmic cell ~~substance~~ etc... It was discovered by an American doctor (or an adopted American doctor) Dr. H......Of New York--he made the discovery just after I was studying with him, and it was wonderful then, to see these little threads of plasma running through the cells--the white cells seemed to be filled with them. Dr. White could discover, by these cells whether a man was an American or an Englishman,--he could make all sorts of diagnoses in this manner. Here is the tissue, and here is the white cell. The food is reduced to a liquid in the digestive process, and in that state it is carried off by the blood, and becomes a part of ~~this~~ the medium ~~in~~ with which the cell is surrounded ~~is found~~. The cell selects from this medium ~~the surrounding medium,~~ the materials which it needs ~~needs~~. These materials form a part of the supply of lymph, being used by the spongio-plasm~~ic~~ of the cell and utilized,--but it must first be reduced to ~~a~~ liquid form, and it must enter into the very structure of the cell before it can be utilized

~~and assimilated.~~ So long as it is outside of the structure of the cell, it is not assimilated. A substance which is in the blood--~~alcohol, for instance--is swallowed into the stomach and is taken into the blood, but it does~~ was yet not become a part of the body; in order to do that, it must be absolutely taken into the structure of the cell--it must enter into the ~~plasmo~~ spongio-plasmic ~~structure~~ of the nucleus before it can become a living ~~food~~ body. Dr. Pavy showed this-- We know that there is glycogen in the white cells--at any rate, by decomposing them, we can get glycogen out of them, hence the reasonable supposition is, that glycogen forms a part of the living structure of the living cell.. . That is ~~the~~ another difference between alcohol and food.

~~Speaking of glycogen reminds me of another difference between alcohol and food,--and that is, that~~ Alcohol cannot be stored in the body, whereas, food substances ~~can be stored~~ ~~are~~ can be and are stored in the body,--sugar, starch, fats etc., ~~are stored in the body~~.

11. Another difference worth noting, is the fact that ~~the body increases~~ in weight under the influence of alcohol only when the individual is inactive; while a person's weight may be increased under the influence of food ~~while exercising, or active;~~ a person may increase in weight under the influence of foods, while at work, which is not true of alcohol.. How is a cell going to utilize alcohol by simply lying beside it?. Suppose I bathe my hand or arm in alcohol; the alcohol simply comes in contact with my arm,--it gives no strength to it. Now suppose the alcohol gets into the skin, and gets next to ~~the mucous membrane~~ a muscle,--does that do the muscle any good?. We will suppose it soaks into the muscle, so that it is right inside of the muscle fiber--can it do the muscle any good? Would a potato lying right along side of a muscle fiber do it any good? No. It must enter into the muscle fiber and become a part of it, in order to do it any good.

In the process of tissue-activity, we have first a building up of tissues, and then a tearing down of the tissues,--~~katabolism and~~ anabolism and katabolism. What is katabolism and anabolism. ~~Katabolism~~ Anabolism means a building up. It is like building up a tower out of stones. ~~What is~~ Katabolism is "taking down". ~~("Falling down.")~~ Here is a cell which has been built up. Energy is stored there. Energy cannot be obtained ~~(Diagram.) There cannot be any energy here~~, except by the liberation of that energy which has been utilized in the building up of the cell. ~~or the tower.~~ Here is the tower built of stones. By-and-by the tower falls,--the energy which is put into those stones in building up the tower is released and expended when the tower falls. Now suppose there are ~~is~~ some ~~alcohol~~ stones~~, or anything else~~ lying around on the ground ~~outside of the tower,~~ which were ~~has~~ not ~~been~~ built into the tower,--is there any energy in the ~~there~~ manifested by them ~~which can be utilized~~ in the falling down of the tower ?--No. ~~In order for it to be utilized, it must enter into the structure of the tower and become a part of it.~~ So, ~~you see that alcohol~~, in order to be a source of energy to the body, alcohol must enter into the very structure of the body. ~~If the fall of this tower gives rise to any energy, it is only the energy which has been stored up, and which have been built into the tower,, and those things which are simply lying about it cannot be a source of energy within it.~~

That is why we say alcohol cannot be a source of useful energy in the body,--it does not become a part of it .. Although oxidation of alcohol takes place in the body, it is simply that sort of incidental oxidation which might take place in rusty iron. The oxidation of alcohol within the body does no more good than its oxidation outside the body. Alcohol is burned in the body; but one might put himself in a box, and burn some alcohol in the box, and it will warm him~~, besides, you absorb some heat from the air.~~ But we cannot call that taking food; ~~the alcohol which is burned in a box or can is not taking a square meal; it does not take the~~ place of bread and other foods ;

and ~~so~~, alcohol is burned in the body in the same way, and simply comes in contact with the tissues,--but we cannot, on that account, say it is a food.

13. Let me mention ~~another thing~~, which is worthy of note,--another difference between alcohol and foods-- and that is, that alcohol is a product of katabolism ~~(?)~~ in the absence of oxygen; while food is a substance which is built up in the presence of an abundance of an abundance of oxygen. Alcohol is an excretion, like ptomaines and other toxins; it is a toxic substance and an excretion. While food is a product of the metabolism of plants, which ~~is~~ presents quite a contrast.

Here are thirteen points of difference between alcohol and a food, showing that alcohol is not a food,--and there is not a single particular in which alcohol ~~resembles food or~~ has a real resemblance to foods. Food is a substance which can be digested, absorbed and assimilated in the body.

There is no need of saying anything about food producing energy, because, if it can be assimilated, there can be katabolism; when the tissue breaks down, the energy is set free, but it is the energy of organic combination.

~~Q. (Not understood,--something about building up the body.)~~

~~A. It is the cell that builds up the body.~~ There are two ~~kinds of~~ processes taking place within the body--hydration and dehydration. Hydration takes place under the influence of a ferment. Dehydration takes place under the influence of protoplasm itself. We have dehydration taking place in the process of digestion~~, and dehydration takes place~~ in this way: The nucleus assimilates food,--for instance, it takes into itself glycogen, and sends out a proteid,--it takes in glycogen and sends out fat; and it may take in fat and send out glycogen.

Protoplasm can transform things; it is simply a matter of throwing off, or cleavage. Here is a great proteid molecule (Illustrating by diagram.) Here are all these atoms in here. We will say this portion on the outside is fat, or glycogen--it depends upon what sort of cleavage takes place. In addition to this, we have a sort of breaking down, in which the proteid molecule breaks up entirely in katabolism. All the glycogen or fat of the molecule works out and becomes CO_2 urea and other substances, and the molecule combines with the oxygen--that point was settled long ago--that the oxygen enters into the molecule and becomes a part of it . Now, when the carbon is thrust out, it takes sme oxygen with it; and these materials come in by a rearrangement,--the whole molecule breaks up, and the energy present is set free, and that is the way we utilize energy for different ~~kinds of work.. I hope the point is made clear to you that~~ it is impossible for a substance in the body to be a source of energy until it is taken into the living cell itself, and ~~that~~ it is by the breaking up of the cell or the ~~molecule~~ organic molecules ,that the energy utilized in building it up~~, as in the building of the tower,~~ is set free. Oxygen ~~is built into the tower with all the other elements, and when~~ the tower falls down, then we get simpler elements, and the energy utilized in this work is set free, and becomes energy for some other form of work. Now here is a red corpuscle with its store of oxygen (diagram) The blood contains food substances in which oxidation does not take place. The oxygen is carried to the tissues, and there it enters into the molecule, and is then under the control of the living principle--the principle of life which sustains the body; it is not under the control of a chemical principle, but is under the control of the principle of life. This force is not one which we can produce in the laboratory or the steam engine.

Miss Horner,
C/o Dr Kellogg's
Residence

Lecture & Music & ...
Jan. 29/13
File

LECTURE TO MEDICAL STUDENTS, Jan. 30, 1903.

D I E T E T I C S .

J. H. Kellogg, M. D.

--- X ----

QUES. by Mr. Culver: How do you know that alcohol is not assimilated after it is oxidized ?

A. What evidence have we that alcohol is not assimilated? The same evidence that we have that strychnine, nicotine, morphia and other drugs are not assimilated. When strychnine is administered, it appears in an alcoholized form in the urine. When alcohol is taken into the body, the amount of CO_2 which is actually eliminated is diminished. Now have we any evidence in that fact that the alcohol itself is converted into CO_2.

Q. When alcohol is oxidized, does it not show itself in the CO_2?

A. When it is completely burned, it does,--it becomes CO_2 If alcohol were converted into CO_2 in water, we should find no trace of it in the urine. If you should eat sugar and find sugar in your urine you would say "That sugar is not katabolized," so it is not assimilated. Now a man with diabetis has lost the power to assimilate sugar, and the proof of it is, that the sugar appears in the urine. Now if a man takes alcohol, even if he takes a minute quantity --not more than two or three drams--it appears in the urine,--that is, the derivatives of alcohol. So we have this evidence that alcohol is not katabolized and assimilated, because, if it were, it would entirely disappear as alcohol. When a person eats potatoes or other food, you don't find it lying around in different parts of the body. You never find any of it in the blood, the brain or the tissues.; but when alcohol is taken into the tissues_ the tissues, it is found in the blood and the brain and the tissues. Now it is true that glucose or levulose is found in the tissues, and of course it will be claimed that alcohol would be on the same plane with glucose and sugar, and that that is the reason we find it in the tissues,--but we find more than that--that alcohol passes through the kidneys, and then we have a derivative of alcohol which appears in the urine. That is the same as you should eat sugar and find glucose in the urine--and that is just what happens--if one eats cane sugar, it appears in the urine as glucose.

So one takes alcohol and it appears in the urine with only a slight transformation,--just such a transformation as might take place by contact with substances capable of giving off (?) oxygen. That is a proof that alcohol is not assimilated.

MR. COLVER: I would like to see that point proven.

DR. KELLOGG: It seems to me to be clear. What is the formula for alcohol? ~~("CO_2~~ ("C_2H_5OH.") Yes. Now when this is decomposable, let us see what happens. Here is CO_2 twice when we add oxygen to it,-- then we have H_2O how many times? ~~("Twice.")~~ ("Three times.") Now we have used up all the carbon and hydrogen, and had only one atom of oxygen to start with. Here are three more----it takes six times the oxygen; then the alcohol would be converted into CO_2 in water. The CO_2 would go off, and the water would remain in the body in the usual way,--would you have anything in the urine? ("No.") You would not find anything in the urine--any more than the starch or the sugar that you ate--except in diabetis.. If the sugar is not katabolized, we find it in the urine. Now if we find alcohol or its derivatives, it would be evidence that the alcohol was not katabolized, and if so, it has not been assimilated; because, if it had been assimilated, it could not have gotten into the urine. The only way it could have gotten into the urine would be by the breaking down of the cell, --and then it would not produce alcohol, because when a substance is assimilated in the cell, it has lost its individual characteristics, and never can acquire them again. For instance, a cell has assimilated albumin--(Diagram illustration.) Here is a cell,--now the nucleus of this cell has taken up some of the starch, if the cell breaks up and disintegrates, you don't find starch. You find CO_2 and water, urea and other derivatives of tissue decomposition. In other words, alcohol, or any of the derivatives of alcohol , are not the natural products of disassimilation, as the French call it, or katabolism in the body.

Now there are certain normal elements that result from the katabolism of food--there are certain normal substances that result from the katabolism of food. These normal substances are watr, CO_2 urea, and various chlorids, phosphates and various bodies belonging to the purin family, also various forms of cell---("There are oxalates in some foods.") We are talking about normal metabolim. Oxalates are present very often. When we give a man a substance and find it in the excretions, something different from these normal products of katabolism takes place--what is that an evidence of? It is an evidence that it has not been assimilated, and it is evidence of the presence of a foreign substance that is non- assimilable, or that something has interfered with the normal processes of the body. When we take alcohol, we find it in the urine, or if not the alcohol otself, it is so much like alcohol that we can trace it to alcohol. That is proof that the alcohol has not been assimilated and metabolized; ~~because if it had been,~~ All the different kinds of food-substances--starches, sugars, proteids etc., --these are all converted into urea, CO_2, watr, phosphates, etc.. For instance, if you give

a man gluten, and give another man egg-albumin, and give another man legumen or casein--give him something that has uric acid in it--let different men take these different substances--and you can't tell by examination of the urine which man had taken the casein, and which man had taken the albumin, and so on. Now suppose you give one man alcohol, and then examine the urine--can you tell whether that man has taken alcohol or not ? You can find evidence of it in the urine. Here is evidence that alcohol ~~does not behave~~ is a substance which does not behave like normal food. Professor ...., of England, an eminent physiologist was the first man to take this matter up in a very thoroughgoing, accurate and scientific way, and he showed what I am saying to you. Now in reference to alcohol in small quantoties--even down to two to three drams--he claimed that alcohol to the amount of two or three drams could be assimilated; that if a person ~~took that~~ didn't take over two or three drams in twenty-four hours, none of it could be found in the urine, consequently that alcohol was a food to the extent of two or three drams in twenty-four hours. But you can see how useful that kind of food would be , of which we could ~~eat~~ take no more than two or three drams in twenty-four hours. Suppose a person could take no more of a certain food that two or three drams in twenty-four hours and that this is true of alcohol--that very fact is convincing evidence that alcohol is not a food, because if it can be assimilated only in such small quantities, it is of no practical value as a food. Let us see what amount of food is ordinarily required in twenty- four hours. We require 16 ounces of starch.
(Diagram.) In sixteen ounces of starch there are 128 drams. We also require about three ounces of albumin--24 drams. And we re also require about an ounce and a half of fat--12 drams. Adding these amounts, we have 164 drams for a day's rations. Now taking the maximum--three

drams of alcohol, and let us see what per cent. it is--it is 1.8 per cent.--less than 2 per cent. the amount of nourishment required for a day. And this is the food to which, if you add more than 2 or 3 per cent. the balance would appear in an oxidized form. But how do we know that amount is not oxidized in the cell itself? Of course such a small quantity might easily be oxidized by mere contact with the ~~cells~~ tissues. If you should take an ounce of blood and put it in some easily oxidizable substance and shake it up together, is it likely to be oxidized ? ("Yes.") Oxygen is a blood-producing substance. Oxygen is held in the red blood corpuscles, in the acid state, in a concentrated form. So the blood is a reducing agent .. Now if you take a small amount of alcohol and shake it up with blood, a portion of it disappears. So, if two or three drams of alcohol are oxidized, it could be accounted for by its coming in contact with the tissues--the blood and the cells of the liver. If you inject nicotine into the portal vein of ~~the~~ a dog or rabbit, and it takes twice as large a dose to destroy the animal as if it were injected into the hepatic vein. Have you studied Bouchard? ("Yes.") He mentions that fact. And Roget, a number of years ago, experimented upon that point, and proved it .--that dogs and frogs who had had nicotine injected into the portal vein, and the hepatic vein,--that it takes twice as large a dose injected into the portal vein to kill the animal as it does if injected into the hepatic vein. That proves that the liver destroys a portion of the nicotine. The same is true of strychnia and all other poisons introduced into the body,--and the same is true of alcohol. Alcohol, while passing through the liver is oxidized,--the liver my burn up that amount of alcohol. I think that takes place as a defensive act. So we have, in that fact, no evidence that alcohol is assimilated. But if that quantity of alcohol were assimilated, the quantity is so very small, that it is of no practical value as food.

But this is evidence that alcohol is not a food; for if it were a food it could be utilized in a larger quantity. ("The power to defend the body is lessened by the use of alcohol?") You will meet an old toper (I meet them in Chicago) and they say they are surprised that they get drunk on such a small quantity of alcohol, saying, "I didn't intend to get drunk. I used to drink ~~to~~ forty times a day, and it didn't make me drunk, and now one drink makes me crazy drunk." Did you ever meet that sort of man? So we know that to be the case .. Many old drunkards will say, "I used to be able to drink all I could ~~carry away~~ swallow, and it didn't make me drunk" (one old drinker told me that) but after thirty or forty years' drinking, one drink will make them drunk; their bodies have lost their power to dispose of the alcohol; their capacity for resistance has been used up. Tolerance was established at first, because the liquor was repugnant to the body, but after a while, the defending power of the body is gradually lessened, until it is lost.

Q. How does the action ~~of~~ of the alcohol cause the shrivelling and the misshapen cells of the brain?

A. This action of alcohol upon the blood-~~vessels~~ cells and other tissues was formerly accounted for by the supposition that alcohol had such an affinity for water that it absorbed the water from the tissues; but I have never had much faith in that theory, because it seemed to me that there is no possibility of such a thing ever happening; that such an effect could only take place in the cells of the mucous membrane with which the alcohol comes in contact, but could not occur in the brain-cells? It seems to me that when this takes place in the cell, that it is a reaction of the cell. Ether will do the same thing; strychnia will do the same thing; all irritant poisons have the same effect, according to those who have experimented on the subject.

Q. Does not the alcohol circulate in the blood ?

A. Yes.

Q. But you don't think it is assimilated even then?

A. If a man takes alcohol, in the two hundredth part of the blood, it makes him drunk; and if he swallows the one-hundredth part, it makes him dead drunk. (Blackboard calculation.) Here is thirteen punds of blood,--one-half of one per cent.of blood (blackboard.) 455. The alcohol must be gotten into the blood to make a man ~~drunk~~ dead drunk. You can see that this amount would not be enough to actually produce this shrivelling up of the tissues by the absorption of water by the alcohol.

Q. It is partially oxidized in the body?

A. It comes in contact with reducing substances, and so, changes take place.

Q. Why would it not be reasonable to suppose that the alcohol remains outside of the cell and the oxygen comes in?

A. It has been shown that alcohol does not interfere with the absorption of oxygen, as it fixes the hemoglobin; but if it actually combined with the oxygen, we would have an increase of CO_2.....

Q. It does not oxidize enough for that,

A: It does that very thing--because when a man gets drunk, his lips and face are blue, and he is in the condition of a person who is under an anesthetic,--the person is ~~at death's door.~~ close to death's door. The only difference between alcohol intoxication and ether intoxication is that alcohol intoxication is most harmful, but the effects of ether intoxication are carried much farther. Did you ever hear about ether parties? In the South, before ether was used as an anesthetic, they used to give ether on a towel to a negro and make him drunk by that means. That is the way the anesthetic effects of ether were found out. They gave the negro too much ether, and he became anesthetized and went to sleep, and they thought they had killed him--they thought he was dead, and there was great alarm, and the doctor was called in--that is the way the anesthetic effects of ether were discovered, or one of the ways in which it was discovered, and after that, it came to be used as a medicine.

Q:. How about the way in which alcohol affects the nerve-cells? Is not the effect ~~of alcohol~~ upon the nerve-cells due to the toxins which result from work? Dr. Ride rhood (?) says there is a loss of energy, when the granules disappeared.

A. I think it is due to toxins formed by work, for the reason that we can produce this very condition by injecting fatigue poisons into an animal.

Q. But there is a loss of granules ?

A. That is due to work. Now the retraction of the end-tuft, the gemmules and the dendrites--it is hardly supposable that the action of these is due to the loss of granules, butit may be the case, because we see that produced by irritant poisons, and we know that these poisons are not produced by the work of the cells, and by the fact that this same condition can be produced by the injection of fatigue poisons into animals

Q. He said that the energy of the nerve-cells depended upon being stimulated.

A. He was referring to the peripheral stimulation, also, to that of the blood.

Q. Would that have the same effect when the dendrites were withdrawn?

A. The cell seems to be paralyzed and inactive when the dendrites are withdrawn. The same thing happens when we are asleep,--there is a loss of energy from the accumulation of fatigue poisons. I think it is due to ~~fatigue poisons~~ the accumulation of fatigue poisons. If you introduce thein,, caffein, or some other antidote, or bring some stimulus to bear, this retraction is overcome.

Q. There is a counter-irritant, is there not ?

A. Yes--it gets hold and can't let go of the cell-contact; they will not separate, because the cell is overstimulated by the poisons, the effect is greater than that of fatigue poison--or by reflex irritation. Here, for instance, is a person who has eaten supper,- he is temporarily relieved--the brain is relieved of blood, because the blood is withdrawn into the stomach and intestines, and so, naturally, he becomes drowsy, and goes to sleep. But, as the process of digestion goes on and the gastric juice is secreted, by-and-by the nerve-ends of the stomach become overexcited and overstimulated, and then the solar plexus is irritated, and through this, the brain and nerves are excited and stimulated, and he wakes up; and he cannot sleep any mor That is the reason that eating before going to bed is not good, because it interferes with sleep at night. People who ear just before going to bed, do not appreciate the fact that their restlessness in the morning is due to that very thing .

Q. And sometimes, when they wake up, they eat again.

A. Yes, and in the same manner they are put to sleep again. I have known people to get themselves into an awful state --into a frightful state , I might say--by that practice, for the stomach , by this means becomes completely worn out .

Q. Dr. Fulton talks like that,--he would have the patient take a little fruit after waking up on the nigh.

A. It is a good plan for such patients to use a moist abdominal bandage, because it keeps the solar plexus quiet, and the portal vein full. Reflexly, it relieves the solar plexus, while accumulating the blood. The bandage must be covered with a mackintosh--now let us go on.

Alcohol, then, belongs to the same category with tea and coffee, tobacco, and other poisonous substances, and is not a food. Foods oxidize in the body. Alcohol is oxidized only as other drug-substances are oxidized,--or as quinine, strychnia and iron are oxidized. Most soluble substances when taken into the body undergo some change,--we may say, as a rule, that any oxidizable substance when taken into the ~~body~~ stomach, and which can be taken into the blood, will be more or less changed in passing through the body. So I think, if alcohol is a food, then all oxidizable substances are foods...There are four important alcohols ----ethylic, methylic, amylic, and butylic,--all these substances are oxidizable in the body, the same as wine spirit, etc. Creosote, carbolic acid and other allied substances are related to alcohol, and which, when passing through the body--is there any change? ("There is partial oxidation.") The very same thing is produced in creosote and carbolic acid; and all organic substances which are capable of being reduced, undergo the same changes as carbolic acid--does that undergo a change? ("Perhaps so.") Yes; and oxalic acid appears as an oxalate; but it may be burned. Oxalic acid, when burned, is converted into CO_2 in water; so it may be oxidized in the body.

Q. Does Dr........recongnize this fact?

A. He says nothing about it. I wrote an article published in Modern Medicine, in which I called attention to the fundamental error of Dr. Atwater, showing ~~that~~ that whatever is food must be assimilated; that alcohol is not a food because it is not assimilated, etc.

I got a letter shortly afterwards, asking for proofs , and I gave the arguments which I have given you, but I have not heard from my correspondent since. Not long afterwards, I was glad to see physiologists taking up the matter, and at least a dozen of them pounced down upon Dr. Atwater. One of them said he had heard so great a heresy since the days of Liebig. Liebig recognized only two kinds of foods viz., tissue-forming foods, and fuel-foods. Of course that was a serious error, and one which physiologists have gotten out of, long ago.

LECTURES TO MEDICAL STUDENTS, Feb.2,1903.

Dietetics, (con.)

J. H. Kellogg, M. D.

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There are two kinds of foods,-- organic foods,or ~~carbonaceous~~ nitrogenous, and carbonaceous. Nitrogenous foods are developed in proteids and albuminoids. Gluten, casein, myocene and legumen are good representatives of proteid foods. There are others--fibrin and various other substances, constituting such a small proportion of foods that we will leave them out. We rarely meet with albumens except in eggs, and the juices of vegetables, and there is but a little in milk. When milk is boiled, and the scum rises to the top, that is the albumin of milk, which has been coagulated; that is the scum, or skin, of milk--it is coagulated albumin. And when, in the juices of vegetables, a little curd appears on the top of the water in which it is boiled,--that is vegetable albumin in the juices of vegetables. This is also true of fruits--they contain a minute quantity of soluble albumin. These albumins are, for the most part, alkali albumins. We also have gluten, or proteids. What is gluten? It is a compound substance; it contains vegetable fibrin and vegetable albumin--a vegetable casein and a vegetable gelatin, the vegetable gluten combining the other elements together ~~and~~ gives them their peculiar characteristics. This property of gluten is due to the gelatin which it contains Some cereals do not contain vegetable gelatin, consequently they have no gluten; they have nitrogenous constituents, but they don't contain ~~gluten~~ gelatin, so they don't have gluten. Gelatin is necessary to gluten. I was interested in an experiment the other day: I took some wheat flour and washed all the starch out of it, and then had

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and then had pure gluten. Then I mixed oat flour with the gluten, and then washed it and stole the casein out of the oats. I thought there was enough gluten to capture the casein of the oatmeal..I wanted to give the gluten a chance to pick up the vegetable casein. I didn't find the experiment so successful as I thought it would be, for I expected it would take all the casein out. I think it might be done by adding oat flour to the gluten and take the casein all out of the oats. Casein is found in milk (writing constituents of foods.) Legumen is nitrogenous, and is principally peas, beans and lentils. Gelatin is an albuminoid--it is not albumin, it is an albuminoid. It differs from other foods, and must be taken in combination with them--carbonaceous and nitrogenous principles--in order to sustain life; it cannot sustain life by itself. That experiment has been tried upon some Scotch prisoners: They were fed on gelatin soup, and they grew weak and feeble very rapidly. In carbonaceous foods we have starches and sugars, and there are various kinds of starches and sugars. We have the starches of cereals, sugars and vegetables, and they differ very considerably; their digestibility varies greatly. And we have some substances very similar to starch--inulin is one, and inusite is another; they differ from starch in some very important respects. And we have three sugars,--the three sugars of the di-saccharide type--cane sugar, milk sugar and malt sugar. And then we have the sugars of the mono-saccharide type,---glucose, of which there are two varieties, dextrose and levulose. We have also galactose, which is formed from the milk sugar. Besides, we have some other sugars, as, Mannite which is valuable in some cases. And we have sugars from the diastatic digestion of inulin.

These starches and sugars behave differently. Here is casein, myocene, etc.(writing formulas on blackboard.). Sugars formed from inulin, mannite, inusite--these substances seem to be more readily assimilated by the body than in any other form, so that persons suffering from diabetes are able to assimilate these carbo-hydrates when the cannot assimilate ordinary starch or sugar. This fact is taken advantage of in prescri making prescriptions for diabetics.

Q. Is not maltose more readily absorbed than cane sugar?

A. Yes, because it always contains an abundance of maltase, and in digestion it is converted into two molecules of dextrin; ~~whereas cane sugar~~ it is converted into levulose and dextrose. Cane sugar is a vegetable sugar; it is the sugar of grasses and roots of trees. Cane sugar is found in the roots of maple trees, in the beet-root, in the sugar cane (sorghum)--these are the sources of cane sugar--grasses and roots of trees-- so they are the natural food of herbivorous animals. Dextrose and levulose are the sugars of fruits, and are natural diet for man and for the higher apes. This is a significant fact which should be borne in mind. The diabetic cannot digest cereals at all; he cannot assimilate the carbonaceous matters contained in cereals He is able to assimilate mannite, and he is able to assimilate the carbonaceous matter of the Jerusalem artichoke, which is inulin. He is also able to assimilate inusite, which is found in beans. The sweet principle of string beans is inusite. Mannite is found in manna, the gum of certain trees found in certain parts of Arabia.....So much for starch and ~~fats~~ sugar.

Fats : The carbohydrates and hydrocarbons, olive oil, which is a convenient representative of fat, and butter. And we have various substances in the vegetable kingdom very closely resembling butter. What are the three principles of butter ("Oleic acid, stearic acid, and carbonitic (?) acid.") Which is the most abundant in butter ?

("Oleic acid.") Olive oil melts at ordinary room temperature, while butter does not. The digestibility and the absorbability of a fat depend upon its melting properties.

There are other organic substances which may be classified as foods, since they are utilized in the body. We shall be obliged to classify oxygen as a food for it is utilized in the body. Water must certainly be classified as a food, and in a large sense. Air also may be classified as a food,--we must put down oxygen as a food, because it enters into the composition of the body. Water was once considered valuable as a diluent merely, but water actually enters into the composition of the body. Water is derived from fruit...In the process of digestion the gluten is hydrated--the nitrogenous principle is hydrated and converted into peptone that requires the addition of water to the proteid molecule; so we have actually a use for water--not simply as a diluent but as an organic combination. The water is taken up into the molecule, and then it iscarried on into the blood, enters into the composition of the tissues, and goes right with the tissues and the carbohydrates, and finally it enters into the tissues, so it is a food . In the same way oxygen is a food. Oxygen is carried into the tissues by the red corpuscles and the serum of the blood, and, coming in contact with the tissues, it enters into the molecules and becomes a part of them. That is the way we get energy,--by a combination of hydrogen and oxygen. The molecules fall apart, and then there is a new arrangement by which the oxygen enters into the combination and forms water. Oxygen and carbon combine directly in the tissues. But in the combination of hydrogen and oxygen (?) we don't have a hot fire, so we know that there is simply a rearrangement of the atoms of which the molecule forms a part .

