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COLORADO RIVER WAR RELOCATION AUTHORITY
POSTON, ARIZONA
February 15, 1943

LECTURE I

FOODS

Classifications--Foods may be classified as to:

I. Their Function in the Body

1. Those that produce energy
 - a. Carbohydrated
 1. Starches
 2. Sugar
 - b. Fats
 - c. Proteins
2. Those that build, maintain, and repair the body structure
 - a. Proteins
 - b. Minerals
 - c. Vitamins
 - d. Water
3. Those that regulate body processes:
 - a. Minerals
 - b. Vitamins
 - c. Roughage
 - d. Organic acids
 - e. Water

II. Composition

1. Carbohydrates
Organic compounds composed of C, H, O . These are fuel foods, oxidized in the body to CO_2 and H_2O with the liberation of energy.
2. Fats
Organic compounds of CHO -- fuel foods which are also burned to CO_2 and H_2O with the liberation of energy.
3. Proteins
Organic compounds of C, H, O, N, S , and frequently P , and Fe .
4. Mineral salts
Mineral salts are inorganic salts or ash constituents which occur in food and in the body as simple salts or in combination with complex organic substances which remain as ash after the substances have been burned. The most important chemical elements which belong to this group are:

FOODS

Calcium	Magnesium	Fluorine
Phosphorus	Sodium	Zinc
Iron	Potassium	Cobalt
Iodine	Manganese	Copper
Sulphur	Chlorine	

5. Vitamins

*"Vitamins are chemical substances necessary in the diet to promote the best utilization of food to keep the body in health and vitality, at all ages."

The vitamins which are known to be important for human nutrition are:

Vitamin A

Thiamin-B

Riboflavin-Vitamin G (B₂)

Niacin (Nicotinic Acid)

Pyridoxin-Vitamin B₆

Ascorbic Acid-Vitamin C

Vitamin D

Vitamin K

Vitamins of unknown importance to human nutrition

fat-soluble Acid

Vitamin F

Chondroitin

Choline

The Anti-Gray Hair Factor

6. Water

Composed of H and O in the proportion of two parts of H to one of O.

*Extension Circular 110, New Mexico College of Agriculture and Mechanic Arts, p. 6

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Lecture II

CARBOHYDRATES

How Made:

Carbohydrates, organic compounds, composed of carbon, hydrogen and oxygen are synthesized by green plants in the presence of sunlight from the carbon dioxide of the air and water.

Importance, General:

Carbohydrates form the major part (about 60 per cent) of our daily food. The sugar and starches furnish energy and the cellulose, the indigestible fiber, is useful to the body in other ways.

Classification

The carbohydrates are classified in two ways: (1) According to the way the chemical elements are combined, i.e., to form (a) simple sugars or monosaccharides (b) double sugars or disaccharides, (c) complex sugars or polysaccharides; (2) as sugars and starches.

I. Simple Sugars (or Monosaccharides, $C_6 H_{12} O_6$)

1. Glucose is found in abundance in fruit and plant juices. Grapes and young sweet corn, and onions are rich sources of this sugar. As corn syrup it is used in baby formulas, in the making of candy, jellies, etc. It is the form of carbohydrate circulating in the blood.
2. Fructose is found closely associated with glucose in fruits and vegetables. Honey is its richest food source. Fructose is found also in an appreciable amount in the tomato and mango.
3. Galactose does not occur free in nature. It is a constituent of lactose or milk sugar. The monosaccharides are crystalline, soluble, sweet, and are very easily digested.

II. Double Sugars (or Disaccharides-- $C_{12} H_{22} O_{11}$)

1. Sucrose is ordinary table sugar. It is found in cane, sorghum cane, sugar beets, and in the sap of sugar maples. It is also found in most sweets together with glucose and fructose. It has been reported as constituting one-half of the solid matter of pineapple and of carrots.
2. Maltose or malt sugar, is the form of sugar found in sprouting grain. Malt is usually derived from barley and is often used as a sweetener of cereal products and in the preparation of malted drinks.
3. Lactose is the form of carbohydrate present in the milk of mammals in amounts from 4 to 8 per cent. Lactose is prepared from whey, the by-product in the manufacture of cheese. Lactose is less sweet and less soluble than sucrose. It is often used in the diet of infants and invalids. Disaccharides are crystalline, sweets, soluble, and, as a rule, easily digested. However, under abnormal physical conditions, the eating of foods sweetened with disaccharides (sucrose in particular) may result in fermentation and goo formation.

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Since lactose does not produce these conditions are readily as sucrose, it is often used as a substitute for it. ($C_6 H_{10} O_5$)_n

III. Complex Sugars (or Ploysaccharides ($C_6 H_{10} O_5$)_n)

1. Starch is the form in which most plants store carbohydrates. As fruit ripens, the starch is changed to glucose, with resulting sweetness. Rich sources of starch are: Cereal grains, seeds, roots, potatoes, and green bananas.
2. Glycogen, frequently called animal starch, is the form in which the animal body stores carbohydrates for temporary use. Through the process of digestion vegetable starch is broken down into glucose and then rebuilt into animal starch or glycogen in the liver, where chiefly it is stored. However, it is found in every body cell. As much as 200 to 300 gm. may be stored in the human liver. Oysters and shell fish also contain glycogen. It, with lactose, represents the only animal sources of carbohydrates.
3. Cellulose is the structural part of plants which give them their shape and form. It is to the plant what the bones are to the body. Although human beings cannot digest cellulose, herbivorous animals are able to utilize it. Except under abnormal gastrointestinal conditions, cellulose is valuable as a roughage. When hydrolyzed with acid, cellulose yields glucose. Commercially, cellulose is important in the preparation of celluloid, cellophane, mercerized cotton, rayon, paper, and lacquers. The polysaccharides are non-crystalline substances, relatively insoluble in water, and have little or no flavor.

Carbohydrate Requirements

Carbohydrates are the chief source of energy to the body. The reasons for this are: (1) They are economical because they are found so widely distributed in nature. (2) The body uses them more readily than it does other nutrients. (3) They are more completely oxidized and their waste products are more easily disposed of. In the average diets the carbohydrate intake should be from four to six grams of carbohydrate per kilogram of body weight per day. This averages from 350 to 500 grams of carbohydrate per day, and from 60 to 70 per cent of the total caloric value of the average diet.

Deficiency

The body's ability to store carbohydrates is limited. The liver, the general reservoir for such carbohydrate continually supplies the blood with glycogen to maintain the normal blood-sugar level. Reducing diets deplete the supply of liver glycogen and thus may cause this organ serious damage. A deficiency of carbohydrate in the diet ultimately causes acidosis, listlessness, fatigue, lack resistance and emotional irritability.

Fuel Value Every gram of carbohydrate burned in the body yields four calories of heat.

Sources

Starchy foods: Cooked cereals, such as rolled oats, oatmeal, wheat cereals, as cream of wheat, cracked wheat, rice, hominy, grits, ready to serve cereals as wheat flakes, corn flakes puffed grain, as puffed rice, etc., flours,--

Lecture II

wheat, rye, barley, rice, cornstarch, arrowroot, corn meal, tapioca, sage, foods made from flours as macaroni, spaghetti, noodles, breads, pastry puddings, cakes, potatoes (white and sweet) and other tubers; root vegetables; legumes, as dried peas and beans; green corn.

Sugars Refined, as granulated, lump, pulverized, and confectioners; concentrated sweets, as candies, sweet chocolate, cocoa, jellies, jams, preserves, marmalade, honey, corn and maple syrup, molasses; fruits as dried fruits stewed with added sugar, some fresh fruits as grapes, bananas, dates, raisins, figs.

Adverse Results of an Excessive Carbohydrate Intake.

1. Excess intake of starch leads to constipation
2. Too much concentrated sweets may lead to the formation of fermentation and gas in the intestinal tract.
3. Concentrated sweets satisfy the appetite and thus prevent the eating of building foods.
4. Excess carbohydrates are stored as adipose tissue, and hence if continued, obesity will result. Obesity may lead to the development of diabetes mellitus and of cardiac and kidney disturbances.

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THE PREGNANT WOMAN'S DIET

Why so Important

During the months before birth the baby receives his food materials directly from the mother's blood. Thus, the food which the mother eats should contain everything that both she and the baby need.

