Balanced nutrition.
Energy value of nutrition.

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The plan

- 1. **History of nutrition**
- **2. Proteins**
- **3. Lipids**
- **4.Carbohydrates**

History of nutrition

- **The empirical period**

- **From the empirical period in the matter of nutrition better known are the names of Hippocrates, Galen and Avicenna.**
- **The first information on human nutrition belongs to the Greek physician Hippocrates (460 - 377 BC), considered the parent of medicine. Hippocrates' conceptions and the school he created about eating healthy and sick people are elucidated in such works as "About diet", "About food", "About drinking", "About meat", "About the diet of patients with acute diseases", in different aphorisms. Of these, the aphorism - "Your food to be medicine and your medicine to be food" - is well known.**

History of nutrition(continued)

- **A lot of Hippocrates' recommendations and statements on human nutrition remain valid to this day. In his Hippocratic writings he recommended to doctors: 1) to know the foods and drinks, which are consumed by the population (in the respective territory); 2) how some natural properties of foods can be fortified or, on the contrary, diminished; 3) the relationship between food and physical exertion. Hippocrates also considered what it is today, that the amount of food consumed depends on the constitution, age, season, weather conditions, territorial area.**

History of nutrition

- **Renowned physician Galen or Claudius Galenus (129 - 201), born in Or. Pergam from Asia Minor entered history not only as a Greek physician, but also as a Roman physician because of the fact that he also practiced medicine in the capital of the Empire. Galen's influence on doctors' subsequent decisions in various situations has been felt for 14 centuries. Among the many medical problems Galenus was also interested in the nutrition of the healthy man, but also of the sick man.**

History of nutrition(continued)

- In his writings, Galen described the process of transforming food into the digestive tract. A strong supporter of Hippocrates' ideas, he propagated the position of a moderate diet. According to Galen's opinion, between the feeding sockets it should be enough time for the stomach to be empty and therefore ready for processing the next portion of food. Otherwise, consider Galen, if the mixing of new food with the remains left in the stomach, it is possible a rot process, which negatively affects health.

History of nutrition

- **At the border between the 1st millennium and 2nd millennium, the scientist, philosopher and physician of the East Abu Ali al-Husayn ibn Abdallah ibn Sina (980 - 1037), known in Europe as Avicenna, became famous worldwide. He has worked in various fields. The main book in 5 volumes in the field of medicine, completed around 1020, is the "Cannon of Medicine". This book has been translated into many languages, reprinted many times, known and studied by physicians. In addition to the various treatment methods, the author also describes various preventive measures aimed at maintaining health. Among them are many recommendations related to food.**

History of nutrition(continued)

- **Avicenna considers that the food has triple action on the body: 1) by quality; 2) according to the necessary elements, of which it is composed; 3) depending on the presence of substances with an evil effect. The author proposes recommendations on the organization of food for different population groups, recommendations on diet. In the dietary diet Avicenna also highly recommends various foods, the dietary treatment methods being described also in the nominated book. In addition Avicenna also wrote papers on the importance of water, different foods for health.**

History of nutrition

- **The scientific period**
- **In the history of science, the name of the great French chemist Antoine Lavoisier (26.08. 1743 – 08.05.1794) is well known. By developing the basic concepts of metabolism, appreciating oxygen consumption and producing carbon dioxide (1772), Antoine Lavoisier entered the history of world science first as the "Father of nutrition science." Antoine Lavoisier became a member of the French Academy at the age of 26. For the first time in history, the scientist developed a calorimeter, which allowed him to measure the heat produced by the body as a result of consuming different types and quantities of food, but also for different types of work. He is also the author of the famous phrase "Life is a chemical process".**

History of nutrition

- **A special contribution to the development of nutrition science had German scientists, in particular Justus Liebig, Max Joseph Pettenkofer, Karl Voit and Max Rubner,**
- **Justus Liebig (1803 - 1873) was a German chemist, who had first and foremost contributions in agricultural and biological chemistry, in the founding of organic chemistry. In 1824, at the age of 21, Liebig became a professor at the University of Giessen. He was the first, who founded here the largest school of chemistry in the world, also organizing a laboratory - a model for teaching chemistry and conducting research in the field.**

