

## Lecture

### **Diseases related to violation of the rational nutrition basics and the use of poor-quality products, their prevention.**

On the data the WHO about 70 % all diseases directly or are indirectly caused by a wrong nutrition or infringements quality of foodstuffs.

The breach of these principles may cause the decrease of individual or organized collectives' health level, initiation of the diseases of alimentary origin.

#### These diseases may be determined as:

- diseases caused by starvation, quality and quantity malnutrition (marasmus, protein starvation, hypovitaminosis, avitaminosis and others);
- diseases caused by the dietary intake irregularity (gastritis, stomach and duodenal ulcers, constipation or coprostasis and others);
- diseases caused by overeating (obesity, gout or podagra, hepatitis, cholecystitis, pancreatitis, gall-stone disease and etc.);
- diseases caused by inadequate culinary processing of the product (also gastritis, ulcers, hypovitaminosis etc.);
- food poisonings: bacterial origin (toxic infection, bacterial toxicosis, mycotoxicosis), non-bacterial origin (poisonous by nature products, products which became toxic after storage conditions disturbance and others); products contaminated by toxic substances (pesticides, heavy metals salts and etc.);
- enteric bacterial, virus, zoogenous infections (typhoid fever, paratyphoid A, B, dysentery; hepatitis A, poliomyelitis, enterovirus diseases; brucellosis, foot-and-mouth diseases, tuberculosis and others); geo- and biohelminthes (ascarid, whipworm, beef, pork tapeworm, trichina, fish tapeworm, flukes and etc.);
- effects, caused by the products, contaminated with mass destruction weapon in modern war – nuclear explosion radioactive products, battle poisonous substances (chemical agents), especially particularly dangerous bacterial agents.

### **The scientific basis for the rational, preventive, therapeutic, dietary, and medical-preventive nutrition.**

*The rational nutrition* is physiologically full, balanced for all nutrients, qualitative and safe nutrition of the healthy human, which allow taking care and building up its health, raising the working capacity and longevity, preventing the alimentary (primary and secondary), alimentary caused, transalimentary and food intolerance diseases.

The *preventive nutrition* is used for the purpose of preventing development of alimentary caused diseases in persons of risk group, the *treatment-and-preventive* (medical-preventive nutrition) *nutrition* (TPN) is used for workers of the industrial enterprises that to raise their resistance to influence of harmful production factors and prevent the occupational diseases.

*The clinical (dietary) nutrition* of sick human is the integral part of complex therapy and of the secondary and tertiary prevention of different diseases, which is intended for restore the homeostasis and activity of organism functional systems back to normal after diseases and must completely satisfy the requirements in nutrients and energy including features of metabolism and state of human organs and systems. This type of nutrition is used in medical-and-preventive and sanatorium-and-spa institutions and sanatoriums-preventoriums and attained by order of special compounded nutrient rations (diets), dietary habits and use of special methods of culinary processing of food.

It's necessary to use the *ecological-and-protective nutrition* as powerful mean of protection of an internal environment of organism and raise the resistance to influence of xenobiotics for taking care and building up the population health in case of unfavorable ecological conditions.

**Physiological and hygienic requirements to rational nutrition.** Nutrition must be adequate to its quantity ratio. Quantity adequacy of nutrition depends on the type of work (professional group), age group, sex group, climatic zone, the level of municipal service and kind of rest.

There are 4 professional groups. The first group includes engineers, teachers, physicians (except surgeons), the heads of enterprises, scientific workers, secretaries, etc. They are named workers of mental work.

The second group includes men occupied with light physical work. They are nurses, coaches, salesmen, workers of automatic industrial processes, etc.

The third group includes workers occupied with not hard physical work. They are chemists, surgeons, shoe-makers, drivers, cooks, railway men, etc.

The fourth group includes people, who do very hard physical work. They are builders, foundry men, miners, steel-makers, dockers (table 1). Every professional group includes 3 age groups: the 1-st age group includes men from 18 to 29 years, the 2-nd age group consists of 30-39 year old men, the 3-rd age group consists of 40-59 year old men. This division is connected with fact that every 10 years metabolism decreases by 5 %. The young person should have higher level of basic metabolism. Each age group consists of 2 gender groups: male and female.

In the cold climatic zone the food ration caloricity is higher by 10-15 % because it is necessary to have more energy for supporting the heat balance of the organism due to a more intensive heat transfer. In areas with a low level of the municipal service (areas where water pipes, sewage systems, centralized heat system are absent) human spends more calories of energy by 5-10 %.