Foods Which the Mother Should Include in Her Diet Every Day

1 quart of milk--either taken as a beverage or used in cooking
1 egg, at least
1 serving of meat, fish, cheese or poultry
A raw vegetable, or a vegetable or fruit salad
A cooked vegetable, one or more servings. If possible a green leafy vegetable and a yellow vegetable should be included.
A glass of orange or grapefruit juice or two glasses of tomato juice or two large servings of either fresh or canned tomatoes.
One other fruit (in addition to the citrus fruit or tomatoes.)
This second fruit may be either dried or fresh as prunes, apricots, peaches, apples, etc.
One serving of whole grain cereal as cracked wheat, oatmeal, Ralston, etc.
Whole grain or enriched bread
Cod liver oil or some other source of vitamin D
Liver once a week, if possible
Other foods, such as potatoes, bread and butter, to complete meals.
The amount of these which may be eaten should be limited as indicated by the gain in weight. Over eating is undesirable.

Why Include the Foods Named

Milk.- (Sweet or buttermilk. Cottage cheese or other mild cheese may also replace a part (not all) of the milk). The calcium needs (1.5 to 2 gm. daily) of the mother and child cannot be met without the inclusion of a quart of milk in the daily diet. Calcium is necessary for the building of bones and teeth as well as muscle tissue. Milk also contributes a protein of high biological value, as well as phosphorus, some iron and vitamins B, and B₂ as well as A (if whole) to the diet.

Egg.- One or two furnishes iron, phosphorus, sulfur, some iodine, lecithin, vitamins A, B and D and proteins of high value. Iron is : necessary for the building of blood.

Meat.- Furnishes proteins of high value as well as iron, phosphorus, etc., which are necessary for the building of the muscles and blood of the blood, and thus prevents anemia. It also furnishes a high class protein as well as vitamin A, the B complex vitamins and vitamin D.

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THE PREGNANT WOMAN'S DIET (Continued)

Raw vegetable.- Add to the diet vitamin C, as well as other vitamins, Mineral salts and roughage.

Vegetables.- $\frac{1}{2}$ cup of cooked green leafy vegetables as spinach, beet greens, kale, and Swiss Chard supply the vitamin A requirement for the day. They also furnish other vitamins, calcium and other minerals as well as needed roughage to relieve the tendency towards constipation.

Citrus fruit or tomato juice.- Included for their high vitamin C content, which is necessary for the building of cells in muscles, glands, bones, and teeth.

Whole grain cereals or whole grain or enriched bread.- These should be eaten especially for the B complex vitamins, which are necessary for the growth of the baby. Too, the whole grain cereals aid in preventing constipation.

Cod-liver oil.- This furnishes vitamin D which is necessary for the building of normal bones and teeth.

Water.- A plentiful supply of water will aid the kidneys in eliminating waste products.

Results of Deficiencies of Certain Food Elements in the Pregnant Mother's Diet

Calcium, phosphorus and vitamin D.- If the mother's diet does not contain the necessary calcium and other bone-building materials, they will be taken from her bones, and perhaps from her teeth to supply the needs of the baby. If the mother's diet continues to be low in these necessary materials, the baby may develop rickets before birth. The teeth of the baby is largely determined before birth. Not only the temporary ones, but even some of the permanent ones are well formed while the mother is still carrying the baby.

Iron.- If there is not enough iron in the mother's diet, the mother's supply will be used for the child and she will, become anemic. If the supply of iron is very low, the amount stored in the baby's liver, intended to last him through the first few months of life, will be less than it should be and he will become anemic at an early age.

Iodine.- If the iodine supply in the mother's diet is inadequate, the mother's thyroid gland may enlarge and she may develop the symptoms of goiter. If the supply is extremely low the body may also be affected. Cod liver oil and fish are excellent sources of iodine.

Vitamins.- If any of the vitamins are lacking in the mother's diet or are present in insufficient amounts the mother will show signs of the deficiency, and the baby may fail to gain and thrive.

Rose states: "The increased requirements for building material will be best met by the liberal use of milk and eggs, supplemented by fruit and green vegetables, sun baths and cod liver oil."

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THE PREGNANT WOMAN'S DIET.- (Continued) Typical Menu for One Day

Breakfast:

Stewed prunes
Oatmeal, milk and sugar (if desired) ($\frac{1}{2}$ cup milk)
Egg
Whole wheat or enriched bread toast
Butter
Hot milk flavored with coffee
1 tsp. cod-liver oil

Mid-Morning:

1 glass milk

Dinner:

Cream of tomato soup
Meat (e.g. roast beef, fish or liver)
Spinach or beet greens, or turnip greens or mustard
(One serving $\frac{1}{2}$ to $\frac{2}{3}$ cup)
Baked potato
Carrot salad - raisins and chopped parsley or chopped carrot
tops served on lettuce leaf
Whole wheat or enriched bread
Butter
Baked custard
Orange juice, $\frac{1}{2}$ to 1 glass

Mid-Afternoon:

1 Glass milk

Supper:

Vegetable soup with meat stock
Creamed cheese on toast
Buttered peas
Lettuce salad
Baked apple or applesauce
Milk, 1 glass
1 tsp. cod-liver oil
Grapefruit juice- $\frac{1}{2}$ to 1 glass

Prohibited food:

1. Salty meats and salt fish
2. Fried and highly seasoned foods
3. Alcoholic beverages
4. Highly refined foods
5. Pickled foods
6. Spices
7. Vinegar

THE PREGNANT WOMAN'S DIET (Continued)

Weight Gain for the Mother

The pregnant woman gains on an average from 15 or 20 pounds during the nine months while carrying her baby.

First four months.— The body weight tends to remain stationery.

Fifth to seventh month.— The gain is about 3½ to 5 pounds per month

The excess energy demands are never great, but starting with the fifth month they gradually increase to a point from 20 to 25 per cent higher than at the beginning of the period. This means that if the woman's needs are ordinarily 2,200 calories per day, after the fifth month they will advance to about 2,800 calories per day.

An unusual gain in weight may be due to (1) overeating or to (2) some abnormal condition as an accumulation of fluid in the body. Since any sudden gain may be a danger signal, it should be reported at once to the doctor.

If the doctor advises the eating of less food, do not reduce the quantity of essential foods consumed, but eat less fats, sweets, pastries, and refined cereals and breads.

Do not limit the amount of food with the idea of having a small baby for it is useless and even dangerous.

Morning Sickness.—

About 50 per cent of all expectant mothers have nausea with or without vomiting from about the fourth to the twelfth week of pregnancy. This is often called "morning sickness" because it is apt to come in the morning. Not infrequently, however, it comes in the late afternoon or early evening. When there is more than slight occasional vomiting the doctor should be consulted.

Treatment.— No one method of treatment works satisfactorily with all women. Many have been relieved by taking something to eat before getting up, such as toast and crackers. Sometimes eating five or six small meals a day instead of three larger ones will relieve the woman. The condition is sometimes offset by eating a breakfast, high in carbohydrate (fruit, cereals, bread, jelly) in bed.

Cause.— Dr. Rose stated: "The cause of the nausea and vomiting at this time is not in the stomach itself, but is due to the fact that the connection between the mother and the embryo through the placenta is not yet perfectly established, and a disturbance results from substances necessary in the process of placenta formation getting into the general circulation and affecting the digestive tract for a time." * Rose: Feeding the Family, p. 154

Bulletins:

1. Prenatal Care.--Pub. No. 4
Price: 5 cents (1942)
2. The Road to Good Nutrition.--Pub. No. 270 Price: 15 cents (1942)
Both of these can be purchased from the Supt. of Documents,
Washington, D.C.

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FATS

Definition

Fats are combinations of fatty acids and glycerol (glycerin). There are many fatty acids, but they are all united with glycerol.

Fatty Acids

Hawley and Carden state: "Certain fats and oils are unsaturated, that is, they have double bonds capable of opening and receiving other radicals. Such fats are soft in texture but may be hardened by the addition of hydrogen (through hydrogenation) to solid substances. Fats so saturated do not become rancid as do fats in the unsaturated state, a point of practical importance. Advantage is taken of this hydrogenation of cottonseed oil to form many popular shortenings."¹

It is now believed that some unsaturated fatty acids are necessary for good nutrition. They are "essential fatty acids" and are either not built up or not built up rapidly enough in the animal body to permit their being omitted from the diet. These essential fatty acids are linolenic, linoleic, and arachidonic. These are found in the following foods: soybeans, whole wheat, unhydrogenated cottonseed oil (Wesson), corn or maize oil (Mazola), peanut, linseed, and olive oils, and in egg yolk, and to some extent in lard.

Fats other than these essential fatty acids can be built up in the body from protein and carbohydrate. Food, taken in excess of the body's need, is not burned immediately and is stored as body fat causing an increase in weight. This is a fact which one must consider when making out diets for those who wish to either gain or lose weight.

