Ministry of the Public Health of Ukraine
Zaporozhye State Medical University
Chair of General Hygiene and Ecology

“HYGIENE OF NUTRITION”

2015

The author: Sharavara L.P

- **Hygiene of nutrition** **is** the section of hygiene which studies the influence of different factors, connected to nutrition, on person's organism, and develops recommendations for a balanced diet. The part of hygiene of nutrition is NUTRICIOLOGY. It is a science about nutrients (food substances).
- According to the data of the WHO, about 70 % all diseases directly or indirectly are caused by a wrong nutrition or bad quality of foodstuffs.

THE BASIC SECTIONS OF HYGIENE OF NUTRITION

A rational nutrition is a nutrition for the healthy person for preservation and strengthening health,

A medical or dietary nutrition is for treatment of ill patients,

A treatment-and-prophylactic nutrition is a special diet for those who work in harmful conditions(chemical substances, radiation etc.)

A preventive nutrition is for people with risk factors of developing diseases (an atherosclerosis, a diabetes etc.).

CLASSIFICATION KINDS OF NUTRITION ON PURPOSE AND BIOLOGICAL EFFECT

Kinds of NUTRITION	Purpose	Group	Biological effect
Rational	Prophylaxis of nutritional diseases	Healthy people	Non-specific
Preventive	Prophylaxis of diseases of multifactor nature	Groups with risk factors of Diabetes etc.	specific
Treatment-and-prophylactic	Prophylaxis of occupational diseases	People who work in harm conditions	protective
Medical (dietic)	Correction of violated metabolism	Patients	Pharmacological

Sharavara L.P 2014

PRINCIPLES OF THE RATIONAL NUTRITION AND METHODS OF IT'S CONTROL

1. **Conformity of the calorific value according to the daily energy allowance.** The analysis nutrition begins from the main principle of rational nutrition.

METHODS of the control:

Calorific value is determined:

a) By table-settlement way (in view of a diet and according to the tabular data of food value of products) with the help of calorimetric factors

Calorimetric factors of nutrients:

1g proteins and carbohydrates = 4 Kcal, 1g fats = 9 Kcal.

Protein gives 14 % of daily calories, fats - 30 %, carbohydrates - 56 %.

b) Laboratory burning of 100 g of food product in a calorimetric bomb.

Daily energy allowance.

Consists of the basic exchange + energy allowance for work + 10 % of the basic exchange of digestion peep.

The basic exchange is calculated by the tabular data and depends on a sex, age, growth and weight.

Ways of definition of energy allowance for work:

a) Table-chronometric method (duration of any activity),

b) Direct calorimetry (in the calorimetric chamber)

c) Indirect calorimetry (respiratory factor = O2/CO2)

2. BALANCE of nutrients.

The diet should contain all necessary nutrients: proteins, fats, carbohydrates, vitamins, mineral substances **in an optimum ratio.** It provides the best absorption and high-grade using of food substances. Examples of balance:

Protein ratio: fats: carbohydrates (P:F:C) = 1:1:4 (for adult person), 1:1:5 (heavy physical work), 1:0,8:3 (older persons), 1:1:3 (children).

Ratio between proteins: animal 60 %, plant 40 %,

Ratio between fats: animal 70-80 %, plant 20-30 %

Ratio between carbohydrates: the unprotected 10-15 %, protected 85-90 %.

Ca: P ratio= 1:1,5 etc.

Ways of the control: a) table-settlement, b) laboratory (proteins in products are determined by Keildal, fats - by Sokslet).

3. The optimum regimen of diet.

The food should be accepted with 4-5 hours intervals (time evacuation of stomach), i.e. 4-5 times a day. Taking food less, than in 2 hours is not optimum because gastric secretion opresses. A nutrition less than 3-4 times a day is harmfull. Iin view of the big appetite the person eats too much food - hypercholesterolaemya, hyperlipaemya, adiposity etc.

Taking of food at the same time + (-) 30 minutes - maintenan reflex activity of digestion.

Recommended distribution of daily caloric content by takes of food:

Breakfast - 25-27 %, 2-nd breakfast 10-15 %, dinner 35-45 %, supper 10-20 %.

Ways of the control. Questioning about a diet and definition of caloric content of each reception of food.

4. Good organoleptic properties of food.

Its high comprehensibility, good conditions of food. It is necessary for maintenance of normal conditioned-reflex activity of digestion (Acad. I.P.Pavlov).

5. Safety food in the chemical and epidemiological attitude. Presence in products chemical substances or microbes in higher than allowable levels is high risk of food poisonings. Now it is very important principle in view of global pollution of biosphere by heavy metals, pesticides etc. Ways of the control: chemical and bacteriological analyses.