**Tasks of medical - preventive nutrition** are minimization of industrial factors harmful action and prophylaxis of industrial workers' occupational diseases.

**Medical-preventive nutrition has the following functions:**

1. Increases protective properties and bioresistance of the organism.
2. Increases resistance of the organism to specific harmful factors.

3. Prevention the entry of harmful factors to blood by joining them in stomach and in intestine.

4. Improves the function of affected organs and systems.

5. Promotes neutralization of harmful substances entering into organism.

Medical-preventive nutrition must contain components, covering loss and deficiency of biological active substances such as vitamins. It must include nutrients that have elective protective properties. For example, during the entry of molybdenum into the organism food must include salts of copper; during entry of sulphur it must include pyridoxine and ascorbic acid.

There are the following kinds of medical - preventive nutrition: the first kind is specially made up rations, which take into account harmful industrial factors; the second kind is specially made up drugs. They are given for workers at the factory. Besides, there are milk and dairy products that have prophylactic action. Milk protects albuminous exchange and mineral metabolism, raises resistance of the organism.

There are five main and three additional rations of medical - preventive nutrition.

**Ration No 1.** It is intended for men, who work with radioactive substances and sources of ionizing radiation (uranium, thorium).

Radioactive substances stimulate ionization of atoms and molecules that bring to formation of free radicals, but the quantity of DNA and RNA are reducing during this process. Ration No 1 stimulates antitoxic function of liver. This ration includes milk and dairy products. Chemical composition of ration No1: proteins 59 g, fats 51 g, carbohydrates 159 g.

Caloric content of this ration is 1380 kcal; 150 mg of ascorbic acid are added into the ration for raise additional protective properties.

**Ration No 2.** It is intended for workers who contact with alkaline, metals, nitrogen oxide, fluorine, formalin. This diet contains increased quantity of proteins and PUFA. These substances retard accumulation of harmful substances in the organism. Chemical composition of this ration is: proteins 63 g, fats 50 g, carbohydrates 185 g. Its caloricity is 1481 kcal. 150 mg of ascorbic acid and 2mg of retinol are added during the work with fluorine. During the work with chromium ration 2<sup>a</sup> is prescribed. It contains products including pectin, organic acids, salts of calcium, magnesium, sulphur, amino acids. Composition of this ration is: proteins 52g, fats 63 g, carbohydrates 156 g. Caloricity of it is 1370 kcal. In addition ascorbic acid 100 mg, retinol 2 mg, nicotinic acid 15 mg, vitamin U 25 mg, mineral water as "Narzan" 150 ml should be present in this ration.

**Ration No 3.** It is intended for protection of lead, ceramic (paint) stuffs, zinc white and tin. Chemical composition of this ration is: proteins 64 g, fats 52 g, carbohydrates 188 g. Caloricity of the ration is 1466 kcal. In addition ascorbic acid 150 mg, pectin 2 g are used. This ration contains milk and dairy products, juice with pulp, vegetables, which are not treated thermally, salads.

**Ration No 4.** It is intended for workers, who work with arsenic, phosphorus, mercury, rubber, foam plastic, carbo-plast, pesticides and under high atmospheric pressure. Chemical composition of ration No 4 is: proteins 65 g, fats 45 g, carbohydrates 181 g. Its caloricity is 1428 kcal. In addition 150 mg of ascorbic acid is used. This ration has a lipotropic action and influences selectively liver function and the system of blood formation. Ration No 4<sup>a</sup> decreases section of phosphorus and phosphorus-containing substances in alimentary tract. This ration is enriched by calcium at the expense of milk, dairy products, natural enterosorbents such as pectin and nutritional fibers, essential proteins, which contain in meat, eggs and fermented milk and lipotropic substances, they increase antitoxic function of liver. Besides, this ration includes ascorbic acid 100 mg and thiamin 2 mg.

**Ration No 4<sup>b</sup>** is intended for acceleration of processes of microsomal oxidation amino-nitric compounds of benzene, for acceleration of removal metabolic substances from the organism. This ration provides antioxidative protection of the organism. These protective properties of ration are provided at the expense of complete proteins and sulphur-containing amino acid. Milk, fermented milk products, liver, eggs, fish, bean products (legumes) have these properties. Protected carbohydrates provides energy processes at the expense fruits and vegetables. Besides, ration No 4<sup>b</sup> includes lipotropic substances, hemopoietic microelements, vitamins and organic acids. Vitamin C 100 mg, thiamine 2 mg, pyridoxine 3 mg, niacin 20 mg, tocopherol 10 mcg, glutaminic acid 500 mg are added in this ration.

