Thesis

Twelve Lectures on Domestic Science

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Outline of Thesis

Subject:- Twelve Lectures on Domestic Science.

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References.

Schäfer. Thompson, Hutchinson, Scientific American, Dietetic and Hygienic Gazette. Organic Chemistries, Christian's Uncooked Foods.

Lecture I Methods of Cookery.

Man, undoubtedly lived on raw food at one time, but since cooking has been resorted to for so long, he has lost the power of digesting raw food of many kinds.

The purposes of cooking are- 1. To develop certain flavors in the food which act as stimulants to the appetite. 2. To render food softer (except in some cases as eggs) and thereby make it easier to masticate and easier to mingle with digestive juices. 3 To produce certain chemical changes in food which make it easier of digestion. 4. To kill any parasite that may infect the food, and in this way make food which is poisonous uncooked, perfectly harmless. 5- To favor the secretion of digestive fluids by stimulating the secretive organs. 6. To improve the appearance of food making it more appetizing

There are several varieties or methods of cooking. 1. Boiling. 2. Stewing

3. Roasting 4. Grilling or broiling 5 Frying. 6 Braising 7. Baking 8. Steaming. This wide range of methods of cookery give a variety of diet, which stimulates the appetite and digestive organs.

The old method of boiling consisted of putting water into a hallowed rock and putting a very hot stone which was heated in the fire, into the water. In the process of boiling, a boiling temperature is maintained, and the object is to cook the food by the heat thus obtained. When water has once reached the boiling point, its temperature cannot be raised higher. Consequently, no matter how hot a fire, the food which is in the boiling water will not cook more rapidly. The boiling temperature at sea level is 212°F.

Boiling converts the connective tissue of meat into gelatin. A small proportion of the extractives of meat ooze out and thus giving the soup or broth its flavor. If the meat is to be cooked for soup, it should

be put into cold water, having previously been finely chopped. The water should then be gradually warmed but not brought to the boiling point. If the broth is not wanted for its nutritive value, the meat should be plunged into boiling water at first. This high temperature will coagulate the outside of the meat and thus prevent the juices from oozing out.

Stewing is cooking at a temperature between 35° and 160° F. This method of cookery is used when it is desirable to have the juices in the surrounding liquid. In a stew, the juice and the solids are usually both eaten.

Roasting takes place in the oven, and as roasted meat is thus cooked for its own value instead of for the broth, it is put at first into a hot oven. Or it is sometimes seared on the outside on the top of the stove, before it is put into the oven. In the oven the meat is subject to heat from all sides. This is a very good method of cookery

for meats.

Gritting or broiling coagulate the outside of the meat, as roasting. This method is somewhat like that of roasting only it requires less time, the meat being in very much smaller pieces. In broiling, the meat is put into an oiled pan and cooked as quickly as possible over a hot fire, being often turned so as to cook evenly. But in grilling, it is put onto grills which bring it close to a radiant surface of glowing coals.

Frying is a process of cooking by immersing the food in deep fat. When this is done a violent hissing and cracking noise is heard. This is due to explosions of water suddenly converted to steam. The continued expansion and bursting of this water prevents the fat from penetrating the food so long as the temperature remains above 212.° Thus the food is cooked by its own

steam and the outside is browned by superheated steam.

If a greased plate is used only one side of the food is cooked at first; this is the side in contact with the pan. The food must therefore be turned to cook the other side. While it is turned, the first side with its adhering fat is cooling, the steam within the food is condensing and the fat enters in to take the place of steam, consequently the food is much more greasy than if taken from deep fat and allowed to drain before the steam condenses.

Braising is a method of cooking meat in a solution of animal and vegetable juices. The vessel is sealed so that evaporation cannot take place. This is a good method for cooking tough or tasteless meat.

Baked meat is cooked in a confined space with dry heat which prevents the volatile products which are driven off

in roasting, from escaping, and baked meat is not basted. Baked meat has a stronger flavor than roasted meat.

Steaming is the method used for cooking by indirect heat. Water is put into a vessel and boiled. Another vessel containing the food is set into this boiling water and the food is cooked by the steam which comes in contact with it. The food does not cook so quickly as if it were put directly into the boiling water, but this is a good method for a long slow cookery and no nutriment is lost in the process.

Foods which require a long cookery as cereals, should be cooked in this way. Vegetables are not broken up in this kind of cookery as they are when put directly into boiling water.

Lecture II. Beverages.

The tree shrub grows wild in Assam and other parts of the world between 15° and 40° north latitude. Up to the present time, China has furnished the largest quantity of tea.

The tea plant grows from seeds. It is made bushy by pinching off leading shoots. It is planted in rows, the plants being set three to four feet apart. The leaves are stripped when the plant is three or four years old, and from then until it is ten or twelve when the plant is grubbed up. Tea is gathered about four times per year. The early leaves give the best teas. The flavor, however, depends a great deal on the drying. The soil and climate seem to have some influence on the taste also. The finest China tea grows between the twenty seventh and

thirty first degrees north latitude.

There are three active substances in tea, volatile oils, theine and tannin. Volatile oils can be distilled by ordinary process and it contains the aroma and flavor of tea in perfection. This oil has an injurious effect upon the body. The Chinese are well aware of the fact and they will rarely use tea until it is a year old, thus allowing some of the oil to evaporate. On account of this, tea tasters, who test as much by smell as by palate have attacks of headache and dizziness.

Theine gives tea its power of lessening the waste of the tissues in the human body and when separated forms an alkaloid which has no smell, a slight bitter taste and is composed of colorless crystals. A similar principle in coffee is called caffein.

Tannin gives the flavor to tea.

Green tea has a greater effect on the nerves than black tea because it contains more soluble tannic acid and if taken strong, acts as a narcotic, producing tremblings and headaches with some people. Green tea should be mixed with black tea in the proportion of one to four.

According to Dr. Tebb, public analyst to the brough of Southwark, over six pounds of tea are consumed in England each year per head of population, which means that the average person is in habit of consuming every day, three to six grains of caffein and nine and seven tenths grains of tannin. Half as much alkaloid and nearly as much tannin as is considered permissable to be taken in occasion doses as a drug. This slow poisoning produces palpitations, dyspepsia, sleeplessness and emaciation. Much of the

evil of tea drinking comes from the tea being taken too hot and having been allowed to stew.

According to experiments which have been made on artificial digestion, tea retards the digestion and absorption of all the nitrogenous proximate principles of dietetic substances when peptic and pancreatic digestion were taken together, and that it uniformly retards peptic digestion although tea may resist the diffusion of peptones from the stomach. Digestion of starchy foods seems to be associated by tea, and gluten of flour seems to be the principle least retarded in digestion by tea. It then appears that bread is the natural accompaniment of tea when it is used at a meal. Butter used with bread undergoes digestion more slowly in the presence of tea, but more quickly in the presence of coffee or cocoa.

In strong solutions tannin precipitates the ferment of the gastric juice and makes it inert. Being astringent, it affects the lining of the intestines, thus causing constipation. It will also cause gastric irritation and catarrh. Tea must not be taken in dyspepsia.

Coffee. - Next to tea, coffee is the infusion most used. It is universally used in Turkey, Egypt, Persia and most Mohammedan countries. With the exception of Russia, it is used more in Europe than tea.