We speak of "atoms," but there are no such things as atoms. We also speak of "molecules," but we don't know what they are,--we don't know how big they are. All that part of chemistry is purely a hypothesis, and we use these terms as a matter of convenience, and as a working foundation,--it makes a splendid working foundation, but as a theory, the atomic theory has hardly a leg to stand on. When you analyze the atomic theory, it is absolutely absurd. It must be admitted to be merely a foundation for work, or working hypothesis. By the taking of water into the body the pressure is modified; so the nutrition of the body may be changed in this manner--the blood-pressure is modified, and increased; and by this increase of pressure ~~, and by this increase of pressure~~ we ~~one~~ can exercise an important influence upon nutrition The movement of fluids, with the blood, into the tissues will be increased, and thus the supply of the individual cells will be increased. By this increase of pressure, we have an important means by which the energy of the body is increased. By increasing the pressure of the blood, we actually increase the force and energy of the body. So water, in this respect, a means of force and energy to the body. We take water into the stomach, and it is absorbed into the blood-vessels, and the tension is increased,--we thus increase the arterial tension, and there is increased heart-force --there is an increase, not of resistance, but increased pressure from within, by which we have increased heart-force--the heart contracts more vigorously, and this depends upon the pressure of the vessels, ~~and~~ the blood is forced into the tissues, and the energy of the body will thus be actually increased. So water is not simply a diluent,--it is not simply a means of solution of food-elements--it is itself an important food, containing a food-substance wh whic enters into the composition of the body, and also, by its important function of blood-pressure, actually adding energy and power to the body, although it is itself an inert substance.

This is a very important thing to remember, because, when you have a feeble patient, and who is feeble because he don't drink watr enough, by increasing his watr-drinking until he can take two or three quarts a day, until he gets his blood-vessels well filled, we may wonderfully increase his energies. Here is a man walking a long distance; he has become very much exhausted, dry and thirsty. A glass of water in a short time wonderfully revives him. Why? Not simply because water dissolves the food elements and carries them into the blood, but because it increases ~~the~~ blood-pressure and heart energy, and thus sets the vital machinery to working at a more rapid rate and with greater vigor.

Q. How about salt?

A. I don't believe in salt. You will not find it mentioned in your text-books as a food. It is sometimes claimed that the lime in water is a valuable substance,--that it ~~has~~ is valuable as a food--has important food value; but I don't take any stock in that theory at all. Phosphates may be swallowed after dinner if you want them, but not as food; I don't believe in the theory at all. These so-called inorganic substances belong with the proteids and are a part of them--you can't find them actually in living substances. Gluten has phosphates associated with it; but suppose you apply to gluten the ordinary tests for phosphates,--you wouldn't find them. If you examine the urine, you will find that there are phosphates in the urine--you ~~would~~ will find crystals which will tell you that it is a phosphate. There are triple phosphates...Here is a living substance--gluten or albumin or any other organic substance--we will say, food substance,--examine them with the microscope, and do you find phosphates there? ("No.") Do you find carbonates there ? ("No.") Sometimes you examine the skins of onions, and what do you find there? ("Kariokinesis.") No. Suppose it is a little old and dry,--what do you find there that is akin to what we are talking about ? Oxalate lime-crystals. These are no longer a part of the living substance of the onion; they are now foreign bodies, and are not a part of the living tissue . I think this is an important question.....

Mankind cannot live on chemical substances. There is no chemical substance in food except oxygen. Only inorganic substances are foods. The organic salts are the residue of foods which have been destroyed. It is only when we have supplied to the food some process by which the complicated organic ~~multiple has~~ molecule has been destroyed that you can find these substances....Here is a great proteid molecule,--how many atoms is there in one of them ? ("Several hundred of them.") It has been estimated that there is about 480 --suppose it is 500. We will say this molecule is a mass of gluten,--it is subjected to chemical analysis--we will find salts in it,--and what else? ("Phosphate of sulphur.") A small allowance of sulphates, some carbonates, a very little chlorides, and some potassium salts, a minute trace of chloride of sodium and a very little iron... But there is no oxide of sulphur there; there is no sulphuric acid there. We find oxygen, sulphur, etc. We have hydrogen and sulphate (Writing on blackboard.) Here is potassium, a little sodium and a very little iron. Here is sulphur, hydrogen and oxygen. Put these together and we have sulphuric acid . Here is phosphorus--we have some lime here--we have phosphorus, oxygen and lime--put these together and we will have what ?("Oxygen phosphates")

We will put some hydrogen in it, and we will have some acid phosphates. But there is no acid phosphate here; but out of this, we can get a lot of things--sulphuric acids, carbonates, etc. But it is only after this molecule is destroyed and broken up that we find these things. Here is a great tree,--saw it up and make different articles of furniture chairs, etc., out of it. So we take these substances and subject them to chemical processes, and we find inorganic compounds. We might say that we are not studying the original thing, but the dust out of which that original thing was made. Now every bit of matter is composed of dust plus something --what is that ? (Life.") Life or universal energy, and this universal energy added to dust makes the organic molecule,-- that is the direct product of the action of life. Now when we have torn this molecule to pieces we have only the original dust out of which it is composed. So we cannot call these salts food, but simply the dust out of which food is made. Do you believe that? You will be led into all sorts of trouble, if you don't. . . .

It is impossible for man to make living matter, out of dust, because if it were possible for man to make living matter out of dust, he would be a creator. He can't do it. Man depends upon God's power to create him, and he creates man out of dust; and there is no power in the human body to give life to inorganic matter. This life must be given to it ~~to the body~~ before it can be taken into ~~out of~~ the body. Oxygen and water are are two remarkable substances which enter into the composition of the body. They are the two wonderful substances which have been appointed for that purpose in the world. But when you destroy living matter, and find a residue of this, that, or something else, we are permitted to say that those things were in it before it was destroyed, as the different articles of furniture, chairs, etc., were in the tree in the first place. The only exception is found in this fact, that in some organic substances there are inorganic substances which have been deposited there and which exist there simply as foreign bodies; you can see them in the oxalates of lime, etc.

Q. You don't think that can be accomplished (not understood.)

A. No. But if the body can be built up out of phosphates and carbonates, then that would be possible. But the order of nature is, that in vegetable organization the energy of the sunlight should come in connection with the chlorophyll,--it is the inorganic substances out of which nature weaves this marvelous web that we call "living substance." The atoms are rearranged and formed into living substance. The carbons and hydrocarbons, the carbohydrates and proteids are the three great classes of substance formed by plants. Then the animal takes these substances and incorporates them into itself. Man has no power of organization; he simply utilizes these foods. The body has in it, through the process of digestion and assimilation, the power to transfigure, if you please, this food. The transfiguration of food is one of the most wonderful things that you can imagine--taking these foods--potatoes, bread, etc.,--into the body, and glorifying it, so to speak, through the process of assimilation. The things you eat to-day will be walking around, and talking and thinking to-morrow.

Q. What about the food-value of iron?

A. There has long been much skepticism as to the food value of iron. I once read a little story which may illustrate this -- of course the little squib was only a take-off on the idea of the food-value of iron which many people had: A man was once imprisoned for ~~sme~~ some crime. Of course he was very anxious to get out, and resorted to all sorts of devices for that purpose. At last he happene to think that he had been taking iron, and had been taking large quantities of ~~it~~ "iron bitters" for several months before getting into prison. So he tapped a vein and drew out blood enough to make a crowbar out of the iron which it contained, and pried his way out of prison. That is just as reasonable as to appose that "iron bitters" could have actually fed a man. If that is the case, how is it that a man suffers anemia from the use of iron. Sometimes they are benefited,--I remember when I was a student in therapeutics, the Professor , in one of his talks, recommende iron, and then said, "I must say one thing more to you,--send your patient out-doors and give him plenty of nourishing food, otherwise the iron will do him no good." I then sent in this question: "Why not leave the iron out? Would not the nourishing food and ~~sun~~ fresh air do him just as much good without the iron as with it?" He said, "Perhaps it would." Now there is some iron in food. You wuould be surprised to see what a strong iron taste you will get from the tomato. The strawberry contains a large proportion of iron, and there is a considerable amount of iron in the tomato, but it is organic iron--tomato iron, if you please.--iron in the form in which nature has prepared it for assimilation in the body; and in that form, it is useful, and ca become a part of the blood-crystals.

Here is a patient suffering from anemia, and for some reason this iron in the food does not get into the blood, but is precipitated into the alimentary canal and lost, so that it does not get into the blood. But this iron precipitates the (poisonous?) substances, so that the food iron goes into the blood, while the medicinal iron does the chemical work which is necessary to satisfy these iron-craving compounds

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found in the alimentary canal in these cases.

Q. They do not antidote the toxins?

A. Instead of antidoting the toxins formed, they stop the formation of toxins. We can do that by putting the patient on a diet of fruits and the use of enemas, and clear out the alimentary canal, and give the patient a diet adapted to the condition of the stomach, washing out the stomach and building up the resistance, and thus stop the formation of these acids that rob the food of its iron, and then let the food go into the stomach in its native state,--because the food always contains iron enough for the body... So it is only necessary that the dyspeptic condition of the stomach shall be corrected, and then the condition of anemia will disappear, either with or without iron.

I suppose a large share of the patients who come to the Sanitarium have taken iron and iron and iron--iron in enormous quantities. I will guarantee you that you will not get hold of an anemic patient who has not taken iron in large quantities,--and yet they are anemic. In the London hospitals you will see these anemic people; they are given iron until their stomachs are upset; it disturbs digestion and disorders the liver, because the liver undertakes to dispose of it, and does seize all it can of it, and the liver is thus greatly overworked, and so ~~the liver~~ it cannot make bile as it should, and the patient suffers from deficiency of bile. ~~and~~ There are various other evils growing out of the use of iron.

What we say of iron, we may say of drugs. Opium, for instance, relieves pain, but it does not cure the patient. Iron will increase the blood-count, but it does not remove the cause of the anemia, but it may aggravate the patient's condition by disturbing the liver and the digestion. So you must not be led astray by this fallacy. Remember this, that it is nature that heals, and that drugs cannot heal. They are only palliatives, while the physiological measures which we employ are curative. They remove the cause of the trouble and build up the resistance of the body, and its power to fight disease. Tomorrow you may each write a paper on "Diet."

Miss Horner
C/o Dr Kellogg's Residence
Med Lect Feb. 2/13
Dietetics (File)

LECTURES TO MEDICAL STUDENTS, Feb.12,1903.

DIETETICS, (Con.)

J. H. Kellogg, M. D.

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TABLE OF FOODS .

- FOODS
  - ORGANIC.
    - Nitrogen,
      - Proteids,
        - Albumin,
        - Casein,
        - Gluten,
        - Myosin,
        - Legumen.
      - Albuminoids, - Gelatin.
    - Carbon.
      - Carbohydrates,
        - Starch,
        - Sugar, Sugars,
        - Dextrin
      - Hydrocarbons,--Oils and fats.
    - Salts,
    - Peptogen,
  - INORGANIC
    - Oxygen,
    - Air,
    - Water.

LECTURE TO MEDICAL STUDENTS, Feb. 2 1903.

DIETETICS, con.

J.H.Kellogg,M.D.

We will begin with foods. First we will write Organic, Inorganic. (Writing classification of food on blackboard.) Under the head of "Organic," we will write Notrogenous, Carbonaceous, Organic Salts, and Peptogens. Under the head of "Nitrogenous," we will write Proteids,--what proteids are there ? ("Albumin, casein, myocene legumen, albuminoids .") This will represent the foods,--although there other substances,--the hydrocarbons are fats, and the carbohydrates are saccharides. The carbohydrates are starches, dextrins and sugars. There are many different kinds of starches and sugars. Every vegetable has its own starch. Itis important to know how the starches differ . When I studied physiology and chemistry, starch was starch, but now, we know there is a wonderful difference in the starches,--different kinds of starch, as , potato starch, oatmeal starch, corn-starch and various other starches which are decidedly different in character .Some of these starches are more easily assimilated than other starches,--but we will take that up a little latr.

Now we want the hydrocarbons,--the oils and the fats. These oils and fats consist of oleins,--of what ("Glycerin.") Yes. When we separate the oleins and stearins, and the fatty acids combining with th glycerin base--these constitute the oils and fats. These fats have their different characters, some melting at a lower temperature than others, for instance, butter melts at a temperature between that at which lard and tallow melts... Then there is vegetable fat. There are also fruit-oils, and nut-oils,--peanut oil is really a nut-oil, altho' the peanut grows in a pod in the ground like a bean,--still it has the composition of a nut. In the bean we have 60 % of starch, and in the peanut we have 50 % of fat. The starch in the bean that is lacking in the peanut is replaced by fat. In the "Soja" bean, which is largely used in Japan and some parts of China, the starch is partially replaced by fat. The ~~"soja"~~ "soja" bean contains almost 20 % of fat, but the ordinary bean contains almost no fat. That is the reason the New Englander puts into his beans when he bakes them, a piece of pork, because baked beans are not very satisfactory to him without the fat.

Now, "Inorganic,--" here is Oxygen--I suppose we ought to say "Air." There may be something in air besides oxygen. We have recently found a new metal in ~~from~~ air--what is it ? ("Iron?") We have found "helion"(?) in air. Then there has been found in air something like rain. It has been found that if rainwater is boiled and condensed, that the residue will give off X-Rays or actinic rays, which will take a photograph--this can be done with the residue produced by boiling down rainwater. There are many ~~things~~ wonderful things that the refined methods of modern chemistry and research are bringing to light all the while. So it is found that oxygen, air, and water are "inorganic."

Suppose we classify foods a little further: Foods may be divided into two classes--foods which nourish the body, and foods which aid in the process of digestion. The foods that nourish the body, are the nitrogenous, the carbonaceous, and the salts. And the foods that nourish the body are the peptogens, or foods which somehow aid in the process of digestion,--they call forth the activity of the digestive glands. This substance, "peptogens," has been known for many years--for the last ten or twelve years particularly--the idea has been coming forward more and more distinctly that there ~~is~~ are certain substances which, while they are not essential to the building up of the body (tissue-building) they nevertheless aid in this work. It has been found that egg-albumin when given to a dog is not digested,--the stomach of the dog paid no more attention to it than it would to a piece of wood.. This is a very curious fact. If a piece of beefsteak is thoroughly washed so that it is clean and white, and put through an artificial window in a dog's stomach, the stomach will pay no more attention to it than it would to a piece of rubber. # Recent ~~These~~ studies of this subject have shown that there are in foods, certain subtle substances ~~in foods~~ in addition to the so-called "food-elements " proper.. Recent studies of milk have shown the same thing ,--that is, if you should take a given quantity of milk and separate the casein from it and put it away in one place, and separate the sugar and put it in another place , then take out the fats and put them in another place , then take out the salts and put them in another place ,--it would then appear that we had the whole of milk in these four parcels. But suppose we put them together in the same proportion as we found them, adding the necessary amount of water--would we have milk? It would look like milk, but it wouldn't taste like milk, but if you gave it to a child,it would not nourish him; and if you feed a pup on it, he would die. You may put together the sugar the starch the fat and the albumin just in the proportion that you found it in the milk, and feed that to a dog, and he would die almost as soon as if he had nothing at all given him to eat,--in other words, he will not be nourished by it. Why is this ? Because there is in food, in addition to the so-called food-elements, a subtle substance which is essential to the nutrition of the body,and which is essential to the digestive process,--there is something there which calls forth the digestive power and activity of the stomach.and causes it to form acid and pepsin, and to produce its milk-curdling ferment and rennet ferment. Paulow (pronounced "Pavlow") has given this question a great deal of study. Debove, a number of years ago, gave the matter considerable study, and in his work on Digestion (which I have in my library) he gives more attention to this question of peptogens than any previous author has done.. But Paulow has recently brought forward a wonderful flood of light on the subject of Peptogens. He has shown that there are two kinds of peptogens,--that there is one sort of peptogens which causes the pouring forth of a large amount of acid, and one which provokes the secretion of acid--I might say there are three classes of peptogens: There are peptogens which provoke the secretion of pepsin, and there are other peptogens which cause the formation of acids and pepsins both.. The salts of meat, the purin bodies-- the uric acid and the various purin bodies found in meat--the xanthins, etc., are found to be wonderfully powerful in stimulating the production of hydrochloric acid. This fact was not pointed out by Paulow, but by a German investigator. But Paulow has pointed out the fact that salts in general, and the extracts of meat have the effect to stimulate the production of hydrochloric acid.

On the other hand, Paulow showed, or claimed, that commercial dextrin had the effect to stimulate the formation of both pepsin and hydrochloric acid. But those who have reviewed his work have shown that this is not correct,--that pepsin or dextrin, does not have that effect, but that there certain subtle substances which are associated with the dextrin. Dextrin is a food element--a saccharide--closely allied to sugar and starch and is a food element. The food elements, however, do not have the power to call forth the activity of the digestive organs. But there are certain subtle substances, the composition of which has no been determined, which have wonderful power to provoke the digestive activity of the stomach. So this pepsin--this dextrin which has been formed by the digestive activity of the diastase or ptyalin of the saliva, has associated with it certain volatile or aromatic substances which have this effect. But if we purify the dextrine, these substances are removed, and no longer have this effect. That is the reason Paulow made use of the crude, impure dextrin, which ~~to~~ produced this effect.

We see a beautiful arrangement in this effect: When cooked starch is taken into the mouth, the saliva acts upon it, and converts some of it ~~into~~ into dextrin, and together with this, , the cooked starch produces these peculiar substances. You have noticed a difference ~~that~~, in chewing cereal foods--for instance, bread--here is some flour that has been cooked--it has simply been boiled and made into gruel. You eat that. Then take some of that same flour that has been mixed up with water, and bake it in the oven, and eat some of that, and you will find that it has a different flavor from that which has been cooked into gruel. They have simply been exposed to different temperatures, and have been prepared for the action of the saliva in a different way, and different in degree. When these substances are eaten, the saliva acts upon them to a certain degree, and when taken into the stomach they possess different qualities of peptogen. The saliva produces the peptogen whaich causes the stomach to pour forth gastric juice,--what for ? To digest the starch,--and then to digest the proteids. So the digestion of starch prepares the way for the digestion of proteids; and the acid formed in the stomach passes down into the intestine, and has the effect to provoke the pouring out of bile and of pancreatic juice, which are necessary for the further digestion of substances which have undergone a preliminary change in the stomach.

These are wonderfully interesting facts, and they teach us the fact that there is an intelligent direction of the whole digestive process, and that it is not a chemical process, --that it is not a mechanical process al process; it is not a thing that is going on in obedience to some blind , but there is an intelligent direction in it . Paulow had gone further and shown that for each particular food taken, there is formed a particular gastric juice. Why is that ? Because each particular food has a different kind of peptogen, or a different quantity of peptogen. But the amount of peptogen for each particular food seems to be just adapted to the digestive activity required by the stomach. Paulow makes an argument based upon this fact--and which I don't like--he took a dog and made a window in his stomach--you are familiar with the two-stomach experiment I believe? ("Yes.") He gave his dog meat, and noted the amount of gastric juice ~~formed~~ secreted. Then he gave his dog bread, and he found that when bread was given to the dog, the dog secreted more gastric juice than when meat was givrn to him. What does that prove ? Well Paulow claimed that it showed that the proteids of meat are more easily digestible than the proteids of bread,--in other words, that animal proteids do not require so much power and activity on the part of the digestive organs as does the gluten or proteids of bread, for their digestion. Now that is hardly a fair conclusion. It proves that bread has more peptogens in ~~it~~ it. That is what it proves,--and that is all that it does prove. But Paulow may say, "Why should ~~the~~ bread have more peptogens in it than ~~meat~~ does meat, unless it required more peptogens to digest it ?" What do you say to that ? He said, "The meat has in it the right proportion of peptogen to digest the meat,--that is, to call forth from the stomach the amount of gastric juice and the kind of gastric juice necessary to digest the meat." Now if bread produces more hydrochloric acid and more digestive fluid, --more gastric juice than meat does, that proves that bread requires more digestive activity of the stomach to digest bread than it does for it to digest meat, because there are the peptogens there in the right proportion

("Perhaps the dog masticated the bread more thoroughly than he did the meat?") He generally chews his meat pretty well,--especially in odder to get it off the bone, and if the meat is tough. But there is an answer to this: ("I think it would show that bread is a more suitable food for man than meat, from the fact that it has more peptogens in it.") There is a good answer to this,--and that is, that bread is not a natural food, but an artificial food, and must undergo the process of baking-Bread does not grow on a tree. ("Neither does meat grow on a tree.") No, but it is a natural substance,--sometimes meat grows on a tree--a bird is meat and grows on a tree. Meat grows, but bread does not grow. And in the process of baking bread--the raising of the yeast and the fermentation of bread by the action of bacteria and the yeast upon the bread, has the effect to produce dextrins. And there is a little diastase or syntonin in bread alsoin the bran of the bread, and this material acts upon the starch and converts it into sugar and dextrin, and along with this sugar and dextrin are produced these aromatic substances which act as peptogens. So we have in bread a highly peptogenic substance. We have a melting process going on, and everything, as Paulow has shown, is highly productive of acid and pepsin. In dextrin we have that very thin formed in the raising of bread,--~~in the raising of bread~~ and then, in the crust of the bread, there is dextrin formed by the action of heat. So wehave an artificially produced peptogenic substance, so the bread produces more peptogen than does meat, --that's the reason. This fact proves simply that bread is a more highly peptogenic substance than meat. That is a very useful thing to know, because it shows that bread contains more than enough peptogenic substances to provoke gastric jui for the digestion of bread, and hence that bread would be an aid to digestion; whereas meat contains only enough peptogen to call forth the digestive fluids required for its own digestion, while bread contains more than enough peptogen for its own digestion.

Paulow showed that the addition of dextrin will increase the production of acid and pepsin 600 % or six-fold,— --it wiel be increased six times, even in the rectum....His experiments in this regard are certainly wonderful and remarkable .

But you can now see that his conclusion ~~is wrong~~ in relation to bread is wrong, because bread is not a natural food, but has been acted upon by ~~other substances~~ yeast and other substances,--if bread were a natural product, and was provided naturally, for man's sustenance, we would naturally suppose that there would be only a sufficiently large amount of gastric juice to digest the bread ,but, as we have seen, it is not a natural product, but is an artificial one....

Q. (Something about the "dog.")

A. I have been trying to find a "Paulow dog" but have not been able to find him. Paulow's work has been considered authoritative, so I suppose it has not been thought necessary to repeat this experiments of his. But there are none so much interested in this question as we are, and I don't think it would be wrong for us to ask a dog to help us in this matter.

Q. Does peptogen act upon the intestines and increase their activity?

A. It has been known for a long time that the absorption of these substances during gastric digestion prepares the pancreas for their work., and the reflex action of the acids poured out in the small intestines cause the liver and the various biliary passages to empty themselves and the digestive fluids are poured out.

Q. Do all foods contain peptogen?

A. All natural foods contain peptogen--some more and some less .

Vegetables contain very little peptogen. That is the reason why vegetables are so difficult of digestion. Thatis one cause why vegetables don't agree with other foods ,--thatis one reason, but the great reason is , that vegetables lack peptogens. I suppose you have been told by many, "I can digest potatoes and other vegetables when I eat meat; but as soon as I stop eating meat, I cannot digest vegetables; while I eat meat I can digest other foods better than when I do not eat meat." There is a reason for this . Beef-soup is peptogenic,--beef is peptogenic , while vegetables are not. Bean-soup is peptogenic, as well as beef-soup,--that is the reason you find uric acid in bean-soup--four grains to the pound. Bean-soup is sufficiently peptogenic. Meat is peptogenic, and particularly calls for the formation of acids.

Q. What is panpeptogen?

A. It is a starch that has been acted upon by a diastase ~~in~~ which acts in such a way as to produce the largest amount of achroödextrin possible, and it contains these aromatic substances along with the dextrin.

Q. Is the saliva peptogenic?

A. No. It is slightly alkaline. It has been held by physiologists that the alkalinity of the saliva has the effect to stimulate the stomach to pour forth hydrochloric acid .

Q. In case an animal has a fistula in the neck, and after food has been swallowed, it comes out at the neck, does the gastric activity go on while the animal is eating, and does it not require the presence of food in the stomach to cause an increase of gastric activity?

A. That is a reflex action. There is a sort of activity produced in the stomach reflexly.

Q. Mr. [illegible] said he had a dog who had gastric fistula, and that while asleep, he put a piece of dry bread in his stomach and he had no secretion of fluid, ~~The same effect~~ but when a piece of ~~meat~~ bread with meat juice (?) was put in his stomach while he was asleep, it produced digestive fluid. The same effect has been produced by putting in the stomach a quantity of cold water,--the cold water excited the secretion. He found that when he put the dog in a cage and brought some meat or savory food very near to the dog's nose and let him smell of it before putting it through the window in the dog's stomach, it excited secretion of the ~~stomach fluid~~ gastric juice. I suppose we have all had the same experience and have had our "mouths water" when we smelled savory food. It is a common expression,--when we see or smell of savory food, we say, "It makes my mouth water."

Q. Do you say that meat extracts taken into the stomach excite the secretion of acids in large proportion?

A. His (Paulow's) experiments seemed to show that dextrin has the special property of stimulating the formation of pepsin; and that dextrin when taken in considerable quantity causes the production(?) ~~oxidation~~ of both pepsin and acid. There is also quite an effect produced in the stomach by the vegetable juices. The purees seem rather to secure the production of pepsin rather than acid.

I had an interesting time in Kalamazoo a few days ago. The doctors down there were anxious to know something about hydrotherapy, and asked me to come down there and read a paper before them, on that subject. They waited for me from 1:30 to 3:30, as I was detained. I found thirty or forty people there. The doctors seemed to be much interested in the subject of Hydrotherapy. One of them, Dr. Edwards, the Superintendent of the Insane asylum in Kalamazoo, made some remarks at the close of the reading of the paper. He said that he had been making some comparisons. He found that, twenty ~~seven~~ years ago, he found that ~~of~~ for 347 insane ~~people,~~ women, 100 doses of chloral were given every night; that one in every three tok chloral; he said that they used chloral by the jug-full. "Now (said he) I was looking over our record in Feb. 1902, twenty years afterward, and he found that of 717 ~~persons~~ insane women, the average was 1.7 of a dose for the whole of them for a day; that is less than two doses a day for 717 persons, as compared wih a hundred doses for a day for 347 persons." Just see what a tremendous diminution there was . He also said, "We found the wet-sheet pack sufficient to make our institution more quiet than before, without giving any medicine at all. Patients sleep better, there is less disturbance; the nurses have less labor to care for the patients , and the patients get well better without medicine than with medicine . He said, "I have no hesitation at all in saying that for insomnia,hydrotherapy is more efficient than any medicine that I am acquainted with." That is good/strong testimony in favor of hydrotherapy. Dr. Edwards made these remarks, after some objections and remarks had been made by Dr. Crane. I had some charts there, showing the effects of hydrotherapy, and Dr. Crane raised some objections,--he said, "How could the bloodvessels of the ~~vein contract~~ brain contract when there were no muscles in their walls?" He had been taught of course, that ~~there were~~ the blood-vessels of the brain had no muscles in their walls , so how could they contract? Now tell me what I should have said? How would you mee that ? ("Protoplasm can contract.") The nuclei can contract; capillaries can contract as well as arteries ~~can~~ the arterioles,-- and they have no muscles in their walls. The nuclei can contract,-- that is the thing to notice--and if the nuclei can contract, the cells can contract,--and they do contract, because their caliber is lessened.