STRUCTURE of FOODSTUFF:

1) **Nutrients are** proteins, fats, carbohydrates, vitamins, mineral substances.
2) **Not alimentary substances** are the substances giving to products organoleptic property (color, a smell etc.)
3) **Antyalimentary substances** are antitrypsines (in raw egg protein), antivitamins (ascorbinaza, tiaminaza), antimineral substances (phytates, oksalates).
4) **Toxic substances**:

a) **Inherent in products**: toxins of poisonous mushrooms, solanin in a potato etc.

b) **Casually got pollutants from environment**: pesticides, heavy metals, dioxines etc.

FUNCTIONS OF NUTRIENTS

Function	NUTRIENTS
Energy	carbohydrates, fats, proteins, organic acids etc.
Plastic	proteins, mineral substances, fats, carbohydrates
Bioregulatory	proteins, vitamins, mineral substances
Adaptive-regulatory	proteins, water
Immunoregulatory	proteins, vitamins etc.
Treatment-and-reabilitation	dietary products with the improved composition of nutrients and adequate caloricity
Signal-motivation	gustatory and extractives (spice, seasoning)

PROTEINS ROLE IN NUTRITION

Proteins carry out many important functions in an organism: structural, protective (gamma - globulines etc.), regulative (hormones, enzymes), transport (hemoglobin of blood), energy (14 % of daily calory).

Classification of proteins by full value: high-grade and less high-grade.

Attributes of full value proteins:

1. The presence of irreplaceable amino acids in the protein in an optimum ratio. By this criterion proteins settle down in the following order: eggs, milk, meat, a fish, a soya, sunflower.
2. Good comprehensibility of the protein in organism.

3 groups of proteins:

a) Good comprehensibility - milk, a fish,

b) Average comprehensibility - meat, eggs (after thermal processing),

c) Bad comprehensibility - leguminous, bread, mushrooms.

3. High biological value. After absorbtion the most part of irreplaceable amino acids should be used for the main functions of proteins, except for energy

Irreplaceable amino acids and its functions.

Irreplaceable amino acids are not synthesized in an organism of the person and should be received from the outside with food. Among all amino acids there is 8 irreplaceable for the adult person:

Methyonin, lyzin, tryptofan, leuchin, izoleuchin, treonin, valin, phenylalanin.

Methyonin. 2-3 g per day. Adjusts exchange of fats, phosphatides and cholesterol - the antisclerotic factor. Contains in milk, in cottage cheeses, eggs, leguminous, meat, fishes.

Lyzin. 3-5 g per day. Participates in synthesis of hemoglobin, supports nitrogenous balance, adjusts contents Ca in blood. Consists in milk, meat, fish, soya. It is not enough - in cereals.

Tryptofan. 1,6 g per day. Stimulates growth of fabrics, synthesis blood proteins and hemoglobin, participates in maintenance of nitrogenous balance. Consists gradually in different food proteins.

For children in addition there are 2 irreplaceable amino acids - argynin and gystidin. Conditionally irreplaceable – needs for development, metabolism, blood formation and are synthesized in an organism, but in insufficient amount for a growing organism since stimulate growth.

Protein norm and protein minimum.

Protein norm is a necessary amount of protein for the person per day for performance of all functions. It is a component of the norms of nutrition of the population. Depends on age, sex, degree of difficulty of work. For adults on the average it is 70-100 g per day. The optimum ratio of animal and plant proteins for adults 50 : 50 %, for children 60 : 40 %.

THE ROLE OF FATS IN NUTRITION

Structure of food fats: neutral fats (the ethers of glycerin and fat acids), fat-like substances - phosphatides, mineral substances, fat-soluble vitamins (in some fats).

Functions of fats in nutrition: energy (30-32 % daily calory, 1g fat makes 9 Kcal), regulatory, plastic, protective (from mechanical and temperature influences), flavouring.

The characteristic of the fat acids.

Fat acids share under the contents of free (double) connections in formula on saturated, nonsaturated and polynonsaturated.

1) **Saturated fat acids** (SFA) - stearin, palmytin acids in animal fats, oil and kapron - in vegetative. Nonreactive, are acquired worse others, carry out basically energy function. Contained in the beef, mutton fat. At the superfluous use promote development of atherosclerosis due to a plenty cholesterol and absence of antisclerous factors.