Chemical Composition

Like carbohydrates, fats are composed of C, H and O. However, fats contain more C and H and less O than carbohydrates.

Classification

The fats used for food are classified as (1) solid fats; (2) oils.

¹ Hawley and Carden, THE ART AND SCIENCE OF NUTRITION, C.V. Mosby Company, St. Louis, 1941. p. 103

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FATS (Continued)

Sources

Fat is found in both animal and plant tissues.

1. Animal sources.- Butter, cream, full-cream cheese, whole milk; egg yolk; suet (beef), lard (pork), tallow (mutton); fatty meats, bacon; fatty fish, such as salmon, fat from liver of the cod and halibut; fat from poultry.
2. Vegetable sources.- Vegetable oils, as the oil from cotton seed, corn, coconut and soybeans; margarine, nut butter and other butter substitutes such as those made from vegetable fats; olives, avocado (alligator pears), nuts, coconuts (especially fresh); chocolate, etc.

Function

The chief function of fat is to produce energy. It furnished $2\frac{1}{4}$ times (9.3 Calories per gram) as much energy as carbohydrates. It is therefore, the body's most concentrated source of energy. Hence, as has been previously stated, those who wish to reduce or to lose weight should reduce or increase the fat content of the diet first.

Other functions.-

1. They are carriers of certain vitamins. For example, animal fats, as cream, butter, the fat of whole milk, of liver, of egg yolk and salmon, are important sources of vitamin A; while liver, especially fish liver, egg yolk, milk fat and salmon are the best sources of vitamin D. Vegetable fats, as the oils of seeds of grains, such as cotton, corn, rice and wheatgerm oil are potent sources of vitamin E, and the oil of alfalfa is rich in vitamin K.
2. As previously stated, it is believed that some of the unsaturated fatty acids are necessary for good nutrition.
3. They are lubricants which promote good elimination of waste material (feces) from the body.
4. Fats are spacers of body protein, since body protein will not be used for energy if there are enough carbohydrate and fat in the diet.
5. Fats serve as padding for the vital internal organs (liver, kidneys, etc.) holding them in place and absorbing shock to which they might otherwise be subjected.
6. By way of the subcutaneous layer under the skin, fat conserves the body heat by preventing its loss from the surface area.
7. Stored fat serves as a reserve source of heat and energy when the caloric value of the food is insufficient or for temporary periods when no food is eaten.
8. Fats serve to delay the sensations of hunger because it is digested rather slowly. A diet which is devoid of fat does not have "staying power" and is apt to cause an abnormal feeling of hunger after meals.

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FATS (Continued)

9. Some essential foods, as carotene, for example, require the presence of fat for good absorption.

Fat Requirements

The amount needed by the average adult is from 1 to 2 grams per kilogram (2.2 lbs) of body weight per day (depending upon the amount of exercise taken) or 30 to 40 per cent of total calories for the day.

Disadvantages of Including too Much Fat in the Diet

1. Fat is not as easily digested as carbohydrates.
2. If fat is eaten in excess, it may lead to that type of acidosis known as ketosis.
3. An excess of fat in the diet may lead to nausea or diarrhea.

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THE DIET FOR THE LACTATING OR NURSING MOTHER

Importance

The nutritional demands of the nursing mother are much greater than those of the pregnant woman. In addition to her own needs, the mother's daily food intake must be sufficient to supply the requirements of a very rapidly growing baby, whose food must be increased daily.

Requirements

Energy. Dr. Rose gives the additional requirements for nursing a baby as follows:

First 3 months60 Calories per pound of infant's weight
Second 3 months50 Calories per pound of infant's weight
Third and fourth 3 months 40 to 45 Calories per pound of
infant's weight.*

Thus, a woman of average weight and sedentary occupation will require, while nursing a baby 2800 - 3000 Calories per day; while a woman actually employed and secreting a large quantity of milk may need as much as 50000 Calories per day.

Protein.- In order to meet her own protein requirement as well as that of the infant, the mother should, as a rule, eat 100 to 125 grams of protein per day. As nearly as possible, this protein should include those of high biological value, i.e., the proteins of milk, eggs and meat. Daggs has shown that a high protein intake increases both the quantity and the quality of the milk.

Minerals.- The requirements increase as the baby grows. For calcium, a quart and one-half of milk per day should be taken either as a beverage or in cooking.

The increased demand for iron can best be met by including in the daily diet a generous supply of such foods as eggs, green vegetables, dried peas and beans, and whole grain cereals.

Vitamins.- Vitamin A.- The nursing mother will need at least twice her ordinary requirement throughout lactation to prevent loss of her own reserve. She should include in her daily diet a teaspoon of cod-liver oil in addition to milk, green vegetables, an egg, and butter or butter substitute.

Vitamin B₁.- The mother needs two or three times as much as in ordinary circumstances. In a 3000 Calories per day diet she will need at least 500-600 international units of Vitamin B₁. Her diet will provide approximately 150 I.U. For the remaining one or two hundred units, she should include daily in her diet some specially rich source, as wheat germ, dried yeast, yeast extract or the pure crystalline thiamin.

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THE DIET FOR THE LACTATING OR NURSING MOTHER (cont.)

Vitamins, continued

Vitamin B₂ (riboflavin) is quite essential. When this vitamin is furnished in foods in liberal amounts, mothers experience less fatigue. As a rule, a diet, such as is suggested (see diet outline) will furnish a sufficient amount of B₂.

Vitamin C.- A glass of orange juice or grapefruit juice, either fresh or canned or the pulp equivalent, will, as a rule, meet the vitamin C requirement. It has been found that if the citrus fruit or fruit juice is taken one or two hours before the nursing period, rather than at mealtime, an increased level of vitamin C in the milk at nursing time will be assured.

Vitamin D.- Cod-liver oil should be taken daily for vitamin D.

Vitamin E.- Since this vitamin plays an important part in lactation, it should be included in the diet. It may be had by eating cereal breakfast foods with added wheat germ, whole grain cereals, whole grain breads, green lettuce, nearly all green leafy vegetables, meat, milk and eggs.

Vitamin K.- This vitamin is sometimes prescribed by the doctor.

Water.- At least four glasses of water or other liquid should be taken during the day. These may be distributed as follows: One glass on arising, one just before each meal and one on going to bed.

Cellulose.- Foods rich in cellulose, as leafy vegetables, wholewheat cereals, etc., should be eaten for good bowel movements.

The Diet for the Day Should Include:

Milk.....	1½ quarts
Meat or fish	1 serving, generous. Liver should be served twice a week.
Eggs	1 or 2 each day.
Cheese	1 serving
Vegetables	2 other than potatoes.-one raw, and one green or yellow.
Potatoes	1 or more.- Recommended either baked or with the jackets on.
Fruit	1 glass of either orange or grapefruit juice or equivalent in pulp, or 2 glasses of tomato juice, or the equivalent in pulp. Either the citrus fruit or the tomatoes may be either fresh or canned.
Cereal and bread	Both from whole grain, or a cereal reinforced with wheat germ or one of the "enriched" flours or cereals
Cod-liver or halibut liver oil ...	1 teaspoonful.

Dr. Rose states: "In addition to regular meals, a glass or bowl of hot milk, malted milk, egg nog, or vegex bouillon taken just before nursing the baby in midmorning or mid-afternoon is often beneficial, as it gives both extra food and extra water."**

* and ** Rose: Feeding the Family, p.p. 159 and 164.

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Lecture IV

PROTEIN

Definition

*"Proteins are a group of closely related substances containing nitrogen."

Composition

Proteins contain C H O N S, and sometimes P and Fe.

Occurrence

Proteins form a large part of the solid matter of animal tissue, and it is an important constituent of the plant kingdom. No life exists without it.

Plants are able to build their protein from the soil, air, and sunshine. Animals do not have this ability, so they must obtain from the protein of their food the digestion products necessary to build up the protein tissues of their bodies.

Digestion

Proteins are broken down by the process of digestion into units, known as amino acids, which pass through the intestinal wall by way of the capillaries into the blood stream and are carried to the tissues, which absorb them rapidly. Each tissue selects the particular amino acid which it needs for the building and upkeep of its own particular type of tissue protein.

There are 22 known amino acids and practically of them are used to make the proteins which compose the human body. Apparently, the body can manufacture some of them for itself, but there are at least 10 that it must get from the proteins in the diet. These are designated as "nutritionally essential" amino acids, for if any of them are lacking, growth will not be normal or the processes of life will be halted in some way.