History of nutrition

- **For the first time in history by Liebig, nutrients have been classified. According to the scientist, they can be divided into three groups: 1) plastics; 2) respiratory and 3) mineral salts. He considered that the main function of proteins is plastic function, and in the group of respiratory substances were included substances, which do not serve as sources of nitrogen - lipids and carbohydrates, but which provide energy processes in the body.**

History of nutrition

- **Max Pettenkofer (1818–1901), founder of modern hygiene, searched ways and means of maintaining health and preventing diseases. Successfully applied the experimental method in the field of public health. Through his experimental work, he highlighted the close connection between the human body and the environment. Within the hygiene problems Pettenkofer also dealt with the questions of human nutrition, quality and safety of food.**

History of nutrition

- **The scientific collaboration with Carl Voit resulted in the construction of a "breathing chamber", capable of being supported by human subjects. Research has begun on humans on metabolism during activity, rest, hunger, by accurately measuring food intake and excretion of various substances, oxygen consumption, and carbon dioxide and heat production. The scientist has dealt with the problem of the regulation of the nutrients, of the energy requirement for the different population groups and under different conditions, of some problems related to metabolism.**

History of nutrition

- **Carl Voit (1831 - 1908), a German physiologist and nutritionist, contributed greatly to the creation of the foundations of modern nutrition science. Working at the University of Munich (1863–1908), Voit was involved in experiments designed to determine the use and metabolism of proteins, lipids and carbohydrates in animals under different conditions. Carl Voit is considered by many researchers as "the father of modern dietetics". He established for the first time that based on the amount of nitrogen excreted from the body with urea, one can calculate the required or lost amount of protein.**

History of nutrition

- **Together with Pettenkofer they demonstrated the validity of the law of energy conservation in living organisms. C. Voit also demonstrated that the necessity of the living organism in oxygen is the result, but not the cause. metabolism, that the production of carbon dioxide is proportional to the rate of muscle activity, that the protein requirement is determined by the organized mass of the tissues, while the requirements in fats and carbohydrates are determined, by the physical activities performed. For the first time in the history Carl Voit based on research on real nutrition and the status of nutrition, but also laboratory research of different population groups proposed the norms of proteins, lipids and carbohydrates for the adults: 118 respectively; 56 and 500 g, in total - 3055 kcal**

History of nutrition

- **Max Rubner (1854 - 1932), German hygienist and physiologist has conducted important studies on energy metabolism, especially in children. He launched various theories and conceptions. The most innovative ideas based on the experiments carried out were launched by Max Rubner in the field of energy metabolism, confirming the validity of the law of energy conservation in the economy of the animal body, the isodynamic interrelation of the nutrients, the loss of energy through radiation and evaporation. It can be mentioned, for example, the so-called "Law of isodynamics" according to which it does not matter which energy substance produces energy in the body, claiming that "a calorie is a calorie".**

History of nutrition

- **However, he was warned by the head of the laboratory Carl Voit regarding the adverse consequences of this conception, because the role of each nutrient, energy source, is completely different. Later Max Rubner realized that it is only the energy side. According to the so-called "Law of surfaces", the metabolic rate per 1 kg of body mass of living organisms is inversely proportional to their surface area. Launched by Rubner "rate of life theory" implies that slow metabolism increases the longevity of an animal.**

History of nutrition

- **Max Rubner considered that most large animals have a longer life span than small ones, because their metabolic rates are slower. In 1885 he proposed the *caloric or energy coefficients* of proteins, lipids and carbohydrates in other words how many calories are obtained by burning in the body a gram of these substances: 4.1; 9.3 and 4.1 kcal respectively, known as "Rubner's caloric coefficients". These coefficients were used a certain amount of time both in scientific research and in practical activity.**