- **2) Monononsaturated fat acids (MNFA)** is olein acid - contains 1 free connection in formula, is better soaked up, basically - energy function. Contains in vegetative fats.
- **3) Polynonsaturated (PNSA)** - linolev, arachidon acids (family omega-6), linolenov acid etc. (omega-3). Have some free connections in formula. Most biologically active and valuable among fat acids:
- - regulative function - adjusts exchange of cholesterol (the antisclerotic factor), reduce coagulability of blood and permeability of vessels.
- - Protective function - raises resistancy of organism to infections, toxicants, to surplus ultra-violet rays (antioxidizers).
- - Plastic - are part of walls of vessels and mielyn environments of nerves.
- Suppliers of PNSA: PNSA family omega-6 contains in not refined vegetable oils, PNSA omega - 3 - contains in fat of sea fishes (are most biologically active).

Value of phosphatides.

Fat-like substances - 1 fat acid is replaced with a phosphoric acid and the nitrogenous basis. Representatives: lecithin, kefalin. Participates in synthesis of nuclein acids, in exchange of cholesterol (the antisclerous factor). A plastic role - enters into protoplasm of cells, especially nervous system and a liver. Suppliers: liver, brain, egg yolk, butter, lard, not refined vegetable oils.

Sterines. Share on phytosterines and zoosterines **(Cholesterol)**. Despite of ordinary opinion of its harm, cholesterol is very important for an organism. It has plastic function - contains in protoplasm of cells, creates elasticity of fabrics as hydrophyl colloid due to keeping water. Regulative function - synthesis of vitamin D, bilious acids, sexual and steroid hormones. Protective function – inactives haemolytic poisons.

On modern representations, development of atherosclerosis has multifactorial aethiology, in a basis - infringements of a fatty exchange and increased endogenic synthesis of cholesterol, surplus alimentary cholesterol plays rather small value - an alimentary risk factor of atherosclerosis.

VALUE OF CARBOHYDRATES IN NUTRITION

Functions of carbohydrates:

Energy function (56 % caloric content of a diet per day), 1 g = 4 Kcal.,

regulatory (cellular tissue stimulates a motility and secretion of intestines),

Plastic (enter in structure of protoplasm and cellular membranes),

Protective (connect with heavy metals, cholesterol, glucose inactived cianid poisons),

Flavouring - sweet taste.

In hygiene it share on a degree of mastering:

1) **The unprotected (refined) carbohydrates** (mono- and disacharides – glukose, laktose, etc.). They are quickly absorbed in organism and give energy. At the plenty use of such carbohydrates may be alimentary odiposity, dibetes and caries.
2) **Protected carbohydrates** (starch). It has slow absorbtion in organism and gives most of all energy.
3) **Superprotected:** a) Cellular tissue, b) Pectin substances.

THE VALUE OF VITAMINS IN NUTRITION.

Vitamins are low-molecular organic substances, biologically active in very small amounts.

Functions of vitamins:

a) regulatory - form enzymes and adjust in metabolism,

b) protective - raise resistance of an organism to the adverse climatic factors, harmful physical and chemical influences, infections etc. (vitamin C - antioxidizer).

CLASSIFICATION OF VITAMINS:

WATER-SOLUBLE VITAMINS

Vitamin C - Acidum ascorbinicum
Vitamin B1 - Thiaminum
Hepatoflavin - Riboflavinum
Vitamin B3 or B5 - panthotenon acid
Vitamin B 6 - pyridoxine, pyridoxal, pyridoxamine
Vitamin B12 - cyancobolamyn
Vitamin H - biotin
Vitamin PP - Niacinum, niacin, Nicotinamidum
Acidum folicum

LIPOSOLUBLE VITAMINS

Vitamin A - Retinolum, retinolacetat, retynal
Vitamin D - ergocalciferol (D2), cholecalciferol (D3)
Vitamin E - admixture of tocopherols
Vitamin K - admixture of naphthoquinones

VITAMIN-LIKE SUBSTANCES:

Choline
Inosite (B 8)
Acidum lipoicum - Vitamin U
Orotovic acid (B 15)
Vitamin B15 - pangamic acid
Carnitine
Paraaminobenzolic acid

Biologically fissile materials:
Bioflavonoids

Some vitamins can be synthesized in an organism of the person:

a) Vitamins of group B, especially B 12, are formed in intestines during activity of microflora,

b) Calciferoles (vitamin D 3 - cholecalciferol) are formed in a skin under influence of ultra-violet radiation from provitamine - dehydrocholesterol.

c) Vitamin A (retynol)- from betta-carotines of vegetative food in very insignificant degree (1/6 part of requirement for vitamin A).

Kinds of the vitamin status of organism.