Coffee is the seed of an evergreen shrub which grows from six to twelve feet high. The stem of which is from six to fifteen inches in circumference. When the blossoms falls off there springs from each a small fruit, which is at first green but becomes red as it ripens. This fruit is something like a cherry and is good to eat.

In the flesh of this cherry is the bean which we call coffee, wrapped around in a fine thin skin. The bean is very soft and of a disagreeable taste, but as the cherry ripens the bean grows harder. The cherry later dries up and becomes a pod of a deep brown color. The bean then becomes solid and of a transparent green. Each pod contains one bean which splits into two equal parts. The coffee shrub yields its first crop in the third year. The crop from a full grown tree may amount to five pounds, but is oftener two pounds. The life of the tree is forty years. The tree flowers for about eight months, consequently the fruit is of unequal ripeness so that three gatherings are made each year.

After they are gathered, the beans are placed on mats to dry, being frequently turned. They are then pressed between rollers to remove the husk. The coffee is freed from impurities by winnowing and conveyed to seaports in bags.

In roasting a large quantity of water is driven off, a small quantity of the theine is volatilized and a portion of the sugar is changed into caramel. The cells which contain the fat and albumin are ruptured, and an aromatic substance is developed. One investigator found that roasting lessened the percent of theine from 7.5% to 4.2%, also that the soluble matter in roasted coffee was 39% against 28% in unroasted.

The analysis of roasted coffee varies with the quality, but averages as follows: moisture 1.81%, nitrogenous substances 12.2%, caffein 0.75 - 1.5%, fats 12.03%, gums, sugars etc 1.01%, extractives 22.6%, cellulose 44.5%, organic salts 4.81%. During the process of roasting a portion of the caffein is changed into caffeol.

Caffein exists in coffee partly in the state of combination with tannic acid and potash. These salts can be heated to

150° without undergoing any change. Melt at 185° assuming a fine yellow color, begins to boil, swells up to five or six times its orginal volume and is converted into a porous, brittle mass. At 238° it becomes brown and is part-ly decomposed. The vapor at this temperature yields crystals of caffein.

Caffein reduces the pulse rate, increas-es the blood pressure, by contracting the perifer-al vessels, after a short period of dilation, caus-ing increased force in the cardiac contractions. Caffeol exercises a reverse action. It accelerates the pulse and reduces the arterial blood pressure. Caffein has a depressive action on the cere-brum evidenced by a tendency to drowsiness, a slight vertigo and fatigue occuring after a slight effort. About two hours after a dose there is a feeling of well being with increased faculty to perform difficult and fatiguing work.

Caffeol acts more rapidly in thirty

minutes to one hour. Like most volatile sub-stances, it is eliminated by the lungs and skin, producing a condition like vascular stimulants as alcohol, ether and ammonia.

Caffein melts between 177° and 228°, has a slight bitter taste but is odorless.

Coffee fat is white without odor and of a buttery consistency. It melts at 37.5° and becomes rancid on exposure to the air. The existence of this fat or oil can be seen by roasting the bean. The oil is driven out by the heat and partly volatilized.

The effects of coffee drinking is directed chiefly to the nervous system. It produces a warming cordial impression on the stomach, quickly followed by a diffused agreable nervous epitement which extends itself to the cerebral functions, giving rise to increased vigor of imagination and intellect. While it is true that coffee does stimulate the nervous system to greater activity, at the same time

it retards metamorphosis considerably. The stimulating effect is valuable for reviving wearied spirits and promoting a comfortable feeling. The retarding of metamorphosis is mainly due to the oil, caffein showing this effect only when taken in large quantities.

Coffee decoction should never be boiled, but should be made by pouring boiling water over the grounds.

Cocoa. The cocoa plant grows about twenty five feet high and yields two crops per year of a bright soft yellow fruit. This fruit looks something like a cucumber and contains about twenty five kernels. The tree is not allowed to bear fruit until the fourth year. The fruit is divided into five lobes. Its greatest length is ten inches, the greatest width, near the place of attachment is three or four inches. The fruit usually weighs about ten to sixteen ounces.

The kernels of this "theobroma plant" as it is called are separated, dried in the sun

and roasted. These crushed kernels are called cocoa nibs.

The composition of the cocoa beans is as follows - water 5.58%, nitrogenous substances 14.18%, theobromine 1.55%, fat - 50.9%, starch 8.77%, other nitrogen free bodies 13.91%, cellulose 3.93% and salts 3.45%. Theobromine is almost identical with theine and caffein.

Cocoa butter has an agreeable taste and odor and may be kept indefinitely without change. It melts at a low temperature and therefore can be easily dissolved in the alimentary canal of the body.

In the prepared cocoas on the market oil has been extracted and sugar and starch added. The average composition of prepared cocoa is 6.35% water, 21.5% nitrogenous substances, chiefly proteid, 1.82% theobromine, 27.34% fat, 2.53% sugar, 13.17% starch, 16.48% non nitrogenous bodies, 5.44% cellulose and 5.19% salts.

Cocoa may be either fermented or unfermented. The unfermented is dried.

in the sun immedately but the fermentid is kept in a cool moist place and allowed to ferment.

Chocolate is manufactured from the ground cocoa seeds which have had the husks removed and have been fermentid. These ground seeds are made into a paste and compressed into cakes with moderate pressure. Sugar and flaroring extracts are added, and sometimes spices are miped with the paste before compressing it. The husks are sold to adulturate cheaper cocoa. The chocolate cakes are also prepared with meat extracts.

Cocoa lacks salts and is deficient in starch, therefore cannot be called a perfect food. In the alimentary canal it leaves a large residue.

Lecture III Sugars.

Sugars may be divided into two main classes; the monosaccharides which have the chemical formula $C_6H_{12}O_6$ and the disaccharides with the formula $C_{12}H_{22}O_{11}$. To the former class belong the sugars dextrose, levulose and galactose, to the latter saccharose, lactose and maltose.

Dextrose is one of the simplest sugars and is the form in which most of the sugars are absorbed in the body. It is found in some fruits. It is about three fifths as sweet as cane sugar. It is found in honey, and in all the places it is usually found in combination with fruit-sugar. In the body it occurs in the blood, in the liver and in the urine. In diabetic conditions there is an excess of dextrose in the urine. In hydrolysis of cane sugar, a molecule each of dextrose and levulose are formed. formula being $C_{12}H_{22}O_{11} + H_2O = C_6H_{12}O_6 + C_6H_{12}O_6$. This formation will also take place by boiling the sugar with dilute mineral acids. Dextrose can be made from starch by the addition of a molecule of water.

In Germany, dextrose or glucose is prepared from potato starch. In America it

is prepared from cornstarch. It is usually obtained by boiling with dilute sulphuric or hydrochloric acid. The solution is then treated with chalk and filtered to remove the excess of acid. The solution is then evaporated to a thick syrup and is sold under the commercial name of glucose. If this is evaporated to dryness it is sold as grape sugar. Glucose crystallizes from concentrated solutions in crystalline masses consisting of small six-sided plates. The commercial product resembles granulated sugar in appearance. In presence of yeast it ferments yielding alcohol and carbon dioxide.

Levulose is sometimes called fructose or fruit-sugar. It occurs in combination with equal quantities of dextrose. It is formed by the action of dilute mineral acids or ferments on cane sugar. Pure fructose is obtained by heating inulin with very dilute acids. Fructose is as sweet as cane sugar. It does not crystallize.