Classification

1. Complete, adequate, or class A protein. These are the proteins of the highest biological quality, i.e., the proteins derived from meats, fish, and poultry, the protein of milk and milk products and eggs. These foods not only contain the ten essential amino acids, but they have them in amounts which are well-proportioned and which are adequate for growth and for the maintenance and the repair of tissue.

2. Incomplete, inadequate, or class B protein. These proteins contain many amino acids, but not all of the essential ones. This group of proteins cannot alone maintain normal growth, weight or produce normal health. The foods which belong to the incomplete group are: legumes--peas, beans, lentils and peanuts; cereal grains; nuts; gelatin. These can be used advantageously to supplement the animal proteins (which are always costly), and thus decrease the latter in the diet. Recent experiments have produced some evidence that the soy bean, cottonseed, peanut and cashew nut contain complete proteins.

Function

The main function of protein is to build, maintain and repair tissue. However, proteins also furnish energy. Proudfit states:**"When the diet does not supply sufficient carbohydrates and fats to cover the energy needs, the non-nitrogenous parts of the digested protein will be called upon to make good the deficiency.

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PROTEIN

Function

The main function of protein is to build, maintain and repair tissue. However, when a sufficient amount of carbohydrates and fats are not included in the diet to supply necessary energy, the C H O of the protein will be burned to CO_2 , H_2O and a residue with the release of energy.

Though protein can be used as fuel by the body, it involves a good deal of waste; starch, sugar and fat are burned up almost 100 per cent as fuel in the body, but only a part of protein is burned and the rest is eliminated, mostly from the kidneys. Since protein form the most expensive food group, energy thus produced, therefore, is costly. Thus, where expense is a factor, sufficient protein should be included to assure growth and repair, with little extra to be burned.

When protein is broken down in the body certain amino acids are found capable of yielding glucose and others of yielding a fatty acid. On the average, 50 per cent of the protein by weight may be considered to be potential sugar and 50 per cent to be potential fatty acid.

Of all nutrients, protein has the greatest specific dynamic action, viz.; power to stimulate metabolic processes of the body. The specific dynamic action of protein is 130; of carbohydrate, 106; of fat, 104. The energy thus released, however, is used only to heat the body if additional warmth is necessary. It cannot be used for work.

Effective Use of Protein

Protein is much more efficiently used if an abundance of carbohydrates are included in the diet. Hence, one speaks of the sparing action of carbohydrates. Fat is also a protein sparer but it is not as effective as carbohydrate.

Fuel Value

Every gram of protein when burned in the body produces four calories of heat.

Food Sources

Though all living cells contain some protein, foods are classed as protein foods only when the amount is sufficient to be of definite value when the foods are eaten in normal amounts.

In general, the chief sources are meat, fish and poultry; eggs; milk and cheese; legumes--peas, beans, lentil and peanuts; nuts and cereals.

Milk contains the best quality protein for growth.

Protein Requirement

1. Amount

The Recommended Daily Allowance of the Committee on Foods and Nutrition, National Research Council

<u>Person</u>	<u>Calories</u>	<u>Protein Grams</u>	<u>Per Kg. of Body Wt.</u>
Man (70 Kg. or 154 lbs.)			
Moderately active	3000		
Very active	4500	70	1 gm.
Sedentary	2500		
			(2082)

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PROTEIN

Protein Requirement (continued)

<u>Person</u>	<u>Calories</u>	<u>Protein</u> (grams)	<u>Per Kg. of</u> <u>Body Wt.</u>
Woman (56 Kg. or 123.2 lbs.)			
Moderately active	2500	60	
Very active	3000	60	1 gm., plus
Sedentary	2100		
Pregnancy	2500	85	1 $\frac{1}{2}$ gm., about
Lactation	3000	100	1 $\frac{3}{4}$ gm., over
Children up to 12 years			
Under 1 yr. (6-8 mo.)	100/Kg.	3-4 Kg.	
1-3 years	1200	40	4 gms. about
4-6 years	1600	50	(1-5 yrs. inc-
7-9 years	2000	60	lusive)
10-12 years	2500	70	
Children over 12 years			
Girls, 13-15 years	2800	80	
16-20 years	2400	75	
Boys, 13-15 years	3200	85	
16-20 years	3800	100	

Though the body adjusts itself to varying levels of protein intake, the minimum being $\frac{2}{3}$ gram per kilogram of body weight for an average man weighing 70 kilograms (154 pounds), it is unwise, according to outstanding authorities, to establish the protein intake at this low level in normal diets, because of the varying quality of proteins. As a margin of safety, it is better to provide 1 gram, at least, and preferably $1\frac{1}{4}$ - $1\frac{1}{2}$ grams per kilogram of body weight. Usually, in old age $\frac{2}{3}$ gram of protein per kilogram of body weight is considered sufficient for good nutrition.

2. Type

Growth and development depend upon the type of protein used as well as the amount. Growing children need, at least, 60 per cent of their protein intake from the best-quality protein, while adults should have 30 per cent, at least, (preferably 50 per cent) of their protein from animal origin. This amount for children (2 years of age) could be obtained from $1\frac{1}{2}$ pints to 1 quart of milk, 1 egg, 1 serving of meat--beef, lamb, or chicken (30 grams or 1 oz. plus), and for adults (30 per cent) from 1 pint of milk, 1 egg, and 1 medium serving of meat (85 grams or 3 ozs.). During infancy, pregnancy and lactation $\frac{2}{3}$ of the daily protein requirement should be in the form of animal protein.

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PROTEIN

Disadvantages of Too Much or Too Little Protein in the Diet.- (According to Proudfit**)

Results of diet too high in protein:

- Damaged kidneys, damaged liver
- Excessive putrefaction due to unabsorbed proteins
- Energy production stimulated; this may not be used for work but heats body (often undesirable in warm climates)
- Excess protein will not increase growth, because body uses only as much as it needs and eliminates the rest.

Results of diet too low in protein:

- Nutritional edema
- Impaired growth
- Secondary anemia
- Loss of strength
- Loss of weight due to use of body protein (tissues) to furnish nitrogen necessary to cover body requirements.

*Proudfit: DIET THERAPY, p. 61

**Proudfit: DIET THERAPY, p. 60

Poston
March 24, 1943

A HEALTH MENACE -- FLIES -- MOSQUITOES

FLIES -- IMPORTANT PROCEDURES

1. Because flies breed in filth, darkness and dampness; flies may carry disease. They alight on a sick person and then on food--apple, milk glass, bread, candy, etc.,--their feet carrying the disease as well as excreta and regurgitation.
2. Keeping garbage cans covered.
3. Proper garbage collection.
4. All containers being thoroughly washed before discarding.
5. Scalding daily of garbage cans.
6. Screens being kept tightly closed and in repair.
7. Swatting flies.
8. Spraying all kitchens and mess halls.
9. Proper disposal of dish and waste water.
10. Destroy by fire or burying deeply, all refuse which cannot be carted away daily.
11. Throw fruit skins, and all discarded food into cans replacing cover carefully.
12. Clean cans, milk cartons before placing in refuse cans.

What Teachers Can Do

Discuss flies--call for reports from children on their efforts toward fly elimination.

Discuss the prevention of their breeding--write stories personalizing fly life.

Discuss how flies effect our health.

Discuss what each of us can do to prevent fly breeding.

Discuss what each of us can do to prevent having flies in mess halls and in our home barracks. -- Encourage picture drawing to illustrate fly menace.

MOSQUITOES

As mosquitoes only breed in stagnant water--to prevent breeding it is essential to prevent any accumulation of still water. Recognizing that wherever irrigation is utilized, water will accumulate unless properly drained, it is therefore necessary in order to prevent accumulation of water, that definite action be taken by each individual who uses water for irrigation of gardens or other purposes.

What Teachers Can Do

Each teacher is in a position to influence the thinking of block members through emphasizing the mosquito menace in the classroom.

Students of even kindergarten age can talk about ways of preventing mosquito breeding at home.

Classes may contribute to cutting run ways -- fan-wise -- for water, to prevent still water accumulating near or on school grounds.

Examples

Pools with a sufficient number of fish are safe but unless the overflow is drained off, so that it may be absorbed by the surrounding earth, they may become stagnant and breed mosquitoes.

Waste water from hose connection, floor flushing, air coolers may accumulate under or near buildings. This can be remedied by diverting the water into several small channels to be absorbed by the earth.

As it is obviously impossible for a corps of men to be continuously employed to dig such channels it is the responsibility of all residents, young and old, to prevent mosquito breeding by preventing accumulation of water anywhere near their home or school barracks.