On a level of vitamin security of organism allocate:

1. **Avitaminosis** - full absence of vitamin in a feed for a long time
2. **Hypovitaminosis** - insufficient receipt of vitamin in an organism (about 50 % of requirement)
3. **Subhypovitaminosis** - a boundary condition between hypovitaminosis and normal vitamin state
4. **Normal security vitamins in an organism**
5. **Hypervitaminosis** - superfluous receipt of vitamins (on vitamins A and D).

Methods of diagnostics of the vitamin status:

a) On clinic violations, characteristic for each avitaminosis on concrete vitamin (a scurvy, etc.).

b) Biochemical methods (content vitamines in blood or urine).

c) Functional tests (skin haemorragies at vitamine-C hypovitaminosis).

The factors which influence on vitamins requirement of an organism:

Exogenic:

- A phsycho-emotional and physical overstrain
- Work at high and low temperature
- Work in mines, on Far North
- At contact with industrial poisons, at reception medicines (antibiotics)
- At work with radiation, noise, vibration,
- Smoking
- Seasonal fluctuations - there are not enough vitamins in a diet in the winter and in the spring,

Endogenic:

- Age,
- Pregnancy and lactation
- Infectious diseases
- Endocryn diseases - huperthireosis - strengthening metabolism in an organisme
- Intestinal diseases - infringement absorbtion vitamins

Value of separate vitamins.

Vitamin C - ascorbinic acid. Per day it is necessary for the adult person 75-100 mg. Functions:

- Participates in oxidation-reduction processes,
- Strengthens a vascular wall - prevents haemorragia (scurvy),
- Stimulates immunity - resistancy to infections,
- Regulates exchange proteins and carbohydrates,
- Raises resistancy to toxic substances as antioxidizer,
- Influences mastering Ca (at a scurvy at children - changes in bones).

Very unstable vitamin - an ascorbinic acid is easily oxidized.

Factors, destroying vitamin C: Temperature, Oxygen, Catalysts (salts of iron and cuprum - knifes, utensils), The alkaline environment, Enzyme ascorbinaza (activated at cutting vegetables and fruit. Inactivators of ascorbinaza - salt, sugar, vinegar).

Vitamin D is a complex of calciferoles.

The difference **between ergocalciferol (vitamin D 2) is that** it is formed in plants while **cholecalciferol (vitamin D 3)** is formed in a skin under the influence of ultra - violet from dehydrocholesterol. Biological activity has the products of their oxidation formed in a liver and kidneys. At lack of vitamin D ain child age - rickets, at adults - rarefication bones. Adjusts absorbtion and exchange of Ca - antirachitic action. It is especially important for children.

The reasons of D-hypovitaminosis: lack of a solar radiation (Far North, pollution of the atmosphere, insufficient stay on fresh air, work in mines, etc.), at a food only by vegetative food.

Prevention and treatment of a rickets at children - introduction of vitamin D_3 - 500 International Units per day, preventive artificial UV radiation (1/6 – 1/8 part of biodoze, at rickets – ½ - ¼ biodoze).

At taking very big doses of vitamin D – **D-hypervitaminosis** - heavy infringements of calcium exchange - calcinosis of vessels of heart, kidneys etc. Calcinosis of coronary vessels in the childhood at taking big doses of vitamin D - predisposition to a heart attack of a myocardium.

Vitamin A - retynol.

It is necessary for sight, growth, stimulation of immune system. The avitaminosis is more often at children of preschool age - haemeralopia (night blindness) and kserophtalmya (degeneration eyes conjuctive and corneas). " Vitamin of prosperity " - contains basically in expensive animal products - cod-liver oil and a liver, in plants – betta- carotines. Per day - 1,5 - 2 mg.

Attributes of A-hypervitaminosis: a headache, grow bald, infringements in bone marrow and in a liver, at pregnant - spontaneous abortions and uglinesses of a fetus. The reason – taking big doses of vitamin-A preparations, less often - consumption of a liver of a polar bear - a fatal retinol poisoning.

VALUE OF MINERAL SUBSTANCES IN NUTRITION

Out of 50 elements, which are present in an organism, 26 are necessary, thus 12 of them are macroelements, 14 are microelements.