History of nutrition

- **In USA are very well known in the domain of nutrition Wilbur Olin Atwater and Francis Gano Benedict.**
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- **Wilbur Olin Atwater (1844 - 1907) was a major American specialist in agricultural chemistry. But together with his colleagues, physics professor E.B. Rosa and nutrition specialist Francis Gano Benedict during the years 1892 - 1897 built and then refined a calorimeter to accurately measure the energy provided by food. With this calorimeter Atwater has also studied the energy consumption for basal metabolism, various types of physical activity**

History of nutrition

- **Atwater studies confirmed the veracity of the first law of thermodynamics (the law of energy conservation). The caloric coefficients proposed by Atwater for proteins, lipids, carbohydrates (4.0; 9.0 and 4.0 Kcal, respectively), as well as a large part of the tables with the energy values for different types of activities continue to be used practically throughout world. The scientist also demonstrated the energy value of the alcohol, the possibility of its use as an energy source, opting against the excessive consumption of alcohol.**

History of nutrition

- **Atwater's studies were the basis of the elaboration of state policies in the field of nutrition of the US population. Atwater himself believed that Americans at that time consumed too much fat and sweets, with physical activity being in a small volume. He is also considered the founder of the US Olympic Nutrition System in the 19th century.**

History of nutrition

- **The greatest merit of Francis Benedict(1870-1957) is the construction of the apparatus for concomitant, direct and precise determination of oxygen consumption, exhaled air and heat. He built a large calorimeter, in which he could study 12 people, but the greatest contribution in this direction, however, was the invention of a portable field calorimeter. F. Benedict has done a great deal of research on different animals with hot and cold blood, from mice to even the elephant, on many groups of human population (newborns, young people, old people, vegetarians, malnourished and obese people, different patients, etc.) .).**

History of nutrition

- **Benedict established the factors that influence basal metabolism, such as: sex, age, body condition, water content in the body. In 1919, the scientist published information with a considerable list of data on basal metabolism of different groups of people depending on age, sex, waist and body mass. Basal metabolism standards are of interest till now**.

History of nutrition

- **During the Soviet period, the scientist A. A. Pocrovskii had a special role in the development of nutrition science (27.11.1916 - 28.11.1976).He elaborated the biochemical basis of the theory of balanced nutrition, the principles of dietetic and prophylactic nutrition, the so-called "rule of concordance of the chemical structure of foods with the enzymatic complex of the body", proposed a new approach to determine and increase the nutritional value of food, demonstrated the influence of feeding on the structure and function of cell membranes.**

II.PROTEINS
Essential amino acids

- **Tryptophan**
- **Leucine**
- **Lysine**
- **Isoleucine**
- **Methionine**
- **Phenilalanine**
- **Valine**
- **Threonine**
- ***Histidine***
- ***Arghinine***

Biological role of proteins

- **Plastic role**
- **Catalytic role**
- **Hormonal role**
- **Security of the tissues' specificity**
- **Lipotropic role**
- **Transport of some substances**
- **Energetic role**
- **Protection and enhancement of the resistance of the organism**
- **Maintenance of electrolytic balance and repartition of the liquids in the organism**
- **Maintenance of pH**
- **Antitoxic role**
- **Role in the sight's security.**

PROTEIN SUPPLIERS

Food	Proteins quantity/100 g of digestible food
Meat (beef, pork, chicken, fish)	15-22
Salamis, sausages	10-20
Cheese	15-30
Cow milk	3,5
Eggs	14
Bread	7-8
Macaroni, rice, flour, corn flour	9-12
Beans, peas (dried)	20-25
Soy	30-33
Nuts	17

III.LIPIDS.
Classification of lipids

- ***I. Simple lipids***
- **1. Glycerides (neutral fats)**
- **2. Sterides:**
- **a)Zoosterol**
- **b)Phytosterols**
- **c)Mycosterols**
- **3. Cerides**