There is another thing to be said,--and it occurred to me to say i them, but the time was a little short, and I didn't say it: Professor Heber (?) , of the University of Michigan, has discovered that there are vasomotor nerves in the vessels of the brain, and that question is now settled, zoölogists having searched for these nerves for many years. Now if there be vasomotor nerves in these vessel walls, you would expect to find involuntary muscles there, would you not ? At any rate the fact rests upon experimental evidence. Professor Schuler, in 1874 ,published his experiments on monkeys and rabbits. He found that when he trephined the skull and put a bit of ice on the brain, that it actually caused contraction of the vessels of the brain; the vessels contracted under his eye. So there is no doubt at all but what the vessels of the brain have power to contract--they can contract. I think that this power is less in the brain than in other parts of the body,--but we cannot be sure about that . He (Dr. Crane ?) ~~(Prof. Schuler?)~~ said he doubted these local effects that were talked about ; he didn't believe in the local effects of hydrotherapy. He believed in the general effects, but he did not believe in the local effects. That seems curious doesn't it ? When old ladies have for so many years using fomentations for boils and other troubles. Some time ago I was interested in a little circumstance while in California watching animals in an animal-house. I looked into the monkey - cage and examined them--they look so much like me that I am always interested in them. There were two monkeys in the cage that I examined--a big one and a little one . The big monkey was carefully guarding some nuts. The little one wanted some nuts, but the big one wouldn't let him have them, so he ran off whining and left them. He then got up behind the steam-coil in the cage and he gathered his arms and legs about him, pressing his stomach up against the steam-coil. Evidently he had the stomachache,and knew that fomentations were good for it; and the big monkey knew enough to know that the little monkey had eaten enough. When a man's tooth aches, he presses his hand over it. When a boy has the stomachache, he pulls his knees up as near his stomach as possible, to keep it warm. The same thing applies to earache,--I have often seen a dog carefully place his paw over his ear when lying down. This shows that is an instinct within animals and in ourselves telling us what to do,--to use hydrotherapy. This is a better argument than any philosophical dissertation to prove that there is an instinct in animals and in mankind which teaches us to do that very thing. That instinct is a divine voice within us and speaking to us--it is the creative power within us that made us and maintains and preserves us, telling us to do these things-- in other words, it is God speaking to us, and telling us what to do-- and it means that these things are good things to do, and that there is a sound philosophical reason for doing them.

The doctor (Crane) made another assertion, which showed that he had not studied anatomy so much as he should have done. Now He is an intelligent, cultivated, up-to-date man,--a bactriologist, a chemist and a progressive man. But he said, "This vascular or fluxion ~~effect~~ this effect is produced that has been talked about here, --that ~~there is~~ a connection between the skin and the internal organs--all that is entirely impossible. There is no connection between the bowels and the skin,--they are entirely separate and free from each other. There is no connection between the kidneys and the skin--they are entirely separate. And there is no connection between the lungs and the skin--they are entirely separate from the abdominal wall, and are entirely nourished by the lesser circulation-- the lungs receive their blood from the pulmonary vessels only; and, if should apply cold to the chest and cause contraction of the pulmonary vessels, it would be the worst thing that could be done , because it would asphyxiate the patient; it would prevent the passage of the blood through the lungs, and interfere with and prevent the purification of the blood." That was quite a serious assault upon hydrotherapy, wasn't it ? He then went out . Of course I very politely called attention to the various connections--to the connection between the portal circulation and the skin, between the superior mesenteric vein and the .... artery, and between the superior mesenteric and the left renal, between the veins at the surface, and the liver; between the circulation of the liver and the phrenic brain; between the oesophygial veins and the veins of the stomach; and between the umbilical veins and the portal circulation, and so on.; that the lungs are nourished by the bronchial vessels, and not by the pulmonary arteries; that the lung gets its blood from a pure arterial supply, and not from the venous blood; that the pulmonary circulation is full of venous blood. Suppose the lungs were nourished by venous blood,--they would be behind time, like a baby's legs, which have been nourished by venous blood--blood that has been used in other parts of the body, so the baby's legs are too small for the rest of the body, and cannot keep up with it ; that the bronchial arteries are given off from the intercostal arteries on the right side, and hence hold direct connection with the skin through the collateral circulation of the costals , and so on.

See how important it is to know these facts. If I hadn't known these facts, I should have been completely dumfounded,--if I had not had these facts to present, I should have been completely whipped, because here seemed to be overwhelming proof that hydrotherapy has no scientific foundation--that it is all fantastic theorizing. But when I could show, and did show the anatomical and physiological facts in the case there was not a word to be said . One of the doctors whispered to me and said, "I am sorry Dr. Crane went out; he ought to be here and hear this." There was nothing to be said against hydrotherapy. So our therapeutics and our hydrotherapy rest firmly upon these fundamental anatomical facts. I have endeavored to bring out these facts more fully than ~~ever~~ they had ever before been shown. These facts had been fully brought before, and I believe this work contains all I know on the subject of Hydrotherapy,--it is a new chapter on Hydrotherapy, so far as I know. Of course the facts are not knew, but I have always been skeptical in regard to them until I knew the truth about them. I never believed that the blood could be made to travel through these circuitous routes and get out at the intestines. It seemed like taking a cupful of water on one side of the ocean and sending it out to relieve some city on the other side from a tidal wave. But when I found the ~~tr~~ direct connection between the skin and the intrnal parts of the body (finding suggestions like foot-notes, in trees, etc.) I saw these facts in hydrotherapy, and itgave me great enthusiasm in it. When I found such an exact anatomical basis, as well as experimental and physiological basis, it showed me that the body was made for hydrotherapy; the whole body (especially the back) seems to be exactly adapted to these thermic influences; the back is a keyboard upon which any physiological (?) tune may be played by these influences. ~~All this~~ The body (?) was not arranged in this manner for the benefit of the doctors, but ~~it is~~ because these principles of hydrotherapy are continually operating upon the body. Through changes of temperature, for instance, there are thermic influences constantly being made in the skin.These changes are made largely through the influence of heat and cold operating upon the body. These wonderfully effective impulses are the things that keep the wheels of life moving; these are the wind that blows the mill, so to speak; it is this play of external impressions upon the surface of the body that produce these reflex effects upon ~~between~~ the internal and the external parts, and that is why we have this vascular effect. Suppose we have the earache and make a hot ~~warm~~ application and relieve the ear; then suppose we uncover the ear and let the cold air strike it--how quickly the pain returns. A day or two I saw a patient suffering from neuralgia , and the nurse told me , when I was examining him, that the patient suffered dreadful pain the moment the cold air struck him. What does that mean? It means just what we are talking about--it shows what a wonderfully intimate connection there is between the skin and these internal parts .

LECTURE TO MEDICAL STUDENTS, Feb.13,1903.

Foods, and their uses.

J. H. Kellogg, M. D.

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Table .

	Carbohydrates,
	Fats,
	proteids,
Heat and work,	Albuminoids,
	Water,
	Salts,
	Oxygen.

LECTURE TO MEDICAL STUDENTS, Feb. 13, 1903.
Dietetics, (Con.)
J. H. Kellogg, M. D.
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We were speaking, yesterday on the subject of foods and peptogens. Suppose to-day we consider the uses of foods, and classify foods according to their uses,--first, the uses of foods to promote work and heat; second, to nourish the body,--or rather, to promote work and heat, and for tissue formation; third, to promote the digestion and assimilation of foods. These are the principal classes,--food-elements which promote work and heat; food elements that form tissue, and food elements which are necessary for the digestion and assimilation of foods.

It is possible that there may be other uses of foods,--it is possible that there may be other subtle substances in foods which promote nutrition, that have not yet been understood. It has been recently discovered that the potato can be assimilated by diabetics when other foods cannot be,--that is, when other carbohydrates cannot be. This is a very interesting and important discovery, because for ~~centuries~~ a thousand years the potato has been prohibited from diabetics--carbohydrates have long been prohibited from diabetics, and many diabetics have starved to death; they have lived upon a diet of fats and albumen--meats and fats--and the craving for food, or bread, becomes so intense that the diabetic will sometimes get bread and eat it at the risk of his life, although his doctor has forbidden it; he cannot break away from it, because he has such a craving for it. Possibly the idea exists in the minds of some doctors that nature does not know anything,--that nature is blind. Such a doctor as that was old Dr. Cullen who used to say that he would drive nature out of the sick room as though she were a squalling cat. When men have such a conception of nature, they do not pay any attention to natural appetites. When the diabetic has a craving for bread, that means that he should have bread, and that that demand of nature should be satisfied,--just as, when a fever patient has a craving for water, he should have it . And yet, for a thousand years the fever patient was kept in a state of thirst and of wild delirium--his blood would become so thick, and the poisons of the body would accumulate to such an extent, that he would become delirious. I knew a case of a fever patient who, rendered desperate by thirst got up and drank two quarts of water while the nurse was out. When the nurse came back and found this out, she thought he would die. This fever patient , after swallowing two quarts of water at one time, to the astonishment of every one, got well. When I was a medical student at the Bellevue Hospital, , there was a woman there who was suffering from dropsy, and was under the care of Dr. Austin Flint. In those days, a patient who had dropsy was not allowed to drink water,--the doctor said, "This man has too much water in his body already--why should he drink more water?It's a terrible thing to do. He is full of water. The water is leaking out of his legs , and he already has so much water that his skin is tight with it , and he don't need any more water." In the case of this poor woman, the doctor had used all kinds of diuretics and cathartics, and all sorts of drugs to carry off the effects of civilization through the skin, kidneys and bowels, but the patient "got no better very fast." Finally she was given up to die-- the doctor said, "The case is hopeless." The patient cried and begged for water, and the Professor said, "She will die anyhow , so let her drink all the water she wants." She drank three pints at once, the urine began to flow. In three days she was better, and in a month she got well-- just from drinking water. Dr. Flint recognized the fact inbolved, and it awoke him from his state of ignorance on this point , at any rate. So he then went to studying hydrotherapy,--he raked up and read Currie's books--books that Currie had written a hundred years ago,--

in the latter part of century before last, and he read a paper on the subject and made this confession before the New York Academy of Medicine, and it created quite an interest among the profession there,--there was quite a revival among them. One old doctor got up and said, "I have cured a hundred cases of constipation by giving the patient a glass of cold water before breakfast every day. Another doctor said he had used water successfully in cases of fever patients, and Dr. Hamilton told how he had cured wounds by the use of water,--where a patient, for instance, had been run over by street-cars and wounded and had been ~~and~~ brought into the hospital, and some of his colleagues said, "His limbs must be amputated." But he said he put the limbs in hot water, and that he continued that treatment for three weeks, and they recovered. That treatment kept the legs clean and ~~antiseptic~~ was antiseptic,-- and that was better than being wrapped up in cloths and the production of great masses of suppurating gangrenous tissues, because it kept things clean, and carried off the toxins, and ~~poisons~~ the patients recovered. Dr. Jayne (?) a little red-nosed fop of a ~~doctor~~ surgeon,- but he was as quick as lightning; he would cut off a leg in a minute an a half--that was his time; he was a wonderfully dextrous surgeon, although he didn't know anything about the principles of surgery--and yet he was the "Emeritus Professor of Surgery" in the Bellevue Hospital.— He rose up, and with great pomposity, he said, "I take no stock in this method of treatment--this macerating of the legs in hot water--I believe in cutting them off." He opposed Dr. Hamilton in that respect, and they had quite a lively time. This is very interesting to me, because it occurred twenty seven or eight years ago, when water was hardly ever spoken of as a remedy; so this was an unusual and extraordinary ~~case~~ occurrence. But I used it as a text for an article which I wrote and published in Good Health. And as I made a note of it, I made up my mind that the time would come, when the subject of hydrotherapy would be looked upon in an entirely different light. Now I will return to the subject of "Foods."

There are at least three kinds of foods,--we are learning more and more, continually about the remarkable adjustment of foods to our needs; and there is, ~~in foods,~~ unquestionably in foods, some very subtle things that we don't know anything about. But we know that where there is an instinct or demand for something, that that means that that craving should be satisfied in some way, for instance, that when a diabetic craves bread, he should have bread. He wants carbohydrates, and he seeks bread, because in bread he is accustomed to get his carbohydrates. But it is found that the diabetic can use potatoes instead of bread. Some doctors say "It is only starch,--bread is starch, and starch is starch, and there is no difference." But that is a mistake. The body can assimilate potato starch when it cannot assimilate cereal starch; and the same is true of many other starches. Root starches are more easily digestible and assimilable than cereal starches; that is a very remarkable fact. I don't think this is generally understood, but there is a starch in the "Jerusalem artichoke", the "mannite" of the Jerusalem artichoke; and there is the inusite of the string bean; and the inulin which is found in Iceland moss and some other vegetable products. These substances are assimilable by the diabetic when he cannot assimilate cereal starches at all. So we have something beside the mere gross food elements that we are accustomed to deal with.

There are these three uses of foods. Let us see what we have.: First, the carbohydrates. These are used for heat and work formation. We know their exact value, and we will consider them in a moment. There are the fats, and the proteids, albuminoids and gelatin.

Are there any others? There is water, and salts.

Now carbohydrates, fats , proteids and albuminoids are all useful in heat and work production, because they are oxidized (writing food-elements on blackboard.)

Q. Can't you put down oxygen, or air?

A. Is air oxidized?

Q. It is a food .

A. We will put down "Oxygen." These substances are all oxidized or burned in the body,--we need not go into the details. How does water add to the force-production of the body? ("It increases heart-work.") Yes, it enters into the molecule, and is a natural food.in the sense of tissue-formation, and it is also a food in the sense that it adds to the force of the body by increasing the force of the heart (?) How about organic salts? These salts have been found to have a wonderful power to increase osmotic movement, and increase activity of absorption. When organic salts is added to water,it enters the tissues with far greater rapidity, so that the osmotic activity is increased enormously,--several times above the ordinary. Water, when in the body, is equal to other elements (?)

Now, "Tissue-formation,--" what substances enter into tissue-formation ? ("Proteids.") Fats and carbohydrates.. Salts and water enter the tissues as well, but the salts are associated with the proteids-salts and water. Oxygen also enters into the tissues--so we have practically the same list as before. So it is impossible for us to form two absolute and distinct classes, and say "These are tissue-formers only, and these are heat-producers only."

It is interesting to notice all our heat-formers, and all our tissue formers, and it is interesting to note the relation there is between heat and work. Heat is a bi-product of cell-action. The body produces heat only when there is metabolic activity; you can't have heat produced in the body without metabolic activity. So, whether there is any kind of work done by the body, whether mental or muscular work, there is a certain amount of heat production. This is true less of nerve and ganglia work than of any other portion of the cells of the body, for the activity of the brain seems to be accomplished by less of heat production, and less loss of nerve-energy--less consumption of tissue-- than any other portion of the body---

Q. I didn't understand whether you said that oxygen enters into the tissues.

A. Yes, it is assimilated along with the other elements., and when the tissue breaks down, the oxygen forms a new combination with the elements--that is where we get our CO_2-- the oxygen does not combine directly with the starch; the starch is assimilated into the complex proteid molecule, the oxygen is assimilated into the tissue, there is a breaking down of the tissue, and the oxygen forms a new combination. There are about twenty persons here, forming a group. When we separate and go out, there will be various combinations. Here, two will walk off together, and there two others will walk off together; and here will be group of two or three girls, and there will be a group of two or three boys (or rather young men)--they will go out in smaller groups. This is a good illustration for molecular constitutions, because there are various things that cause this re-grouping. Here with this group, there is something that one wishes to speak with the other about, and so they form a little combination and away they go together. So these little combinations or councils are formed in the molecule, and when the molecule breaks up the council ~~are~~ is over, and the meeting closes. Then these various elements which constitute the gathering, form into various groups and away they go. That is the way the oxygen enters into the molecule, and that is the way the CO_2 comes out.

Q. Then there is no actual union of oxygen as oxygen, with starch?

A. No. This is a very important point--that all these elements come to a common gathering in the living molecule. That is the way food must be assimilated before it can be used,--it must enter into the molecule--the convention, so to speak; the molecule is a convention of atoms. You will find that this is a good way to illustrate this point.

Food is a bi-product, and , in connection with heat and work, amounts to more than actual work. It is similar to the way we run our engine, by which we make our electric light and serve several other useful purposes. We also have heat ,--can any of you tell me the relation between these two? ("About one to seven.") Yes; there is seven times as much heat as work.. We can find out how to get at this ,--how may heat units are there in a pound of water? ("Seven.") We will take a pound of water at 212° F. There are 1150--we will say water at 70°, and 8 pounds pressure--it depends upon the pressure. How many heat units do we have ? (Blackboard.) About 1150 heat units. (Blackboard.) There are 1150 heat units in that steam, and 8 pounds pressure. Temperature, 212° to 235°,--the temperature rises quite rapidly. When this steam has passed through the engine and come out into the air and forms exhaust -steam, what is the temperature? ("About 212°.") It ought to be that. When it condenses, how much heat has been used? It is still steam and it has latent heat in it, because it is steam. How much heat has been used in the engine? ("113.") How much has been put in it ?

The water was 70° when it went into the boiler? (Blackboard.) 1080. So there has been 1080 heat units been put in. (Blackboard.) We have utilized only 113° of the 255° with which we started. The difference in temperature is 142°. So by using the exhaust steam, we can double the value of steam. You can save more coal in thisway than by letting the steam go out into the air; so we add 113 to 142--255. You want to know all about this when you come to build your sanitariums --which you will have to do. Your sanitarium will come before you are ready to take charge of it ,--it will be waiting for you, and you want to be ready for it . Now about what is the proportion--1080--how will we find it ? (Blackboard.) Nearly ten--it is practically one-tenth . So in the use of the engine under ordinary circumstances, by exhausting the steam into the air, we have one-tenth work and nine-tenths heat.

So we have another form of the problem : Ww will use the exhaust-steam for heating the water, and we will put in hot water. (Blackboard.) We have 4. So if we use the exhaust steam for heating the water, what will be the proportion? One-fourth work and three-fourths heat. But we have not yet determined the actual effect of the work--we are simply running the engine, and we will have to determine this by making the engine do something , for we have not yet taken into account the friction. Here the engine does not heat the water,--we have simply taken this bi-product of heat and utilized it by an artificial contrivance. The very best engine that ever was made is not able to produce more than one part of work to six parts of heat. Now what does the body do? What is the proportion of heat to work? Four parts heat, and one part work,--while the best engine ever constructed--the very vest it can do is one to six--one part work and six parts heat. But the ordinary engine, as we see it ordinarily work gives the proportion of about one to ten. So we see how large a proportion of this bi-product is heat, whether it is mechanical work produced by the steam engine, or whether it is work done by the body, heat is a bi-product, and the bi-product is greater than the work that is done.

Another very important fact that we should know is, that we cannot have ~~heat~~ unless we have heat cell-work. So (please note this point) when we diminish heat production what do we do? We diminish cell-work. Now see what this accounts for, right away,--see how immediately it explains a very interesting thing: At what time of the year is the appetite best ("In the winter.") ("In the fall.") Perhaps it is best in the fall,--but when will one have the best appetite --sitting in a dining-room all day, or by going out into the cold air? ("Going out into the cold air."). Suppose one man goes out into the cool air, and breathes the cool air, and at another time, the same man remains in the house in a warm atmosphere,--would there be the same difference as in the other case? ("Not quite the same difference, but there would be some difference.") ("He would have the greatest appetite sitting in a warm room.") Is that your experience? ("There is greater cell-metabolism.") Has your experience shown that to be true? ("No; but I would conclude that from what I have already been told.") We must correct our theories by actual experience, or else we will be led astray. ("Cool air will make you shake pretty soon, and that will produce a lot of heat.") You are probably thinking of the English navigators in the Arctic regions who sat down on a rock and shivered themselves warm. Heat will increase metabolism, but cold will do the same thing. When a person breathes cold air, that will increase metabolism; both act in the same way. If the temperature of a room is sufficiently high to raise the temperature of the body, that will increase cell-metabolism. But suppose it is not quite so high,--suppose the temperature of the room is not high enough to increase the temperature of the body,--

will that increase metabolism? Suppose the temperature of the room is 80°, simply an ordinarily warm room, and one sits quietly in that room, and another person stays out of doors in a zero temperature,--which will have the better appetite ? ("The one who is out-doors.") Yes. That is the reason we put our patients out on the porches in cool weather. Every time I go down to East Hall and find the patients indoors, I drive them out - doors. That is why we have supplied the buildings with porches and balconies,--so that the people can get out-of-doors; that is of the highest importance--that all the patients should be out-doors as much as possible . Why? To increase cell-metabolism.

Now in very hot weather, and in very hot climates, heat production is reduced to such a degree that cell-activity is diminished to a point so low as to interfere with the activity of the individual,--and that is an important thing to remember . That is the reason why cold baths are useful in hot weather,--the reason why the morning cold-bath is such a wonderfully invigorating thing. That is the reason why you are refreshed when you get into cold water, when the weather is very warm. That is the reason why, when we are exhausted in very warm weather, we love to bathe our hands and faces in cold water,--and also bathe the neck with cold water . This is because the cell-activity of our brains have been reduced to such a low degree that you must have something to increase cell-activity. That is the reason the patient who comes here from the South, and from a very warm climate, suffering from "slowed nutrition" as Professor Bouchard calls it , is benefited by the cold bath and have a good appetite for our simple food. The skins of such patients soon become clear, and there is a wonderful development of their physical vigor, because of the increase of cell-activity. What does that?

Cold water,--it is the increase of cell-activity to take the place of the heat that has been carried away.

Q. Is that what causes the laziness of people who live in hot climates?

A. Yes. Twelve or fifteen years ago I was in Florida, and I saw some of the people building a house, and I said to a Northern man who was there,--"I saw these people who are building this house move about their work very slowly,--and I observed the same thing in ~~Florida~~ Cuba where some negroes were unloading a cart of bricks--each man would walk slowly up to the cart and pick off a brick, and walk slowly along and ~~lay~~ slowly drop it down in its place., and then slowly walk back to the cart again, and continue that slow gate-- I said to this Northern man, "I don't wonder the South is called 'slow',--the people are awfully lazy down here." He said, "That is what I thought when I first came down here, and I worked so hard that I nearly killed myself the first year I was here, but since that time I have gotten to be just like the rest of them." Now we of the North have probably had the impression that this condition is purely psychological --because the hot climate of the South was enervating, and that the people had not energy enough to rise above it . But this condition os not psychological--it is physiological--it is normal anc necessary in a very warm climate that the rate of physical activity shall be slowed down, because nature, in order to prevent the temperature from rising cools the body off by perspiration and inhibits the heat-producing process, as a great quantity of the bi-product of heat would bee too much for the body; consequently these inhibitory forces are set in motion to lessen muscular work and bring about a general level of activity which is safe for it in its environment. That is an interesting ~~subject~~ point, because it gives us an explana-

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tion of the sluggish movements and the lessened activity of the people living in warm climates, and why we who have been living in a cool climate must slow down when going into Southern climates, or we shall be slowed down by sickness. Some of our foreign missionaries would do well to note this fact. They have gone into very hot climates and they have said, "We must set these sluggish people an example, and do things with energy," and so they have worked with all the energy of their home habits, and have pretty soon slowed themselves down.

There is another very important thing that we see here,--and that is, we see the reason why the people of temperate climates are the rulers of the world--it is because of their greater cell- activity--the higher grade of life which the people of temperate climates are able to lead. We can see why we are able to study easier in the winter than in warm weather, and why we are glad to get through studying before hot weather comes. So there is a physiological foundation for the repugnance to work on the part of those who live in hot climates.

Q. Suppose the climate is very cold,--is not the same effect produced?

A. Yes.

Q. And that is the reason the people of the far North are like the people of the South in this respect?

A. Yes.

Q. Do you say that heat slows down metabolism ?

A. No. The defensive forces of the body recognize the fact that the body is likely to be damaged by the excessive rise of temperature, inhibits the heat-producing processes, and takes away the energy and activity which would lead us to extreme muscular exertion, by which too much heat would be produced--so that the bi-product of heat would be excessive and prove dangerous to the body. It is the same reason that leads the engineer to turn off the steam if he finds his engine is doing too much work, or is carrying more steam than necessary. Suppose a man is running an engine and heating a house at the same time, and all the exhaust-steam goes into the house, and the peoplein the house complain that they can't stand so much heat, and that it must be stopped,--the only way would be to throw off a supply of heat from the engine, thus lessening the work of the engine as well as heat in the house. No our arrangement is such that we may say that our building is heated by exhaust steam...This building is heated by the exhaust steam of an engine. There has formerly been an enormous waste of steam going out-doors into the air. In the exhaust-steam there is nine-tenths as much energy as before it was used (?) So, in building your sanitarium you must see that the exhaust-steam is utilized in heating your house just as it goes through it.

Heat is a bi-product of cell-activities of various sorts...It is probable that the heat of the muscles can be set to work--that is, the heat of the thermogenic apparatus, nevertheless there is cell-work also, so that, in order to lessen bodily heat it is necessary to lessen body work. Cell activity is diminished along with heat-production, and at the same time, so that when there is a lessened demand for cell-heat, there is a lessened demand for cell-work

Q. I should think the body would be able to throw off that excessive heat.

A. In warm weather we perspire a great deal, but it would be destructive to the body to go on producing heat simply to throw off heat. So nature economizes her forces, otherwise it would be a useless expenditure of energy. For this reason the appetite is diminished somewhat in very warm climates .

Q. Is it not true that a person in a dry hot climate is more energetic than a person living in a wet hot climate?

A. Yes.

LECTURE TO MEDICAL STUDENTS, Feb. 18, 1903.

D I E T E T I C S, Con.

J. H. Kellogg, M. D.

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(Distributing the booklet "Daily Ration.") In this booklet you will get more information on the subject of the Daily Ration than anything else that I could put in your hands. I would like to have you read this over carefully, because I am going to examine you on this point as well as other subjects.

The basis for the study of the daily raton, is certain facts which it is good for us to know. To begin with, there have been many interesting experiments made by Dr. Smith, of England, away back in 1874. The first information that I found on the subject was published in Dr. Smith's work on "Foods," published by the Appletons about thirty years ago, the first scientific work published on Foods, so far as I know. Dr. Smith has done much effective work in the same direction since, but this work has been carefully studied and used by others.

One of the first things worked out, was, the number of calories of food required for a kilogram of weight. Let us seeif we can find it,--let us start with this foundation: How much energy is produced by the average man in a whole day of twenty-four hours? Two million five hundred thousand. Suppose a man weighs 70 kilograms,--about how many calories of work would that man do in the course of the day? Pretty near 36 greater calories for each kilogram--let us convert this into heat units. Take ~~What is a~~ lesser calories. Let us take one degree centigrade, and multiply (blackboard calculation) 1.8° F × 2.2 = 3.96. We have 3.96, practically four. So we will multiply the number of calories by ~~four~~ 4, and get the number of heat units,--we get 10,000 heat units. Now the average man weighs about 150 pounds,--let that be the foundation for our study here.

We will see how many calories is required for a pound of work. (Calculation.) It is 66 That units. We will see how this agrees with these figures. (Calculation.) It is 144 heat units to the kilogram. The number of heat units to the pound (calculation) sixty-six. This is a good drill for you. You ought to be able to make these reckonings in order to make up bills of fare. When I was a member of the State Board of Health, I was asked to furnish a ~~statement of~~ ration for the Jackson prisoners, and make a special report for the rations of the prisoners. I did so, and was very glad to make some suggestions which I thought would be valuable for them.

We know this, then, that the daily ration--the daily demand for energy --is at the rate of 66 heat units per pound. If we should say 60, I think we should get a little nearer the average, the average person weighing a little below 150; so I will put this down in my mind ~~as~~ that 60 ~~heat~~ units of energy is required for every pound that a person weighs.

Now suppose a prson weighs 200 pounds--a symmetrical person weighing 200 pounds--we can ascertain how much energy he requires. How many calories would he require per day? ("12,000.") Yes,--we say "heat units" etc., because we can make people understand these terms. The average doctor don't know anything about "calories." He learned about them, but has not used the term and has forgotten it. There has been a determined attempt to introduce the French metrical system into this and other countries, but the English and American physicians won't have it;they insist on sticking to the old English system, and we may as well recognize that fact, although we keep familiar with the French system. Suppose a man is very fat,--he weighs 200 pounds, but naturally he would weigh 150 pounds--does that man require 12,000 heat units? ~~of en-~~

("No, sir.") Why not? ("Because the fat keeps the heat in, so there is not so much given off, and there is not so much oxidation.") Then you think that man has no more use for energy than though he had no surplus fat? ("Not so much; because the fat keeps him warm,--he has to carry it around.") The more probable supposition would be, that he don't carry it round,--and that is the reason why he has got it,-- in other words, if he were more energetic he would not have ~~so much fat.~~ this surplus of fat. The fatter a man gets, the less exercise he takes. It is very rare to see a ditch-digger or a well-digger-- a man who is working laboriously,--who is excessively fat, unless it occurs through heredity.