CLASSIFICATION OF MINERAL SUBSTANCES

MACROBIOELEMENTS (Content more than 10 mg/kg 1 mg %)	MICROBIOELEMENTS (Content less than 10 mg/kg 1 mg %)
1. Cations - Calcium, Potassium, Magnesium, Sodium	1. NECESSARY: Iron, Iodum, Fuorine, Zincum Copper, Cobalt, Manganese, Nickel, Selenium, Chrome etc.
2. Anions - Phosphorum, Sulfur, Chlorine	2. Necessity not is clarified: Strontium, Boron, Bromum, Cadmium etc.
3. Enter in organic bonds - Oxygenium, Carboneum, Hydrogenium,	3. TOXIC: Lead, Cadmium, Arsenic, Hydrargyrum

NEED MINERAL SUBSTANCES
(mg per day)

Calcium	800 - 1500
Phosphorum	1200- 3000
Magnesium	400 - 500
Iron	15 - 18
Zincum	15
Iodum	0,15
Copper	1,5 - 3
Manganese	2-5

The characteristic of separate MACROELEMENTS

Calcium. Per day - 0,8g, for pregnant, at a lactation 2g. It is especially important at children's age - 1 - 1,5г in days.

Functions: plastic – in structure of bones, teeth (increases hardness), regulatory - strengthens vascular walls, participation in coagulability of blood, transfering pulses in nervous system, maintenance of normal nervous - muscular excitability, part of buffer systems, Protective - raises resistibility to infections, renders desensibilization action (antibiotics).

Conditions for Ca digestion

1) An optimum ratio with phosphorus: Ca: P = 1:1,5 - in milk and dairy products (cheese, cottage cheese).

Presence of vitamin D improves absorbtion of Ca

An optimum ratio with magnesium – Ca : Mg = 2 : 1 (for children 9:1). Magnesium is sn antagonist of Ca. It contains in cereals.

4) Enough proteins in food

5) Absence of plenty fats and sorrel acid form insoluble substances with Ca.

Phosphorus. Per day 1,6g, children – 3g., pregnant 3,8g.

Functions: plastic - is part of a bone marrow(elasticity), a nervous fabric

regulatory - formation of phosphatides and nucleinic acids, formation of buffer systems of an organism.

Conditions for digestion: Ratio Ca: P = 1 : 1,5**,** Enough fats in food.

Sources: dairy products, a yolk of eggs, a fish, leguminous, meat

MICROELEMENTS.

Mineral substances contained in an organism less than 1 mg - %, necessary for an organism in small quantities, but have very important regulation role.

The diseases, connected to infringement of microelement structure of nutrition are named MICROELEMENTHOSIS.

CLASSIFICATION OF MICROELEMENTOSIS

(connected with lack or excess of microelements in ground, water and food stuffs)

HYPOMICROELEMENTOSIS	HYPERMICROELEMENTOSIS
MONO-HYPO MICROELEMENTOSIS On fluorine - caries On Iodum - endemic struma On Ferrum – ferrum-deficit anemya	MONO-HYPER MICROELEMENTOSIS 1. NATURAL: On a Molybdenum – molybden gout, on a Selenium - selenum toxicosis, on Strontium- strontium rachitis, On Fluorine - fluorosis, on Cadmium - cadmium nephropathy On Iodum - Basedov illness
POLY-HYPO-MICROELEMENTOSIS On Ferrum, Copper, Manganese, Zincum – anemia	1. ANTHROPOGENIC: On Hydrargyrum - illness Minamata On Cadmium - illness itai - itai On PCD - illness Usho On Lead, Arsenic, Pesticides Dioxines, Nitrates
	POLY-HYPER MICROELEMENTOSIS On Strontium, Manganese, Fluorine - Urov illness

VALUE OF SEPARATE MICROELEMENTS

Fluorine. Daily requirement is 2,5-3 mg. It adjusts exchange of Ca and P. Takes part in formation of dentyn, dental enamel and bones. At lack - caries, at surplus (5 % of territory of Ukraine) - fluorosis - damage of teeth, bones, infringements of intellectual development at child age.

Iodine. Daily requirement is 0,1-0,2 mg (100-200 mcg). Participates in synthesis of hormone of a thyroid gland thyroxin, adjusts function of this gland. At lack develops hypothyreosis (endemic craw or mixedema). At surplus - hyperthyreosis (Basedov illness).

Iron. Per day - 15 mg, for women - 30 mg. Synthesis of hemoglobin (60 % of all iron in an organism), is part of some oxidizing enzymes - peroxidasa, citochromes. It is a necessary for cytoplasm and a nucleus of cells.

Conditions for digestion: a hydrochloric acid, vitamin C.

FOOD POISONINGS.
THE REASONS, CLINIC, PREVENTION.

Food poisonings are non-contagious, mass diseases, caused by the use of substandard food, containing microorganisms or toxins of various origin.

It differs from intestinal infections (dysentery, cholera etc.) – non-contagious! (absence of transfer ing the disease from the patient to the healthy person).