II. Complex lipids

1.Phosphatides:

a)lecitines

b)cephalines

c)serinphosphatides

d)inositolphosphatides

2.Sphingolipids

a)sphingomielines

b)sphingoglycolipids

Essential fatty acids

- **I. Class omega – 6**
- ***1. Linoleic acid***
- ***2. Gamma - linoleic acid***
- ***3. Arahidonic acid***

II.Class omega -3

1.Linolenic acid

2.Eicosapentaenoic acid

3.Docosahexaenoic acid

Biological role of lipids:

- ***Energetic role***
- ***Plastic role***
- ***Mechanical protection***
- ***Influence on the digestive system***
- ***Influence the assurance of the organism with some mineral elements***
- ***Source of fat - soluble vitamins***
- ***Influence on the structure of nervous system***
- ***Influence on the function of internal organs***
- ***Influence on the synthesis of the water***
- ***Influence on the metabolism of some water soluble vitamins(B_1, B_6, C)***
- ***Influence on the elasticity of sanguine vessels, skin regeneration***
- ***Influence on the content and metabolism of cholesterol***
- ***Influence on the synthesis of prostaglandins***
- ***Influence on the blood***

FOOD WITH HIGH CONTENT OF LIPIDS

Food	Lipids,%
Oil, fat, melted butter	About 100
Butter, margarine	65-82
Cream	20-35
Fat cheese (Swiss Cheese)	20-30
Pork, sheep, duck meat	10-30
Beef, turkey, chicken meat	5-25
Fat fish	15-20
Salamis, sausages	20-40
Nuts, peanuts	40-35
Chocolate, halva, cream cakes	20-35

IV. Carbohydrates
Classification of carbohydrates

- ***I. Digestible***
- **1. Monosaccharide**
- **2. Disaccharides**
- **3. Polysaccharides (starch, glycogen)**

II. Indigestible

1.Insoluble hemicelluloses

2.Lignins

3.Pectins and others

4. Cellulose

Biological role of carbohydrates

- 1. Energetic role
- 2. Role in the activity of CNS
- 3. Protection of proteins
- 4. Influence on the metabolism of lipids
- 5. Influence on the acid – alkaline balance
- 6. Influence on the function of digestive system
- 7. Influence on the function of endocrine system

Role of dietary fibers

- *Insoluble:*
- 1. Accelerate the colon advancement
- 2. Have hydrophyte properties (in the result of water's connection the volume of
- Intestinal contents is increased)
- 3. Form compounds with metals, biliary acids, cholesterol
- *Soluble:*
- 1. Form the viscous solutions
- 2. Delay the gastric removing and absorption from intestines
- 3. Normalize the intestinal flora
- 4. Decrease the putrefaction flora
- 5. Connect the cholesterol in intestines and decrease its absorption
- 6. Decrease the absorption of glucose in intestines and prevent hyperglycemia
- 7. Form compounds with heavy metals and radionuclide

FOOD WITH HIGH CONTENT OF CARBOHYDRATES

Food	Content of carbohydrates, %
Flour, rice, biscuits, maize, macaroni	70-75
Bread, croisants	40-45
Beans, peas	50-55
Potatoes	18-20
Grapes, plums, cherry, apple, pears	12-18
Honey	70-80
Sugar	100
Candies	55-75
Jelly, jam	20-40
Chocolate	50-60

AVERAGE CONTENT OF VITAMIN C

Vitamin C quantity	Vegetables	Fruits
< 5 mg	dried onion, cucumber, aubergine, red beet, vegetable marrow, celery	bananas, appricot, bilberry, cherry, quince, peach, pear, melons, blackberry
15-30 mg	potatoes, green beans, lettuce, green peas, tomatoes, garlic, radish	
31-45 mg	green onion, nettle	raspberry, gooseberry
46-60 mg	white and red cabbage	grapefruit, orange
61-75 mg	cauliflower, turnip, orache	strawberry, lemon
76-150 mg	green pepper, dandelion, dill	
151-200 mg	parsley leaves	
>200 mg	red pepper	roseberry