There is another reason why this fat man does not require so much energy as the man who is not so fat,--and that is, that the amount of energy required, has a definite relation, not only to weight but to surface; and there is a more definite and intimate relation between the surface of the body and the heat-loss--or rather, the amount of energy required--than there is to the weight of the man,--it is more definite and direct, because a larger proportion of fat is required to keep the body warm-- how much ("Four-fifths.") So that, while the weight of the body does not determine the amount of heat required, it determines the amount of work. But the surface of the body determines the amount of heat loss--what is the ordinary surface of the body? ("Seventeen square feet.") More recent discoveries show it to be larger than that. There has been a new invention for determining the surface of the body. A Frenchman has made a new invention for determining the surface of the body, and by his machine he has discovered that the old figures were wrong. You can hardly imagine what that invention is, unless you know.

It consists of an inking-roller with a sort of cyclometer attached to it, telling how far it travels. This inking-roller is applied to a man and rolled round and round his body until he is completely covered with ink. The roller has a certain, definite surface which is known and when a man's body has been inked all over, you look at the cyclometer and detrmine the number of revolutions, and multiply the number of revolutions by the surface or area of the roller, and find the surface or area of the man.. There is a simpler way of determining the ~~contents~~ area of the body. The man who discovered this method has a quantity of sticking plastr, and he knows the area of it. He cuts this sticking - plaster into strips, and winds it around the man's body until it is completely covered. Then he measures the area of the sticking-plastr left, and the difference between the area of the whole amount of sticking-plaster and that which is left ~~will~~ gives the area of the man. This is a simple method, and every one can use it .

Q. How much is it ?

A. Twenty-one and a half square feet. And for every square foot of surface, the body requires 600 heat units every twenty-four hours. Multiply this by 20 and we have 12,000 heat-units which the body requires per day. This is based on the higher estimate--12,000 instead of 10,000-- we will say, then that 500 heat-units is required for every square foot of surface--that would be on the basis of ~~3000 instead of~~ 2500 instead of 3000--so we will put that down and apply the same standard.all the way through, taking 2500 as being required for a day's work.

Persons waking and sleeping consume foods at different rates,-- and the same is true of walking at different rates. A person walking at the rate of three miles an hour, consumes 1 1/2 ounces of fat. Walking at the rate of two miles an hour, he consumes an ounce of fat.

Q. How long does it take him to consume it?

A. An hour.. A person who is asleep consumes one-third of an ounce of fat; awake, half an ounce of fat.

Q. I would think it would make a difference as to what food entered the stomach.

A. But that is the average right through. Let us see what this difference would be,--an ounce of fat gives how many heat -units? (Calculation.) 437 1/2 in an ounce.. (Calculation.) 10234--how many heat units then in an ounce of fat? Practically 1000--an ounce of fat is practically how many heat units ? ("1000.") That is easy to remember We will say it is a thousand, although it is nearly 1100. A man,when asleep, consumes, in an hour , one-third of an ounce of fat,--that would be not quite 340 heat-units in an hour, or 8160 in twenty-four hours, ~~the amount which a person~~ . So a prson by staying in bed would reduce his output of energy considerably,--how much would he save by staying in bed? How much is the average output in a day? ("10,000.") Now the man who stays in bed reduces that--he saves 2,000 heat units--he saves nearly one-fifth. You must understand these things, and by explaining them you can command the obedience of your patients by making them understand why they should stay in bed--for instance, you will say to the patient, "You must stay in bed,--you must rest and remain in bed, because when you are up and going about,you are using up your energy." And you can show the patient how much energy he is consuming. So your patient goes to bed, and you pull down the curtains and tell him to go to sleep, but if he lies awake and moves about, the consumption of ebergy will be more than if he slept quietly, and his consumption of energy will be half an ounce in an hour, instead of being one-third; that would be practically 500 heat units in an hour--how much would that be in 24 hours? ("12000.") This is on the higher estimate of 3000 heat units an hour.

These facts have been determined experimentally, and of course such observations can only be approximate. I am not giving them to you on my own authority, but from experiments actually made. Suppose a man is walking two miles an hour,--he consumes an ounce of fat, --that is twice as much as though he were asleep. ~~I f~~ If that man kept awake all day, he would consume a lot of fat. If he walked all day, he would consume more than he could digest; it would be just twice that--it would be 24528 heat-units . Suppose that man walks three miles an hour?

Q. Does that principle apply to bicycle-riders?

A. The lose flesh very fast. If he could keep going he could digest food enough, but he can't ; his energy is soon exhausted. (Calculation.) How much do we add here? ("12,000. ") Yes. (Calculation.) 36792, walking at the rate of three miles an hour. It is a good thing to remember that. So the fat patient has to walk two miles an hour to burn up an ounce of fat. When he discovers that, he will be ambitious to cut off ~~as much~~ fat as ~~he can~~ fast as he can. I have found it advantageous to present these facts to patients.

Persons of different ages consume energy at different rates,-- a baby consumes .8 as much as a child three years old; and a child three years old consumes .5 as much as a boy or girl 10 years old, and a woman .8 as much as a man --they ~~have~~ consume only .8 as much energy, in proportion to their weight, as a men do. Dr.........Has written a book on "Sex", in which he has worked out the whole social fabric on the fact that women consume only .8 as much energy in proportion to their weight as do men, hence he claims that the feminine protoplasm is not so active as the masculine protoplasm, and that the metabolism of women is a little slower than that of men,and that that is the reason why women have not kept up with men in the race, and have fallen behind and are called "the weaker vessel." But I will let you discuss this question in your Medical Society,--as I understand that you have one . I want you to study this question of the daily rations and bring in your reports to-morrow as to the amount of each element required. Figure it out and see how much will be required on the basis that we have mentioned here.

Q. Don't you think the greatest difficulty of vegetarianism is to find the proportion of proteid which is most easily digested and assimilated?

A. To get the proper amount of proteids,--that has been one of the great problems-- there are two great problems,--to get the easily digestible proteids, and the easily digestible fats. The most serious problem has been to get the fats,--because we can easily get the gluten from wheat. Gluten is an exceedingly digestible fat....Proteids and nuts have been neglected until recently. In every starch factory in the United States ~~there has been~~ in making wheat starch there has been an enormous waste of gluten. For years and years an enormous quantity of gluten has been thrown away. Gluten is very perishable,--it won't stand shipping, because it is filled with germs from the flour, and so it soon begins to decay, and it decomposes as fast as bread. In a few hours from the time the starch is washed out of the wheat, the gluten will be in a state of putrefaction, consequently it is difficult to utilize it.. There is a large starch factory in Jackson where they sell gluten at a low price to be fed to pigs. A large quantity is made up to be fed to pigs and a large quantity is thrown away as waste. But these products are going to be utilized as people come to ~~recognize~~ appreciate vegetable products , and we find methods of dealing with them. This matter has been experimented on for twenty years,-- that is, how to deal with ~~it~~ them in such a way as to get them into a digestihle food. But within the last two or three years, we have found a method by which they can be disposed of quickly, and in a commercial way, and be utilized.

The gluten of wheat, dry, ground up into a fine powder must be immensely more digestible than any meat product, because the meat enters the stomach in large masses, while gluten enters the stomach in very fine particles, so the gastric juice and the digestive fluid come in contact with every particle at once. When brought into a very finely powdered state, gluten will be found to be very readily digestible and assimilable. Our various gluten meals have come into wide use. Drs. Tyson, Osler and others are utilixing our gluten meals which are made in our factories, and which have the reputation of being the best gluten preparations in the world. I had a letter from aFrenchman in Geneva (Switzerland), who is disposing of them there, having charge of a factory there. He says that physicians there speak highly in favor of these gluten foods and prescribe them for their patients. I had a letter yesterday from Dr. Tyson of Philadelphia, in reference to our glutens; he is much interested in them. I have had several letters from him recently on that subject. He is one of the leading physicians of the United States. Drs. Tyson and Osler have mentioned these facts in their text-books. This matter has been neglected, and we are the only ones here, ~~are~~ who have made a careful study of the subject, and have succeeded in making use of these glutens further along than any one else. As soon as we made a complete success of it, a large number of people capitalized it and exploited it, and made large sums of money out of it,--and this others did, instead of our doing it--but I suppose the Lord wants it that way. Dr. Funk said to me at one time, "You remember, when I was with you, I prophecied that you would have a great thing in the food business, and you ought to be making many thousands of dollars out of it,--the other fellows are making money out of it ." But it may be that is the way Providence wants tit to be done,--so I conclude that we have got bigger business than that to do. The thing we want to do is to get good foods into people's stomachs, but we don't care to serve as cook and waiter; The important thing is, that people shall get good foods, and if a whole lot of these people are willing to do the drudgery, put in their money, and do the hard, grinding commercial drudgery, we ought to be willing that they should do it . We have most of us been brought up to think that making money is the great thing. You remember of hearing of the advice of the dying Quaker to his son,--"John, get money. Get it honestly if you can, but get money." That is the spirit that we see in the world about us --to get money ~~in~~ any way, ~~way~~--- that is the great summum bonum. But it is not so with us; truth is the greatest thing of all, and if these men will help us spread the truth I am willing and thankful to have them do it. In a conversation with Mr. Post, I told him that I considered him one of our greatest self-supporting missionaries,--and he said,"Humph!"

LECTURE TO MEDICAL CLASS, Feb.19,1903.

D I E T E T I C S ,Con.

J. H. Kellogg, M. D.

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(Exhibition of proposed new Sanitarium chair.).........

We were talking about the bill of fare. What are the proper proportions, in your opinions, of proteids, carbohydrates and fats ?

A STUDENT: I think the right bill of fare would consist of Carbohydrates, about 500; for fats, 56, and for proteids, 89; ~~that would be about 3 ounces of proteids.~~

DR. KELLOGG: That would be about 3 ounces of proteids, 2 ounces of fats, and about 18 ounces of carbohydrates. That would be a pretty good ration; it would be sufficient to support a working man while working hard. Mr.......what is the result of your observations?

MR..........I should think there should be more proteids, and perhaps a little less carbohydrate,-- about 4 ounces of proteid and one and a half or one and three quarters ounces of fat, and 16 or 17 ounces of carbohydrates.

DR. KELLOGG: That would be a good dietary. What is your opinion, Mr......

MR....... I think the observations were, a greater difference between proteids and fats--about 7 of proteids, 3 of fats, and 40 of carbohydrates--the percentage was 7, 3, and 40.

DR. KELLOGG: How many ounces would that be ? Proteids, practically 3 ounces; fats, 1.2, and carbohydrates, 16. Now, as the result of all our observations, I have made up my mind that that is the right proportion. Our observations were made upon 265 healthy helpers--125 men, and 140 women--composed of nurses, dining-room girls, people working around the house, and on the farms--all classes. There was about an ounce difference between the men and the wome; the women ate about an ounce less than the men. ("They ate more in proportion to their weight.") Yes. You have not all had sufficient time to study this paper; I would like to have you look it over carefully.

Now suppose we had the proportions, 3 ounces of proteids, 1 1/2 ounces of fats, and 16 ounces of starch. How many heat units would there be? How many heat -units is there in an ounce of fat? ("10,000.") How much in an ounce of proteids? ("Practically 500.) (Calculation.) Putting these together, how much have we ? ("11000.") That is the way our experiment came out. Of course we were not trying to bring people down to an absolute equilibrium. Ten men and ten women were weighed at the beginning and at the end of the experiment , and they were found to have gained a little in weight--the sum total of their weights was a little greater at the end of the experiment than at the beginning.

Now, as near as I can judge, from reading and studying other observations, our experiment made in relation to this subject was the most authoritative ever made. If you will read Atawater's experiments, you will find that they were made on the families of laboring people , -- some colored people from the South, and some were Irish families, or some other common laboring people who gave no especial attention to diet, and were not trying to regulate their diet in aphysiological way, and they were not eating physiological foods; they were eating meats, mince-pies, and all other kinds of unwholesome things, eating pepper and various other condiments, and were eating foods without reference to their physiological effects. In Atwater's experiment, these persons were not carefully weighed--no attention was paid to their weight, but simply the amount of food they ate in a given time. Many of these persons could not be watched every moment, and could not be relied upon to report everything they ate, so we don't know but what they ate a little more than they reported, and more than they ate at the table. So it seems to me that our experiment is the most authoritative, the largest and most accurate experiment ever made, as regards the number of persons, and the conditions under which the experiments were made. The food was weighed,— it was not all analyzed, but the estimate was made upon the analysis made in the tables,—and that is the way most of these experiments were made. The foods were not all analyzed, but in most cases the constituents of the foods were known, so the composition and analysis was taken from the table, and the calculation was made in this way, so, as I said, I believe ~~the is~~ this is the average ration for a person doing ordinary work--3 ounces of proteids, an ounce and a half of fat, and 16 ounces of carbohydrates,--in other words, we have the same number of heat-units in proteids as in fats, and 8000 carbohydrates. Why do we take such a small quantity of fats, a moderate amount of proteids, and a large amount of carbohydrates? From all experiments made, it is evident that carbohydrates are the natural source of energy for the body,--they are the natural source of energy for supporting heat and work.

You see at once what an argument this is for a vegetarian dietary; it shows at once that man could not possibly live on a carnivorous dietary--he could not live on a meat diet. It shows that if you eat meat you must take a large a large amount of vegetarian food with it, in order to be able to tolerate it, because meats consist very largely of fats and proteids, and these constitute much less than half the bill of fare — about one-fifth. Since this is the case, it is evident that four-fifths of the food must be of vegetable origin.

Q. There are people who live almost entirely on meat.

A. Yes,--and what kind of people are they? The natives of Terra del Fuego are the most degraded of all human beings, and the same is true of the aborigines or natives of Australia. They feed upon frogs, rats and other small animals which they can capture in swamps. We have a good illustration of the difference in people living near each other, and under similar conditions, in the Circassians and the Kalmuc Tartars, their countries being close together, so that they have essentially the same climate, and live under the same physical conditions,--the only difference is the food. The Circassians are largely vegetarians, and they are the finest looking people in the world. When I was in Constantinople I saw many fine Circassian ladies. Every rich Turk has a Circassian woman for his wife. It is the fashion in Turkey for the rich to purchase their wives in Circassia. The Turk buys his wife the same as the farmer buys his horse. Nearly all their wives were slaves which they ~~have~~ bought in the slave-market, the same as you would buy a horse or a cow in the market. These Circassian women were brought to Constantinople in great numbers, until recent years, for sale in this way. And they have had the reputation for many years of being the most beautiful women in the world. I have met several of them. One Circassian lady once consulted me in regard to the health of her daughter, a young lady about 16 years old, and a very beautiful girl. She was a ~~very beautiful girl~~ native of Circassia. These Circassians live almost entirely on barley and fruits and vegetable products, and are an agricultural people, and live upon these simple foods. The Kalmuc Tartars lived, originally, in the same region, and were people of the same racial descent, living in the same sort of climate and under similar physical conditions. They live almost entirely on the flesh of horses-the milk and flesh of ~~horses and~~ cattle and horses--they live almost entirely upon animal food. And these Kalmuc Tartars are said to be the ugliest people in the world,--indeed the women are so homely that you can hardly tell a woman from a man; they are recognized by travelers as ~~bei~~ being a very uncouth and ugly looking people. And the only essential difference, so far as one can discover, between this people and the Circassians, as regards physical conditions, is in their diet.

Q. Are not the Indians of South America, who live on meat hardy and energetic?

A. Yes, that is true of the Indians of the Pampas, but they are short-lived. They live on horseback and live by the chase mostly, but they are very short-lived. Many authorities on physiology state distinctly and positively that it is impossible for human beings to support life for a great length of time on a strictly meat diet. This is shown by the recognized bill of fare. Carbohydrates must be obtained from Cereals(?) ~~meats~~ must they not ? This ~~bill~~ vegetarian bill of fare that we have presented here, is very interesting from the manner in which the experiment was made, because the subjects of the experiment were not required to live on any particular article of food. There was a large bill of fare, and they were allowed to select anything they wanted, from this bill of fare. They could have fats in abundance, and were given milk-foods, etc.--it was not strictly a vegetarian diet; they were allowed to eat eggs, or anything else on the bill of fare, which presented a large variety.

When persons are confined to certain articles of food, their nutrition is likely to be disturbed, by a lack of relish. But in this case, no such thing occurred. The things that they ate were carefully noted; their bills of fare were all collected every day, and the amount that they ate was carefully dished out to them, so it was known how much they ate of each particular thing, and the experiments were made so carefully that we obtained good results. It is interesting to see that our results were so near to others,--they differ but very little from other experiments, as you will see,--what authority did you quote? ("There was a table that I obtaised from an old authority who used to say that there should be an equal quantity of fats and proteids in the bill of fare .") These men gave, in their tables, simply what they ate themselves. But here were 265 persons who were allowed to eat what they chose, without restriction. Then we collected the results and compiled them. So I think this is a more authoritative epperiment than any other experiment that has ever been made, because of the elimination of the factor of compulsion, and the facts already stated. We have in this little pamphlet a statement od authorities (Citing authorities and reading from tables in "Daily Ration.")

MISS EVANS: Atwater says "Thirteen (?) ounces of carbohydrates."

DR. KELLOGG: Atwater's experiment was made upon Negros, common laborers, and that class of people who had gotten into a gross way of eating; and they were in the habot of eating large quantities of ~~pork~~ fat pork, so they ate fat pork in the experiment. In our experiment we had intelligent people who had studied the subject of diet, and they had a large dietary to select from, and they selected what they wanted, and as much as they wanted, and they were all well nourished. So, as I have said, this experiment is worth a great deal more than all other similar experiments put together, so far as I have been able to observe.

Q. Would not experiments made with people who knew nothing about diet, have been better?

A. In the first place, these people had been led in the right channel by a wholesome and proper bill of fare, and so the general diet was right,--they had only to select individual articles and eat what pleased them. If we could find a man who had never been instructed about dietary, and had a natural appetite, he would be the right man; but you could not find such a man in our civilized society, because our modern life is so perverted.

Q. Don't you think the poor class of people use more carbohydrates than Atwater allows?

A. ~~Allows.~~ Yes. In cold weather we need more fats. Sometimes you will have a craving for fats, and then you ought to have them. Sometimes you will have a craving for sweets, and then you should have sweets; sometimes you will have a craving for proteids,--and that means nuts, and you should have them.

LECTURE TO MEDICAL CLASS, Feb. 23,1903.

Dietetics,--Meat.

J. H. Kellogg, M. D.

---- X ----

I HAVE been looking your papers over in order to find out wherein you are short . You are here to make history, and I want you to make it as fast as you can.

Milk is the most important of animà foods, because it is essential to life. It is generally believed that flesh is the most essential of all animal food, but this is certainly a mistake. I am going to put in your hands a copy of my little book,"Shall we Slay to Eat?", and I am going to ask you to read and study it, and write a paper on the subject of animal foods,-- I am going to have you write an abstract of the book--a brief statement. The one thing you should be thoroughly conversant in, is this question of Vegetarianism,and the Natural Diet of Man. You are all to be chief apostles on this question at some time, and somewhere, and you will be pillars for the support of many people, -- you will be their authority on this subject,and I don't want you to leave this school with any doubts upon this question. We have had some students who have gone away from here with doubts as to whether it is wholesome to eat corpses or not ; and some have shown their doubts by devouring wild beasts and domestic animals. Would you be a missionary going through the country taching the importance of healthful living, and at the same time consuming wild beasts and domestic animals--sheep , cows, etc? One can hardly imagine such a thing,--from our standpoint. It seems difficult to realize that we should become so perverse that a Christian man and a missionary could get into such a state of ignorance and error as did the great missionary John Williams, on this question of Diet.

He and his family had been in the South Sea Islands ten years when they thought they would have a great feast for the purpose of celebrating the tenth anniversary of their arrival in the islands, so they had a couple of oxen shipped from England for that purpose,--think of the expense involved! When the oxen came, they had a great feast prepared,-- "But," said he, "what was our surprise and disappointment when we found that we could not eat the meat!" They had lost their appetite for beef and could not tolerate it. Said he, "My wife actually shed tears because (as she said) she had become such a savage that she could not relish English roast beef,"--they had become so much like those natural, barbarous people that they could not relish it.

Now it is necessary for us to preach a return to savagery in this respect, at any rate. We have got to talk about it; we have got to agitate the subject, and continually hammer it in--that we have gotten away from nature, and that we must get back to nature. That is the whole thing we are aiming at--is to get back to nature again--because nature and God are one. Some people don't know that. Not long ago, I was reading in a paper, considered to be a theological authority, in which the writer of the article made light of the idea that the wonderful operations which take place within the body are evidences of God's presence there, intimating that it is only nature that does these things; that it is nature that keeps the heart going; that it is nature that is performing all the remarkable functions which are continually taking place within our bodies. When we take such a position as that, we elevate "nature" to an equality with God. If nature can create --if nature can impart life and maintain life--then nature is a creator; then nature is God, and we have two Gods instead of one, a philosophy which certainly cannot stand.

There is but one God, and he has established the natural order of things, and the great trouble is, the departure from the natural order.

Now a few words about meat: I don't think I need to talk long upon the subject of the dietetic use of meat, because we don't believe in it; but there are a few things about meat that we should undertsand. First, in regard to the digestibility of meat. Meat is largely composed of proteids, fats and salts. About 15 % of meat is composed of nutrient value, and creatin, creatinin, xanthin, and other purin bodies, uric acid, carnic acid, etc. These substances are found in meat as the result of disintegration.--

Q. Do these purin bodies go along with the "salts?"

A. These are the extractives,--put them with the "salts." These extractives represent partially oxidized wastes. They are commonly reckoned in, in estimating the nutritive value of flesh. The nutritive value is determined by the amount of nitrogen which it contains,-that is, the proteid composition is determined by the amount of nitrogen. This is an error, because it does not take into account these extractives,--but they are not food, hence the nutritive value of meat is lower than it is reckoned to be. What is the nutritive value of beef? (""19.3 %") We will take it at that, but one seventh of that is extractives, so we must deduct about 3 % from the food - value of meat, here. So, as matter of fact, the food-value of meat is about 16.5 %. These extractives have no food value, as we know, and when taken into the body they are eliminated as poisons. Pawlow (?) has proved this, and Haig also.. When this physiological fact was brought to light, I immediately seized upon it as an argument against the use of flesh, because there was abundance of proof that these were poisonous matters. I was met, at that time, by some of my colleagues by the proposition that these substances are simply fats which had not been entirely utilized; that they had been partially oxidized, and all that was necessary was for the oxidation to be completed, and then you get a certain food-value out of them; that besides this, they have a certain stimulant value which made them helpful; so we ought to be thankful that we have them in meat, instead of opposing its use. But a further study of the subject shows that they have no food-value,--and how has it been shown? ("By experiments upon a dog.") A dog was fed on meat extracts, and another dog was fed on water, and the dog that was fed on water lived the longest. That fact showed that these extracts were not food, but poisons; because if they had had any food-value whatever, the dog who fed on them would have lived a little longer than the dog who was given water. Liebig's Extract of Beef which is so largely given to invalids and people who have fevers, and which are supposed to contain concentrated nourishment, killed the dog. Now if dogs were carnivorous animals--but they are not; there is no such thing as a carnivorous animal. So-called carnivorous animals are such by force of circumstances; but there is no animal which must subsist upon meat and can't get along without it . There is no animal whose habits , structure and organization compel him to ~~live on meat~~ subsist on meat. We will take this up a little later . But suppose the dog were a carnivorous animal,--he ought to be, of all animals, the best prepared to get the benefit out of these meat-extracts; but this dog was killedbby them. Then, speaking generally, see what an atrocious thing ,what a terrible thing it is , ~~th~~ to feed thousands and thousands of poor invalid patients upon these extracts. Armor's works are sending out great numbers of carloads of these extracts all over the world, in the form of "bouillon," etc. It is so all over the world. Thousands of mothers take great pains to prepare beef-tea and chicken broth for invalids and for children that are pare chicken-broth and beef-tea for invalids and sick children. Think waht an awful result must follow from the use of the extracts of all these corpses,--and when you are speaking upon this subject, don't be afraid to say "corpses," and "cadavers." We want people to see spooks and hobgoblins around, when this question is discussed. Wherever there is a dead person in the house, people sort of shiver if they hear a little noise in the room after dark, and when they look round, they expect to see spooks; they expect to see a ghost. Now we want to make people feel that way whenever there is the corpse of a pig or an ox around,--we want to make them feel "spooky." People think I am very impolite in talking about meat,--they think "Dr. Kellogg uses rather rude language when talking about meat-eating," but I am willing to stand that for the sake of shaking somebody up so hard on this subject and the results of eating flesh, that they will never forget it.. One lady says that she has not tasted meat since she heard me lecture on "Milk-punch (?)". Some time ago I had a letter from a lady in S. Dakota, in which she said, "Doctor, the butchers here are all down on me. I have been circulating your tract on 'Pork' in every house in this village. I had 200 of them and I took one to every house, and since that, the butchers here have all stopped dealing in pork, They could not stomach pork after reading the tract,--and now, " said she, "I want you to send me something just as bad about tea and coffee, so that the people won't want it. So I wrote out a story which actually happened, and sent it to her. It happened down in California. A man who was sitting at the table at the time of the occurrence, told the story. A Chinaman said he had to make arrangements to be sent back to China to be buried on his own land he said that that was their custom. Another man said that he thought it would be very expensive. "No," said the Chinaman, "we will be sent home in boxes of tea. They will pack us in tea,--that is dry and it makes a good packing. When the box gets home, it is unpacked, and the tea is sent back; the tea makes the best kind of packing, and it don't cost anything to send the bodies." He said he told the story at the table, and an oldlady sitting at the table got up andwent out of the back door and vomited, and she has not been able to take tea since. Then there is another story of a lady in California: She was one day "tellingher fortune " by looking at the tea-grounds in her tea-cup, and she discovered something among them that was very peculiar, and got hold of it and brought it out, andit proved to be a Chinaman's toe-nail. How did it happen to get there? The tea is dried in the factories and put in chests and then the Chines cooles jump into the chests and tramp down the tea, and of course the Chinman's toes-- the same thing happens to them that happened to ours-- a portion of the nail dropped off and the lady found it; she could not drink any more tea after that. She did not read her fortune in tea grounds any more. I wrote these stories out for this lady and published them in Good Health, and she carried that copy of Good Health all over the town and read these stories to the families, and it spoiled the tea trade there. That woman was a true missionary. I don't say that that is the thing to do under all circumstances, but this illustrates theprinciple,-- if you make a sufficiently strong mental impression upon the minds of people, it will stick to them. Twenty-five years ago one of our workmen, a strong,sturdy,healthy man came to me looking as though he had been sick for several days and I ask him what was the matter. Said he, "Dr. I can't eat-- it is too ridiculous to tell you what it is but it is a fact--I can't eat a thing. Day before yesterday while I was working it would be very expensive. "No," said the Chinaman, "we will be sent home in boxes of tea. They will pack us in tea,--that is dry and it makes a good packing. When the box gets home, it is unpacked, and the tea is sent back; the tea makes the best kind of packing, and it don't cost anything to send the bodies." He said he told the story at the table, and an oldlady sitting at the table got up andwent out the back door and vomited, and she has not been able to take tea since. Then there is another story of a lady in California: She was one day "tellingher fortune " by looking at the tea-grounds in her tea-cup, and she discovered something among them that was very peculiar, and got hold of it and brought it out, andit proved to be a Chinaman's toe-nail. How did it happen to get there? The tea is dried in the factories and put in chests and then the Chinese coolies jump into the chests and tramp down the tea, and of course the Chinaman's toes-- the same thing happens to them that happened to ours-- a portion of the nail dropped off and the lady found it; she could not drink any more tea after that. She did not read her fortune in tea grounds any more. I wrote these stories out for this lady and published them in Good Health, and she carried that copy of Good Health all over the town and read these stories to the families, and it spoiled the tea trade there. That woman was a true missionary. I don't say that that is the thing to do under all circumstances, but this illustrates theprinciple,-- if you make a sufficiently strong mental impression upon the minds of people, it will stick to them. Twenty-five years ago one of our workmen, a strong,sturdy,healthy man came to me looking as though he had been sick for several days and I ask him what was the matter. Said he, "Dr. I can't eat-- it is too ridiculous to tell you what it is but it is a fact--I can't eat a thing. Day before yesterday while I was working around the place and I happened to pull a plant up and I met with some thing, and it was something very repulsive that I found under the plant, and it sickened me and I vomited, and when I sat down to my dinner the picture of that object came up before me and I went out into the orchard and hung on to a tree and vomited every thing I had eaten; and every time I sit down to the table I think of that plant and the horrible object, and it makes me sick to the stomach and I have to go out and vomit." Now that was a strong robust man, but it was a difficult case to cure, and I had to devise means for diverting his mind from that object. So the impression is what you want to make, and if you can set that one thing at work against the use of meat, it is a good thing to do. We have got to use psychological arguments as well as other kinds of arguments--and this is the psychological argument. I have made up my mind to talk straight on this subject, and I have succeeded better since I have been doing so. I can see, when I am talking to an audience, when I have made an impression. So when this is done you have made an impression upon a person so that whenever they come in contact with beefsteak, pork chops, and similar abominations, the jaw drops and the appetite is gone. This is done by a sort of psycological magic as you may say. An old Quaker once said to an old habitual drunkard "Friend wouldst thou reform?" and he said he would. Then the Quaker said "It is very easy for thee to reform; it is as easy as it is for thee to open thy hand." "I would be very happy if you would tell me how the thing is done." The Quaker said "When thee take a glass of whiskey and brings it to thy lips, open thy hand before drinking and so long as thee continues to do this thee will never get drunk again." All he had to do was to open his hand and he would drop the glass. You see it is just the same thing with bringing the meat to ~~the mouth.~~

the mouth. Ifyou can somehow snatch his appetite from him, ashe is raising the meat to his lips, you can reform him. That is the secret of the "Keeley Cure." He tells patients who wish to be cured of the drink-habit,--"There is the whiskey barrel; drink all you want,--help yourself.." The man who was telling me the story said when he had been there a couple of days, he wanted some whiskey. He said that hypodermic injections were given every day, and that different bottles were used. He said he took a glass of whiskey (and it was good whiskey, too) but in a couple of minutes he went to vomiting,--and said he, "I nearly vomited up my boots,--I thought I would never stop--and I didn't want any more whiskey.. I then went home, thinking I was cured; whenever I thought of whiskey, it made me sick,--just the thought of it made me sick., and I got along all right for a while. But one day, I thought I would see if a little whiskey would make me sick, and I took a little sip of it, and it tasted good--it was all right; and from that moment I wasn't cured any more. I went back to Keeley, and had the same experience as before . I saw that the same bottle was used as before, and I said, 'Don't give me anything out of that bottle,--give it to me out of the other bottle.' 'Oh, no!' said he, "you must have it out of that .' I found out afterwards that he had given me a dose of apomorphia, and it made a strong mental impression, and so long as the mind had that impression, I was cured." That is the whole art of the "Keeley Cure.' I am telling you this so that you will see that there is a very powerful use that can be made of psychological impressions. You must make such an impression upon the mind of the woman who has a tight waist, for instance, that she will think it is a dreadful thing,--you must fill the air with spooks and hobgoblins of disease that she will feel that it is an awful thing to constrict her waist. And, in regard to meat-eating,--you must present the subject in such a manner that the meat-eater ,when he sits down to a meat dinner, will think heis attending a funeral,--you must be able to tell him awful things pertaining to meat-eating. We have to feel in our souls that these things are so, and then we won't have any great difficiulty in making others feel so.