Food poisoning may be only in a person, who eat food, containing harmful substances or microbes.

CLASSIFICATION OF FOOD POISONINGS:

I. ALIMENTARY POISONINGS OF MICROBE ETIOLOGY:

1) TOXINFECTIONS - alive microbes with nutrition (E.coli, Proteus, Cl.perfringens, Bac.cereus etc.)

2) BACTERIAL TOXICOSES - microbial toxins with nutrition:

a) Staphylococcal toxicosis (Staphylococcus aureus)

b) Botulism (Clostridium botulinum)

II. ALIMENTARY POISONINGS NOT MICROBE ETIOLOGY:

1) BY TOXICANT PRODUCTS:
a) Toxicant mushrums (pale poganka, fly-agaric etc.)
b) Toxicant plants (beladonna, etc.)
c) Toxicant weeds (heliotrope)
d) Toxicant parts some fishes

2) BY PRODUCTS SOMETIMES OR PARTICULATE TOXICANT:
a) Stone fruits (amygdaline)
b) String bean (fasin)
c) Potatoes (solanine)

3) BY CHEMICAL MATERIALS:
a) Heavy metals - lead, copper, Zincum, Hydrargyrum etc.
b) Pesticides
c) Nitrates and nitrites
d) Alimentary additives

III. MYCOTOXICOSIS

Sort of fungi	Mycotoxins	Food products	pathology
Aspergillus	Aflotoxins	Nuts, Coffee	Cirrhosis and primary cancer of a liver
Aspergillus	Ochratoxins	Grain, Coffee	Balkan epidemic nephropathy
Fusarium	Trychocetens	Grain	1. Fusariosis (poisoning “drunk bread”) 2. Alimentary-toxic aleukia
Claviceps	Alkaloids of ergot	Grain	Ergotism
Penicillium	Pathulin	Juices, Mashed Potatoes	Malignant tumours

IV. ALIMENTARY POISONINGS OF UNKNOWM ETIOLOGY

1) Alimentary paroxyzmal toxic myoglobinuria (Gaffen illness)

2) Poisoning with quail meat

3) Urov illness (the illness Kashin) (now it is referred to poly-hyper-microelementosis on strontium, manganese and fluorine)

FOOD POISONINGS OF MICROBIAL

Aethyology:

1. **Toxicoinfections** - are caused by food, which contains alive microorganisms. Specific activators are salmonels, potentially pathogenic microflora – E. Coli, proteus, etc.
2. **Bacterial toxicoses** (the old name - food intoxications) - arise when one takes food products which contain bacterial toxins, formed in it. Representatives - staphylococcal toxicosis, botulism.
3. **Mixed aethyology** - when there are both alive microbes and toxins - for example, salmonels + staphylococcal toxin.

TOXICOINFECTIONS.

Product sources: meat products, especially minced (pies with minced meat), eggs (are frequently infected by salmonels), a fish (stuffed, fried and hot smoked), lactic products.

Conditions when products become dangerous for toxicoinfection:

1) The reasons of hit of activators in products:

a) using ill and tired animals, wrong cutting animal carcass,

b) Wrong storage and transportation of products, processing uncooked and ready products on one board, one knife etc.,

c) Non-observance by the personnel of food objects rules personal hygiene, absence of regular physical examinations personnel, attraction to work at kitchen unknown or ill people.

2) The reasons of duplication and preservation activators in products:

a) Wrong storage - non-observance temperature and terms of realization,

b) Insufficient thermal processing

Clinic toxicoinfections.

There are 5 clinical forms:

Gastroenterythic form: nausea, vomiting, dyarrea, pains in stomach

a) easy degree - 80 %,

b) average degree - 20 % (rise temperature up to 38),

c) the heavy form - 2 % - body temperature 38-40 C, decrease of arterial pressure, very heavy intoxication.

2) Typhoid form – heavy intoxication with intermitted temperature

3) Choleric form – heavy intoxication with strong dyarrea

4) Dysentery form – dyarrea with blood in faecal masses

5) Grippe form – like grippe with gastroenterytis.

Preventivon of toxicoinfections.

Elimination the reasons of hit and duplication activators toxicoinfections in products (see higher).

BACTERIAL TOXICOSES

Group of food poisonings of microbial aethyology, caused by the microbe toxins, which have collected in products.

1) A staphylococcal toxicosis.

Causative agent is Staphylococcus aureus, which is capable to produce in products eksotoxin. Products - sources: dairy products, creams, pies, cakes, fish and meat products.