Galactose comes from the hydrolysis of milk sugar.

Cane sugar saccharose is widely distributed in nature. It is found in fruits, in sugar cane, sugar beets, sap of maple tree,

and walnuts. Also in the blossoms of plants and in honey. Saccharose crystallizes from water. If healed to 210° to 220° cane sugar looses water and is converted into a substance called caramel. Invertin, the enzyme formed by yeast, transforms cane sugar into fruit sugar and dextrose and these undergo fermentation, but cane sugar of itself never ferments.

Manufacture of cane sugar: When beets are used they are crushed with water to dissolve the sugar. The dark colored solution which is obtained is then evaporated and passed through filters of bone black to remove the coloring. The solution is evaporated to a small degree in the air. Later it is put into large vacuum pans from which the air is partly ephausted. The boiling thus takes place at a lower temperature than would otherwise be required. The crystals are then passed through centrifugals which are funnel shaped sieves, and which revolve very rapidly and the liquid is thrown by centrifugal force through the sieve, the crystals remaining behind

The crystals have been partly dried by this process but the drying is finished in a warm room.

Molasses is a by-product in the manufacture of cane sugar. It is that part of the so- which does not crystallize. It is a highly nutritious food and can be used as a preservative.

Lactose: This sugar occurs in milk and forms a chief part of an infants diet. For the infant cannot digest any starch for the first year of his life and yet he needs a carbohydrate. Human milk contains a greater percent of lactose than cows milk. Lactose is more expensive but not so sweet as grape sugar. It is less soluble than dextrose or saccharose.

Sugars perform the same function in the body as starches, since starches must be converted to sugar before they can be used by the body. Sugars have a more agreeable taste than starches and they possess an antiseptic and preservative power. Sugars are not necessary to the body if starches or fats are eaten. Since sugar is easily soluble it tapes

the digestive powers but little, the only change cane sugar undergoes is being converted to dextrose and levulose in the intestines by the succus intericus. Sugar is a good food if not taken in excess, but since it is so highly concentrated an over amount produces diabetes and constipation, dyspepsia and disorders in assimilation and nutrition. One pound of sugar will yield 1860 calories of heat, which is enough heat to raise five gallons of water from the freezing to the boiling point. If sugar be taken in strong solutions it is irritating to the skin. This can be seen diabetic people breaking out with eczema. A pound of butter will will wield twice as much energy as a pound of sugar but the cost is nearly five times as great and the butter is more prone to cause indigestion. Sugar is not only the cheapest food we have but it is a better proteid sparer than fat because it is more readily burned in the body.

Lecture IV. Fruit.

Perhaps fruits comprised the diet of primordial man, and ddstodaysthe savage tribes living outside of the frigid zones.

Fruits are composed of water, starch-es, sugars a vegetable jelly called pectin, cellulose and organic acids.

The only class of foods which occur to any extent in fruits is carbohydrates. The carbohydrate which predominates is the monosaccharide levulose or fruit sugar. However some fruits as apples, apricots and pineapples contain cane sugar also and some contain starch as the banana while all contain cellulose. Since levulose is easier to assimilate than cane sugar, fruits containing it may be given to mild forms of diabetes.

The general composition of fresh fruits is something like the following: water 85% to 90%, proteid 1%, fat 1%, carbohydrate

5 ½ to 10 ½ %, cellulose 2 ½ % and mineral matter .5 %.

Pectin is found in ripe, pulpy fruits. This is a vegetable gum, the properties of which are not fully understood. It is by virtue of pectin that jelly can be made. In the process of ripening pectin is changed into a sugar called pectose.

The organic acids are mainly in combination with alkalies then form salts of carbonates or phosphates. The acids which occur most frequently are malic, citric, tartaric and oxalic. Citric acid is found in lemons, limes and oranges, tartaric is found in grapes while malic predominates in apples, pears, peaches, gooseberries and currants. As fruit ripens the organic acids are covered with the sugars and gums that develop, to some extent. Thus we see why it is that the ripest fruit is the sweetest.

The minerals occur mainly in combination

with the organic acids, the main constituent is potash. The minerals when taken into the body render the blood more alkaline and the urine less acid.

The small amount of proteid which is found consists mainly of albumin. This, however, is found in such a small percent that it furnishes little nutritive value to the fruit.

A small amount of fat is also found in some fruits

Cellulose occurs in very different amounts in different fruits. It is found in smaller quantities in cultivated fruits than in wild fruits.

The odor and flavor are due to etherial bodies. These are sometimes not found in chemical analysis. The flavorings are of no nutritive value but they stimulate the appetite thus making the food more palatable.

Cooked fruits are more digestible because their cellulose is softened. The gums

also converted into a gelatinous form. The fruit looses some of its carbohydrate when cooked but if the juice is eaten with it, all the food value is obtained.

The digestion of fruit depends upon the kind; one large, raw, ripe apple will digest in about three hours. If fruit be unripe more cellulose will be present and thus it will be harder to digest. There are also certain acrid substances in unripe fruit. These substances are very irritable to the intestines and often cause diarrhoea by increasing peristalsis.

Fruits may be divided into two classes; first the flavor fruits and second the food fruits. The flavor fruits are those which contain eighty percent of water. The food fruits are those which contain more than eighty per cent of solids. The flavor fruits contain a small amount of sugar, which is their only nutritive value. They are eaten chiefly for their agreeable taste.

The banana is a good example of the food fruits. It contains 74% water,

& 2 % carbohydrate and 1.5 % proteid. The unripe banana is sometimes dried and made into flower or meal. This flour is rich in carbohydrate and mineral matter as compared to wheat flour, but does not contain as much proteid. Banana flour is used to make a sort of bread that is easy to digest. This flour is about equal to rice flour in nutritive value. The fig, date and raisin have even greater nutritive value than the banana. The date and banana contain sufficient food to sustain life for some time. The apple is wholesome but slightly nutritious.

Among the least acid of the common fruits are peaches, sweet pears, sweet apples, bananas and prunes.

Fruits which contain the most water are musk-melons, water melons, oranges, lemons limes, shaddocks and grapes. Those fruits which furnish potash salts lime and magnesia are apples, lemons, limes and oranges.

Uses of fruits to the body: 1. To furnish

nutriment, to convey water to the system and relieve thirst, 3. To introduce salts and various organic acids which improve the quality of the blood and react favorably upon the secretions. 4 as anticarbutics 5. as diuretics and to lessen the acidity of the urine. 6. As laxatives and cathartics 7. To stimulate the appetite, improve digestion and give variety to the diet. 8. As special cure for certain diseases.

When fruit ripens and the soluble pectin is formed, the starch is converted into levulose and dextrose.

Fruits may be eaten at any meal but if they are taken for their dietetic effect, they are better eaten at the beginning of a meal or between meals. If to be taken for their laxative effects, they will produce good results if eaten before retiring. The skins and seeds of fruit seem less irritating if taken with starchy foods. They are, however, very indigestible. Dried fruits are not so good a food as fresh fruits. Some dried fruits cannot be digested at all, such as citron and raisins.

Lecture V Starch.

Starch is widely distributed throughout the vegetable kingdom. It is a polysaccha-ide and the starch group includes starch, in-ulin, lichein and glycogen. It is closely related to cellulose having the same formula $(C_6H_{10}O_5)n$.