**Ration No 5.** It is intended for workers who work with carbon bisulphate, phosphorus organic pesticides, butyl spirit, synthetic fibers. It includes products, which contain biologically complete proteins, PUFA and vitamins, which prevent disturbances of liver function and nervous system. This ration includes proteins 58 g, fats 53 g, carbohydrates 127 g. Caloricity of ration No 5 is 1438 kcal. In addition ascorbic acid 150 mg, vitamins A 2 mg, B<sub>2</sub> 3 mg, PP 20 mg, lots of water are used.

Medical - preventive nutrition is effective, if it is given before the work or in the middle of a working day. It is not recommended to change the food products in the ration. Medical - preventive nutrition is given only during doing harmful work. In all rations it is recommended to limit quantity of salt and fatty products, which disturb the electrolytic balance of the organism.

**Radio-protective nutrition** includes four levels.

The first level of radio-protective ration foresees using of antisorbents in ration, for example activated carbon. The second level provides improving metabolism in cells at Creb's cycle. The third level of radio-protective nutrition foresees liquidation of free radical formation (a lot of food components can bind free radicals and prevent the formation of toxic products). The fourth level provides anticancero-genic protection. Such action have tocopherol with compounds of selenium and retinol with  $\beta$ - carotene.

Radio-protective nutrition prevents entering radionuclides into the organism, retard absorption of radionuclides in the gastrointestinal tract and accelerate fixing of radionuclides and removing them from the organism.

In this connection the radio-protective ration must contain the following substances: radioblocaters, radiodecorporaters, radioprotectors. Radioblocaters decrease resorption of radionuclides in an organism, radiodecorporaters accelerate removing of radionuclides from the organism, radioprotectors decrease the formation of free radicals. Radio-protective nutrition foresees to increase protein-containing products at the expense of milk and dairy products, to increase quantity of PUFA and to decrease SFA. Quantity of complicated carbohydrates (pectin) at the expense of fruits, juices and vegetables should be increased. Quantity of vitamins especially of ascorbic acid,  $\beta$ - carotene and vitamins of B group, quantity of minerals (potassium, calcium, magnesium, iodine and fluorine) should be increased too at the expense of fruits and vegetables, meat and sea products, fish, sea cabbage, crabs, legumes, beans, haricot bean.

### **The formula of radio-protective nutrition**

Radio-protective nutrition must contain:

#### Increased quantity

- protein
- polyunsaturated fatty acids
- vitamins
- mineral substances

#### Decreased quantity

- saturated fatty acids
- table salt

The best form of heat treatment of the products is boiling but not frying, because during boiling radioactive substances (especially cesium and strontium) get out from food products into water.

### **Types of Therapeutic Diets**

A therapeutic diet is a meal plan that controls the intake of certain foods or nutrients. It is part of the treatment of a medical condition and are normally prescribed by a physician and planned by a dietician. A therapeutic diet is usually a modification of a regular diet. It is modified or tailored to fit the nutrition needs of a particular person.

Therapeutic diets are modified for (1) nutrients, (2) texture, and/or (3) food allergies or food intolerances.

Common reasons therapeutic diets may be ordered:

- To maintain nutritional status
- To restore nutritional status
- To correct nutritional status
- To decrease calories for weight control
- To provide extra calories for weight gain
- To balance amounts of carbohydrates, fat and protein for control of diabetes
- To provide a greater amount of a nutrient such as protein

- To decrease the amount of a nutrient such as sodium
- To exclude foods due to allergies or food intolerance
- To provide texture modifications due to problems with chewing and/or swallowing

### **Common therapeutic diets include:**

#### **1. Nutrient modifications**

- No concentrated sweets diet
- Diabetic diets
- No added salt diet
- Low sodium diet
- Low fat diet and/or low cholesterol diet
- High fiber diet
- Renal diet

#### **2. Texture modification**

- Mechanical soft diet
- Puree diet

#### **3. Food allergy or food intolerance modification**

- Food allergy
- Food intolerance

#### **4. Tube feedings**

- Liquid tube feedings in place of meals
- Liquid tube feedings in addition to meals

#### **5. Additional feedings** – In addition to meal, extra nutrition may be ordered as:

- Supplements – usually ordered as liquid nutritional shakes once, twice or three times per day; given either with meals or between meals.
- Nourishments – ordered as a snack food or beverage items to be given between meals mid-morning and/or mid-afternoon.
- HS snack – ordered as a snack food or beverage items to be given at the hour of sleep.