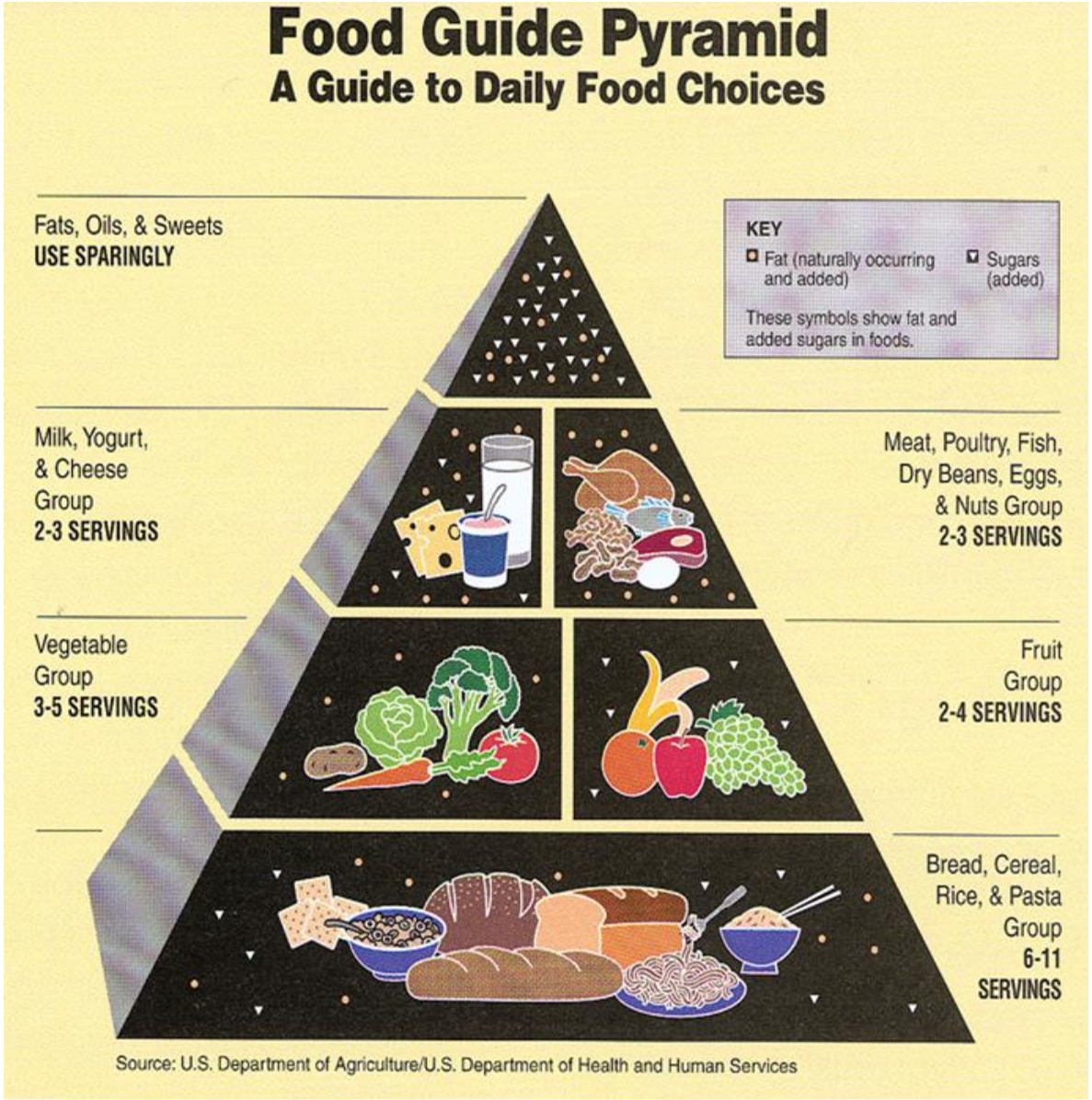
The state of nutrition in dependence on Body Mass Index (BMI)