FLY AND MOSQUITO EXPERIMENTS

Caution: Keep Out of Reach of Young Children

FLY EXPERIMENTS

I. To show contamination carried by fly's feet:

Secure a clean petri dish with a fresh gelatine mixture. Keep covered. Open and allow a fly to walk across it. Cover immediately and place in a sunny place. Watch the fly tracks.

II. To show contamination caused by excreta from the fly's body:

Catch a fly and imprison her under a glass placed on a clean white piece of paper. Give her food and water and slip a match under the glass to provide air. Watch the fly with a magnifying glass and see how she contaminates the clean paper.

III. To show early stage of fly development:

Search for fly larvae and bring in for inspection. Put in a warm place and see if flies will hatch.

IV. To exterminate flies in the house:

Make fly swatters and traps.

MOSQUITO EXPERIMENTS

To learn how mosquitoes breed and grow:

Get a pailful of pond water with mosquito wigglers in it.

Put this in a clean glass jar and fit a glass lamp chimney or another jar with bottom out, on top, fastening it with a strip of adhesive.

Put a piece of cheese cloth over the top of the chimney, allowing a six inch cord to hang down into the chimney from the center of the cheese cloth.

Fasten the cheese cloth with a rubber band.

Keep the jar in a warm place day and night.

Watch the change in the wigglers with a reading glass. Watch them hatch.

Notice the mosquitoes as they sit on the cord.

Feed them with a little ripe banana or dates placed on the cheese cloth and sprinkled with water.

Study the mosquito, size, shape, wings, legs, manner of resting and compare those found in Poston with pictures of the malaria mosquito.

Conditions:- Invitation No. CR-43-167

1. Delivery:- Asphalt is to be shipped pre-heated at the highest permissible temperature in insulated tank trucks. The lowest permissible application temperature of the MC-3 liquid asphalt is 175 degrees Fahrenheit. In case the material is delivered below this temperature, the Government will furnish booster equipment to heat and circulate the material until the above minimum is reached, however, no charge to the Government by the bidder or his delivering agent will be permitted due to delay in unloading the Liquid Asphalt. Schedule of shipment will be arranged prior to time needed-- to begin about May 15, 1943. Method of application (MC-3) will be made the Gardner Denver or similar type mixer.

2. Award:- Award will be made to the lowest aggregate or as made to be the most advantageous to the Government. Bidder hereby certifies that the government shall receive the benefit of any decline in the market price of the material furnished hereunder.

3. Bids and Payments:- Bids will be tendered and payments made on basis of U.S. Standard Gallon at 60° F. computed according to Standard Abridged Volume Correction Table for Petroleum Oil. A.S.T.M. designations D206-36 amended to date. Invoices shall be supported by delivery tickets whereon is shown the amount, the date, and the receiving agent's signature. Invoices governing oil delivered against any contract written hereunder shall show exact number of gallons at time of loading, A.S.T.M. correction factor and the net gallons. Certified scale weights will be obtained from all tankers as shipped in. Payments will be made on basis of net gallons loaded in tankers or gallonage computed from certified scale weight, whichever is the least.

4. Authority for Purchase:- Arizona Asphalt Application No. 3-2-28 authorizes this purchase. Photostatic copy will be furnished to the successful bidder.

5. Analysis Reports:- Analysis reports setting forth the results of the various test factors enumerated in the applicable specification, shall be procured in duplicate by the contractor for each tank car or tank transport truck shipment.

6. Tax Exemption Certificates:- Tax exemption certificates covering all applicable federal, state, county, and municipal excise taxes will be furnished at stated times to cover all deliveries to that activity during the named period of time.

7. Safety Regulations:- Deliveries shall be made in strict accordance with all applicable laws, ordinances or regulations and the latest approved safety practices.

Estimated shipping weight _____ lbs.
Delivery will be made in lots of approximately _____ gals.
Shipping point _____.

BIDDER

BY _____

DATE _____

COLORADO RIVER WAR RELOCATION AUTHORITY
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POSTON, ARIZONA
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THE HEALTHY, WELL-NOURISHED CHILD

General Characteristics

The healthy, well-nourished child has a general appearance of well-being and fullness of life that is characteristic of all healthy young animals.

In the infant this is manifested by an air of contentment and peace with the world. He sleeps long and soundly. When awake he lies cooing, gurgling, waving his arms, and kicking happily, or he plays contentedly. If his general care and training have been good he cries seldom, and then usually because he is hungry, wet, or otherwise uncomfortable.

The older child who is healthy and well-nourished likewise has an air of contentment, vigor, and interest in life. His body is upstanding; his eyes are clear and bright; his facial expression is alert and happy. His general appearance is one of physical fitness, ability to do, and enjoyment of life.

In the healthy, well-nourished child of any age appetite and digestion are good, elimination is regular, and sleep is sound, wholesome, and refreshing.

Specific Characteristics

Bones

Framework.- Strong and well-built. His head and chest are well shaped and his arms and legs are straight.

Teeth

"Baby teeth" as well as permanent ones are likely to be well formed and sound. The gums are firm and light pink and hug the teeth closely; there is no tendency to bleeding.

Muscles

Well developed and strong.

Posture

Tends to be erect. The head is erect and well balanced. The chest is symmetrical, and the shoulder blades are flat. Usually, in early childhood the abdomen is somewhat prominent, but after the age of 3 or 4 years it should not extend beyond the chest; after this age the chest becomes more prominent.

Fat Padding

The bones and muscles of the arms, legs, and entire body are covered with a moderate padding of fat. Thus, the body has a well-rounded appearance, with curves rather than sharp angles.

Blood and Skin

The blood contains the normal amount of hemoglobin and the normal number of red blood cells, as determined by a laboratory test. Physical signs of a good blood supply are shown in a pinkish color of the mucous membranes inside the mouth and eyelids, the ears as seen against the light, and the fingernails. The skin has a healthy appearance that comes from a good blood supply.

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MALNUTRITION

Definition

Malnutrition is faulty or poor nutrition.

Causes

1. An insufficient food intake.
2. Food of poor quality.- Food which does not supply all of the necessary nutrients, especially the essential proteins, minerals, and vitamins, or which does not supply them in sufficient amounts.
3. Faulty dietary habits. Example: The eating of unbalanced meals.
4. Aversion to numerous foods.
5. Failure of the body to digest and absorb the food furnished it. This failure may be caused by different things as (1) fatigue, (2) worry, (3) nervous tension, (4) a chronic disease or (5) a physical defect.

Classification

1. Malnutrition which causes a specific deficiency disease.- This occurs when the essential food factor concerned is completely lacking over a short period of time or is supplied inadequately for a long time. Examples: Shortage of iodine results in goiter; long-continued shortage of vitamin A results in xerophthalmia, a serious eye disease; an insufficient amount of calcium, phosphorus and vitamin D will cause the bones to be malnourished. When this happens to babies or young children, the bones tend to become soft and bend easily, and the disease called rickets may occur, which may result in lasting deformities.
2. General malnutrition.- This results when the diet is low in a number of the dietary essentials.

Symptoms¹

In Infants and Children

1. Lack of appetite
2. Failure to eat adequate breakfast
3. Failure to gain steadily in weight
4. Aversion to normal play
5. Chronic diarrhea
6. Inability to sit
7. Pain on sitting and standing
8. Poor sleeping habits
9. Backwardness in school
10. Repeated respiratory infections
11. Abnormal intolerance of light
12. Abnormal discharge of tears
13. Bad posture
14. Sores at angles of mouth

In Adolescents and Adults

1. Lack of appetite
2. Lassitude and chronic fatigue
3. Loss of weight
4. Lack of mental application
5. Loss of strength
6. History of sore mouth and fatigue
7. Chronic diarrhea
8. Nervousness and irritability
9. Burning, prickling of skin
10. Abnormal intolerance of light
11. Burning or itching of eyes
12. Abnormal discharge of tears
13. Muscle and joint pains, muscle cramps
14. Sore, bleeding gums
15. Sores at corners of mouth

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MALNUTRITION (CONTINUED)

Description of a Malnourished Child

Dr. Roberts gives the following description of a malnourished child:² "He lacks first of all, the vigor and poise of a well-nourished child; his face has a strained, worried, "down and out" look; his general attitude is one of dropping fatigue. He may appear fairly normal at play, or in animated conversation, but when he is in repose an attitude of fatigue and ill-being appears. A malnourished child as a rule is thin, his muscles are small and flabby, his head sags forward, his abdomen protrudes, his chest is flat, and his shoulder blades extend like wings. His teeth are likely to be decayed, and even though cavities are filled the teeth soon decay again. The gums may be tender and may bleed easily. The mucous membranes inside the mouth and eyelids are pale.