Starch is found in the form of granules in the cells of plants. The nucleus of the granule is on one side. Only under the microscope can the granule and nucleus be seen. The granule is composed of layers of starch granulose and starch cellulose. The starch cellulose is the densest layer and a layer of it surrounds the outside. The form of the starch granules is different in different plants.

Starch is insoluble in cold water. Upon the application of dry heat starch is converted to dextrin as is seen in the crust of bread and also in toasted bread. By the action of dilute acids,

starch is converted to dextrin, maltose and glucose. Diastase, a ferment which exists in plants converts starch to maltose and dextrin. If starch be treated for a few days with cold, dilute mineral acids, it is converted to soluble starch without the formation of a paste. Starch never occurs in the crystalline form, but as a white powder. Like proteids it can be precipitated from solution by neutral salts such as ammonium sulphate.

Test for starch. Starch paste gives a blue color when treated with iodine, and when treated with bromine it gives a yellow color.

Manufacture of corn starch. Corn is first treated with warm water, then the soaked grain is ground between stones while a stream of water runs through it continuously. The starch then floats away in the water as a thin milky fluid and runs upon sieves of silk bolting cloth which are kept in constant motion. The starch passes through with the water as a

milky fluid and this is allowed to settle, then the water is poured off. The starch is next treated with caustic soda or sodium carbonate, the object being to dissolve the gluten, oil, etc. The mixture is then taken to long, shallow, wooden troughs where the starch is deposited, the alkaline water running off. The starch is finally washed with water and dried at a low temperature. The purest form of starch is the arrow root. It is obtained from species of the maranta plant which grows in the West Indies and other tropical regions. Bermuda arrow root is the most highly valued. Tapioca is starch obtained from the tuberous roots of the bitter casava, a native of South America. Sago is starch obtained from Sago palms of India.

Raw starch is not digestible and therefore foods containing it must be cooked. Starch is gelatinized below the boiling point of water. Pure starch will cook over direct heat in seven minutes if the mixture is

very thin. But when starch is in vegetables surrounded by a cellulose wall, a great deal longer time is required. Cereals containing starch should be cooked for several hours. Vegetables which contain starch should have a long, slow cooking.

Starches check albuminous waste in the body, yield heat and energy: they are also fattening. Starch does not enter into the structure of the tissues except as glycogen in the liver. Starches are more easily metabolized than fat or proteid.

The digestion of starch begins in the mouth. The digesture fluid saliva, which is secreted by the salivary glands contains the ferment ptyalin. This ferment is secreted by both the parotid and submaxillary glands. It has a diastatic action on starch. This ferment commences the work of converting starch into dextrin and maltose. The following equation represents the change that takes place - $(C_6H_{10}O_5)_n + H_2O = C_{12}H_{22}O_{11} + (C_6H_{10}O_5)_{n-2}$

maltose + dextrin

then $(C_6H_{10}O_5)_{n-2} + H_2O = C_{12}H_{22}O_{11} + (C_6H_{10}O_5)_{n-4}$.

finally $(C_6H_{10}O_5)_2 + H_2O = C_6H_{12}O_6 + (C_6H_{12}O_6)$
dextrose + levulose.

Maltose is the chief sugar formed, yet there are traces of dextrose. The first dextrin formed is erythro and later acro-dextrin and maltose are formed, from this erythro-dextrin. Erythro dextrin gives a red color with iodine, acro dextrin gives a yellow color with iodine. This process of the digestion of starch is only just begun in the mouth and it stops in the stomach after the alkalinity of the food is neutralized. The action is again taken up in the intestines where the amylopsin has the same action as the ptyalin. The maltose thus formed is converted by the succus intericus into dextrose and levulose, in which form it is absorbed almost altogether, although it is possible for the absorbing cells of the intestine to take saccharoses, dextrins, & starch and convert them to dextrose before turning them into the blood stream. The sugar is taken to the tissues by the blood stream. It is never

built up in the tissues but stays in the fluid which surrounds the cell. If more carbohydrate food is taken than is required, it is stored in the liver in the form of glycogen or built into fatty tissue or eliminated by the kidneys. The decomposition products are H_2O and CO_2 which are excreted by the lungs, kidneys and skin. The CO_2 ~~by~~ the lungs; the H_2O by the lungs, kidneys and skin.

Lecture VI Cereals.

Cereals are preparations from different starchy seeds of plants.

The chief carbohydrate in cereals is starch, which makes up about 65 to 70% of the whole grain. Sugar is also present to some extent, but cellulose does not exist except in the outside covering. There are scarcely no organic salts. The general composition of cereals is water 10 to 12 per cent, proteid 10 to 12 per cent, carbohydrates 65 to 75 per cent, fat ½ to 8%, mineral matter ½ to 2%. Since cereals contain carbohydrate to such a great extent, they should be taken with other foods richer in proteid and fat. All cereals are deficient in fat. Considering that the nutritive value of cereals is so high and that they are easily absorbed, they rank high among the foods.

Oats contain about 59.1% carbohydrate, 10.9% nitrogenous matter, 94% of which is in the form of proteid and can therefore be utilized for building material. The husk of the oat

kernel adheres so closely to the inner part, that it is difficult to remove. A considerable part of the cellulose is therefore left in the meal. This cellulose stimulates peristalsis of the intestine by irritating the membrane.

Oats produce a heating effect upon some people and causes eruption of the skin. This is due to a special constituent avenin. However, some efperiments deny the epistence of this substance.

There are different ways of preparing oats for a food. They may be simply cleaned and ground producing oat meal. Or the husk may be removed and the remainder ground. The product is then called oat flour. Groats consists of the flour from which all the oats have been removed.

Another method from that of grinding, which is coming into use now to a considerable eptent, is that of rolling. The

oats are put to great pressure between the heavy rollers, and the cell wall and the cell wall thus becomes ruptured; the cellulose is broken down and the grains are flattened out and thereby made easier to cook. Heat is sometimes applied during the rolling process and the grains thus become partially cooked. The heating not only lessens the time for after cooking, but it alters the fat so that it does not become rancid. Since oatmeal does not contain gluten it is not a good flour for bread making. But it is miped with water and made into oatmeal cakes. If the oatmeal be miped with wheat flour it can be made into bread and muffins. The same amount in weight of oat cake contains twice as great a fuel value as that of wheat bread. Finely divided oats demand a cooking of several hours; whole or cracked oats would require a cookery of from 8 to 24 hours. on account of the starch and cellulose which they contain

Maize or Indian Corn. From chemical analyses we learn that maize has as great a nutritive value as wheat, except in mineral matter. It contains twice as much fat as wheat or barley and three times as much as rye. It does not have as much proteid as some of the other cereals but 87% of the nitrogenous matter is in proteid form.

Sugar corn is a variety of maize which contains an extra amount of sugar. Maize has a high nutritive value and moreover is comparatively easy to digest. 90% of the dry matter is absorbed while only 82% of the dry matter of wheat is. Maize is also a very economical food.