So the dietetic use of meat is a short story. It is supposed to be more digestible than other food, and it is claimed that it leaves less residue than any other food, --that there is less waste in it than in other food. But this argument only relates to the intestinal residue--the feces. Of course flesh must be all soluble,--and why must it be entirely soluble? ("Because blood can be made out of the soluble part.") ("Then bone ought to be soluble.") It is. There was once a bicycle-rider who was swallowed by a man-eating shark in the vicinity of Honolulu. He was a famous bicycle- rider; he got lost and they found him in a shark's stomach. They identified him by his bycicle shoes and his great toe, which were left. They also found one of his feet left,--it was protected by his tough leather shoe--and that was all that was left of him. They identified him by a peculiarity in his great toe. The shark had digested him, bones and all. Yes, bone is soluble. So meats are soluble; but the waste parts of meats pass off through the kidneys instead of passing off through the bowels ; there is 15 % of this waste material that passes off through the kidneys.

When we come to peas and beans, and allied foods, there is practically none of this kind of waste --there is practically none of that soluble waste, because that part is all nutritive . It is only the insoluble parts that are innocuous;--it is the insoluble parts that are waste matter. Now which is safer for the body,--which would be the safer for one to take into his alimentary canal--the soluble substances, or the insoluble wastes that are of no value to the body? ("Insoluble substances.") Yes. Because the soluble substances ~~can be~~ are taken and circulated in the body; while the insoluble parts are taken into the intestines ... The wastes of potatoes and bread are far greater than those of nuts. The loss in flesh foods is great, as compared with the better class of vegetable foods. What is the value of beans ? ("Eighty-six.") How much is the ~~value of~~ proportion of proteids? (("Thirty.") Twenty four; starch, sixty. How much fat in beans ? ("Two.") Is there any bean that you know of that has more than that? Yes, it is called by the Chinese, the "soja bean." The "soja" is a mold that is formed by the fermentation of this bean; it is from this mold that "Taka-diastase is made,--and that is the way it was discovered. These "soja" beans contain about 20 % of fat. Now the peanut is really a bean, the pod growing in the gound; but that has a still larger per cent. of fat,-the starch replacing the fat-- about 50 %.; all told, we have 86 %. How much water is there in the bean? ("Fourteen.") I have been revising this table according to the latest results which have been reached by Atwater and others, and I have made quite a number of changes, and I must study them up and familiarize myself with them . (Blackboard calculation.) About four parts in a hundred actual waste,--that is not vry much . What is the waste in meat? ("Fifteen.") There has been a tremendous error propagated in reference to meat and vegetables,--that vegetables contain so much rubbish and waste that we cannot eat them, but meat is a concentrated food, and has not much wastes, and these wastes are a great burden to the body. Of course it is not good for a child to swallow pennies, marbles, etc.,--it is a great inconvenience to the child , but they generally get through all right, unless they stick in its throat.

But if that child swallows arsenic, strychnia or some other insoluble poison which could ~~not~~ be taken into the blood,--that is quite another thing. Now the wastes in beans are much more than those in meat, and some others have a good deal more than do beans insoluble wastes. But here is meat containing 15 % soluble wastes which are taken right into the body and the blood, and come in contact with the brain and nerves, which is a very serious matter, and I want you to see what a serious matter it is . Osler has made experiments upon monkeys in localizing motor areas. He went over to Paris where there is no law against vivisection and made these experiments . You are all familiar with the subject of motor areas (illustrating by diagrams.) By making an application of electricity to the swimming area, for instance,, the animal will make efforts to swim with its ~~limbs~~ fore and hind legs...We had a case of a young woman who had epileptic fits, and in the operation, I applied electricity to the caecum, and she had spasms beginning in her left limb, and localized the area by making applications of electricity,--and every time the electric current would come in contact with the tissues and the circuit closed, there would be a strong twitching of the leg. Now Osler found that if he put extract of beef on these tissues--on the brain, on the motor area--it was at once paralyzed, so that there was no response to the electric current. That shows you the effect of extractives upon the nerve-tissues. Strychnia had the same effect, also opium and alcohol, and a great variety of other toxins. The meat extractives acted as a poison, and not as a stimulant. It has been supposed that meat extractives were a stimulant to nerve-tissue. That is the reason why meat-extracts, beef-tea, etc., have been recommended. Others believe that whiskey is a stimulant. Mr..... told me once, that he would rather have beef-tea than strychnine; that he believed it was a stronger stimulant than strychnine Judging from this experiment however, it is not a stimulant. Experiments in France have shown that there is no actual stimulant in meet extracts, and there is no substance which can be given which will actually increase thepower of the nerve centers; it is agood thing to remember. #Waller, the son ofthe celebrated Edward Waller of London, made some interesting experiments. in London when I was with him (he is a proffessor in King's College there, and I was with him making experiments and assisting him making experiments on rabbits in determining the time of the reaction after the application of a stimulate.) The knee jerk is very strong and the rabbit was a very accommodation subject. I noticed some apparatus for the purpose of making muscular experiments on a large scale, and I found the doctor had been carrying on extended researches upon the feet of two or three students for the purpose of determining the time of muscular contraction. (Explaining by diagram) You have seen these muscle preparations have you not? (Yes.) In this little cup beef tea and varyous other substances for energizing the muscles was placed andthe muscle was at intervals bathed with this nutrient substance which kept it moist. We found that a weak solution of sugar energized the muscle, but that beef tea paralyzed the muscle. I was interested in this matter but he did not know anything about it. I inquired about it, and afterwards I repeated the experiment myself and found it to be true that a strong solution of beef tea when applied to a muscle paralyzed it . If we set a muscle to work, it would work for a little time and then become paralyzed, and then if we let it rest it recovers; and if we washed it with a normal salt solution, it rested it right away and was able to go to work again promptly. But when washed with beef tea or other flesh preparations, such as bouillon, it was paralyzed.

This shows the power of toxic substances upon muscle tissue--Q. You said that there is 15 % of extractives in beef?

A. 15 % of the proteids of meat are extractives.

Q. The Beans are dry while the meat is wet--the proteids are compared on the same level--both dry?

A. Yes, but you multiply the beans by four so as to bring the right porprotion or rather divide the waste by four which would be the same thing, beefsteak being about three-fourths water.

Q. It would not be 15 % would it?

A. I divided by seven--we will compare these extractives and instead of putting 15 % we will put it about 3 % of the total amount. Baked beans are dry and we add water and then we compare them with beefsteak in which there are three parts of water, and the porprotion of waste is only one-fourth as great when we add water.

Now with reference to the digestibility of meat: Raw meat digests in two hours, but if the meat is boil ed it requires three hours for digestion, and if the meat is roasted it requires four hours for digestion. So we see that the gigestibility of meat is no gr eater than that of vegetable foods. Rice requires one hour for digestion; tapioca, two hours.

Q. Does it make any difference about the quantity?

A. If it is a small amount, two or three ounces,--hard boiled eggs require three and one-half hours for digestion, but if chopped up they digest in two hours. Here is boiled salmon (Referring to chart) which requires four hours for digestion; oysters three hours and one-half--practically three hours-- andthey are supposed to be quickly digested. Tell people that when they swallow an animal alive and kicking they must not expect he is going to be easily digested; he will fight for his life and he is bound to live as long as he can.

Q. Are these oysters alive when they are swallowed ?

A. Yes. People eat live oysters,--oysters on the half shell are always alive (" Lots of fishermen eat them just as they pick them up") Yes,--they will crack the shell and swallow the oyster with the slime of the ocean,---the whole thing is so filthy that you can hardly imagine how people have brought themselves to such filthy habits of eating. The "oyster juice" is the slime that the oyster secretes in its mouth and the alimentary canal--the execreta--for the oyster has an alimentary canal, and a colon and an outlet for its alimentary canal; on the inside of the oyster shell is found everything that pertains to the oyster--the stomach, bowels, kidneys, liver and all the other things pertaining to theoyster,--and the idea of swallowing a whole beast as would an aniconda, is most repelling , andyet ~~people~~, by seeing the thing done many times, it ceases to be horrible. After becoming familarized with the most disgusing things they cease to become disgusting after while. In the use of tabacoove we see how horrible it is at first--it was as horrible to the man as it is to you and me, but by and by he becomes accustomed to it and then he is delighted with it. People who acquire a taste forthese horrible things--such as , finnan haddie,etc,- I was up in Canada one time, some years, and I heard a great deal about finnan haddie and I said to myself I guess it would be a good chance to see what finnan haddie is like. So I called for some finnan haddie and inspected it after it was put down on my plate among other things and I assure you there was not anything tempting about it, for I very soon discovered that there was something rotten a good deal nearer home than Denmark--it was something filthy and lothsome; I took a very small bit of it and brought it to my nose, and it was awfully repulsive; it smelled like a corpse about a month old--and perhaps older. Finnan haddie is simply rotten fish, but it is greatly liked in Canada, and in the cities on the Northern border of the States where you will find finnan haddie is a favorite article of diet. In India there is a certain class of people who have an appetite for rotten fish-- they gather up a lot of fish and let them lie in water awhile and they bury it up in the ground for from one to three months, until it is thoroughly rotted and becomes soft, andthen they dig it up and scrape the fish off the bones and bruise it into a mass and sprinkle a little currie powder over it andthen it is a great delicacy. I said to a very intelligent Hindoo who had cometo this Country to be educated and who became a graduate at the Jefferson University,--he was stopping here at the Sanitarium at one time and I told him that I had heard of "Gnappee" or rotten fish, and that it was a favorite article of food in India, andhe said it was so. I said I supposed it was eaten by the poor who couldn't afford anything better. " Oh no: he said " I eat it myself, and I don't belong to the poorer class, and I like it very well." I suppose that I looked disgusted at that, and that he saw my disgust written in my face, and he said "Do you think it not nice to eat rotten fish? you eat rotten milk in the form of cheese, and the Chinaman eats rotten eggs-- it's all the same thing." I hadn't a word to say--only I told him that I didn't eat cheese such as is eaten in this country. It is all the same thing--simply proteid decomposition--cheese is a proteid decomposition of casein. There is another kind of proteid in fish,--there are certain substances or flavors of decomposition that people learn to like,--for illustration, there is a tribe of people in Asia, or rather, on the border between Europe and Asia--who have acquired a liking for the dung of certain birds, and this is collected with quite a good deal of care, and used as an article of food, and as a delicacy. The birds' nest of the Chinese are not much better, because they are thoroughly sat-

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urated with the excreta of birds. Birds' nest pudding is a great luxury among the Chinese. These birds' nests are sold at a very high price there--fifteen to twenty dollars apiece. They contain a sort of gelatinous matter gathered from sea-weed, and are thoroughly saturated with excreta, like the contents of a hen-coop, and the Chinese affect a great liking for it. Some years ago I was in a Chinese market, and I heard something about Chinese eggs. I wanted one of these Chinese eggs, so I b~~r~~ought one and brought it home. It was a great rough looking thing, and was as large as a big stone, and looked like a large cocoanut. I said to the Chinaman, "That is not an egg!" "Yes, that is an egg," he said; "the egg is inside; it was enclosed in plaster of Paris so that it would~~n~~ not smash, and they keep them in that way for years and years, and this egg had been imported from China. These eggs are all real antiquities. I broke ~~this egg open~~ one of them open, but I was glad to retire to a distance until the ozone had acted on it.

It is a mistake to suppose that meat is so much more nutritious than bread and ~~fruits~~ other foods,--it is not, because the waste elements are of a different nature; it is a mistake to suppose that flesh is more digestible than these vegetarian foods,--it is not; it is less digestible,--lean beef requires four hours for digestion; rare roast beef three hours, ect. (Reading from chart)..... I am going to ask you to write a paper tomorrow on "The Daily Ration."

LECTURE TO MEDICAL CLASS, Feb. 24,1903.

Dietetics,--Eggs .

J.H.Kellogg, M.D.

------X --------

TO-DAY we will talk about eggs. An egg is simply a young chicken; and whatever there is in the chicken,there is in the egg; there is everything in the egg that is necessary for the chicken--for feathers, bones, blood, brains, nerves and muscles--everything that is in the chicken is in the egg.. It has been supposed that the egg-shell gets thin during the process of incubation; that it gradually thins by absorption, and that it furnishes something towards chicken-making; but more recent studies have shown that the egg-shell is not necessary for that purpose; that it is dead matter, and that the living animal matter cannot ~~live~~ subsist on dead matter ; that the lime-salts and other salts which enter into the composition of the body,must be in organic combination to be assimilated. There is no positive proof that these inorganic salts can be assimilated unless they are found in organic combination. A dentist finds his patient has affected teeth, and they give them a preparation of phosphate of lime,--they find it present, and so they conclude that it is food for people,out of which teeth can be formed. Nothing can be more absurd. When a portion of tooth is gone,it don't grow in again,--it is gone forever, and it cannot be reproduced by phosphate of lime. The tooth does not grow after it is fully formed,and there is no possibility that phosphate of lime will prevent the decay of a tooth. Teeth do not decay because they have not phosphate of lime enough, but because of the lowering of the bodily resistance and the presence of germs which set up processes of ulceration. Decay of the teeth is an ulcerative process,--but let us return to our subject.

The egg is characterized by one peculiarity as regards its salts--it contains more calcium than any other food substance--except what? (Milk) more than any other food substance except milk. Milk and eggs contain large quantities of lime salts. Eggs in particular are supposed to be particularly good for children with rickets. An egg combined with milk may be sometimes usefully employed in such cases where animal food is necessary. I believe it would be quite sufficient if we should subsist entirely upon vegetable products if we could have the right sort of vegetable products . If we had the right kind of vegetable food we would have no need to appeal to the animal kingdom for any nutritive material, and I am satisfied we would be better off without it, and we will see some reason why, in connection with our study of eggs.

Eggs contain a large proportion of iron; forty-six eggs contain a grain of iron. The egg contains one part in ten thousand of iron, but it does not require much iron in a day-- not more than a dozen eggs-- how much iron is lost in a day? ten killograms (Blackboard calculation) We will call it seven,--what do we conclude from that (" The fat is what we need.") The body requires one-seventh of a grain of iron in a day. How many eggs does it take for a grain of iron? ("46") How many eggs will be required per day to furnish the total amount of iron required? ("Six") half a dozen eggs--six or seven eggs would furnish ~~would~~ the total amount of iron required by the body per day. If you had an anemic patient, that would be a good way to supply iron and would be a much more sensible way than to supply iron in the form of iron fillings knives and forks spoons and crowbars. Iron is an inorganic substance and itis just as difficult to utilize this as for the teeth to chew the knives and forks spoons and crowbars,--it is a substance to which the stomach is refractory; pepsin won't desolve iron; the there may be a littles hydrochloric acid that will act upon it, but if it does it will produce chloride of iron which will neutrilize the hydrochloric acid and destroy it digestive agency. So you would not expect that chloride of iron or any of the salts of iron, or any preparation of iron would have the effect to increase digestion, would you

Now it is worth while to consider what is in an egg. An egg weighs about fifty grams,--that is,--about three and three-fourths ounces It has a shell weighing about twelve per cent. of its weight. There is, in the egg, about one ounce of white and one-half ounce of yolk-- that is in the natural egg of a hen. The duck's egg weighs fifty percent more than the hens egg, and the weight of the goos egg is three times as much as the weight of the hen's egg, but the eggs of ~~the~~ geese and ducks are not much used as they have a strong flavor; the duck's egg has a very strong flavor, because the duck eats bugs, earth-worms, filth offal of all sorts--but the chicken is almost as bad, so it depends upon what the egg is made up of, as to its flavor.

The iron of the egg is contained in the yolk. The yolk and white of the egg are very different substances. The white of the egg consists of different kinds of albumin, which are bound together,--the albumen is enclosed in millions and millions of ~~cells~~ minute cells and cell walls. The albumen of the egg is not a homegeneous substance and is in small cells. That is the reason why a beaten egg is more digestible than when other wise prepared, or swallowed out of the shell, or swallowed whole in a glass of wine, because in beating it up, the cell walls are broken up,-- the cell walls form, more or less, an obstacle to the digestive process, and when the albumen is broken up and divided into minute films, and the gastric juice mixes freely with it, and comes in contact with all the different particles of albumen etc., and it quickly dissolves these particles, so that digestion is greatly aided by the whipping of the egg into a state of froth.

Now, about the composition of the egg: The white of the egg contains about 86 % of water, and about 13 % of proteids. The yolk of egg contains 51 ~~per~~ % ofwater, and 16 % of proteids. (Blackboard calculation.) This shows that the yolk is much more nourishing than the white--its nutritive value is much greatr than that of the white of the egg. Let us see what the actual nutritive value of the yolk is, as compared with ~~the white~~ thatof the white. (Calculation.) The yolk is practically one-half water, and the other half consists of one-third proteids...(Calculation.) The proteids is practically ~~two~~ 42 heat-units. Now there is twice as much fats as proteids. (Calculation.) So the total food-value of the yolk of one egg is 210 food units. Now let us see how much there will be in the white. This is the only way to study foods so as to know anything about their nutritive values, and one needs to become familiar with this kind of facts, and thus have a store of knowledge which you can utilize in your daily experience. Most doctors prescribe for their patients by the "rule of thumb," simply guessing atit, and trying one thing and then another. Dietetics must be put on a scientific basis, just as hydrotherapy is, also, our other means ~~ods~~ oftreatment .

Q. ~~How~~ Can we tell how much watr there is in the food ?

A. You can tell pretty nearly . The cooked cereals, peas, beans, and that class of food usually contain three parts of water to one of solid substance. Of course, soups contain but little besides flavor, but with peas, beans, etc.,you can estimate two-thirds water,and not go very far astray

Q. Is not some of the water cooked out ?

A. Yes,--but it ends up with about 1/4th dry substance. Now let us take the white of egg,--we will say there is an ounce. (Calculation.) Proteids, 65 food units. Now how much fat is there? ("One-fourth of one per cent.") That is hardly worth noticing. (Calculation.) Sixty-five food units for the white of egg. The yolk has practically three times as much food-value as the white .

Now suppose we have an anemic patient, and you wanted him to eat eggs, so as to get bloodmaking material, and get fat and make proteids, it wouldn't be very ~~wise~~ wasteful to throw away the whites because they contain only one fourth total food-value of the egg. (Balckboard calculation.) The white has practically one-fourth the food-value of the egg, so you can throw the white away without sacrificing much--you have thrown away one-fourth the food value of the egg, and one half the bulk of the egg.

Q. You would have to take about 30 eggs, at that rate, to get the total nutriment for a day's rations?

A. Let us see how much would be required. The egg as a whole, contains 275 heat units (food-units?) how much would be required for a day's rations? ("Forty.") (Blackboard calculation.) Eleven.

Q. Where do your carbohydrates come in?

A. The albumin of the egg contains carbohydrates which are included in the proteid molecules; in that respect the proteids ~~of~~ of egg differ from the proteids of milk. The proteids of egg contain a carbohydrate molecule, and so it can get glucose and carbohydrates out of the albumin.. Let us see how much egg would be required for the proper ration of proteids--how much would one have to take, of egg? We will reckon heat-units: the yolk furnishes 42 heat units, and the white contains 63--there are 105 heat-units in the ~~egg~~ proteids of the egg. (Calculation.) It requires about 1500 heat units, in the form of proteid for the daily ration.. One egg contains practically one hundred,-- how many eggs would that be ? ("Fifteen.") It requires fifteen eggs to furnish the proper amount of proteids for a day's ration. The white of egg contains no fat. ~~Now an ounce of fat~~ The yolk has one-fourth of an ounce of matter, and two-thirds of that is fat,-- that is, one-sixth of it is fat. Now an ounce of fat contains 1000 food-units. (Calculation.) There are 167 food-units. About ,500 would be required per day--about the same as of proteids. Fat 170 food units (Calculation.) Dividing 1500 by 170, we have practically, nine eggs to furnish the proper amount of fat, and fifteen eggs would furnish the proper amount of proteids, so two-thirds of the same amount of eggs would furnish all the fat required. But there is something else that is not furnished by the egg. The proteids can be cut down some, and replaced by fats. Some of the proteids are used for fuel. The amount of proteids can be cut down considerably, so we will say that it takes fifteen eggs for the proteids, and nine eggs for the fat, and the average would be twelve. Then a dozen eggs would furnish all the fats and proteids a person requires for a day's ration.

Some of these things are highly practical, and we want to get the on a practical, usable basis and from scientific data. We will say, then, that a dozen eggs can be accepted as the quantity of eggs which will furnish the proper amount of fats and proteids. Then, if a person adds carbohydrates to that --say a pound and a half of bread--that is more than we need--say a pound of bread; that would give you about 60 % of starch. We need about 16 ounces of starch, so we want a pound of zwieback--it will take about 18 ounces of zwieback, and you have a little excess of proteids; you can say, eighteen ounces of bread zwieback, granola, granose, toasted wheat-flakes, or any of the dried cereal preparations, and a dozen of eggs, will make a complete day's ration, and it would give you everything required for complete nutriton. If you take fruit in addition, it would be for a dessert. Now a word about the digestibility of eggs---

Q. Can you prove by actual experiments that these figures which you have given us are correct?

A. Of course this rests upon the foundation of dietetics in general,--we know this to be true--we have proved it by numberless experiments,--that, as to the unit food-value of proteids and carbohydrates,--for example, experiments of this sort have been made --to give a man proteids in the form of casein, eggs, albumin and legumen, and then in the form of meats. These experiments have been made in Germany during the last few years, and have shown that proteids and fat ~~these elements~~ can be interchanged without disturbance of the patient's digestive equilibrium. Reutner (?) and others have made experiments of this kind. There have been a great number of experiments of this kind made in Germany during the last eight or nine years. It would be well to verify these results.

Now about the digestibility of eggs: A whipped raw egg leaves the stomach in about a hour and a quarter, while an ordinary raw egg remains in the stomach over two hours. Experiments have shown this ..... I have had some suspicion of the accuracy of these experiments, because the passage of the stomach tube stimulates the motility of the stomach. A very interesting fact has been noted,--that the raw egg remains longer in the stomach than the whipped egg or the hard boiled egg--in fact it remains in the stomach a little longer than a whipped egg or a hard boiled egg,or a soft egg--in fact it remains ~~in the stomach~~ a little longer in the stomach than a finely divided soft boiled egg; a finely divided soft egg leaves the stomach more quickly,when well chewed,than the raw egg,unless it has been well whipped up. Pawlow seemed to find the reason for this in the fact that the white of the egg does not contain peptogens, and hence does not stimulate the stomach to form hydrochloric acid. It is so soft and mucilaginous or glairy in its consistency that it does not stimulate the stomach so to move it out with sufficient promptness. A raw egg is practically digested in the small intestines. There was a time when we objected to the use of eggs for gastritis, but since this fact came to light, we saw that the simple white of egg dissolved in water and well beaten up is one of the best remedies ever found for a person suffering from gastritis, for it soothes the stomach, and readily passes into the small intestine where it is digested. But with a boiled egg it is different,--it causes the stomach to pour out gastric juice, and is sometimes irritating to the stomach when it decomposes and decays and sulphides are set free,--and these are irritating and give rise to the odor of rotten eggs; this is what blackens silver and iron when exposed to it . It is a curious fact that when eggs have been boiled for a long time, sulphides are formed,--when you examine eggs that have been boiled for a long time , and separate the white from the yolk,you find a film, and that means sulphides of iron--the sulphide has been set free and robs the yolk of its iron, giving rise to this offensive odor and black color; the sulphides have been decomposed by the heat and the long action of the air. We sometimes note this in hard boiled eggs when they are some days old--and even after they have been kept only a day or two they become discolored from the same cause--sulphides .

Q. Is it still organic sulphide?

A. No,--not after it is set free. Now the composition of this, nobody knows; this fact is recognized by the best authorities,--that nobody knows its composition, just as nobody knows what is the composition of the brain, of the egg, or the fluids of the eye, etc. These are organic , living tissues, and nobody knows the composition of the living tissues--living muscles, etc. We know the composition of dead muscles but we don't know the composiíon of living muscles. There are various substances in the egg; it is supposed that there is nuclein in it, but there is some doubt about that. Pawlow says there are no purin bodies in the egg unless there has been incubation; but if there has been incubation,there is nuclein in the egg. You can readily see that there can be no nuclein until after vital work begins.. When there has been nuclear activity, then there will be some of these products by nuclear cleavage, but you have no such products unless there has been cell-work. I think Pawlow must be right. His observations are more to be relied upon in this line of investigation than those of Dr........for he is a chemist,and has employed more exact methods than Dr......, and I think he is right about it . This puts eggs along with milk, as being foods that are free from uric acid, and foods which can be substituted for bread by persons who wish to avoid the evils of chronic rheumatism, and want to keep their bodies free from purin substances.