In such a child the animal spirits natural to all healthy young are likely to be lacking. He may be listless and inactive, and may therefore be considered lazy, or he may be of the overactive, high-strung type, constantly on the go. Such a child usually tires easily, lacks endurance, and is irritable and difficult to manage."

Degrees of Malnutrition in Children

Since children cannot be separated definitely into two groups, the well nourished and the malnourished, it is customary for physicians to rate the nutritional condition of children in five classes, "excellent", "good", "fair", "poor" and "very poor". Children in the lowest groups should be considered as definitely undernourished and definite steps should be taken to bring these as well as the "good" and "fair" groups into the "excellent" class.

Where Found

Malnutrition is found in children who come from both the low and the high economic groups. In general, there are less malnourished children in well-to-do families. However, the extent of malnutrition in any group depends largely upon the degree of food intelligence of the parents.

¹ Subcommittee on Medical Nutrition, Division of Medical Sciences, National Research Council.

² Roberts, Lydia J., THE ROAD TO GOOD NUTRITION, Department of Labor, Bureau Publication No. 270, United States Government Printing Office, Washington, 1942. p. 7.

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LECTURE VIII

MINERAL SALTS

Definition

Mineral salts are inorganic salts or ash constituents.

Occurrence

1. They make up the ash left after the burning up of the organic or combustible part of the food.
2. They are found in foods either as free mineral salts or held in combination with the organic foodstuffs, i.e., proteins, fats and carbohydrates as they occur in nature.

Names

The chemical elements which belong to this group are:

Calcium	Sulphur	Chlorine
Phosphorus	Sodium	Fluorine
Iron	Potassium	Zinc
Iodine	Magnesium	Cobalt
Copper	Manganese	

Function

1. Important factors in the building and the upkeep of the bones and teeth.
2. Help to regulate the body processes.
3. Aid in building tissue and in maintaining the life of the cells.
4. Contribute to maintaining the acid-base balance and the osmotic pressure of blood plasma and tissue fluids.

Foods Rich in Minerals

Vegetables
Fruits
Whole grains
Milk
Cheese
Eggs
Meat, especially liver
Nuts

Foods Poor in Mineral Elements

Highly milled cereals (e.g., white bread, unless made with milk), and white rice.
Purified starches and sugars
Fats (such as butter, salad oil, lard, suet, bacon) and fatty meats.

A diet consisting chiefly of meat and potato, white bread, starchy foods, fats and sweets, will be deficient in minerals, especially, calcium, phosphorus, and iron.

Factors Affecting Utilization

The absorption of the mineral elements from the intestine into the blood stream and carried by the blood stream to the tissues depend upon:

1. Proper functioning of the digestive tract to insure good digestion and fairly complete absorption.

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LECTURE VIII

MINERAL SALTS (Continued)

2. General character of the diet. The mineral salts of certain foods are better utilized than those in other foods. Example: Calcium is well utilized when furnished in a mixed diet either by milk, eggs, root or leafy vegetables.

3. There should be a proper balance between the amounts of the different mineral elements themselves. Examples: Unfavorable utilization exists when phosphorus is provided in large amounts and calcium in very small quantities, or vice versa. Excellent results are obtained in the utilization of these two elements when they are fed in the ratio provided by milk--i.e., nearly 1:1. The taking of foods high in calcium favors iron utilization.

4. Liberal amounts of vitamins in the diet favor the assimilation of the mineral elements. Example: Either vitamin D or exposure to direct sunlight is necessary for keeping the level of calcium and phosphorus in the blood up to normal, and for utilizing these elements in the building of firm bones and teeth.

Mineral Elements Apt to be Lacking in the Diet

Calcium, phosphorus, iron and iodine are the only minerals in which the diet is apt to be deficient. Sodium and chlorine are usually added to food in table salt. Since the other minerals are widely distributed in foods, the diet usually furnishes the necessary supply for the body.

Calcium

Calcium forms 99 per cent of the skeleton. In addition it is essential for many physiologic processes, as:

1. The normal action of the heart.
2. The coagulation of the blood.
3. The efficient utilization of iron.
4. The correction of disturbances of inorganic imbalance in either direction.
5. Its influence in the retardation of intestinal putrefaction.

According to Sherman, the American diet is more likely to be faulty in respect to calcium than to any other mineral element. The requirement is greatest in children, pregnant women and lactating women.

The calcium need of the body may be met easily by using freely of milk and milk products. It is difficult to meet the calcium requirement without an ample use of these foods.

Foods Which Will Meet the Daily Calcium Need:

You may use one, two or three:

One:

1 c. stewed tomatoes	2 eggs
Potato--100 gm. in skin	4 carrots
$\frac{1}{2}$ bar shredded wheat	1 c. strawberries
5 slices whole wheat bread	3 oz. round steak
$\frac{1}{2}$ cup asparagus	3 bananas
1 small serving spinach	1 orange
4 apples	
1 grapefruit	

Cost.....70 cts

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MINERAL SALTS (Continued)

Two:

1 small serving string beans
1 egg
 $\frac{1}{2}$ shredded wheat biscuit
1 orange
2 glasses milk

Cost.....15 cts.

Three:

$2\frac{1}{4}$ glasses milk

Cost..... 8 cts.

Thus, without the inclusion of at least one pint of milk daily, there is inadequate intake of calcium.

Phosphorus

The need for phosphorus is similar to that for calcium but the danger of a deficiency is not so great.

Phosphorus has the following functions:

1. It is necessary for the proper development of the bony structure of the body.
2. It is intimately concerned in all cell multiplication.
3. It is an essential constituent of the plasma and other fluids and is found in organic union with proteins, fats and carbohydrates.
4. It aids in the work of the various glands.
5. Its presence is largely responsible for the ability of the cells to absorb nourishment and to get rid of their waste products.

Phosphorus occurs in abundance in milk, egg yolk, cheese, meats, and whole grains. As a rule, since phosphorus is commonly associated with calcium and protein in foods, if their needs are met, the phosphorus need will be met also.

Iron

Though its importance is great, the quantity of iron in the body is small--only about enough to make one iron nail of medium size or the equivalent in weight of one copper cent or about 3 grams. About 70 per cent of the iron content of the body is in the blood.

Iron is essential for the formation of hemoglobin, the red coloring matter and the oxygen-carrying pigment of the blood.

Copper is an essential factor for the proper utilization of iron.

A diet which is insufficient in iron for any length of time will result in anemia, a disease, the symptoms of which are paleness, weakness, shortness of breath, lack of appetite and a slowing up of all the vital functions.

Iron rich foods are red meats, especially liver, eggs, dried beans and peas, whole wheat, oatmeal, spinach, dried prunes and molasses.

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MINERAL SALTS (Continued)

All of the iron in food is not available to the body. In this connection McLester states:² "About half the iron in wheat, oats, yeast, soy beans, beef muscle and liver can be used for the formation of hemoglobin, while less than one fourth of that in oysters, spinach and blood is available for that purpose."

Due to losses in menstruation, pregnancy, and lactation, women have a greater need per unit of weight for iron than men. The infant is born with enough iron stored in its liver to supply its needs for a few months after birth. However, when the baby is about 4 months old, egg yolk (a small amount), and whole grain gruels should be gradually added to the milk diet to insure plenty of this mineral. Of course, as the child grows, additional iron containing foods are introduced into its diet.

Iodine

This mineral is found in the body in even a smaller quantity than iron. There is only about 25 mg. in the entire body. It is used by the thyroid gland in the manufacture of thyroxin.

An insufficient amount of iodine in the diet results in the enlargement of the thyroid gland (simple goiter). Thyroid trouble is most often encountered in fetal life, at adolescence, or during pregnancy, these being the three periods of life when the needs of the organism is unusually high. Males are much less subject to thyroid difficulties than females.

Goiter is found in specific areas called goiter belts. These regions are, in general (in the United States), the whole basin of the Great Lakes and most of the Pacific Northwest.

Babies, colts, calves and young pigs born in such districts are very apt to be still-born and goiterous, even though the mother may not have shown evidence of iodine insufficiency.

Since the sea is the great reservoir of iodine salts, goiter is not found where sea-food, i.e., kelp and seaweeds, the flesh of fishes and shellfish, salmon roe and cod-liver oil, is prominent in the diet. Iodized salt and fruits and vegetables grown in non-goiterous regions and the drinking water of such sections are other sources of iodine.