Barley is noted for its richness in mineral matter. It contains more fat than wheat but is poorer in proteid. The amount of fat which it contains varies from 3 to 5%. Barley meal is made from the whole grain ground. Scotch barley is a preparation

without the husk. The chief preparations which are mostly used for food pearl and patent barley. The pearl barley is the grain stripped of its husk and polished. The patent barley consists of the pearl barley being ground into flour. Since barley is deficient in gluten it is not a good flour for bread making, but when mixed with one half its amount of wheat flour very good bread can be made of it. Barley bread is used by people in northern Europe and southern England and it is especially used in the winter time in Scotland and Wales and wheat bread is so dear.

Rice ranks the poorest of all the cereals in proteid and fat. It has 76% of starch which is present in small and easily digested grains. When rice is boiled it swells up and absorbs nearly five times its weight of water. Some of the mineral constituents are lost in solution so that rice is better cooked by steam. 19% of the proteid is waste.

Atwater says that the requisite proteid of the body can be obtained more

cheaply from cereals than from any other class of foods.

Lecture VII Cellulose.

The substance which composes the frame work of plant cells has received the name of cellulose. Cellulose belongs to the polysaccharides the same group in which starch comes but is not in the same sub-group. Starch is classed in the starch sub-group while cellulose is in the cellulose sub-group. The chemical formula is $(C_6H_{10}O_5)n$. The cellulose group includes cellulose, hemi-cellulose and tunicin. Cellulose is found in all the vegetable kingdom; in trees where it has become very hard it is called lignin.

When pure, it is a white translucent substance insoluble in water, alcohol, ether, fats or etherial oils. It is not affected by dilute acids or alkalies. It is decomposed by concentrated sulphuric or phosphoric acid or hydrochloric acid, first to a substance resembling starch, later to dextrin and finally to grape sugar.

Cellulose does not melt upon heating but turns brown and eventually decomposes. If it is treated with nitric acid, it yields nitro-compounds of an explosive nature.

Hemi-cellulose yields monosaccharides when treated with dilute mineral acids. The hemi-cellulose of wheat and rye yield arabinose and xylose. The hemi-cellulose of some nuts yields mannose.

Cellulose is also found in the animal kingdom; here it is called tunicin. The fibers of animal cellulose are more complex than those of vegetable cellulose. Animal fibers are soluble and yield dextrose on decomposition.

Pure cellulose contains about 9% water. Cellulose is soluble in Schweitzers reagent which is an ammoniacal solution of cupric hydrate. The cellulose may be precipitated from solution in this by acids, alcohol etc. Cellulose turns green with iodine and concentrated sulphuric acid.

Although cellulose is not acted upon by any of the digestive ferments, experiments on man have shown that 40 to 60% disappears, therefore it must be digested. How this is done is not known as there has never been any ferment isolated which will digest cellulose. When acted upon by certain organisms, cellulose undergoes decomposition, and sets free CH_4 and acetic and butyric acids.

Cellulose gives bulk to the food and it thus increases peristalsis. It loosens the food and thus prevents constipation. In some vegetables as carrots and celery a part of the cellulose may be dissolved and absorbed. Cellulose is almost useless for purposes of nutrition itself and it also prevents the digestive fluids from getting to the food which it encloses. Unless it has been thoroughly broken up in the preparation of the food.

Rules for cooking vegetables: 1. Vegetables must be fresh to be wholesome and palatable. Summer vegetables should be cooked

the same day that they are gathered and gathered while the dew is still on. 2. Pick over and wash well, cutting out all decayed parts. 3. After paring lay in cold water some time before cooking. 4. If they are to be boiled salt should be added to the water. 5. Cook steadily after they have started to cook 6. Vegetables should be thoroughly done to be palatable and digestible. 7. Drain well after they are cooked. & Serve hot.

Green vegetables such as celery and lettuce are valuable for the minerals which they contain as well as for the laxative effect which they have, which is caused by the cellulose present. Green vegetables may be eaten raw or cooked. Those which do not have much starch and are taken simply for the flavor and the bulk which they make, may be eaten raw. But those which have a large percentage of starch should be thoroughly cooked.

Raw green vegetables are very palatable in hot weather when one doesn't want

so much food.

Vegetable foods are digested almost entirely in the intestines. If there is not a large amount of cellulose in the food the digestion will be more complete. But since the vegetables contain a large amount of cellulose digestion and absorption are not so perfect of vegetables as of proteids. Since vegetables contain so little nutriment for the bulk, a purely vegetable diet would not be advisable.

Legumes. Lecture VIII

Proteids. "The proteids are highly complex, and for the most part uncrystallizable compounds of C. H. O. N, and S, occuring in a solid viscous condition, or in solution in nearly all solids and liquids of the organism."

All any of the proteids contain phosphorus and when ignited, nearly all leave a small amount of ash.

Since the proteid molecule is so complex no satisfactory formula can be given. The digestion of proteids takes place in the stomach, the gastric juice, the changes which the proteid undergoes in the stomach may be represented by the following scheme given by Schäfer.

Proteid

- acid albumin
- Proto albumose
- Hetero albumose
- Deutero albumose
- amphlopeptone.

This digestion is only theoretical. After passing from the stomach to the intestine, the proteid is acted upon by the trypsin of the pancreatic juice. To illustrate this action Schäfer gives the following Proteid

Alkali Albumin

Deutero-albumin

antipeptone, amido acids, etc.

Legumes are such vegetables as peas and beans. They closely resemble the cereals inasmuch as their chief food constituent is the food that has been stored up for the young plant. However, the characteristic of legumes in their richness is nitrogen. As in cereals a large part of their stored food is starch. The roots of leguminous plants are supplied with little nodules which are masses of bacteria. These nodules have the power of taking the nitrogen from the air and passing it throughout the plant. The nitrogen is found mainly in the chief proteid of the plant

legumin. This proteid has also been called vegetable casein because it so closely resembles the casein of milk. The close relationship of milk casein and legumin is shown by the fact that a kind of cheese can be made from beans. Legumin unites with lime salts forming an insoluble compound in water. This is why peas and beans will not cook soft in hard water. If a small amount of soda is added to the water, this soda will throw down the lime and the legumes cook much more quickly. Magnesia has no effect upon legumin. The proteids of some of the legumins contain sulphur, beans contain more sulphur than peas, while lentils contain the least of all. Legumes have abundant carbohydrate but are very poor in fat. They are for this reason often prepared with fatty foods as pork and beans. They may be cooked with a large amount of butter or served with butter sauce. Dried peas and beans require a long soaking to soften their skin. The proteid of legumes differs from the gluten of wheat and will not make bread. The percentage of protein in

these bodies exceeds that in the best beef. Although legumes contain a large amount of proteid, it is by no means all absorbed, for only about one half is used by the body. Peas and beans have a tough eternal coat which is never digested. Since they are likely to produce intestinal fermentation and produce gas they cannot form the sole article of diet. If legumes were to be taken as the exclusive food, eighteen ounces of peas or beans, making six pints of soup would have to be eaten daily. Very fresh young peas are easily digested.

Kidney beans or haincots make a very good article of diet, for they are one of the very best legumes. They are also very cheap. Before cooking they should be thoroughly soaked until they are swollen and soft before they are boiled. They should then be boiled until perfectly tender. They may be flavored with onions or parsley. Fresh, young string beans are very digestible, also fresh, young lima beans but the dried lima beans are indigestible. The red bean is less likely to produce diarrhoea than the white beans. If

has a more tender skin and absorbs water so easily that it is easy to ferment.

In China and Japan they say a bean is the chief article of proteid food. This supplies the proteid for the rice diet. Several varieties of bean cheese are made from its vegetable casein.