The composition of the egg is complex; it has half a dozen different kinds of proteids, but these do not exist in their distinct form in the egg. But the egg is a very complex substance--an extremely complex substance, the exact constituents of which no chemist knows, and the chemists admit it; the best authorities recognize this fact; they can simply analyze the dead egg.There is a lesson in this . Analysis shows us what is in dead substances, but it does not show us what is really in living substances.. ..Organic substances entering the tissues will support life, while dead substances will not .

To-morrow you may write a paper on eggs.

MEDICAL LECTURE, Feb. 25,1903.

F R U I T S .

J. H. Kellogg, M. D.

--- oOo ---

We have been talking about eggs,--let us talk about fruits to-day. Fruits consist of water, digested carbohydrates and flavoring matters. Fruits consist chiefly of water, and contains a small amount of nutrient material in the form of digested carbohydrates. In the process of ripening, the starch that is found, a portion in the fruit and a portion in the cellulose, is converted into sugar.

There are various kinds of sugars in fruits, but they are fruit-sugar, mostly. There are certain fruits, as the apple, the pine apple the apricot and the pear, which contain a small amount of cane sugar. This fact must be taken into account sometimes, when feeding diabetics on fruit. The date and the watermelon also contain a small amount of cane sugar.

Fruits generally contain fruit sugar, but there is a special kind of carbohydrates found in fruits known as "pectin bodies." These have essentially the same composition as starch, but they behave differently. they become gelatinous. It is in the presence of these bodies that fruit juices are converted into jellies by boiling and by concentration. Nearly all the fruits contain more or less of these pectin bodies. These bodies are, by boiling (?) converted into what are called "pentoses", as they contain five atoms of carbon. These pentoses or pectin sugars are not easily assimilated, and this must be taken into account in the treatment of diabetics. Fruits which contain a large proportion of gelatinous substance--fruits which jelly easily--must be avoided by diabetics because of the large amount of pentoses which they ~~contain~~

produce . Apples must be excluded in these cases, because of the large proportion of pectin which they contain. Other fruits contain less pectin, and consequenly are better for diabetics,--fruits which do not jelly very well--do you know of any of these ? ("Cherries, raspberries, peaches.") How about whortleberries?. You can buy jellies made of all kinds of things, but they are not made of pectin . They are jellied from pigs' feet, fishbones, horses' hoofs, and skins of various animals. So-called tomato catsup is made of apples. There are large manufactories for this purpose,--one in Northern Michigan .

Q. Why do you refuse to give diabetics fruits containing a large proportion of pentoses?

A. Because they are not easily assimilated. They increase the amount of sugar in the urine; I think they appear in the urine, at any rate they tax the kidneys.

Q. How do they get the flavor into this tomato product?

A. The tomato has citric acid, although it has been supposed to contain oxalic acid. Recent investigations show that the tomato contains citric acid. ~~in it,~~ and you can add this tomato flavor ~~;--~~and you can use coal-tar. All the flavors of fruits are found in coal-tar. Coal tar has everything in it; for it is from nature's Pandora's box ; it comes out of a tree. The tree contains everything which is necessary or likely to be needed. She has put them in little bundles, doing as a missionary would, who is going to a remote corner of the earth,--he puts into his trunk everything that he is likely to need. Nature does the same thing with the tree. Coal-tar is distilled from the tree, so everything is there,--wood contains everything. All the different essences and flavors are in coal-tar. All the colors are there. Coal-tar is a mine for the chemist, and is continually bringing out something new. Sugars are there-and ~~sugars~~ things that are sweeter than sugars--saccharine is there, and saccharine is 550 times sweeter than sugar. Powerful poisons are there--medicines which produce sleep, and medicines which lessen heat production, and medicines which depress the heart; medicines which dilate the surface vessels--antipyrin etc.,--all the poisons, flavors and colors are there. There seems to be a little of everything in coal-tar. Most of these so-called "gelatins" are entirely innocent of fruit, and it has never had any acquaintance with a tree or shrub, but is composed of cheap acids, flavors and colors...It is very different from the gelatinous matter used to make tar.

The amount of nutrient material in fruit is extremely small, as a rule--so small that the great majority of them cannot be looked upon as foods. However, we may divide fruits into two classes,--food-fruits and flavor fruits--fruits which are used for flavoring, and fruits which ~~are used for foods~~ act as foods.. The number of fruits which act as foods is very small, the date, the fig and the banana constituting most of the fruits which act as foods. On the average, fruits contain 85 % to 90 % water--about one half of one per cent. proteids, about the same amount of salts, and five to ten per cent. of carbohydrates, and contains as high as two or three per cent. ether extract or flavoring material. The thing to remember is the nutrient value of fruits. Some have as high as 6 per cent. woody material, and whortleberries even go as high as 12 per cent. woody matter; there is great waste in them. In blackberries and raspberries there is 6 or 7 per cent. woody matter. I will give you a table to-morrow... People will ask you these questions,- for instance a patient asks you for whortleberries, but he does not require much acid, so you will not give him whortleberries, but you may give him whortleberry juice with ice-water--or something else would be still better for him; the best thing to give him would be pear juice ~~because that contains~~ only one tenth of one tenth per cent. acid.

which contains only one tenth of one tenth per cent. of acid.

There is a wonderful difference in the quantity of acid which fruits contain. Lemon juice contains quite a large proportion of acid--45 grains of citric acid in an ounce of lemon juice, and this is capable of neutralizing 5 1/2 grains of bicarbonate of soda. It is easy to determine the strength of lemon juice by means of carbonate of soda, because it has practically grain for grain.... Mr. ~~Ri-sl-ey~~ Risley, I wish you would figure this out and see if it is right. There is a close resemblance between these organic acids and starch, as they are formed from the same foundation; the resemblance is so close that it is a matter of practical importance.

The organic acids of fruit must be classed along with sugars as foods. There was a time when they were not regarded as foods. They were formerly classed along with the mineral acids, and it was supposed that when taken into the body they were treated like ~~any~~ other acids; that they decreased the alkalinity of the blood and produced a state of so called "acidaemia." More recent investigations show this to be a mischievous error. Thousands of people have been robbed of the benefits of fruits by doctors who tell them, "You must not eat apples,--apples contain malic acid--" as if malic acid were as dangerous as uric acid. That was one of the objections urged against the admission of the American Medical Missionary College into the Medical Society--that this college believed in acids as foods; that vegetarianism was taught here, and that it was a mischievous error, because it induced people to eat acids, and hence that it was the cause of rheumatism; that this college was a sort of scourge in the land, because of its mischievous teaching.

A STUDENT: There is a gentleman over across the way who is living on a meat diet, and he is forbidden to eat malic acid.

DR. KELLOGG: I am thankful that people can see what their standard is; it is stained with blood. Our standard is white.

It has been found by recent studies upon the subject, that these fruit acids are force producers, and that equal weights, as compared with starch--equal weights of organic acids --malic acid citric acid or tartaric acid --will produce about one half the number of heat units. The food value of organic acids is about one-half that of starch or sugar; So organic acids are a food. These acids have the advantage over cane sugar and over starch, that they require no digestion,--that they are ready for immediate absorption. But this is true also of sugars in general-- levulose and dextrose (glucose in its two forms,levulose and dextrose) is the sugar of fruits, and this is ready for immediate absopption; it does not require conversion; cane sugar requires conversion,- but we will take that up a little later.

These organic acids are foods, and when they have been absorbed and undergone oxidation- what is the result of oxidation - what do we have left? ("Water and carbon-dioxide.") It has not gdvanced so far as that -- I should not have said oxidation, but the assimilation of acid. ("Alkali.") Yes, alkali carbonates, In utilazition of fruit acids there is these alkaline carbonites, which increase the alkalinity of the blood and the urin, instead of deminishing it. This is a thing we know, for the reason that we have been carrying on a series of experiments here. The first result was -- for the first few hours--there was a great increase of uric acid. In a few days the urine was loaded with urates.

That looked as though there was a great increase of uric acid, but is was ith unloading of uric acid, which was a matter of great consequence. From that time on, the uric acid diminished rapidly, and the alkalinity of the urine also diminished rapidly, so that within less than three days there was actually the appearance of triple phosphates. The urine became so strongly alkaline and, and without decomposition-- it was a wonderfully interesting thing-- that the alkalinity should become so pronounced that there were actually present triple phosphates in large quantities, and this continued throughout the experiment. This proves beyond the possibility of doubt that there is a bery decided tendency in fruit to render the urine alkaline. If the patient has uric acid and the alkalinity of the urine is low, and he is suffering from ecxzema or some other skin disorder-- a c ndition which grows out of this acid state of the body-- when we have such a patient, what would be better than to put him on a fruit diet? I have seen good results from a fruit diet in such cases. This experinece, for many years, has shown that there is a wonderful virtue in the fruit cure. (" The lemon cure is much used for the cure of rheumatism.") that is all right, although it is entirely opposed to the teachings of certain members of the pcofession. There is a certain Dr. in England who has brought out the idea that a great majority of cases of rheumatism was the result of carbo-hydrotes, and theyy must be surpressed , and that meat diet was a specially valuable for rheumatism. Now there are some poor anemic patients who have starved on oatmeal and similar foods, and who afterwards took a meat diet and were benefited, because theirnblood was improved, and so the hasty conclusion wa drawn that these patients were successfully combating rheumatism by this means. This Dr. drew the conclusion that meat is a remedy for rheumatism and that carbo-hydroates is the cause of rheumatism, but the conclusion was a hast one. Any conclusion, at any time and any where, that is contrary to a law of nature-- that is contrary to a great fundimental principle that you know to be true, you should be suspicious of. Never adopt a doctrine which diametrically opposes a thing which you know to be true, and which harmonizes with nature. That is a principle that I have stuck to for many years, andmany times it has been a great help to me. I never went into that meat eating fad that started years ago,-- and whi did'nt I do it? because I knew that meat eating was not good, and that God never intended me to eat it, and I knew that if He did not intend that I should eat it , it was because it was not good for me to eat. Water is agood remedy, because God made it for us to use. Exercise is a good remedy for God made us to exercise. But meat eating is a thing that God never intended us to do, consequently, it cannot b a good remedy, as a rule,-- there might be some circumstances in which meat might be better than something else, and there might be circumstances in which even saw-dust or similar materials might be useful. Lean meat well cooked would be better than oatmeal half cooked, because it is more easily digested, and one would get more strength out of it,-- so it a question of circumstances very frequently, more than a question of actual value-- Q. The fruits which make the blood more alkaline are mostly flavor fruits?

A. Yes, because they abound with acid, while the food fruits contain but little acid and a great deal of sugar. The banan a has a nutritive value almost equal to the potato, as you can see by the chart. (Reading Food values from chart.) The difference between the potato and the banana is small,--

the bananna is better than the potato-- it has about the same nutritive value and is a better food.

Another interesting thing to note if reference to the bananna is the resemblance between the bananna and rice,-- suppose we take the water out of the bananna and make flour of it-- it would be more nourishing than rice-- it has a hight nutritive value. Suppose we take the water out of the potatp (Calculat on) the product is 78 , when we take the water out, so rice and the potato are practically the same thing--have about an equal value--boiled rice and baked potato,weight for weight have practically the same nutritive value. The same is true of the bananna, only the bananna is a little more nitrogenous-- what is the rate(" It is 2-9/10.") That is almost the same asthe potato (Calculation) A little more than 10-1/2-- it is practically 10. So the proteids for the bananna is ten, and the carbonaceous, 70. So bananna flour is better than the potato or rice. The bananna has a greater nutritive value than the potato, and a little more proteids, and almost the same amount of carbo-hydrates. So bananna flour is a little richer than rice in nutritive value. In Central America it is customery to feed the laborers a daily ration of 2lbs of bananna flour and a quarter of a lb. of salt meat or fish. The bananna is cheap. I have seen when I was in Vera Cruse and the Terri Corriente, banannas growing in the woods in great bunches,-- they grow wild there just as hazel bushes do here. If a bunch hapens to be over ripe they wont ship it. They have to get them green for shipping, otherwise they would not last until they got to New York, and if they do not they are thrown out on the dock as worthless. You can buy these great bunches of ripe banannas for two or three cents a bunch. Now we can take many of those banannas that have been thrown away and dry them in an evaraptor,just such as we use for evaporstoring apples, and then grind them into flour. I have had sent to me from Bluefields some samples of banannas ready for grinding, and also some bananna flour. I could buy them for 10 cts. a lb. It costs nothing more than the labor of making it. Banannas have an advantage over rice-- in what respect? ("More proteids.") The carbo-hydrates are almost completely digested,--converted chiefly into the form of sugar, with a small amount of dextrine and a very little starch.

Q. Did not Stanley live for years on bananna flour?

A. Yes. It is used extensively in England. (" Stanley is living on bananna flour now.") We have a few specimines here and I wish you would bring them in. We will have to have a medical dietetics dinner at our house one of these days. We have many samples from all parts of the world, which I am sure you would be interested in.

Q. What do you think of eating banannas raw?

A. The raw bananna should be ripe and mellow like a peach. Banannas that are tough should not be eaten,--a bananna that you cannot crush within the tongue is not fit to eat, but it must be chewed as you would chew a piece of meat it is not fit to eat; it must be mealy like a potato,-- sometimes you will find a potato is soggy so it has to be chewed in order to be swallowed; a potato in such a cndition is not fit to eat; it should be mashed and dried before eaten. Heavy,solid , boiled potatoes are very indigestible; the potato must be mealy so that each particle will separate freely and mingle with the digestive fluid. That is the reason many cannot eat potatoes-- they are soggy, especially at this time of year --and why are they soggy at this time of year? The starch is being cnverted into sugar and dextrin, and getting ready for summer. The potato contains twice as much sugar in January and

February as in September, because it is getting ready for the nurseling of roots that are getting started in spring.

Q. I should think it would be better than fruit.

A. It would be better if it were properly cooked and mashed dry. The dextrin present in sugar makes the potato soggy when baked or boiled. When potatoes have been kept very cool this change does not take place; that is the reason you will find some potatoes mealy and other potatoes soggy,--potatoes kept in a warm place will be soggy and will sprout more quickly than if kept in a cool place.

Q. Why does freezing a potato change it.

A. I do not know why freezing should make a change in the potato and utterly spoil it. You would not expect the freezing would make any chemical change. I understand that the potato can be frozen and thawed out gradually and will come out all right. I have been told by farmers that they leave their potatoes in the ground, andin the spring when the ground is thawed out their potatoes come out all right,--do you know that to be true ("It is true if the sun has been kept away from them.") If it is kept from continually changing by freezing and thawing so that they have only one freezing--that would make some difference.

To come back to bananas ,--they are a wonderfully interesting fruit for the reason that they have such a large nutritive value and such wonderful productiveness. Humboldt was the first to call attention to this matter. He made a careful calculation and found that a piece of land of a thousand square feet is capable of producing six thousand pounds of bananas, but only thirty-three pounds of wheat, and one hundred pounds of potatoes. According to this calculation bananas will support twenty-five times as many people as will wheat from the same ground. But I have seen accounts of raising ashigh as 800 bu. of potatoes on an acre of land. In Central America banana flour is used as a staple article of diet. All through Mexico and Cuba one sees everywhere in the markets great heaps of bananas that have been fried in lard. The plantain is used for this purpose more than is the banana. The plantain is larger than the banana and slightly acid when cooked, and has a more agreeable flavor than the banana when cooked. It does no t become mealy as the banana does, so it can not be eaten raw,nbut when cooked the plantain is more agreeable to the taste than the banana; it is about twice a large as the banana and has a very agreeable acid flavor. These plantains are put in great dettles of lard and cooked in that way. You will see them lying about in the markets,and look very much like dough-nuts, only they have the shape of the banana. The plantains does not contain any fat, and if people there live on plantains they get a craving for fats, and there seems to be asort of instince in this which leads them to use bananas. You will find this in every hot country; this must be due to the poverty of fats. Rice has almost no fat--only about 2 per cent--and the banana has almost no fat, and the system requires an ounce and one half a day. The native Hindoo adds a little "ghee" to his porridge, for I suppose he don't eat so much fat as the average American does,in that form, but he takes it in the form of grease--he takes it "straight," so to speak,so it looks as though he uses much fat. He does not use milk or cream,--he won't eat milk ("cow's grease" as he calls it.) A foreign missionary,Mrs. Griffith, ~~a native~~ who had lived in India some little time, told me this as being pe her personal experience: She noticed that the milk that she used had a queer taste and she told them she did not like it as well as she did the milk at home she did the milk at home and that she could hardly endure it. She tolerated it however--she gradually got used to it. After she had been two years in India she one day met a very intelligent native lady who wxplained the flavor of milk,--she said: we Hindos, you know, dont use milk; we only milk the cows for Europeans, and in doing o we feel that we have sinned against the cow and robbed the calf, and that we have to make it right, so we make an offering to the gods andthe offering consists in dropping into the milk a quantity of cow-dung. This is a universal custome-- cow-dung is put in the milk to compensate the cow as a sacrifice to the gods. That is the universal custome in India,, it is n t generally known however. The American dairyman does practically the same thing, because he rubs the cow with his arms and limbs, dropping stable liter into the milk, and he perhaps neglects to wash his hands and the udder of the cow, and manages to get into the milk as large a contribution of excreta as the Hindoodoes--and perhaps a larger amount. The Hindo's, as I said, does not use fats . They have a good reason for not using it. still they have not a very great aversion to filth, because they bathe and empty their slop buckets all into the same village tank from which they get their drinking water. That is the reason they have cholera a great deal. This water is all they have for drinking water for the whole year; it gets covered with a green slime. The nativs go down there to bathe every morning in the tank, and the exereta of animals gets into the tank when it rains, and they wash their cloths in these tanks, also the kettles and other utensils out of the house, at the same time they get their drinking water there. Some of them boil their water. Some of the ladies there consider it as dangerous to drink water without ~~water~~ cooking it;

it is the universal habit of women in India to cook water, and they ridicule a foreigner for drinking water without cooking it. They understand that there is something alive in water that requires cooking and we know there is.

Tomorrow we will consider the subject of fruits and some of their special medical uses, which I hope will be of some service to you.

MEDICAL LECTURES, Feb. 26, 1903.

Foods, (Con.)

J. H. Kellogg, M. D.

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Here are some papers for distribution, on the subject of "The composition of fruits ".

(Report of Committee) I took milk that was sterilized, and took the skim milk, and the raise cream after the milk had stood twenty-four hours and after it had been sterilized--that is the same as is used every day--this is the first,--the sterilized that had stood twenty-four hours, and then I took simply the skim milk--I found in each c.c. 248,000 germs, and in the raised cream that had set at the same time there were 76,000 germs in each c.c. Then I took the first milk and got the separated cream, and in the separated cream we found 1,400,000 germs in each c.c.. Next I took the separated milk and found 486,000 germs in each c.c. more than in the cream. Then in the full milk I found 1,800,000. Then we let the mall stand twenty-four hours at 70 F. and the germs in the cream were so thick that we could not count them, but we estimated them and found that in the separated milk there was 100,000,000 in each c.c.. In the full milk there were just 2,000,000 in each c.c. This shows in the separation of milk germs get thrown away from the cream.

DR. KELLOGG. That is an interesting observation. There are actually more germs in separated milk than in separated milk skim milk. When you let it rise the germs are intangled in the cream and rise to the top. You may repeat the experiment and dilute the milk ten times. This is an important obserbation, showing the advantages of separated milk over the process of rising.

These are two important things that we learn here, also the fact that the sterilizing of milk enormously reduces the number of germs. Of course we know that the pro scess of sterlization is not a process by which all the germs are killed; but the colon bacillus is not killed--what temperature is required for that? Two hundred and forty degrees F,-- the colon bacillus dies hard.

Q. In how long a time?

A. Twenty minutes to half an hour; it depends upon the temperature,--the higher the temperature, the less time is required. At what temperature should you steralize beef tea? have you steralized it, or Pasteurized it ("No.") Suppose you were going to steralize some blood serum, how would you proceed? ("We would use the water bath.") What temperature would you take? (212) (We wait until they develop) It is with germs as it is with corn,--the seed of corn will resist frost or cold and heat to a remarkable degree, but when it has begun to sprout it quickly goes down before the frost, and a little excessive heat will kill it a hot wind like that in Nebraska will destroy a whole corn field, and a sharp frost will kill corn. It wil is the same with germs-- the growing germs are easily killed by a lowered temperature.

Now we will turn to the subject of fruits. If you undertake to make a calculation from the chart you will find that sugar is in excess because sugar is included in the carbo-hydrates, but the figures give you the nearest results in the relation of the amount of sugar. In grapes, carbo-hydrates 15-5/10 . Grapes are put down as containing 16 to 17 % of sugar. Hot house grapes may contain as high as 30% sugar-- they are very sweet. Ther is a g great deal depends upon the degree of ripeness of fruit. Green fruit containes starch, and tannic acid to a large amount. In the ripening of fruits, tannic acid as well as starch, and a portion of cellou is converted into sugar. Sugar is formed in the process of ripening, by the carbo-hydrates , the cellulous and the tannic-acid--dont forget the tannic acid. That is the reason the process of ripening absorbes oxigen. While the fruit is green it obsorbes CO_2 and gives off oxigen. But when fruits are in process of ripening they obsorbe oxigenand give CO_2 just as an animal does. So in a large fruit house carbonic acid gas accumulates all around the floors so that people have even been aasphyxiated. It also accumulates in fruit cellars, refrigerators etc., from the CO_2 thrown of by the fruit a ripe apple breaths just as a man does. There are vital changes continually going on. Under the influence of the acids of fruit the cellulose and carbon are converted into sugar, and through the absorpition the tannic acid is also converted into sugar, according Bunge. This is an interesting fact. That is the reason the same apple that has a sour, bitter and astringent taste becomes sweet when ripened. Did you ever taste the green sweet apple? You know how astringent and bitter it is; the green sweet apple seems to be more astringent than the green sour apple. The green crab apple containes a good deal of tannic acid and is extreamly astringent.

The boiling of fruits has the effect of gelatinizing the fruit because of the pectin bodies by which petick acid is formed in the process of ripening. It is not sulable in cold water, but is soluable in boiling water, and so the fruit is heated by boiling point , but the tannic acid is boiled and forms a gelitenous mass in cooling,-- pectose disolves in boiling watee and then forms a gelitenous mass when it is cooled. Pectic acid is found in ripe fruit scattered here and there in particles that are ins soluble in cold water, but in boiling the water the pectic acid is disolved and reduced to a solution of glucose and then it becomes a gelatinous mass. That is the philosophy of the gelling of fruits. That is the reason that fruit must be boiled to produce jelly.

Q If fruit is too ripe, it is best for jelly, as quinces for instance ?

A. The probability is that these pectin bodies are carried a little fartherin the digestive process and converted into sugar or pentoses, just as they are in the stomach,-- the change of carbo-hydrates into sugar or levulose must be accompanied by a change of tectose into pentose. Pectose is a carbo-hydrate from which pentose or 5-atom sugar is derived, so that the digestive process which converts the starc h and tannic acid into levulose may also convert the pectose into pentose.

Now let us consider the medical use of fruits: Fruits are a food, because of the food value of the organic acids, as carbo-hydrates. I stated to you yesterday that these are foods of the same nature as sugar and starch, but they have an adv ntage over them, bec use they are ready for immediate absorption and are extremely diffusible and are very readily oxidised when they enter the body.

Now what is the composition of these acids? How many know, for instance what malic acid is? Do you know the composition of oxalic acid? ("$C_2 H_2O_4$") That is oxalic acid; this will give you an idea of the composition of it. What is the compo ition of malic acid? ("$C_4H_6 O_5$?") What is the composition of tartaric acid? (" $C_4 H_6O_6$") What is the composition of citric acid? (" $C_6 H_8 O_7$?")

Q. A person can ~~eats~~ eat more fruit than other food, impoportion,?

A. Fruit ~~that~~ remains in the stomach ~~for some~~ but a little time + does not call for a large amount of hydorchloric acid nor tax the stomach; it doesnot excite the stomach to secretory action, so one can eat a -

large quantity of fruit. Now take the grape which it contains 15% of carbo-hydrates--even as high as 30 %. Melons have only a little carbo-hydrates; there is something more than water in melons-- melons 066 %--half the value ofthe potato. So when one sits down before a great water-melon and devours it, he hasre really eaten only half a potato. A 16 lb. water-melon would be almost equal to four pounds of potatoes. But when one takes water-melon he should drink them and not eat them. The carbo-hydrates arein solution, so one can get considerable food from the melon. Orange juice, 10 % carbo-hydrates ,-- see what a valuable thing that ~~is~~ a large amount of carbo-hydrates-- completely digested for the stomach . Lemons 8 % .

Q. I ~~dont~~ don't under-stand that melons have only 06. or practically 1 %; I should think they ought to have more .

A. I think that must include the rind also, as that is too high. The conditions under which these analyses were some of them made are not given and the probability is that more ofthe melon is included. Figs, dates and pruned contain a high nutritive value,--fresh prunes, 18 %,-- that is two thirds as much asthe potato. Raisins, seventy-four percent of carbo-hydrates, so we have in handful raisins quite a fraction of a dinner; with a good big handful of raisins and pocket full of nuts you have a day's ration. There is nothing much better either. (" Turkish boys fill their pockets with raisins and nuts on going to dinner.") Yes, nuts are principally used in Turkey; you will see men hawking peanuts along the street of Constantiople. The peanut is called "the monkey nut" because the monkeys dig them out of the ground; They are also called ground nuts.

Q. What about the tomato?

A. It ixs a fruit , botanically, but in work s in dietetics it is considered a vegetable. The tomato contains citric acid.

A STUDENT: We have made experiments which show that tomato juice encourages the digestion of c rbohydrates.

DR. KELLOGG: That is a very interesting fact, and if it were verified it would add to our store of knowledge,e- it is very interesting if it can be verified. Every new fact relative to nutrition is worth a gold mine. It is generally supposed that acid fruits hinder the digestion of carbohydrates, but if the tomato encourages the digestion of carbohydrates, we can make great practical use of it, because many people have difficulty with carbohydrates.

Let us condsider the composition of the plum,--1.8 % citric acid; sugar 2.5 %; proteids 1.6%; it is practically all nutritive value; .03 %-- There is quite a little iron in the tomato-- 8 % cellulose. If you look in the right-hand column of the chart you will see that the value of the tomato is almost equal to that of the turnip; it containes 5,800 food units , while the turnip has 6,000; it is only a little below the squash; the tomato has a little morethan lettuce-- there is .03 % of sugar on lettuce, and 1.4 % of proteids. Spinach contains 3.6 % Proteids-- quite a large amount of proteids in spinach-- and 6 % free fat-- that is quite large too. Salts 2 % in spinach-- that is very high; spinach can be used for salts when we want to feed the patients something that has no carbohydrates in it.

The food value of fruit then, is sometimes very large and very valuable, because it is already digested. But if we want to give our patients predigested carbohydrates we dont have to use cereals, malt-honey,etc, because we cannot always get them. Fruit, here , is quite expensive and some other things are cheaper if we eliminate the water,-- for instance we pay a dollar a bushel for apples; a bushel would be about sixty pounds and one-eighth of that is practically about seven pounds of food there, at the rate of a dollar a bushel, it would be about seven cents a pound; that would be just as cheap as carbohydrates in the form of toasted wheat flakes, granose biscuit or crackers. If you can get potatoes at fifty cents a bushel, and the potatoes have twice the food value of apples then the potatoes would be four times as cheap as apples. Apples cost four times as much as potatoes , and when you get potatoes down to twenty-five cents a bushels then the relative value of apples to potatoes would be one-eighth, apples costing eight times as much as potatoes for the same amount of food value. Sometimes apples are cheap--as low as forty cents a bushel, then their value would about twice that of potatoes. So that food in the form of fruits in this country are, on the whole expensive,--and the same is true of nuts. Cereals and vegetables are useful foods because of their relative cheapness, but we may find a different condition in reference to them in some tropical countries,-- we might find wheat high; in India, for example, very likely we can get these same carbohydrates in a predigested form in fruits,if we carefully select the right fruits , at a very low rate . Should we say to a patient simply this, " A fruit diet would be good for you?" No, not unless we told him what foods to take; he might want to take berries,--for instance whortleberries in which he would find a large amount of woody matter and but little actual food.