The following list includes brief descriptions of common therapeutic diets:

#### **Clear liquid diet –**

- Includes minimum residue fluids that can be seen through.
- Examples are juices without pulp, broth, and Jell-O (gelatin).
- Is often used as the first step to restarting oral feeding after surgery or an abdominal procedure.
- Can also be used for fluid and electrolyte replacement in people with severe diarrhea.
- Should not be used for an extended period as it does not provide enough calories and nutrients.

#### **Full liquid diet –**

- Includes fluids that are creamy.

- Some examples of food allowed are ice cream, pudding, thinned hot cereal, custard, strained cream soups, and juices with pulp.
- Used as the second step to restarting oral feeding once clear liquids are tolerated.
- Used for people who cannot tolerate a mechanical soft diet.
- Should not be used for extended periods.

#### **No Concentrated Sweets (NCS) diet –**

- Is considered a liberalized diet for diabetics when their weight and blood sugar levels are under control.
- It includes regular foods without the addition of sugar.
- Calories are not counted as in ADA calorie controlled diets.

#### **Diabetic or calorie controlled diet (ADA) –**

- These diets control calories, carbohydrates, protein, and fat intake in balanced amounts to meet nutritional needs, control blood sugar levels, and control weight.
- Portion control is used at mealtimes as outlined in the ADA “Exchange List for Meal Planning.”
- Most commonly used calorie levels are: 1,200, 1,500, 1,800 and 2,000.

#### **No Added Salt (NAS) diet –**

- Is a regular diet with no salt packet on the tray.
- Food is seasoned as regular food.

#### **Low Sodium (LS) diet –**

- May also be called a 2 gram Sodium Diet.
- Limits salt and salty foods such as bacon, sausage, cured meats, canned soups, salty seasonings, pickled foods, salted crackers, etc.
- Is used for people who may be “holding water” (edema) or who have high blood pressure, heart disease, liver disease, or first stages of kidney disease.

#### **Low fat/low cholesterol diet –**

- Is used to reduce fat levels and/or treat medical conditions that interfere with how the body uses fat such as diseases of the liver, gallbladder, or pancreas.
- Limits fat to 50 grams or no more than 30% calories derived from fat.
- Is low in total fat and saturated fats and contains approximately 250-300 mg cholesterol.

#### **High fiber diet –**

- Is prescribed in the prevention or treatment of a number of gastrointestinal, cardiovascular, and metabolic diseases.
- Increased fiber should come from a variety of sources including fruits, legumes, vegetables, whole breads, and cereals.

#### **Renal diet –**

- Is for renal/kidney people.
- The diet plan is individualized depending on if the person is on dialysis.
- The diet restricts sodium, potassium, fluid, and protein specified levels.
- Lab work is followed closely.

#### **Mechanically altered or soft diet –**

- Is used when there are problems with chewing and swallowing.
- Changes the consistency of the regular diet to a softer texture.
- Includes chopped or ground meats as well as chopped or ground raw fruits and vegetables.
- Is for people with poor dental conditions, missing teeth, no teeth, or a condition known as dysphasia.

#### **Pureed diet –**

- Changes the regular diet by pureeing it to a smooth liquid consistency.
- Indicated for those with wired jaws extremely poor dentition in which chewing is inadequate.
- Often thinned down so it can pass through a straw.
- Is for people with chewing or swallowing difficulties or with the condition of dysphasia.
- Foods should be pureed separately.
- Avoid nuts, seeds, raw vegetables, and raw fruits.
- Is nutritionally adequate when offering all food groups.

#### **Food allergy modification –**

- Food allergies are due to an abnormal immune response to an otherwise harmless food.
- Foods implicated with allergies are strictly eliminated from the diet.
- Appropriate substitutions are made to ensure the meal is adequate.
- The most common food allergens are milk, egg, soy, wheat, peanuts, tree nuts, fish, and shellfish.
- A gluten free diet would include the elimination of wheat, rye, and barley. Replaced with potato, corn, and rice products.

#### **Food intolerance modification –**

- The most common food intolerance is intolerance to lactose (milk sugar) because of a decreased amount of an enzyme in the body.
- Other common types of food intolerance include adverse reactions to certain products added to food to enhance taste, color, or protect against bacterial growth.
- Common symptoms involving food intolerances are vomiting, diarrhea, abdominal pain, and headaches.

#### **Tube feedings –**

- Tube feedings are used for people who cannot take adequate food or fluids by mouth.
- All or parts of nutritional needs are met through tube feedings.
- Some people may receive food by mouth if they can swallow safely and are working to be weaned off the tube feeding.