Conditions for staphylococcus infection and accumulation of it's toxins in products are:

a) Staphylococcal diseases of the personnel of eating establishments - quinsy, pustular diseases of a skin,

b) Wrong storage - at room temperature, non-observance terms of realization.

Clinic: gastroenterytis with rised temperature, diarrhea(seldom), in heavy cases – infringement of cardiac system, dehydrotation of the organism.

Prevention: physical examinations and discharge of personnel, correct storage products, it is especial for cakes and pies in a hot season.

BOTULISM

The causative agent is Clostridium botulinum which produces exotoxin. Features of the activator:

а) spore-making - spores withstand boiling during 4-5 hours, (a bacillus in the vegetative form – only 15 minutes), are kept at temperature -16 ^{0}C during 14 months, withstand action of preservatives - salts, vinegar, sugar for a long time,

b) **obligate anaerob microbe** - develops without access of oxygen (canned food),

в) **under certain conditions** (+ 10 - +30 ^{0}C without oxygen) form the strongest neurotropic exotoxine. A fatal doze for person is 35 microgramme.

Clinic of botulism.

Toxin affects central nervous system - an oblong brain - nucleus skull-brain nerves. The following structures are more often affected:

- Nucleus of nerve oculomotorius – pthosis (falling of upper eyelid at one eye) , anisocaria (different diameter of pupils of the eyes), frustration accommodation of eyes,
- Nucleus of optic nerve - a fog, "net" before eyes, decrease of sight
- Nucleus of glossopharyngeus and hypoglossal nerve - violations of speech up to aphonia (person can not speak), violations of swallowing (person can not drink water),
- Nucleus of facialis nerve - disappearance tonus of mimic and chewing muscles at the one half of face,
- Nucleus of vagus nerve - increases pulse at **the normal or low temperature, defecation is normal or propensity to locks** (unlike other microbial food poisonings – very important differential symptome!).

There can be spasms, pains in muscles, defeat of vessel, respiratory centers in central nervous system - death. The mortality without treatment is up to 70 %, with treatment is up to 30 %.

Treatment of botulism.

Injections of antybotulinic serum or anatoxine (15000 IU, second doze of 5000 IU after 5 hours). At the use suspicious product - injection serum in a doze of 2000 IU.

Prevention of botulism.

Strict observance of temperature during preparation of canned food, dry-cured fishes, meat. At the domestic conservation – make it in small banks at long time of boiling, storage of canned food at temperature less than 10 degrees.

FOOD POISONINGS NOT MICROBE AETHYOLOGY

1. Poisonings with poisonous mushrooms.

Poisoning by pale poganka.

The most poison mushroom. It contains **ammonitotoxine and ammonitohaemolysin**. Blocks all kinds of a metabolism, first of all carbohydrate and water. Sharp gastroenteritis – cholera-liked diarrhea - dehydrotation of organism – violations of central nervous system and cardiac system (sharp falling the blood pressure). In blood it is gaemolysis (destroying) of erythrocytes - pallor skin and sharp hepatic insufficiency (destroyed parts of erythrocytes go with blood to liver) - yellowness of a skin. Death may be from a collapse at violations of CNS.

Poisoning by fly agaric. Athypic appearance - sometimes it mask under edible mushrooms. Contains **muscarin and mycoathropin** – changes m-holinolytic nervous system. In clinic: gasthroenteritis, perspiration, tearing and salivation, expansion of pupils of the eyes. Defeat of central nervous system as an alcoholic poisoning. Death from a paralysis respiratory centre in CNS.

Prevention poisonings by poisonous mushrooms.

1) The population must to know poisonous mushrooms by means of sanitary - educational work: lectures, conversations, posters, use mass media (TV, radio).

2) Control in the markets – places of sale mushrooms - sale mushrooms only under the sanction of the sanitary medical assistant. Sale mushroom salads and mixes is forbidden.

2. Poisonings by poisonous wild-growing plants.

Are most typical at children's age.

Plants with m - cholynolytics - **atropine, giosciamine, scopolamine - beladonne, benbane, dope**. In clinic it is gasthroenteritis and expansion of pupils of the eyes (beladonne – from Latin “beautiful woman” – in Middle centures women drop to the eyes solution of beladonne – dark, beautiful eyes), spasm of accommodation (violation of sight on close distance), dryness and reddening skin and mucous. At poisoning by dope, benbane – also sight and acoustic hallucinations + oppression central nervous system (CNS). Death - from violations of CNS. After recovery may be the remote effects on CNS – amnesia (loss of memory), etc.