There is another use for fruits, which I believe we were the first to recognize,--and we were the first to ascertain and to put this food value upon a scientific basis,--and that is the antiseptic value of fruit acids. All fruit acids have power to destroy germs;malic acid and citric acid are of equal value in the destruction of germs . One per cent. of citric acid will destroy all known germs, ~~or~~ ordinary lemon juice will kill every pathogenic germ in half an hour, ordinary lemon juice or the juice of a sour apple will kill all pathogenic germs in half an hour

Q. Dont they use them in cholera regions now?

A. Yes, I have noticed that the sanitary department in Chicago have just found that out and drop a few drops of lemon juice into a glass of water to purify it. Good strong lemonade is safe to use after standing half an hour. But ordinary water in Chicago at least-- cannot be purified by a few drops of lemon juice. And it takes more than a teaspoonful of chloride of lime to disinfect a whole barnyard; so it takes more than a few drops of lemon juice to purify Chicago sewage .

Q. How about vinegar?

A. It was announced some years ago that lemon juice should be used instead of vinegar, because it will disinfect and remove the danger of typhoid fever.. There is an account of an outbreak of typhoid fever from use oysters in England,-- ~~and~~ the Dean of Winchester died from the use of oysters; ~~and~~ the mayor had a great dinner and a number of people died from eating oysters at this dinner. So the oyster trade has fallen off 60 % in that locality.. There was one large grocery dealer who had been selling thousands and thousands of oysters every day, and he declared after the death of the Dean of Winchester he had not sold one oyster and he had more than five hundred thousand oysters in his oyster beds and he could not sell them; that he had seven hundred oysters coming in tomorrow andthere wasno demand for them. Some one suggested that they should have a department for the inspection of oysters, so that they might know when they were safe and sound. It was proposed to the Brittish Parliment not long ago that there should be provision made for the inspection of oysters the same asthey had for inspecting hogs and cattle, you can see what a great task they had before them, should they attempt the inspection of oyster beds,--they would have to feel the oysters pulse and look at its tongue to see if he was suffering from some infectious disease. This is really too ludicrous to expect for the task would be too great--to examine all the oysters in these oyster beds one by one to see if there were any of them really infected. The oyster is an scavenger; it is his duty to destroy germs, and he works at it as hard as he can until some man comes along, like some gigagantic Cyclops. The ideas has been suggested that the oyster could be made wholesome by putting a few drops of lemon juice on him, but that does not change his character; it may kill his parasites, but the oyster retains his pedigree,--he is still a wild beast and should not be taken into the stomach.

Fruit juices have wonderfully disinfective power,--they have power to destroy all typhoid fever germs and all pathogenic germs which find their way into the body; same is true of malic acid. All sour fruits are reliable, safe and wholesome disinfectents. . This cannot be said of all other acids. Sulphuric acid is a disinfectant acid ~~is a disinfectant~~/ Hydrochloric acid is a disinfectant, but oxalic acid is not wholly so; it is to some degree a disinfectent. Tannic acid is a disinfectant. The acids are all poisons, every one of them. But here we have a disinfectant in fruit juices which has almost the same power as the other acids, destroying germs without injuring the body. It has been said that germicides cannot be of any practical use to the body, because, although they destroy germs, they will destroy the body aswell. But here is an exception, forinstance, citric acid will not destroy thebody; is is a natural product to some extent. Cowmilk contains citric acid,--cow's milk ~~containsx matx~~ produces citric acid such as is found in the lemon, in 24 hours. This citric acid in cow's milk preserves the milk. Milk is more likely to contain hard curds because of the citric acid which it contains. These acids, when taken into the stomach, are of immense value.

of immense value. They can be used to purify water, but they can be especially used to purify the body and cleanse the mouth. The stomach is a preparatory chamber in which food is collected, and where the food is p prepared for intestinal digestion before passing into the more intricate recesses of the digestive apparatus.

One of the things ~~necessary~~ necessary to be done for the stomach is to disinfect it , and to destroy the germs which it may contain. The stomach is naturally furnished with a sufficient amount of hydrochloric acid to perform this work. But there is a large multitude of people in civilized lands who have not a sufficient amount of hydrochloric acid, and hence are unable to disinfect their stomachs.--These are important facts, and it would be well to jot them down. I never attended a lecture without taking notes, and I am afraid some of you are not putting into these studies the proper amount of work. I would like to have you put down these facts , so that you will have them to refer to, when you need them, and you should make the preparation before it is needed. It would be well to make a little note-book of different subjects, and put down facts pertaining to each subject,--I think you will find this a wonderful help. You can quickly and easily prepare a talk from notes which you have made in your books, and will be ~~ready~~ more ready to get up and talk, if called upon to do so . Some of our graduates have been called upon to talk, but they wander around , ~~but~~ and they don't talk facts. It is not enough to tell people that it is "very important to eat proper food,—" every one knows that; or "We all are dependent upon our food for the sustenance of our daily lives,--" every one knows that. But in this manner, one can talk half an hour without saying anything . We want you, when you get onto your feet to speak, to be able to parade a lot of facts before people which will make them open their ~~xxxxxxx~~ eyes ; they will do that when you talk facts,but when you harangue people they will go to sleep; but as soon as you begin to parade facts before them, they will wake up. I sometimes have to say things over to you four or five times, because I see some are not giving proper attention to what I am saying. So I must prod you up so that you will get all the good you can out of this course of study. We ought to have six months, and put two or three hours a day on dietetics.

This disinfecting property of fruits is one of the most important--I think I may say, the most important property that fruits possess. When you come to the use of fruits in medical dietects, you will find that these are the two all-important things pertaining to fruits,---the predigested carbohydrates and the disinfecting acids which fruit contains. This disinfecting property relates only to fruits which contain acids. Sweet fruits do not contain this disinfecting power. These acids have power to disinfect the stomach. We are continually swallowing germs which lodge in the air and the dust. The germs which are found in the dust of cities is capable of setting up fermentative processes in the stomach. The dust of the streets of Chicago has been foubd to be almost a pure culture of the colon bacillus ,in some instances,--"the manure germ" is a good name for it, and it is mentioned in medical journals at the present tinme, as "the manure germ," because it is found in heaps of manure and animal excreta, and people will understand it better when we speak of it as "the manure germ." It is sometimes called "the barnyard germ," and is exceedingly dangerous, as these germs in the animal excreta are found in the streets. These germs are taken into the nose, and the fluids of the nose catch them and they are carried to the back of the throat and swallowed. The stomach is a receptacle of germs which are brought into the nose and mouth from the air, food and watr. Tears also wash out the nose and wash these germs down to the back side of the throat, and they are swallowed into the stomach. So there is, between meals, a constant accumulation in the stomach, of these germs; the warmth and moisture of the stomach facilitate their growth, as an incubator, so that when the food enters the stomach, it meets with a great quantity of germs capable of setting up putrefactive processes in the stomach.

Q. Is there not some hydrochloric acid in the stomach between meals ?

A. I think not. Observations show that there is no hydrochloric acid in the stomach between meals, except in case of hyper-secretion. . You should pass the stomach tube in the morning before the patient has taken breakfast, in order to determine this . When the meal begins and food is swallowed, the stomach quickly pours out a large quantity of hydrochloric acid which quickly disinfects the stomach, so that in cases of ordinary digestion there are no germs to be found in the stomach fluid in an ordinarily healthy stomach between meals. This fact has been discovered in our Laboratory. That fact was not know until it was discovered in our Laboratory. It has been generally believed that germs are necessary for the digestion of food,--that they ~~w~~are essential and necessary for this purpose . Professor Vaughan, of Ann Arbor, thought, for many years , that germs were necessary for the digestive process. Pasteur also thought that germs ~~w~~are necessaryfor digestion, and for the support of animal life. It was only when one of his assistants showed that beans (?) could grow and develop in a sterile medium, that Pasteur admitted that vegetables could get along without germs, but he still claimed that human beings could not.? Nuttall (?) an American, some years ago, proved that guinea-pigs can live without grms. It is well known that the body of the new-born infant is absolutely free from germs. It has been found that there were no germs ~~of~~ in the body of an infant which had been asphyxiated. Experiments have been made with guinea-pigs; they were put in a glass case and fed in a very ingenious way, one of them being fed with germs, and the other was fed in the usual way. They were preserved with antiseptics for several weeks. It was then found that the animal who was fed no germs did as well as the one who had been fed on germs--at the end of several weeks they were still sterile and all right. Professor Nova, at my request, came here for the purpose of assisting us in the examination of germs. Our method has not been employed in a systematic way by anybody else. It is a method which occurred to me; it proved to be correct and I employed Professor Nova to come and spend some weeks here, to assist me in perfecting a technique by which I could get reliable and scientific results. The Professor immediately began to work out a plan...After about a week, he said to me, "Doctor, I am very much discouraged,--I can't get any germs at all from the subjects, and I am surprised; I have tested my method over and over to see if there is anything wrong, but my fluids are all right, and I can't find anything wrong, but I can't get any germs. I had given the subject well toasted granose flakes for his test-meal, and didn't use bread because I wanted something which had no germs in it, and I knew if we gave our subjects bread we would find germs. I supposed there would be germs enough swallowed in the air, so that there would be some germs found; but at the end of the week, the Professor said he couldn't find any germs. I said, "I guess we will find some germs for you;" so I gave ~~him~~ the subject the usual testmeal of bread, and then germs appeared in great quantity. Every single specimen contained germs. But when the patient was given a sterile meal, no germs were found. That is the reason we find so many specimens without germs. If we should give the patient ordinary raised bread we would find germs in great numbers in cases in which no germs are to be found when sterile water and food is used. These facts, I believe, were made known by Professor ....of the University of ....

where they use granose flakes for a test-meal, because they get results which are reliable.

This proves what has not been heretofore known, that when the system is in a healthy condition, and fed on sterile food there are no germs, because the stomach is able to destroy the germs which are naturally there, and if you don't take in any germs along with your food, no herms will make their appearance in the stomach fluid, and if there are germs present the stomach may destroy them and may not; it depends upon the amount of hydrochloric acid present. Now we have a stomach which does not make hydrochloric acid enough to cleanse itself,-- or a man with his tongue badly coated, who is suffering from gastric catarrh-- he is continually swallowing mucus. Many people have a filthy habit of clearing their nose and drawing their filth into the back part of the nostrils and swallowing it and then it goes into the stomach. Many people with a bad nasal catarrh never use a handkerchief at all. They draw the excreta that obstructs the nostrils back into the back part of the throat and swallow it into the stomach. Such people's stomaches must get exceedingly foul, and it is no wonder that such people have awful indigestion. Many people are not to blame for this, because their attention has not been called to it. If a child has a cold and the mother neglects to supply the child with a good number of handkerchiefs, the little one is compelled to adopt some means of disposing of the mucous, and the child naturally has the habit of swallowing every-thing he gets into his mouth and nose . Young babies always swallow every-thing that will go into the throat. The child cannot blow its nose until it gets to be several years old. It is considerable trouble to teach some children to blow their noses--it is generally three or four years old before it can do so.

Here are abundant means of rendering the stomach foul, and thus it becomes exceedingly filthy. Just think of the number of germs in a cubic centimeter of ordinary sputum! Think of the vast number of germs which are carried into the stomach by the mucous from the nose and throat. In many cases there are large tonsils which make pockets into which food collects, decays and rots,--and this is swallowed into the stomach. Many people don't take the trouble to cleanse their teeth, and there are cavities in which portions of food decay, and it accumulates between the teeth and rot. Every night, there are eight hours in which the stomach is an incubating chamber, and then the germs can lodge in the mouth, when they come in from the air. And there is a great growth of germs during the night, in consequence of which persons wake up in the morning with the tongue coated with slime, and then they eat their breakfast, and the fluid and saliva clears the germs out of the mouth and carries them down into the stomach. These persons who are suffering from hypopepsia, having foul tongues and mouths and a foul breath --nearly all such people are suffering from hypopepsia, and deficiency of hydrochloric acid. Such people are benefited by using fruit. They say, "I take a little cider before I go to bed, and it does ~~me~~ him good . There is no doubt that such people are benefited by this means,-- it is the malic acid which acts as a disinfectant in the stomach. Many people say " I have been benefited by orange juice" I have seen wonderful benefits arising from use of orange juice.

Many patients could not exist without taking orange juice in the k morning and half an hour before dinner. These persons suffer from dialated stomach, and the orange juice acts as a disinfectant in the dialated stomach.

I am satisfied that you will not find these facts in your text books, unless you find it in Mod ern Medicine, but they are very im portant.

A STUDENT. Dr Walls(?) treats rickety babies with orange juice.

DR. KELLOGG. That is the thing to do, because the orange is nourishing; it is food for the child, and it is also a disinfectant. Many mothers are afraid to give fruit to their children; many are afraid to give fruit acids to rickety children, because they think that they cause the alkalinity of the blood to deminish, and they imagine that the alkalinity of the blood is still further diminished by acid fruits. The alkalinity of theblood is not diminished but increased by the use of fruits.

Q. Is not beef tea used in hospitals ?

A. Yes,. When I was assisting Dr. Savage, of Birmingham, Eng.-- that wasn 14 years ago. A patient was under an operation and he nearly lost his life in an operation for removal of the kidney. The Dr . was a little clumsy in getting the kidney out and tore off two or three large veins andthe patient nearly died, and he was given beef tea--he was ordered to take two pints of hot beef tea every three hours after theoperation, with theidea that the beef tea had strength in it,-- andwhy? Because the ox is strong. That was a good reason wasn't it?

We may enumerate rapidly a few diseases in which fruit juices may be employed. In cases in which beef tea is commonly emploued, fruit juices should be used. Also all pi juices should be used; all cases in which there is infection of the alimentary canâ,--and that means all cases of autointoxication, cases of diarrhoeą-- chronic diarrhoea, chronic dysèntery and all other cases of this sort. But you say " acids are stimulating to peristalsis, ~~xxxxxxx~~ exciting activity of the bowels and sometimes causing diarrohea." but is green fruits that produce this effect--it is not theacids. Acids stimulate peristalsis, but not to an abnormal extent,--there is a great difference about that. Now it is true that in using hydrotherapy--hydrotherapy influences the bodily functions in a variety of ways, but not to an abnormal degree,-- forinstance a hot bath will lessen heat production, but not to an abnormal extent; if it is prolonged it produces hear producti on. But acid fruits do not abnormally increase peristalsis, and cannot in themselves produce diarrhoea; they may produce looseness of the bowels, but not catarrh of the bowels or diarrhoea,--in fact they havethe opposite effect. They are useful in all kinds of autointoxications, because, in autointoxication there is dimunation of the alkalinity of the blood, and in autointoxication there is henerally an infected state of the elimentary canal,-- prenicious anemia , for example--and here you may use fruit juices in great abundance; there is nothing better for such cases. Where there is an infection of the eeleimentary canal it is corrected by these fruit juices.

Fruit juices are most valuable in cases in which there is a dilated state of thestomach, in which the pulp of fruit will find difficulty in getting out of thestomach promptly. If we have a cale of dilation of the stomach andthe patient says, " I cannot eat fruit very well; fruit makes me feel uncomfortable," give him fruit juices then because they will pass readily out of the stomach,-- they will pass out just as readily as water--and a little more so, because the acid will stimulate the motility of the stomach. But if the patient is suffering f from a putrescent state of the colon from extremely foul fecal matters--in other words, if the patients stools are very foul, then give him fruits, because the fruit pulp will pass into the colon carrying some of the acid with it which will mingle with the contents of the colon and exercise a disinfectant power there. So if you want to get disinfect the stomach give fruit jueces; but if you desire the disinfecting power to be applied farther down the alimentary canal--especially if you wqnt to influence the colon, then the pulp of fruit should be used. These are not mere theoritical observations, but they have a good practical foundation.

In the War of theR Rebellion the soldiers often suffered from camp diarrohea; more soldiers were killed by that than by bullets of the enemy. Camp diarrhoea is the great scourge of war. I have met many persons suffering from intestinal catarrh who have said " I have had camp diarrhoea in the army, and I have had it ever since." I ha ve met many persons who had suffered many years from catarrh of the intestines contracted in the army. Now the reason for this is, of course, the infection of the water supply, and a lack of sanitary precautions. Now it was observed during the war, that when peach -time came, the soldiers made raids upon thepeach orchards, down in Georgia especially, they were rapidly cured; the worst cases rapidly got well; whole regiments who were take down with camp diarrhoea were cured in a short s space of time a fter they got into an orchard containing large quantities of peaches. This is a part ofthe medical history of the war and it is recognized as a fact of practical use.

Linneus reports a case of a man who was cured of consumption by the free use of cherries. The grape-cure has been practiced in Switzerland for centuries. The patient eats from one to eight pounds a day,--the seeds and skins are rejected; he takes nothing but grapes, with the exception of a small quantity of dry bread. Zwieback is best for these cases. The same method has been practiced in this country in some parts of Ohio where there are extensive vineyards; also in some parts of California, but not to a great extent. It has never been systematically practiced in this country. It has not been worked up, but if any one will put the proper amount of effort and capital into it, there can be an immense work done in the propagation of the grape-cure. But the apple-cure, and the peach-cure are just as good,--and so of other fruits--and with any one fruit.we are likely to find it so. But the fruit-cure and the fruit diet are the things that we depend upon in feeble cases in which the body requires the disinfection of the alimentary canal--the introduction of fruit-acids for the purpose of increasing the alkalinity of the blood. Our plan consists of giving the patient four meals a day, allowing him at each meal, all the fruit he wants. At two meals, allow him to take, in addition to the fruit, a small amount of zwieback. We allow him four meals a day, and he is directed to chew the food thoroughly, rejecting the seeds and skins. Fresh fruit is best, but cooked fruit may be employed when fresh fruit is not available. We have found, in our laboratory researches, that if fruit juices have been thoroughly sterilized by the Pasteur filter, under pressure, that they have a greater power to inhibit the development of germs than the juices of cooked fruits. These experiments have been repeated, and we have found that stomach germs will not grow in fruit-juices. I made a study of this fact six or seven years ago,--I made a study of all the different kinds of fruits and cereals as culture media. My idea was to find out which kinds ofgerms grow in different kinds of food stuffs so that I wouldhave some guide in dietetics, and in that way I found out this interesting fact that no germs would grow in fruit juices, where one or two million germs would develop in a cubic centemeter with out fruit juices, and the same would be found perfectly stèrile with fruit juices.

Q. Why do so many germs grow in sweet cider?

A. They dont.

Q. The acid turns it sour. Yeast only produces alchol and carbonic acid gas and the alkali is not produced in sufficiently large quantity to doany harm, and the yeast will not grow--it is not found very often in the stomach--it s very rare that yeast is found in the stomach fluid, the gastric juice will destroy it. The mucus ofthe stomach does not encourage the growth of yeast . Yeast somestimes is found in the stomach in cases of cancer, dilated stoamch and stasis. Whenever yeast is found growing in the stomach to a onsiderable extent that of itself is pretty good evidence of the dilation of the stomach, and when weh ve sarcemia, that is evidence of dil tion of thestoamch and stasis.

What I am saying is not true of sweet juices,--for instance the pear, which contains only a very small proportion of acids; must be an acid fruit juice, and the moreacids present, thegreater is the disinfecting power. The best acid all, I think, is the malic acid. Citric acid is a little sharper than malic acid, but in malic acid we have the same disinfectig power as in citric acid,--it has just as high germicidal power as citric acid, but is is better tolerated by the stomach; it is not only quite so tart, but it will be tolerated when the citric acid will not be tolerated. Citric acid is one of the best acids of fruits of fruits and has greater power than many other acids. In most acid fruits there is a mixture of citric acid and malic acid; in apples malic acid predominates; in lemons and the tomato, citric acid predominates, but these two acids are mixed together in other fruits.

Mr. -------: I had a patient, and he had cystitis and he was put on cider or apple juice and the irritation and the patient suffered excruciating pain, especially nights, and then I put the patient on lemonade, and immediately things cleared up and the patient at once improved, and every bad symptom disappeared.

DR. KELLOGG: Did the acidity of the urine diminish also?

MR.------ I did not examine the urine thoroughly, but I put the patient back on the apple juice again, and the same symptoms reappeared and then I put him back on the lemonade again andthe symptoms disappeared. When put on apple juice the patient drand just as much water as before and the urine was only about one-fourth what it was when I put him on lemonade, and the patient increased in weight when put on apple juice and decreased in weight when put on lemonade.

DR. KELLOGG: That explains it--the lemonade had a higher diuretic effect; it was not the malic acid, but it was probably some other factor- ("I would like to know what it was.") q that is very interesting, but I dont know about it; there are many such questions, and by close observation and experimentation there is a great mass of truith that can be brought out. I have told you only a little part of the story of fruit,-- there is a large more to be said about it, and we will take up the subject again at some future time........ I am going to ask you to write a paper on this subject, " The natural food ofman," and I will ask Dr. Harris to look after the class in my absence.

LECTURE TO MEDICAL CLASS, March 6,1903.

Dietetics,--Laxative foods.

J.H.Kellogg,M.D.

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IN the dietetic treatment of patients for constipation, we must understand the causes of the constipation,so far as diet is concerned. We must classify these foods into various groups.--In the first place, we have constipation which is due to a too concentrated diet. Man naturally requires a considerable amount of residue in his diet. This is indicated by the sacculated colon, as, the colon of herbivorous animals.

The colon of herbivorous animals is different from that of the carnivorous animals. All carnivorous animals have a concentrated diet and have a short alimentary canal. Herbivorous animals have a long alimentary canal and a sacculated colon. The alimentary canal of man is longer than that of carnivorous animals, and not so long as that of herbivorous animals. In herbivorous animals, the alimentary canal is twenty or thirty times the length of the body. The alimentary canal of the carnivorous animal is four times the length of the body. The alimentary canal of the frugivorous animal (the class to which man belongs) is from ten to twelve times the length of the body. So, in that respect, man is intermediate between the carnivorous and the herbivorous animals.

It has been observed by German anatomists that the vegetarian people of Southern Russia, who for centuries have lived almost entirely upon a vegetarian diet, and rather a coarse vegetarian dietary, have a much longer alimentary canal than other classes who have lived on a flesh diet,--in other words, that the alimentary canal of the people of

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who are practically vegetarians,
Southern Russia is longer in proportion to the length of the body than the alimentary canal of the beef-eating Englishman, or the beef-eaters of North Germany. This is a very interesting fact, which was pointed out I think, by Hiertel (?). The idea of these anatomists was, that the alimentary canal of the vegetarians of Southern Russia was lengthened by their diet; but I think perhaps we should argue the other way,--that the alimentary canal of the carnivorous Germans and Russians has become shortened by their large use of flesh in their dietary. This observation would be confirmed by other studies and experiments. This is a subject which requires a large number of experiments which would give us positive facts. But it is a fact, without doubt, that the alimentary canal requires a certain amount of bulk in food,--and the purpose of this is, to stimulate (not to irritate) the alimantary canal. The undigested substances which come in contact with the ~~alimentary canal~~ mucous membrane of the alimentary canal,--they titillate it and induce a contraction by this titillation--I use the word "stimulate " because I don't like the word "irritate. If you apply the tip of the finger to the sole of the foot, the titillation produces contraction. Or you might the sole of the foot with a pin, and there would be a contraction produced by the irritation. Or by the light stroking of the sole of the foot or under the ribs contraction may be produced by titillation. This is a reflex action of the muscles of the part, from some one's touching it .. It is in the same way that Coarse materials taken into the stomach excite pristalsis of the alimentary canal; but this effect is produced by titillation, and not by irritation. It is important to recognize this difference, because certain persons come forward with the theory that all coarse

materials of food should be removed, as they irritate the stomach and mucous membrane of the alimentary canal; that the bran of wheat should be removed, because it must irritate the mucous membrane of the alimentary canal, and produce inflammation. That is a mistake. There is no irritation produced by these coarse materials,--it is a mere titillation produced by contact of these coarse materials with the mucous membrance. The same thing happens when we get something in the throat, as, a fishbone --you feel a strangling sensation succeeded by coughing. The same thing happens if you get a grain of wheat in the throat,--the mere contact of a foreign body causes a peristaltic movement which forces the penny or other foreign body along. So with a marble or other foreign body, which, even though it is not irritating, is recognized by the nerves of the mucous membrane of the alimentary canal, and which causes a peristaltic movement, so that the foreign substance may be forced along and disposed of in the usual way.

An incident occurred some time ago, which illustrates the principle that the food must have bulk, or coarse material, for the use of animals with a large alimentary canal and a sacculated colon. Some horses and mules were being carried from Portland, Me., to the West Indies, on a sailing vessel, about a year ago. It is authentically recorded that a storm came up and swept overboard a large quantity of hay which had been stored on the deck for the use of the animals, and there was nothing but corn left for them to eat. In a few days some of the horses were declining,--the mules were all right, while the horses were sick. Some one then called attention to the fact that the mules had been biting off bits of the boards on the ship and eating them. The Captain ~~set~~ took the hint and set the ship's carpenter to shaving up the boards and giving the shavings to the horses and mules in their food, and the

the horses as well as the mules got along very well after that. Horses must have hay with their corn. They can do very well on oats because they have the husks of the oats. If the horses could eat the corn-stalks with their corn it would form a wholesome diet for them; but the corn alone is too concentrated and causes constipation. The same thing happens to human beings when they take their food in too concentrated a form; there is not a sufficient residue to stimulate the peristaltic movement of the alimentary canal, and the consequence is, that such food-stuffs are too long retained in the ~~stomach~~ colon, and being retained for an excessive length of time, the watery portion is absorbed, and the fecal matters being dry, the result is an impaction and an excessive accumulation of fecal matters in the colon.

You can see at once, that there are certain food-stuffs that must be constipating in their tendency, because of their lack of residue,--now let us see what they are. These foods are, especially such foods as rice, fine flour bread, corn-starch and all sorts of farinaceous foods from which the coarse parts have been removed,--corn-flour must be classed with the rest--these are all constipating.

Q. Sugars, too?

A. No, not sugars. Now here is wheat flour (referring to Diet Chart), fine flour bread, rice- arrow-root and potato meal; it is a little doubtful as to whether milk should not be included. Meats and eggs are also constipating foods. Recent observations show that the potato is dissolved, all but two or three per cent.; it is more completely absorbed than any other food --even more completely absorbed than rice or wheat-flour bread, and there is a larger residue from ~~the~~ cows' milk than from the potato.. A mealy potato, when thoroughly masticated, is one of the most completely absorbent of all food-stuffs. Early observations upon this subject have been shown to be erroneous by later studies.

There are certain other foods which have a laxative tendency, when they are properly prepared, for instance, peas, beans and lentils and sweet potatoes, also vegetables, such as carrots, beets, parsneps, and lettuce, also oatmeal bread, barley bread, etc., and all foods which contain a considerable amount of woody matter, are laxative in character. All mushes, as oatmeal mush, cracked-wheat mush, graham mush and mushes in general, all kinds of pasty foods and soups of every description, and gruels of every sort, are all constipating. I must make an exception of fruit gruels and fruit soups; but all cereal soups, and all other cereal mushes and gruels are constipating. Now why? Because they are mucilaginous. It would be worth your while to put this down, otherwise you will be sure to forget it. It is necessary to tell people these things, because they don't know them. How many people do you suppose know, to-day, that oatmeal ~~mush~~ is constipating, or that cracked wheat is constipating. Thousands of people are eating these materials ~~because they thi~~ with the idea that they are laxative,--but they are not,--they are constipating, and the reason of this is, that they are mucilaginous. I used to think they were laxative, and I didn't know why they were not. I put the question to Professor Kuttner (?)..... in Berlin this Summer, and he said, "These foods are constipating because they are pasty it is because they are mucilaginous." I saw the point right away, and I was glad to find this out, for I had puzzled over it a good deal, for I could not make up my mind why patients were not relieved of constipation by the use of coarse mushes, but I found out that they were constipating, so I have not recommended mushes for some years back. I find that Professors Kuttner (?) and Boaz, of Berlin, are denouncing mushes as much as I am, and their great objection to them is, that they produce constipation. They have not yet got hold of the idea of the necessity of thorough cooking, but they absolutely fobid every one of their patients to eat mushes, unless they have diarrhoea; if they have diarrhoea, they are allowed to eat them, but patients who have constipation are not allowed to eat mushes at all. But the use of these food-preparations is very common. Go to every family where they think they are practicing health-reform, and every morning it is mush for breakfast. Some people think they would hardly be Christians if they didn't eat graham mush, oatmeal-mush or something of that kind for breakfast. This isthe badge of their reform-work--that they are mush-eaters. But we must now get on a better foundation. I began to labor for this end twenty9five years ago, but it is only recently that I have had assistants ,so as to be able to make an impression on the world, and with the aid of quite a number of valuable assistants across the way, and in other parts of the town, I think the oatmeal trust will get a pretty hard blow.