BMI	State of nutrition
< 10	Undernourished Denutrition, V degree
10 – 12,9	
13 – 15,9	Undernourished, IV degree
16 – 16,9	Undernourished, III degree
17 – 18,4	Undernourished, II degree
18,5 – 24,9	Undernourished, I degree
25 – 29,9	NORMAL
30 – 34,9	Overweight
35 – 39,9	Obesity, I degree
≥ 40	Obesity, II degree
	Obesity, III degree

The structure of the adult population over 18 years according to the results obtained in the Republic of Moldova in 2006 BMI,%

Persons	Total	Urban	Rural	Men	Women
Overweight	34,5	33,9	35,1	36,9	32,7
Obese	15,5	16,3	14,8	13,3	17,1
Normal weight	42,6	40,3	44,8	45,9	40,5
Undernourished	7,4	9,5	5,3	3,9	9,7
Total	100	100	100	100	100

FOOD GUIDE PYRAMID



The state of nutrition in developing and developed countries

Indicators	Determinant factors in developing countries	Determinant factors in developed countries
Poverty	Lack of resources or access to healthy food; basic foods are insufficient for a healthy diet	General prosperity, but poverty of minorities; insufficient additional programs (food enrichment, school feeding) General prosperity, but poverty of minorities; insufficient additional programs (food enrichment, school feeding)
Lack of education	Absence or lack of knowledge concerning healthy nutrition	Good knowledge on healthy nutrition, but at the same time the obesity is spread in poor population
Deficiencies of micronutrients	Deficiencies of iron, iodine, vitamins A,B,C and D are spread; insufficiency of technologies for manufacturing of row foods	Fortification of food-stuffs with iron, iodine, vitamins A, B, C and D in USA, Canada and other developed countries.

The circle malnutrition-infection	**Poor sanitary conditions; lack of control to prevent diseases through vaccination as parasitic, diarrheal, respiratory diseases, tuberculosis, malaria; the state of nutrition is compromised**	**High levels of sanitation, coverage with vaccination, major benefits in nutritional status, at the same time - existence of population groups with high risk (HIV, tuberculosis, drug abuse and homelessness)**
Food safety	Harmful agricultural practices, land exhaustion by inappropriate agricultural practices; soil erosion, practice small parcels of land; system failure garbage and waste utilization; food prices exceed income	Agriculture based on scientific and technological achievements; high productivity, abundance, product variety, food is relatively inexpensive compared to family income
Inadequate diets and non-communicable diseases	Undernourishment together with poverty, the average insufficiency of calories for one person; hyper nutrition of rich and middle classes of the population with high the incidence and prevalence of cardiovascular diseases, diabetes	Hyper nutrition with high quantities of sugar and animal fats; the incidence and prevalence of cardiovascular diseases are high, but the mortality caused by these diseases is lowering
Breast feeding	Is spread and long, but supplementation with different special foods doesn't exist	Breast feeding is high and very good supplemented with different special foods

Quantity, quality and the price of foods	**There are characteristic contamination, pollution and food spoilage, lack of supply of vegetables, fruits, animal products, excessive cost of food**	**Ensuring with foods and their quality are good; distribution, marketing, processing, packaging, proper regulation and supervision; relatively inexpensive**
Monitoring	**Insufficiency of monitoring of ensuring, distribution and consumption of foods; there are necessary studies concerning the spreading of anemia in connection with food consumption**	**Systematically there are made investigations concerning the state of nutrition**
Necessity of strategies and national objectives	**Preventing deforestation and loss of land; rural poverty, lack of education due; lack of credit and agricultural support; harmful agricultural practices; extensive and dangerous use of pesticides**	**Government supports agriculture, scientific researches in this field, there are support systems, transportation and marketing; limited use of pesticides, agricultural work is mechanized**