The peanut which is really not a nut but a legume resembles nuts in as much that it contains a large amount of fat. Peanuts are nutritious but difficult of digestion when roasted whole. The flour is made from the ground and batted nuts and contains three times as much nutriment as an equal weight of beef and twice as much as an equal weight of peas. Peanut meal which contains no proteid is used for pancakes.

This meal contains 52% protein, 27% carbohydrate and 8% fat.

They say the bean also is used to make a flour which is used for diabetes.

The legumes are not readily digested in the stomach. They may at first sight appear more nutritious than meat. But considering the fact that the proteid of legumes is harder to digest than animal proteid it can be clearly seen that the reverse is true.

Lecture IX Bread Making.

Wheat belongs to the cereal family. The seed contains a large quantity of starch which is stored as food to be used by the young plant. This stored food is called the endosperm of the grain. The germ of the seed contains a large amount of fat and proteid and it is the growing part of the plant. The starchy material and germ are enclosed in a hard outer covering; which consists of three layers. The outer layer consisting of cellulose and a small amount of mineral matter. The middle layer is made up of small cells of cellulose and pigment. This pigment gives the bran its brown color. The inner layer contains the least cellulose of all. It has imbedded in the cells of cellulose, a proteid which is called aleurone.

The constituents of wheat may be divided into two classes, the organic and inorganic substances. The inorganic matter consists of water and mineral matter, the

organic is composed of fat, starch and allied bodies having a similar composition, and nitrogenous bodies. The amount of water in the wheat grain varies from 10% to 15%. The wheat contains 1.5% of ash and the finished flour contains .4%. Bran has 6 to 7 % of ash. More than half the ash consists of anhydrous phosphoric acid which is mainly in composition with potash forming potassium phosphate. Magnesium is also present as a salt of phosphoric acid. These phosphates are important for their food value, and the removal of these phosphates diminishes the nutritive value of bread, but in a mixed diet this is not noticed as the phosphates are supplied by other materials.

The fat of the wheat is almost entirely confined to the germ and husk. The gluten contains the insoluble proteids, a portion of the ash and oil. It exists as a powder in the wheat grain, but when treated with water it swells up into a grayish, elastic, sticky mass.

In the process of milling the germ is removed on account of the oil which it contains;

for this oil is likely to become rancid and the soluble protoid is likely to digest the starch, and make a dark colored loaf.

The earliest bread was made by miping flour and water together, but this produced such a hard cake that it was difficult to masticate and digest. A method was then devised to get gas into the bread so that it would be light and spongy. It is by virtue of the gluten that the bread is enabled to remain in a spongy mass. This it does by swelling up and hardens in the shape which it has been left by the gas passing through. The reason that wheat flour makes the best bread, is because it contains the most gluten of any of the flours. The "hard" wheats are rich in gluten while the soft wheats contain more starch. The gluten of hard wheat can be miped with large amounts of water and makes a large loaf of bread with comparatively little flour. Soft wheat does not make so large a loaf but the bread contains less water and is of a more agreeable flavor.

Rye costs less than wheat and is easier

cultivated especially in cold countries. It is not so good as wheat flour for bread making for it does not contain a sufficient percent of gluten. In the cold countries it is used almost all together for bread making. When the whole grain is milled the flour contains a greater per cent of proteid than wheat flour.

Maize flour contains no gluten and consequently cannot be used to make leavened bread. It makes very nutritious johnny cakes and pan cakes, but they dry so quickly that they must be eaten fresh. Maize is richer in fat, poorer in cellulose and protein and about equal in starch to wheat flour.

Yeast. The yeast plant occurs in the air for if malt extract be placed about any where fermentation will set in. It also occurs on the outside of all ripe fruit. This is called wild yeast. Yeast is a very small fungus, the shape of which is round or oval. It is one celled and reproduces in two ways. First: by forming buds which break off into new plants, second, by forming spores which will produce new plants

under favorable conditions. The plant will grow from spores if it has enough moisture, heat and food material. Yeast develops best at a temperature of 97°-95° F.

When yeast has favorable conditions it reproduces again and again and feeds upon sugar giving off alcohol and carbon dioxide. This process is called fermentation.

The Egyptians made yeast by obtaining some wild yeast and setting it in dough. Then saving out some of the dough before baking to leaven the next bread with and so on. The best commercial yeasts are the compressed yeasts if they are carefully made. They may contain some bacteria which give a slight acid taste to the bread.

The dough. The liquid used in making raised bread is usually water, though sweet milk, buttermilk and whey and water from boiled potatoes ~~did~~ sometimes used. Breads mixed with milk are more nutritious on account of the proteid and carbohydrate gained thereby. It is, however, a little slower to rise than water bread. Salt is added to give flavor to the bread.

Since yeast develops best at a moderately high temperature, the materials

which go into the bread should be at least luke-warm. The kneading should be done where no draft strikes the bread to make it cold. And since oxygen is needed to aid the growth of the yeast, all the dough must be kneaded to the surface. If too little yeast is used the loaf does not rise well and if too much is used the pressure of the gas will burst the gluten. Since salt retards the fermentation of the yeast, it should be added near the end of the kneading.

The best method for bread making is to set a sponge, putting the yeast with a portion of the flour and allowing this to set until it becomes light. Then mixing the sponge with the rest of the material, allowing this to rise a few hours, in a warm place. The yeast continues to grow, and the gas goes on increasing until the pressure is greater than the elasticity of the gluten can stand.

In olden times the bread was put into the ashes of the fire to bake. Later the old-fashioned baking ovens were used and finally our ovens of today. When the bread is put into

the oven the yeast continues to work until a temperature of 158° F is reached when the plant is killed. The gas inside the bread continues to expand under the influence of heat, which gives bread the bread its spongy appearance.

During the baking the proteids and carbohydrates are changed chemically. The crust is changed into dextrin and sugar and the moisture is dried out. If the oven is too hot at first the crust forms quickly and prevents the gas escaping from the crumb. In order to prevent the crust from forming too fast, the top of the loaf is sometimes moistened before putting into the oven.

For ordinary purposes the oven should be heated to 400° to 500° F and a pound loaf should be baked about one hour. Baked bread does not contain so much carbohydrate and proteid as the flour which is put into it, the explanation being that a small percent of it went to feed the yeast plant.

Sogginess in bread may be caused by flour poor in gluten, or by too much water in

the bread, or by too little or too poor yeast or by insufficient rising, kneading and baking. Heavy bread is one of the most indigestible of foods because it rolls up in a lump and the digestive juices cannot attack it. Large irregular pores in bread come from imperfect kneading or from the bread having risen too long. Bread loaves should always be baked in individual pans.

Lecture X Uncooked Foods.

Much has been said of the virtues of uncooked foods. The adrocates of an uncooked diet, usually go to the extreme and adrocate that all the food principles can be utilized by the body without being cooked. This idea, however, we are unable to accept as we know that much raw starch cannot be assimilated. Consequently, starchy foods would be of no avail for the work of the body. Notwithstanding this fact, there are many foods which are more digestible uncooked than cooked. Albumin is one of these foods. When albumin is cooked it coagulates in a solid mass, and if it undergoes a rapid cooking this mass is very tough and is almost impenetrable by the digestive fluids. Meat and eggs therefore since they contain a large per cent of albumin are more easily digested uncooked. When a raw egg is beaten up lightly it is in such a condition that every particle can be attacked by the digestive fluids. Raw eggs are a good food for people of weak digestive powers.