There is nothing worse for the bowels than making a breakfast of mushes. But many people have great faith in mushes, and they will sit down at the table and put them down with great celerity,--and they think that when they have done that,they can eat anything else at the same meal; they seem to have a sort of idea that oatmeal-mush when eaten, serves as a benediction to everything elsd that is taken into the stomach, and that when they have eaten mush, they can safely eat fried steaks, Saratoga chips and everything else that comes along . I remember seeing a man out West eat mush at a hotel table; he had a large plateful of oatmeal mush, and in twenty seconds it was gone. He just put his nose down to his plate and scooped in the mush as fast as he could ladle it in. He then called for his fried potatoes, ham etc.,and proceeded to finish an abominable breakfast.

All these mushy,pasty substances are constipating. Rice is constipating when cooked to a heavy paste,--it is then exceedingly constipating. So we must keep this in mind,--that all sorts of starchy foods which contain but little residue, especially when cooked in the form of mushes,are extremely constipating, because they are mucilaginous,and lie against the mucous membrane of the alimentary canal like a poultice. They have not the solidity necessary to stimulate the intestine to a proper degree of peristaltic activity, and when they reach the colon, a large proportion of them will not be digested, and the water is left behind or absorbed. So we find these patients suffering from constipation accompanied with an enormous quantity of gas, and the patient complain of flatulence. These facts will be verified clinically by talks with patients in regard to their diet and conditions. If you find a patient with constipation, flatulence with dry, hard, fecal matters, and the formation of a large quantity of gas, and a great deal of trouble from this cause, you may be sure that the patient is a mush-eatr and that this is the real cause of these accumulations, and of the constipation.

What should be he diet of these patients? You must give them bulky food. They should have food of such character that ,while it is bulky, it does not form pasty masses ~~when which~~ the water is absorbed. There is a class of foods in regard to which this is not the case,--for instance, spinach, cabbage, etc., but such food is difficult ~~to deal with~~ foods for the stomach to deal with,consequently , this is a good kind of bulky food for such a patient. Most of these patients have slow stomachs, as well as slow bowels, and consequently these foo containing a large amount of woody matter, as, the parsnep the beet an the carrot, are very hard to get out of the stomach.

So patients who have slow motility have slow colons--they go together--this is a good thing to remember--they all suffer from a too long retention of these food-substances in the stomach, so these are not good things to recommend. I don't remember of recommending such foods as turneps or carrots to a single patient in many years, but I have recommended sweet potatoes, asparagus, green beans and string beans--which may be taken with benefit,--peas, beans, and lentils also may be eaten by this class of patients, if care is taken to remove the hulls. there is considerable woody matter in these foods. It is just as proper to remove the hulls from these foods as to remove them from corn or rice. Beans can be treated in the same way,--and I think the time will come when this will be the rule, with beans. There is uric acid in the beans and this gives them a little flavor, so there is a little something that is missing from the bean when the hull is removed. But when the hulls of beans are removed, they can be cooked in forty minutes, while it requires five hours to cook them with the hulls on. Now the stomach can deal with the beans that have been hulled with just as much more facility as the cook can. Now the process of hulling beans requires no apparatus except a colander. The hulls contain uric acid, and when the beans are heated in hot water, the hot water dissolves the uric acid, and when the beans are put through the colander you get rid of the hulls. You can make a colander by punching holes through the bottom of a tin pan by the use of a hammer and nail, so you need not buy any machine for hulling beans. So beans can be prepared by any cook in almost any place, without the hulls.

Q. Is there any difference in the taste of the beans after the hulls and the uric acid is removed?

A. There is a slight difference in the taste, and so people like them best with the hulls. Cooking will disintegrate the hulls to some extent ...

Q. The beans are not cooked?

A. No. They are heated , but not sufficient to cook them. They are then put through a colander and the skins are rubbed off.

Q. The first watr is poured off the beans?

A. The first water should be removed, so as to remove the uric acid. There is a little uric acid in all vegetable products. There is a little tannic acid in the bean. There is a little tannic acid in all green fruits, and very likely in all vegetables also.

Q. Dr. Rossiter told us that if a child swallowed a penny or a marble or some other indigestible thing, we must give him all the potatoes he could eat,--why is that ?

A. The stomach cannot act upon a small mass like a marble, but acts upon a large mass; besides, the potatoes lubricate the indigestable body, and open up the pylorus, and the whole mass is removed.. . Food is an organic compound, as a whole, but it is not a chemical compound. If for instance, you should separate the materials of which an apple is composed, and then bring them together again, ~~and~~ the apple would not taste like an apple,--and so of milk or an egg- -let a chemist separate the elements of an egg, and then put them together again, and it wouldn't taste like an egg,--it wouldn't be an egg. The subtle substances which are present in foods as a whole, somehow escapes in the process of analysis; when you bring the elements together, you have not the food that you had. I think I have told you of the dog who was fed on milk, the elements of which had been separated and then brought together again,--and he starved to death; Another dog was fed on desiccated milk, and he throve on it. Thousands of babies have been starved to death on foods, the elements of which have been separated and then brought together again, because there are certain substances which are essential, and which somehow escape. Pawlow calls attention to one of these,--peptogens. This is an important fact. Then there are some ~~substances~~ of these substances which have been known to be such for many years. Attention was called to osmazome some years ago, by Bellows; he called attention to the osmazome or flavoring substance of foods. These substances are important as an aid to digestion; they are also peptogenic.. There is a great deal that is not known, on this point, and we cannot reduce nutrition to a chemical preparation. We cannot express foods by chemical formulas. But we will take this up again, as it has an important bearing upon the question of foods.

There are some foods which have the effect to cause constipation, as they lessen peristaltic activity, the reason of which we have just discussed.

Now there are certain laxative foods. They are laxative because of their large bulk,--and I have mentioned some of these -- coarse vegetable products, and all kinds of fruits.

There is another class of foods which are laxative because of the acids which they contain. All acids are laxative; all acids stimulate peristaltic activity.. Every one of the organic acids is laxative,--citric acid, malic acid, and tartaric acid-- all the organic acids are laxative in their character. I wonder how many of you can write a formu of each of these acids on the blackboard. I will see if I can remember them.-- ("Malic acid $C_4H_6O_5$"); ("Tartaric acid, $C_4H_6O_6$"); ("Citric acid, $C_6H_8O_7$")

All acids are laxative, and all sugars are laxative; these are concentrated foods, nevertheless they are laxative. Why are acids laxatve? Because the acid itself acts as a stimulant to peristalsis; they are a stimulant to intestinal activity. Why are sugars laxative ? Because they cause the intestines to pour out a large quantitie of fluids;— they increase the amount of fluids present; the more concentrated the sugar, the more laxative it is . Constipation is due ,in many cases, to excessive dryness, and sugar increases the secretion of fluids.....Mothers often give their children a teaspoonful of New Orleans molasses for their bowels. ("Molasses and sulphur.") Yes — the sulphur is laxative also. It is perhaps the most harmless of laxative products ; if you have to give a laxative,perhaps you could not give anything more harmless than ~~this~~ such a combination; it is better than salts. Sulphate of soda and other sulphates are common laxatives--sulphate of soda is particularly laxative,and it is very harmful and irritating.

I want you to remember these formulas. You will find some doctors who will say that organic acids are poisons , producing rheumatism, etc., and I want you to be able to prove to such a doctor in a most convincing way, that they are not acids , but foods; and by retaining these formulas in your minds, you can show him that you know what you are talking about . When you are able to put down the formulas, you can floor him,--he won't dare say a word , for fear of exposing his ignorance You can show him that carbohydrates are not acids like mineral acids, but that they are sugar-testing carbohydrates. In a chemical compound (?) sugar is an acid,--we have saccharate of lime, saccharate of lead, etc.. So the fact that sugar is sweet, and that citric acid is sour does not make them poison....

This is not for your benefit, but it is for the benefit of the doctors whom you wish to convince when they claim that the use of meat is proper, and that fruits are harmful. We must fight that thing, for it is an awful error. When you stop to think what thousands of rheumatics are being fed on meat by their doctors, you will see the importance of this question. This institution across the way , for instance, makes a specialty of treating rheumatism by the use of meats,--there are thousands of doctors who believe that rheumatism can be cured by meats. They say to their patients, "You must eat meat." We want to oppose that error. We have got the truth on our side, and we must fortify ourselves with truth on every question.. And this is a vital question. If meat is necessary for the cure of rheumatism,it is also necessary to keep people from getting rheumatism. If a man's father had rheumatism, he must eat meat to prevent rheumatism,--and there are many people who would have to do that , if meat-eating prevented rheumatism. But meat is not good for rheumatism, and you must know the chemical formulas in order to be able to demonstrate this .. So I want you to learn the formulas so as to be able to use them. I don't ask you to remember anything that is merely technical, because I know you have plenty of that in your text-books; but I want you to have everything that is practical, and nothing else.

LECTURE TO MEDICAL CLASS, March 9,1903.

Dietetics,-- (Con.)

J. H. Kellogg, M. D.

---oOo---

WE are still talking about diet in constipation. The foods recommended are, first of all, whole grain preparations,--not in the form of mushes--for pasty, mucilaginous preparations produce constipation. But for these cases, cereals in the form of breads, particularly granose flakes, or toasted wheat-flakes regularly, every morning for breakfast, in the place of breads, will afford complete relief from constipation. I have been told by a large number of persons that the use of granose flakes is a complete remedy for constipation.

A STUDENT: A lady ~~patient~~ told me that she ate granose flakes regularly for two months, and was completely cured of constipation.

DR. KELLOGG: She wasn't completely cured,--she went back to her old diet again. It should not be supposed that people will be cured by this means, in every instance, but if they find a diet that relieves the bowels, they should adhere to it, and follow it continuously for some time, as they may sometimes find substitutes in diet,--for instance, they may have graham crackers. Crackers consisting of ordinary flour and bran are not graham crackers. Whole wheat crackers are not a substitute for graham crackers,--graham crackers are better than whole wheat crackers. Bran is not irritating, except in some cases of intestinal irritation, etc. In such cases bran is irritating, and the coarse graham preparations cannot be used on that account. But granose flakes can always be used,--and the reason of this is, that in making granose flakes, the kernels are cooked, and then they are dried until they are tough. Of course the starch has been converted into paste and cemented together,--the thin layers of bran are cemented to paste bread renders it more insoluble, so that there is less residue from white toast than from white bread, consequently it would be more constipating . Zwieback made from gems is very good. That is a very good way to make a fruit toast. Split the gems and put in the fruit and put them in the oven and toast them thoroughly, and it makes a very nice fruit toast. The gems should be light, and should bake clear ~~through~~ until they are browned clear through, and they make a wholesome sort of bread . Rolls are preferable to gems . They can be made similar to gems . How do you make rolls? ("Take cold water and a certain amount of flour, and mix it up, and mix in some nut- meal and butter; it can be about three-quarters of an inch through. Put them in the oven and bake them until they are brown all the way through. ") Would you mix it up soft, or in a stiff batter? ("It should be kneaded well.") Why? ("To break it up and get the gluten all the way through it ., so as to hold it togther.") Does any one know of any way of improving this process? ("Beat it with a wooden mallet.") In making beaten biscuit, the mass should be pounded very hard all around the outside, and then folded over, and with the mallet it should be beaten all round the edges. What for? ("Air.")..... These coarse grain preparations are excellent, especially the breads ..

Next to these grain preparations come fruits of all sorts , especially raw fruits, such fruits as apples, peaches, apricots, preferable to plums, grapes, raisins and figs,--these are all excellent---

Q. Because of their high acidity?

A. ~~We are~~ Because of their bulk,--we are considering foods from the standpoint of ~~their~~ bulk--I should have said "prunes" instead of plums, because prunes are sweet, while plums are mostly sour and require sugar, hence they are objectionable from some standpoints ,but not from this standpoint.

Next come acid fruits, and the acids and juices of acid fruits, as grape-juice, orange juice, lemon juice, lemonade--a glass of lemonade before breakfast, --a glass of lemonade with but little sugar in it--malt honey,--all the malt preparations and extracts of malt are good; and I think that figs are largely useful for constipation, because of the large amount of sugar which they contain. Honey may be mentioned as a wholesome sweet, which is good for constipation.. Mothers sometimes make a sort of preparation of bran and honey, which is used a great deal in cases of constipation, and in many cases it is to be recommended as useful in some respects. I cannot recommend other sweets, except sweets of fruits.. There is made, at the present time, a grape sugar which is prepared from raisin-grapes. It is made in the form of a syrup, and also in the form of a granular mass--a pure grape-sugar, which ought to be very excellent in cases of constipation.

There is another sugar which can be used freely, which is called "manna." This can be purchased at stores at $.75 a pound. That is rather a high price, still a person suffering much from constipation would not mind that; it is no more expensive than many drugs. It can be bought at a low price when bought in large quantity. Manna is the inspissated juice of a shrub which grows in the Arabian desert. It contains a special sugar known as "mannite." It ~~[illegible]~~ is useful in diabetes, in which constipation exists, and can be taken and assimilated when other forms of sugar will not assimilate, so it is very useful for this purpose.

I must also mention nuts as being especially valuable in these cases. They are valuable because they contain fats,-- that is probably a special reason. I think, however, nuts are valuable in constipation for the reason that, as ordinarily eaten, they are not thoroughly masticatedand there is a residue left,--there is a larg number of particles which are carried down into the colon--a larg number of particles of nuts whaich carry with them a large quantity of unabsorbed fats. If you ask patients who eat ordinary raw nuts, in regard to their stools, they are white. This id due to the large amount of fat present. The same is true in cases of catarrhal jaundice, and in cases in which there is a lack of bile,--the white appearance of the stool is due to the presence of unabsorbed fat, and not simply the lack of bile .. In these cases, when bile is absent, there is ~~almost~~ no absorption, ~~of fat~~, or almost no absorption of fat. In some cases, when the pancreatic juice is absent, there is no absorption of fat. In these cases, the stools are very white. The ~~cos~~ so-called "clay-colored stool" contains a greater portion of fat taken in with the food; it is this that gives the stool that colour; the same is true of fruits,--I believe this peculiar color is due to the presence of unabsorbed fats. This would have the effect to lubricate the colon, preventing the harding of the fecal masspp--the stools having the same lubricating property as water. The watr is absorbed, and the fat left behind, and this aids the passage of the stools which are formed in hard masses.

All fats are good for constipation --you know castor oil is a general remedy for the constipation of children. And for all classes of persons, castor oil is one of the safest and surest laxatives. But it nauseates many people, and is objectionable on that account. --

Q. Doesn't it make the patient more constipated afterwards?

A. All these remedies do that. Castor oil has this effect, because it contains this essential irritating principle of the castor bean--it is very highly irritant. Ripe oloves may be eaten with benefit

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by persons suffering from constipation, and the ripe olive is excellent for cases of chronic constipation; I have seen such cases almost entirely relieved of their constipation by eating a handful of nuts. This is an exceedingly useful thing to know. I believe that a number of persons suffering from constipation and who cannot find relief in any other way, would find relief by eating a handful of nuts with their meals,--either that, or six or eight ripe olives. All sorts of fats have the same effect, but I think that nuts are better than ordinary fats.. Nut butter or coccoanut cream is a good remedy for cases of this sort .. I find that quite a number of persons are relieved of constipation by the free use of cocoanut cream, as the fats seem to encourage digestive activity.

Did I tell you about the product named "Ko-nut? There is a cocoanut fat which is being sold in the market extensively. Many of our people hardly know what "Ko-nut" is. ("The factory burned down.") They have built it up again, and are manufacturing it ,--but I hope none of you will want any more of it . I called round at the factory some years ago,--I never introduced this product, and at that time I thought I would examine it . I was told that it was the product of the cocoanut. I thought it might be just what we wanted, as I had been trying to get hold of cocoanut fats,--I had sent to missionaries in the Tonga Islands and the Hawaiian Islands, and asked missionaries to collect some cocoanut fats for me ; I could thus get hold of a variety of cocoanut fats, as I supposed, and get hold of something that I could use with advantage. But they were always rancid, and the oils were always rancid, and I could get nothing pure. It was put up in hogsheads, and was impure, and the only way it could be made pure, was to subject it to a chemical process by which the acids would be neutralized--both the vegetable and the fatty acids--the fatty acid is irritating , as you probably know from experience, on getting into bed and blowing out a candle, --the fatty acid is extremely irritating--

Q. Is it not the same with a kerosene lamp?

A. That is not quite so irritating. When you burn a tallow candle you have a mixed fat, and when this burns, the smoke ascends for some little time, and the products are imperfectly oxidized, but in the lamp, there is only one acid, and you don't get the very irritating acid known as cresylic acid. The manufacturers sent us several barrels of this coccanut product, and it looked nice and tastd nice, so we ordered twelve to fifteen barrels of it, and this business seemed to be very promising, and we felr very much gratified, and I thought it was going to be a great blessing to us. The agent came to us to make arrangements for sales on a larger scale. But the agent said to me, "I wish you would explain this: "We find that we can't make this product and have it keep well unless we make it from rancid oils; I wish you would explain to me why cocoanut oil won't keep unless it is made from rancid cocoanuts." I saw at once why it was, and I said to him: "It is plain why it won't keep unless it is made from rancid cocoanuts and not from fresh ones,--and that is, when a thing has rotted once, it won't rot again, and when we separate the ~~acid~~ oils, everything in the cocoanut that be decomposed is already decomposed. It has alread decomposed, so it cannot rot again. These folks reported, after that, that they didn't make cocoanut oil from rancid cocoanuts, but from fresh ones. They also stated in their circulars that they owned large plantations of cocoanuts in the West Indies, and that their merchandise was manufactured from these fresh cocoanuts which grew on their own plantations. On investigating the matter, I found that they had no cocoanut planatations, and no cocoanut oil factory, and never had; that what they sold was but the product of some crude cocoanut oil shipped in large hogsheads. It is shipped from Ceylon. It is made in this way (Illustrating by diagram.) Here is a trough about 16 feet long and a foot deep. The cocoanuts are cracked open and piled into this trough till the trough is full, and then, on hot days in a tropical climate, the sun shines on these cocoanuts, and it soon molds and fills with maggots, and decomposes until it becomes thoroughly rotten, and the oil trickles down into a bucket, and this is emptied into a hogshead, and when the hogshead is thus filled, it is labeled "Cocoanut-Oil." The manager told me these hogsheads came from Ceylon, and that this article is made in this way in Ceylon. Dr. Read told me that he had seen the process, and that he knew just how to make it .. Of course, when this article is treated chemically, these acids are removed---but it is simply a chemical product, and is not a food, any more than any food preparations where the elements of a food have been separated, and then combined and the vital principal left out .. It is just as reasonable to eat this preparation as it would be for one to go through the country and gather up rancid soap-grease, old fried grease, rancid butter, odds and ends of fats of various kinds, fry out the fat, put it through a chemical process so that it comes out chemically pure and sweet--it is just as reasonable to eat that as to eat the other--and I don't know but one might better take that kind of fat than no fat, but it is not an ideal use of fat.

Q. Do you say that this is not clear fat anyhow?

A. I think the word "clear fat" is better, because in free fat, the fat is not in combination. An emulsion is a preparation in which the fat has been divided into minute particles and is opaque; but these clear fats in a fluid state, are transparent like water...Any emulsion will separate when heated,--put in cream and boil it and the cream will rise to the top--if you heat it long enough, you will find the cream standing on the top. How is it with ordinary cow's cream? When you fry it, it becomes free fat--clear fat, or grease, just like any other fat; it sort of sputters in the skillet because of the casein that is in it,--and in that respect it is not so easy a fat to fry with as butter, because there is watr in it and casein in it, and the water causes it to sputter; it can be used in frying as well as any other fat. The heating bursts the film which surrounds the fat--(explaining by diagram.). Cream is a very strong emulsion,--it is stronger than most emulsions,--and why? Because each little particle of fat is surrounded by quite a dense layer of casein. Now in cocoanut cream this film which surrounds the fat, in my estimation is a proteid or an albuminous substance--there is more or less albumin in the cocoanut--it is an albuminous substance, and not casein.......

in the cocoanut there is a little thin layer of albumin (?) while in milk we have casein, which is a denser layer, but it is a stronger emulsion, and does not break up so easily as in the form of clear fat, but the distinction of the emulsion is, that it will mix with water, and that you can dilute it (?) ("Cocoanut fats?") It contains several fats that melt at different temperatures. There are some fats in the cocoanut which will at a temperature as low as 60°. There seems to be, in the cocoanut, the whole series of fats,--olein, stearin, palmatin etc.

Q. Do you think people should use free fats?

A. It depends upon circumstances,--we want to eat the best thing we can get. It is best to eat fats in the state in which nature presents them to us. Our principle is, to hold up the natural food-dietary,--that is the principle we stand on; and so when we come to these clear fats, we recognize them as being artificial combinations,--they are food-elements which have been separated from their natural combinations, and are not presented to the body in their natural form, and consequently are more difficult for the average stomach to manage than other fats: It is true the average stomach manages to get along with clear fats, especially fats which, like butter have a low melting point. Butter has comparatively a low melting point. Tallow is much less digestible than butter because it has a high melting point. Cocoanut fat has been shown to be just as digestible as butter; it has practically the same melting point as butter,--Hutchinson calls attention to the fact that cacao butter has the same melting power (as butter?) The higher the melting power, the less the digestibility, and the lower the absorbability of the fat, and the lower the melting point (?) the more easily the fat is digested, and the more readily it is absorbed--granting, of course, that all the fats melt ~~dissolve~~ at the temperature of the body . When you eat a ripe olive, you must chew it up, and you have a cream, the same as when you chew nuts. Nuts can be pressed so as to get oil out of them,--take cream and press it, and you can get oil out of it . By chewing, you make a pressure in which the particles are broken up, and then driven together in the form of ~~free fat~~ clear fat. The same is true of olives--put them together and bruise them, and you have free fat .

Q. Does the process by which the "Ko-Nut is made deteriorate it ?

A. It is subjected to a high temperature on account of the presence of lakalis, and that must deteriorate it somewhat.

Q. What becomes of the (not understood.)

A. It is washed away.

Q. Is it well to put salt into cocoanut cream?

A. In the form in which you get it, there is a considerable salt, and putting in much more spoils the flavor of the cream.

Do you like it so? ("No.") I think you will find that salt spoils it. You can make cocoanut cream,--it is very easy to make it. It is easier to get a cream from the cocoanut that is good to eat, than in any other way,--and it costs less. When you are abroad, you can buy fresh cocoanuts in some places for five cents apiece. Now three of these cocoanuts will make a pint of most delicious cream. If you buy cocoanuts in quantities you can get them at three or four cents apiece.--- you can get three cocoanuts for a dime in many places. Then the process is this: You take off the shell with a hatchet. Keep the milk by itself. Then get the meat out with the aid of the hatchet--the meat will come out almost whole. Then chop up the meat, keeping the water by itself--there is very little fat in that. Put the meat through an ordinary ~~shredder~~ vegetable shredder so as to break the meat up into fine bits; the only thing necessary is to get it fine. Put it through the shredder the second time and grind it up finer. Then put it in three parts of hot watr to one part of this cocoanut pulp, and let it stand half an hour. Don't let it stand two or three hours, if you do, it will ferment, it ferments very quickly. But let it stand half an hour; then strain it through a muslin bag so as to get the coarse pulp out of it. Then put ~~away~~ it away in a cold place--put it in an ice-box or a refrigerator for the cream to rise and separate. In three or four hours you will have a cream risen to the top. Put it in the refrigerator and let it stand over night, and in the morning you will have on the top an inch or two of the most delicious cream,--solid, and better than you can get in cans.. The cocoanut cream served here is not so good as that which is freshly prepared. The process of preserving it in cans deteriorates it slightly; it does not have the delicious taste of the fresh cocoanut.. When I was down in Philadelphia I found them making cocoanut cream themselves in their sanitarium. They have not been able to get it out in sufficient quantities to supply the demand , but they have a little apparatus, and they are doing something. They buy cocoanuts at 3 1/2 cents apiece, and they are making cream in quantities sufficient to supply quite a good sized family, and with but little trouble . Now you can take cream that has risen during the night , or during the day, when the weather is cool, and work it over with a ladle, and mold it into neat little shapes, as is done with butter, when cold. It is then very nice to serve, and it is very palatable. It seems to me to come nearest to butter of anything you can get hold of. I feel very much gratified that we have found a way in which we can preserve it for an indefinite length of time .

Q. What is the matter with the cocoanuts themselves?

A. They contain a large amount of indigestible woody fiber--that is, a ripe cocoanut. But the cocoanut, as found on the tree a little while before it is ripe is a very different thing from a ripe cocoanut .. At the very last stage of ripening, a large amount of the starch of the cocoanut is converted into cellulose ; but while the cocoanut is still green and the shell is soft, it can be cut open with a knife, and the pulp eaten with a spoon; it is then a most delicious jell, and there is not a particle of wood about it , and you can eat it with a spoon. I have eaten it in that way while at Key West, and they are then very nice indeed; that is the way in which they are usually eaten. The ripe cocoanuts are not eaten by the ladies...They eat the green cocoanuts in the dry provinces,--if a native wants drink, he stones a cocoanut tree, or climbs the tree and gets the cocoanut. It is always cool, because the vapors arising from the surface of the soil renders it cool; so the cocoanut is very nice and cool, fresh and sweet, and the water in it i pure,--no matter where the cocoanut tree is found--even if the tree is growing in the most pestilential ~~region~~ swamp--it contains pure water. The cocoanut is largely used for watr in the tropics. The cocoanut is a wondrfully useful fruit. The outside is used for making burlaps,, bags and similar articles. They build houses of the cocoanut tree. They also make garments of them, and the shells are used for various purposes. The contents of the cocoanut are usefol for making soap, and the desiccated soap made of the cocoanutiis being used in enormous quantities. This is simply the cocoanut ground up and dried. The have found a method of preserving this article, but I don't know what it is ; they have found some process by which it does not become rancid ...

I must tell you about the best cocoanuts: There is really only one cocoanut that is first class , and that is the San Blas cocoanut. San Blas is, I believe situated on the West coast of South America, or in the Northern part of Central America. They differ from the ordinary cocoanuts, being larger, sweeter and they are round. They come from a near point to their market, so that they are only a few days in transit North--to New Orleans or sme other port in that latitude, and consequently they are fresh when they arrive. The cocoanut must be kept fresh. You can crack it and see if there is watr in it,--and if there is, it is fresh. If there is no milk in it, it is not fresh and you must not take it nor eat it at all. The cocoanut has three openings which make it look like a monkey's face. One is soft-- ~~why?~~ -- which one is that ? ("The lower one. ") Why is not the other soft? (Not understood.) Anything else? ("That is where it grows.") Yes , it is left open there for the sprout to go out into the ground, and draw in the sustenance. This is sometimes opened to get the water out ; it gets bruised when the opened, and the water sours. Nature puts all her products in hermetically sealed cans, and the cocoanut is canned, and when the can is broken, the water sours, yeast gets in, and the cocoanut is spoiled. In selecting a cocoanut, you must be sure that there is water in the cocoanut, and that it is not sour. Another thing: The cocoanut ~~is~~ spoiled when it is frozen; if you put it in the refrigerator and freeze it and it spoils it, and you can't get the cream out of it. I learned that fact at the expense of about a thousand cocoanuts, and I will tell you about it, so that you won't need to waste a thousand cocoanuts. Some of you will find yourselves in tropical countries, and if you do, I hope you will take up the business of making cocoanut cream and shipping it. If, at any time, you should want the technique for this purpose, I will be glad to send it to you.

Q. How about olives in hypopepsia?

A. I think they are good--but we will take up "hypopepsia" tomorrow.

Miss Hornes
C/o L S Dr. Kellogg Residence

Lect to Med Class
Dietetics
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