References:

¹ McCollum, E.V. and Becker, E.J., FOOD, NUTRITION AND HEALTH, The Lord Baltimore Press, Baltimore, Maryland, 1942. p.38.

² McLester, J.S., NUTRITION AND DIET IN HEALTH AND DISEASE, W.B. Saunders Co., Philadelphia, 1940. p. 127.

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LECTURE IX

MINERAL SALTS (Continued)

THE ACID-BASE BALANCE

Acids and bases (alkalis) are formed in the tissues as a result of chemical processes. Normally the alkalis in the system counteract the acids, and vice versa, preserving a neutrality or an acid-base balance. The type of food eaten influences the amount of acid or alkali present in the tissues, for some foods, when burned in the body, produce acids and some produce alkaline substances. The preponderance in a food of one group of these substances (elements) is the deciding factor in determining whether that food will, after metabolic breakdown is complete, yield an acid or an alkaline (basic) ash, or will result in an acid or alkaline urine, since the food constituents which are not taken up by the body are largely eliminated through the kidneys in the urine.

The acid-base elements are grouped as follows:

Alkaline elements

Calcium

Sodium

Potassium

Magnesium

Iron

Acid elements

Phosphorus

Sulphur

Chlorine

Carbon

The foods in which these elements predominate are:

Base-forming foods

Fruits (except those mentioned under acid-forming foods.)

Vegetables (except corn)

Milk

Nuts (almonds, brazils, chestnuts, cocoanut)

Olives

Molasses

Acid-forming foods

Eggs

Meats, poultry, fish (especially oysters)

Cheese

Grains and their products, as breakfast cereals, rice, corn bread, plain cake, macaroni, spaghetti, and other foods made from grains.

Plums, prunes, cranberries and rhubarb.

Nuts (filberts, peanuts, walnuts.)

Neutral foods

Pure sugars, syrups

Starches, tapioca

Fats (cream, sweet butters, cooking

fats--lard, olive oil, salad oil, mayonnaise)

Tea, coffee or Kaffee Hag, postum.

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LECTURE IX

MINERAL SALTS (Continued)

It is believed that the body is in a better condition to resist disease when its fluids are neutral or even faintly alkaline. Too, mineral elements are less apt to be excreted and hence more likely to be held back in the body for its use, when there is a preponderance of base-forming over acid-forming foods in the diet. However the base forming foods should not predominate to such an extent as to produce a strong alkaline condition, as it might cause a physical disturbance which would likely result in a serious physical up-set.

Thus, just as soda neutralizes the acid of sour milk in cooking, so will an acid-forming food neutralize a base-forming food. In the scientific planning of meals, one takes cognizance of this fact. From an acid-base standpoint, combinations which balance include, among others, the following: Milk and cereals, meat and a generous serving of potatoes. Some examples of combinations which do not balance each other because each food is acid: Meat and rice, meat and spaghetti, meat and corn.

In this connection, the word acidity does not refer to the taste of the food or to the fact that a food contains acid. For instance, tomatoes and citrus fruits, as well as many other acid foods, are base-forming when burned in the body because of the fact that the alkaline minerals predominate in their composition.

Acidosis.-- Too much acid, which causes a condition known as acidosis, will be produced in the body:

1. When the diet contains too much fat and too little carbohydrate. In a case like this, the body will be flooded with organic acids which require neutralization and so deplete the alkaline reserve.
2. In starvation.-- The body does not receive enough food to carry on its work. Thus, it breaks down its own tissues and uses them. This process produces excess acid.
3. In wasting diseases there is an increase in metabolism of the tissues which results in too much acid.

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LECTURE IX MINERAL SALTS (Continued)

RULES TO OBSERVE IN BOTH FOOD PREPARATION AND IN MENU BUILDING FOR INSURING
SUFFICIENT MINERAL SALTS IN THE DIET.

I. Food Preparation

General

1. Use a small amount of water in the boiling of most foods.
2. When canning foods which need to be pre-cooked, as meats and some vegetables, pour over the food in the jar the liquid in which the food was pre-cooked.
3. When using canned foods, use the liquid in which they were canned. This applies to all canned foods as fruits, vegetables, etc.
4. Cook any dried food in the water in which it is soaked.

Fruits

1. Use fruits raw often. Serve unpeeled when possible. When peeling make the peeling thin.

Meats

1. Do not let meat stand in water before cooking.

Vegetables

1. Use vegetables raw often.
2. Do not soak vegetables. Do not let vegetables stand in water after they have been cut up.
3. Cook vegetables whole or in their skins, when possible. When peeling, make the peeling thin, or scrape only skin deep.
4. As a rule, vegetables should be cooked in a very small amount of water.
5. Serve the vegetable in its cooking water or use the cooking water in making gravies, sauces, and soups.

II. Menu Building

General

1. Adults should use in their diet, at least a pint of milk a day; children up to at least fourteen years of age should have a quart of milk daily.
2. Fruits and vegetables, should be used liberally.
3. Use eggs, cheese or meat every day. The glandular organs, as liver, kidney and heart should be used occasionally.
4. Either sea foods, canned vegetables and canned fruits from non-goiterous regions or iodized salt should be used by those who live in a goiterous belt.
5. When possible, use whole grain breads and breakfast cereals instead of those made from highly milled grains.
6. Use molasses rather than the highly refined syrups.

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LECTURE IX

SUMMARY OF MINERAL SALTS

Type of Salt	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating Women
Calcium	Building of bones and teeth Essential for growth Essential for coagulation of the blood Essential for proper functioning of the heart muscles and nerves Essential for iron balance Necessary for activation of the enzymes Necessary for lactation	Poorly developed bones and teeth Brittle bones Osteoporosis Rickets Tetany Dental caries Excessive bleeding Muscular soreness Nervousness Irritability	Cheese, Cheddar Milk Egg yolk Clams, long Scallops, steamed Collards Cabbage, loose leaf Turnip greens Mustard greens Broccoli, flower, buds, and leaves Chard Lettuce, loose leaf Dandelion greens Endive Dried figs Hazelnuts Almonds Bran Boston brown bread Molasses, pure sugar cane Maple syrup	0.8 to 1 gm.	1 to 1½ gm. depending on age	1.5 gm.	2.00gm.

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LECTURE IX

SUMMARY OF MINERAL SALTS (Continued)

Type of Salts	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating Women
Phosphorus	Building of bones and teeth Essential constituent of blood, brain and nerve tissue Essential for all cell activity Acts as a buffer substance in the blood and muscles to maintain body neutrality Essential for growth Influencing factor in the metabolism of carbohydrates and fats Influencing factor in the activation of enzymes Essential for reproduction Factor in the prevention of rickets	Poor development of bones and teeth Growth retarded Loss of weight The development of rickets	Cheese, American Egg yolk Dried beans Dried peas Peanuts Whole wheat Shredded wheat Oatmeal Liver Entire-wheat flour Rye flour Oysters Meat, 20 per cent protein Pecans Brown rice Dried figs Milk	0.88 to 1.32 gm.	1 to 1.32 gm. depending on the age of child	1.65 gm.	1.65 gm.

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LECTURE IX

SUMMARY OF MINERAL SALTS (Continued)

Type of Salts	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating Women
Iron	<p>Iron in protein compound is the formation of every cell in body</p> <p>Essential constituent of hemoglobin, which is the protein of the red blood cells</p> <p>Iron as hemoglobin is intimately concerned in the formation of red cells (the body reuse the iron after hemoglobin is broken down for the building of new hemoglobin.)</p> <p>As hemoglobin, iron is responsible for carrying oxygen to the tissues and assisting the maintenance of neutrality.</p>	<p>Low state of vitality</p> <p>Decreased hemoglobin formation</p> <p>Decreased number of red blood cells</p> <p>Retardation of growth</p> <p>Chlorosis, a type of anemia developed in young women, may owe its development to a shortage of iron and copper, together with other influencing factors</p> <p>Anemia (hypochromic)</p>	<p>Dried beans</p> <p>Egg yolk</p> <p>Dried peas</p> <p>Entire-wheat grain</p> <p>Eggs, whole</p> <p>Oatmeal</p> <p>Spinach</p> <p>Prunes, dried</p> <p>Lean beef</p> <p>Kale</p> <p>Beefsteak, medium-fat</p> <p>Cheese</p> <p>String beans</p>	12 mg.	6 to 15 mg. depending on age of child.	15 mg.	15 mg.