Since we know that uncooked food was all that primitive man had to live on, it looks reasonable to believe that man can do it to quite an extent now. It is easy to see how one can have a balanced dietary on uncooked foods. The proteid which he needs to build the tissues can be obtained from eggs, meat, vegetables and milk. The energy can come from sugar (which is much easier to digest than starch) and also from fat. This fat can be in the form of cream, butter, vegetable oils and also the fat which we get from other foods. Cellulose can be taken to give bulk to the food and increase peristalsis.

A Week's Menu of Uncooked Foods.

I

Breakfast.

Oranges with powdered sugar – nuts and carrots radishes – onions.

Unfried bread – butter – milk

Luncheon.

Dried Beef - Lettuce and nut salad.
Unfired bread - butter
Blackberries with whipped cream
Grape juice.

Dinner.

Orange and lemon fruit-soup
Cabbage salad - Cheese and date sandwitches
Sweet pickles - bread - butter
Ice cream (made with raw eggs).

Breakfast

Pineapple with thick cream
Fruit-egg-nog - cod fish (raw)
bread - butter.

Luncheon.

Apple and nut salad
Cheese eggs - Bread - butter
Lemon gelatin with walnuts and bananas.

Dinner

Sliced tomatoes - olives - sliced cucumbers.
Unfried bread - Celery and nut salad - butter
Orange bavarian.

III

Breakfast.

Bananas with powdered sugar
Oat groats with nuts - milk
Unfried wafers - butter - honey.

Luncheon.

Apple salad - Cheese and dried meat sandwiches
Bread - butter - Grape bavarian

Dinner

Figs - Lettuce with vinegar and sugar
Nut salad - Cream candy.
Unfried Bread - butter - Orangeade

IV

Breakfast

Dates - Raw flaked oats.
Junket
Unfried bread - Butter - honey
Milk

Luncheon

Cabbage slaw - Cottage Cheese
Pecans - Ice Cream

Dinner

Vegetable soup - Oyster cocktail
Egg cream - Strawberry ice
Unfried Bread - Butter

V

Breakfast

Apples - Raw beef balls
Bread - Butter
Peaches and cream - milk

Luncheon

Fresh green pea soup.
Sweet pickles - Banana salad.
Pineapple sherbet.

Dinner

Stuffed tomatoes
Creamed cheese and almonds
Maple mousse - Spinach salad.

VI

Breakfast

Strawberries with heavy cream
Peanuts - Cream of Cereal soup.
milk

Luncheon.

Cream of celery
Raspberries with Egg cream
Tomato salad

Dinner

Strawberry soup Nut custard
Nut and Fig Marmalade

VII

Breakfast

Plums - Whipped Eggs - Milk

Luncheon

Stuffed dates - Chipped dried beef in Cream
Banana Salad

Dinner.

Fruit salpicon
Sliced Onions in vinegar - Clams
Vegetable salad with nuts
Chocolate ice cream.

Recipes.

Oranges With powdered sugar.

Pare the oranges with a knife taking off the indigestible white part just beneath the rind. Divide into divisions taking off the tough white part which surrounds each division. Serve with powdered sugar.

Nuts and Carrots.

Put two medium carrots and ½ cup pecan meats through a fine vegetable grinder. Moisten with rich milk. Set on the stove long enough to heat (but not cook), stirring in half a cup of cream, a little salt and butter. Serve.

Lettuce Salad with Nuts.

Pour Mayonaise dressing over fresh, crisp lettuce leaves. Then sprinkle English walnut meats on top.

Mayonaise Dressing.

1 tsp mustard
1 tsp powdered sugar
½ tsp. salt
¼ tsp cayenne
Yolks of 2 raw eggs.
One pt. olive oil.
Two tbsp vinegar.
Two tbsp lemon juice.

Unfired Bread.

Unfired bread is manufactured where the necessary apparatus is at hand. Cannot be made in the home. It is dried by the sun, or when the sunlight cannot be obtained electric light is used.

Orange and Lemon Fruit-Soup

The juice of an equal number of oranges and lemons

Cabbage Salad.

Chop cabbage fine - serve with mayonaise dressing.

Cheese & Date Sandwitches.

Cut two slices of cheese. Serve with dates between them.

Ice Cream

1 qt. cream
½ cup sugar
1 egg

Fruit Egg Nog.

Beat 1 egg quite stiff
½ glass grape juice
½ glass cream
Beat thoroughly and serve.

Cod Fish.

Shredded dried codfish soaked
Butter.
salt.
pepper.

Apple and Nut Salad.

Chopped apples – Mixed nuts – Salad dressing.

Orange Bavarian

Equal quantities of fruit-juice and whipped cream. Add to plain jelly.

Cheese Eggs.

Cream cheese — Blanched almonds
Milk or cream — Lettuce
Olives — Radishes

Moisten slightly cream cheese with milk or cream. Mould cheese around blanched almonds the size of a robin's egg. Arrange in nest of lettuce leaves and garnish with olives & radishes.

Lemon Gelatin.

Make a lemon jelly and put in sliced banana and walnut meats.

Celery and Nut Salad.

Celery broken into small pieces.
Walnut meats – salad dressing.

Oat Groats with Nuts.

Soak oat groats in luke warm water for seven or eight hours. Drain and serve with ground nuts and thick cream.

Cheese and Dried Meat Sandwitches.

Cheese sliced thin. - Dried meat.
Place the meat between the slices of cheese.

Cream Candy.

Add enough cream to powdered sugar, so that the mixture can be rolled into little balls. Put into parafine paper and press walnut meats on the top.

Orangeade.

Juice of one orange. Three tbsp sugar.
1 cup water

Cabbage Slaw.

Cabbage chopped fine. Vinegar, sugar, cream.

Junket.

1 qt milk 2 tbsp powdered sugar
1 tsp liquid rennet.

Vegetable Soup.

1 tomato
1 carrot
1 small pepper
1 stalk celery
1 small apple
1 oz. nuts
½ cup wheat flakes
milk.

Put all through a fine vegetable grinder. Add sufficient milk to make the quantity desired. Allow to stand an hour or two, heat, stirring in one half cup of thick cream and serve.

Egg Cream.

Whip the whites of two eggs quite stiff. Add one glass of cream.

Maple Mousse.

1 pt double cream
1 cup maple syrup
} Beat until stiff. Set on ice.

Fresh Green Pea Soup.

Green peas - onion or celery - milk
Grind onion, celery and peas, add enough milk to make the desired consistency. Warm to 150° F.

Cream of Cereal Soup.

Soaked Cereal, fruit juice.
Cream.

Cream of Celery

Oat flakes - Celery - Cream
Celery Salt Flaked wheat.

Stuffed Tomatoes.

Place cabbage salad in hollowed tomatoes.

Nut and Fig Marmalade.

Alternate layers of figs and nuts - press firmly together. Serve with whipped cream.

Whipped Eggs.

Whipped eggs - fruit juice.

Lecture XII Infant Foods.