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LECTURE IX

SUMMARY OF MINERAL SALTS (Continued)

Type of Salt	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating Women
Iron	Assist in the prevention of anemia Iron and copper are stored in the liver of the fetus especially during last months intrauterine life.						
Copper	Plays an important part in the transformation of iron into hemoglobin Stored with iron during the last months of intrauterine life in the liver of the fetus acts as an insurance against any slight danger of shortage for several months after birth of infant.	Possible retardation of formation and regeneration of hemoglobin The so-called hypochromic anemia, to which chlorosis belongs, may owe its development to a deficiency in the formation of red cells, whose chief solid constituent is hemoglobin.	Fresh calves' liver Nuts Dried legumes Cereals Dried fruit Poultry Fish Animal tissue Green legumes, beans and peas Roots and tubers Leafy vegetables Fresh fruits Non-leafy vegetables	3.5 mg	Infant 1 to 1.5 mg. Child 1 to 2.5 gm.	?	?

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LECTURE IX

SUMMARY OF MINERAL SALTS (Continued)

Type of Salts	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating Women
Iodine	turn exert chemical control over even the remote parts of the body.						
Sulphur	Essential for growth (as a part of protein) Essential to oxidation processes and an important factor in protein metabolism. Essential to the proper development of the nails and hair. As cystine, an amino acid, it is a component part of the hormone insulin As cystine, occurring in the blood corpuscles, it takes an active part in the process of nutrition. Sulphur also occurs in bile,	Since growth depends upon the intake of protein, a lack of sulphur-bearing proteins would retard growth A poor development of nails and hair may be traced to deficiency in sulphur. Certain types of dermatitis may be caused by a deficiency in this mineral	Most of the protein contain sulphur. It is believed that a diet containing 100 grams of protein will contain 1 gram of sulphur. Eggs, egg white, beans, lean beef, cheese, hard clams, entire wheat, walnuts, oat-meals, molasses, peanuts, peas, and fish. Sulphur occurs as constituent of food as well as body tissues.	Approximately 1 % of protein is Sulphur. If the intake of good quality protein is adequate to cover the individual's daily needs, the sulphur requirement, as a rule, will be met, also. *Proudfit: DIET THERAPY, pp. 80-85 inclusive.			

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LECTURE IX

SUMMARY OF MINERAL SALTS (Continued)

Type of Salts	Function in the Body*	Effect of a Deficiency*	Food Sources in Order of Richness*	Requirements per Day			
				Adults	Children	Pregnant Women	Lac-tating women
Copper			Liver is much higher in copper than beef (about 20 times as much tissue)				
Iodine	As essential constituent of thyroxin, the secretion from the thyroid gland, iodine is necessary for the control of metabolic rate. The body's metabolic processes are controlled to a large degree by the group of organs known as endocrine glands, which are responsible for those specific substance known as hormones, which in	Metabolic disturbances occur when there is a deficiency or an oversupply of secretion of one of the endocrine glands. When there is a shortage of iodine, the thyroid gland makes an effort to synthesize the hormone by increasing the number of secreting cells and the volume of thyroxin secreted, and the development of goiter is the result.	Iodized salt Sea food Fruits and vegetables grown in nongoitrous regions.	One microgram equals one millionth of gram. ?	14-45 microgram	?	?

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LECTURE X

VITAMINS

COOKING TO CONSERVE VITAMINS

1. Use as little water as possible, and do not discard the water which is left. Vitamins B,C, and G are water-soluble. It has been estimated that when the water in which vegetables (except potatoes and tomatoes) are cooked is discarded, one-third to one-half of their vitamins C content is lost. Potatoes and tomatoes suffer little loss in cooking. Since steaming and baking (instead of boiling) will tend to prevent such loss of vitamins from vegetables, these methods of cooking should be used when-ever possible. When the food is boiled, serve the water with it, or else use it in making soups, gravies and sauces.
2. When boiling food, raise the temperature to the boiling point as quickly as possible. A short cooking period is one factor in the preservation of vitamins.
3. Don't use long cooking processes such as stewing when shorter methods are practical.
4. Do not add soda to the water in which food is cooked (as is sometimes done to preserve the green color of vegetables) as it favors the destruction of vitamin C.
5. Don't stir air into foods while cooking. Vitamin C is easily destroyed by oxidation, and oxidation goes on quite rapidly when heat is applied in cooking, unless precautions are taken to exclude air.
6. Don't put food through a sieve while still hot, as air will be incorporated and oxidation will be speeded up by the heat.
7. Chopped fruit and vegetable salads should be prepared just before serving as exposure to the air reduces the vitamin C content. When the food is chopped or cut into small pieces, more surface is exposed to the air, and thus more vitamin C is lost.
8. Serve vegetable juices and fruit juices as soon as they are prepared, if possible, otherwise place them in a closed vessel and store in the refrigerator. Marketed juices, unless served as soon as extracted, furnish insignificant amounts of vitamin C.
9. Frozen foods should be plunged (while still frozen) into rapidly boiling water and cooked for as short a time as possible. If they are thus treated, they will be exposed to the air for the minimum amount of time. Therefore, the loss of vitamin C by oxidation will be lessened.

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LECTURE X

VITAMINS (continued)

10. Serve raw frozen foods (foods which are to be eaten raw), as strawberries, etc., immediately after thawing.
11. In home canning by the open kettle method most of the vitamin C is destroyed. In commercial canning, when the air is exhausted from the cans before heating, much of the vitamin is retained.
12. Acid in food protects the vitamins, to an extent in either cooking or canning. For example, cabbage loses about 70 per cent of its vitamin C in with a very small loss of the vitamin.
13. In cooking, vitamin A is lost if fats become rancid or are heated in the presence of air. In the absence of air there is no loss, even though they may become rancid.
14. Do not let milk stand in the glass bottle in the sunlight.
15. None of the vitamin A in milk is lost in pasteurization, or in canning. When boiling milk it is better to bring the milk quickly to a boil than to keep it warm in an open pot.
16. In the process of drying, fruits and vegetables lose one-half or more of their vitamin A content.
17. Cook any dried food in the water in which it soaked.

Summary

In this connection, Bogert states: "The extent to which vitamin C is destroyed depends upon the temperature to which the food is heated, the length of time it is heated, and the acidity or alkalinity of the food, as well as upon how freely the air can get at it during the heating. The high temperatures of the pressure cooker, prolonged cooking, cooking in an open kettle, and adding soda to the food (as is sometimes done to preserve the green color of vegetables) all favor the destruction of the vitamin. The presence of traces of copper also favor the oxidation, so that canning in a copper kettle is to be avoided. LOWER TEMPERATURES, SHORTER TIME OF HEATING, AND ACID REACTION OF THE FOOD, AND THE EXCLUSION OF AIR ALL FAVOR PRESERVATION OF THE VITAMIN." *

*Bogert- Nutrition and Physical Fitness.. p. 259

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LECTURE X

VITAMINS (Continued)

Fruits, (continued)

3. The storing of fruit juices.
 - (1) Citrus fruit juices.- When possible, extract the juices just before they are to be served. When this is not practical, immediately on extraction, place in the refrigerator.
 - (2) Tomato juice or fruit juice other than citrus, heat the fruit before straining.
 - (3) Do not let the juice come in contact with iron that will rust or with copper-bearing metal. If it is necessary to use a mesh strainer, use a well-tinned one.
 - (4) Fill the container full and cover with a close-fitting lid.
 - (5) Place in the refrigerator.
 - (6) After using part of the juice, place the juice in a smaller container, to keep the container full. This keeps out the air and thus prevents oxidation.
 - (7) Do not shake juice unless the container is full.- Shaking will mix air with the juice.

Milk

1. Do not let milk stand in a glass bottle in the sunlight.- Milk is high in riboflavin and riboflavin is destroyed by light.
2. Place in the refrigerator.

Vegetables

1. Wash thoroughly (about 4 times) green leafy vegetables- cut off roots, shake off water and store in vegetable container in refrigerator. Store peas and lima beans unshelled, if possible. Do not keep them long. Store in the vegetable compartment of refrigerator. If shelled before using cover tightly. Be careful not to freeze the vegetables.
2. To store fresh root vegetables in the refrigerator, wash off the earth that clings, and cut off the tops (but save), leaving about $\frac{1}{2}$ to 2 inches of top. Place in the hydrator or a moisture-tight vegetable bag, or wrap in a damp cloth.
3. Be sure vegetables are crisp when they are to be prepared for cooking or eating raw, or for storage. Keep them that way during storage.