Since an infant grows fast it needs a large amount of food which is capable of building tissue, and since it has so much surface for the relative size of the body it will need fat to supply heat. And since fat supplies a great deal of fuel, it is a very necessary food for the infant. Mineral matter is needed for the bones. If the infant does not have these food tissue builders he becomes weak and his flesh gets flabby. A disease rickets is a consequence of the bones being imperfectly nourished. The fat seems to serve the purpose of building tissue in the early life; it also furnishes a packing material for the bones in the form of marrow, also for the nerves by plenty of packing. However fat must not be given in excess as it will injure the digestive organs and cause vomiting and diarrhoea. Milk which is fed to infants should not contain over 6½% of fat. Care must be taken to not feed carbohydrates to too

great an extent. They are valuable if not given in too large quantities inasmuch that they supply heat and also spare the proteid. If given in large quantities starch and sugars are likely to undergo fermentation in the stomach. The gas produced by this fermentation will cause pain in the bowels and perhaps diarrhoea.

The minerals which are of the most importantance in the child's food are salts of lime, potash and phosphoric acid. Phosphate of lime is the material for the bones and phosphates of potash are needed in the muscles and blood. These foods are more available for the use of the body if they are in combination with some organic material.

Water forms an important part of the infant's food and when he is thirsty, milk will not satisfy his thirst as water will.

An infant should never be overfed. In the summer time when infants are fretful, mothers usually feed them, while perhaps

the discomfort came from thirst or the heat.

Considering that the infant secretes ptyalin only from the parotid gland and the amylopstic ferment is not secreted from the pancreas until the child is two months old, and that these ferments are not strong enough to digest starch, one can see how important it is that no starchy foods be given.

There are five ways of feeding infants. 1. Mother's milk 2. Wet nurse 3. Bottle feeding 4. Mixed feeding, partly mother's and partly bottle feeding 5. Garage.

Since human milk is the natural food for the young we must take its composition for the standard of an infant's food. Chemical tests show that milk from different women differ in composition and that also the from the same mother varies from day to day. The composition of human milk taken about the middle of the second week of nursing, according to a reliable chemical analysis is - water 87.75%, solids 12.25%, proteid 1.62%, fat 3.14%, milk sugar 6.26%, mineral matter .27%, citric acid

.05% unknown extractives. 91%. The extractives although of an unknown nature, contain N. The milk which is excreted for the first two or three days cholostrom. It is especially rich in proteid and coagulates on boiling. It contains cholostrom corpuscles, is yellower and more alkaline than ordinary milk. The cholostrom being laxative it rids the child's alimentary canal of waste matter which is found in it at birth. For the first few days the child should be nursed four or five times a day. Water may be given between times. After this he may be fed as often as once in two hours, until he is six weeks or two months old. His feeding should come between five in the morning and eleven at night, and only once in the middle of the night. After the child is four or five months old it need not be fed between ten at night and seven the next morning. The length of time for the babe to be kept at the breast is from fifteen to twenty minutes. The only effect that the diet of the mother has upon the milk is that a proteid diet increases the amount of fat in the milk.

Nearly all of the food principles of milk are absorbed in the intestines. 99% of the proteid, 97% of the fat, 90% of the mineral matter and all of the sugar are absorbed.

In artificial feeding one should endeavor to modify cow's milk that it corresponds as nearly as possible to human milk. However, the food must be prepared with special reference to the individual child's bodily condition. Condensed milk is cheaper in the cities than fresh cow's milk. If it is to be used, beef juice or egg albumin should be added to supply protein and cod liver oil for the deficit in fat. Since cow's milk will produce about five times as much curd as human milk, it should be diluted with two parts of water for very young infants. Since diluting decreases the percent of fat, it is better to take cream and dilute it and add one teaspoonful of sugar to four ounces of diluted cream. If cane sugar is used it is likely to ferment. The best milk is fresh cow's milk if it can be kept from contamination. This is better than boiled, sterilized, pasteurized

or peptonized milk. Milk which is to be fed to a babe should be artificially cooled as soon as milked so as to prevent the rapid growth of bacteria. The vessels which hold the milk should be carefully scalded each day, and these vessels should be covered, especially in foul air or in a damp cellar.

If the mother does not have enough milk for the babe no harm will come from feeding it part of the time with cow's milk, and nursing it part of the time. If the mother's health is poor she should not be wakened at night to feed the child but it should be fed cow's milk and nursed in the day time.

Garage is a means of feeding a baby through a catheter. This is done by putting the rubber catheter through the mouth about eight inches. A glass funnel through which the food can be poured should be attached to the end of the catheter. This is a good way to feed infants that have weak stomachs, gastric catarrh, when they refuse food or are too weak to take it.

Prepared infant foods usually

contain too much starch and sugar and too little fat. Babies fed upon these foods are likely to be either emaciated or marasmic or those who are stout and apparently robust but whose strength and power of resistance to disease is deceptive. The carbohydrates are not like those of natural milk, although they have been partially converted into dextrin and maltose by diastase.

The infant may be weaned between the tenth and eighteenth month. Ordinarily not before the twelfth.

Lecture XII Food for Young Children

Children generally do best upon a milk diet even after they are weaned, up to the end of the second year. At the end of the second year, the digestive juices have increased in their strength, the muscles of mastication are stronger, the intestines longer, and the walls of the stomach thicker. Milk may then be used as part of the diet, but it will not satisfy all the demands for food. If illness occurs after the child has been put upon a solid diet, he should be again returned to fluids.

Children at the age of four or five care little for fat but have a desire for sweets and acids. The acids can be supplied in fruits which are a pleasing food for children, and since fruits are wholesome they should be given in large amounts.

In proportion to their weight a growing requires three times as much carbohydrate and six times as much animal food as an adult.

Children under five years of age should not be fed any fried foods, salads, potatoes, the coarser vegetables, rich confectionary, twice cooked meats, tea or coffee.

Children should not be allowed to form the habit of piecing between meals, and they should never be allowed rich pastries.

A child should be allowed plenty of time for his meals and the parent should see that he masticates it thoroughly. The child should not be allowed to see rich and indigestible and know that he cannot have any of them. A child should never be forced to eat against his will; if he refuses to eat there is usually something wrong, either with his mouth or stomach or else the food is not prepared properly. If food is refused simply from peevishness the child should not be urged to eat, but the food should be removed and the child be not allowed an opportunity to eat until the next meal.

In warm weather, less food and more water should be given. After the child is two years old he may be fed almost-

any meats if cooked rare and finely scraped.

When children are in school there are so many demands upon their systems, both physically and mentally, that care should be exercised as to the kind of food they receive. They should have abundance of food, both carbohydrate and proteid. For the proteids are needed to build new tissue and as the child is growing he will need enough to supply the wasted tissue and also build additional material. He will need carbo-hydrate to supply energy for his various activities.

Girls take less exercise in the open air than boys and consequently are more constipated. This difficulty can be removed by allowing plenty of fresh vegetables in the diet. Children should not be so rushed with their studies that they do not have plenty of time to eat their meals. They should not be rushed away in the morning with their breakfast eaten hurriedly or only part of it eaten at all

The mineral matters which are

so necessary for building the bones, should be dirived for the first two years at least, chiefly from cow's milk. If milk is supplied in abundance, the three most important minerals; lime, polash and phosphoric acid will be supplied. These elements are also found in egg. The yolk of the egg is especially rich in minerals. Iron is found in egg yolk, in red meats and such regetables as oatmeal.