Cikuta (cikutotoxine). In Ancient Greece used for cuicide. Children use it as tubules. Excitation, then - oppression CNS. Loss consciousness, spasms, expansion of pupils of the eyes, cold sweat, vilations of breath, cianosis. Death in 2-3 hours from a paralysis respiratory centre.

The wolf berries. **Myserin -** irritation action - bloody vomitting, a diarrhea. **Daphin** - infringement CNS and cardiac system. 10-12 berries - a fatal poisoning.

Wild grapes. Brionin. Heavy gasthroenteritis, excitation, then - oppression CNS. Death - from a collapse. A fatal doze for adults - 40 berries, for children - 15 berries.

Prevention poisonings by poisonous plants.

1) Destruction it in territory of children's preschool establishments

2) The control under children at walking in parks. Work with tutors.

3. Poisonings by products sometimes or in part poisonous.

Solanin in a potato. In growing and become green potates. Has irritating and haemolytic action. In clinic it is gasthroenteritis of easy and average degree of weight. Prevention – to not use become green parts of potates.

Fazin in haricot beans. Its toxine give irritation and gaemagglutination (stick of erytrocites) action. Destruction toxine is at long thermal processing. The use haricot bean or its flours in shops is forbidden. In case of it food poisoning it is gasthroenteritis of easy and average degree of weight.

Amygdalin in stone fruits. Most of all - in bitter almonds, in stones of apricots, peaches, cherries etc. In organism it breaks up with allocation cyanic acid - blockade fabric breath. In heavy cases - loss consciousness, plentiful vomitting, diarrhea, spasmes, death in 2-9 hours at paralysis of the respiratory center of CNS.

Prophylactic measures - to not use these products or boiling for a long time, because toxins are termolabilic (destroy at high temperature).

4. Poisonings by salts of heavy metals.

The reasons:

a) From utensils (the zinc buckets, copper utensils, glaze on pottery),

b) From the ground polluted by heavy metal - lead (about highways)

Zinc and copper (cuprum). Basically act from utensils at storage in it sour products. Not heavy gasthroenteritis – in intestines are formed albuminates of copper and zinc - are not soaked up in organism - ulcering, irritating action at intestines.

Lead. It may hit in food from utensils (glaze) and ground. Poisonings are usually chronic. In clinic - a lead triad: lead encephalopatia (violations of CNS) and polyneuritis (vilations of perypheris NS), lead pains in stomach, lead border on gums. In blood - bazophyl granularity in erythrocites, retyculocitosis (irritation action at blood-forming organs), increase contents lead in urine (more than 0,04 mg / l).

Prevention:

a) hygienic reglamentation of heavy metals in products and control observance it maximal permissible concentration,

b) prevention transition metals from container, utensils.

5. Food poisonings by agrochemicals.

5.1 Food poisonings by pesticides.

Pesticides - chemical means of protection plants from wreckers, illnesses and weeds. Without application it is loss 50 % of a crop. Sometimes it is possible accumulation it in products above maximal permissible concentration and development poisonings.

The reasons accumulation of pesticides in products:

a) Application non-authorized preparations (very proof or toxic),

b) Excess the established norms of the charge or frequency rate of processing,

c) Non-observance term of expectation - time between last processing plants and harvesting.

The clinic poisonings depends on group pesticides – chlorine-organic (decrease activity of cytochromoxidaze – enzyme of tissue breath), phosphorus-organic (decrease activity of cholinesterase – accumulation of acetylcholine in organism), carbamates, etc.

5.2 Food poisonings by fertilizers.

Fertilizers - substances for increase productivity of plants. Nitrogen fertilizers are most of all applied. Thus in plants can collect nitrates - in organism are restored in nitrites and connect with gaemoglobin in erytrocites – metgaemoglobinaemia – gaemoglobin can not transport oxygen and it is hypoxia. Are especially dangerous to children first 3 months:

in stomach it is not present HCl - stop restoration nitrites from nitrates.

chidren in this age have fetal gaemoglobin – very sensitive to nitrites

Low activity of enzyme metgaemoglobinreductase in children – makes gaemoglobin free from nitrites

At high levels nitrates in products can created nitrozo-combinations (NS) - cancerogenic effects.

6. Food poisonings by food additives.

The alimentary additives - not nutritional chemical materials, syntheticaly imported to foodstuff with the purpose enriching of organoleptic properties, conservation products and enriching technological processes preparation nutrition.

For learning alimentary additives and addition them in the list allowed alimentary additives there is the Joint committee experts of FAO/WHO under the alimentary additives.

CLASSIFICATION ALIMENTARY ADDITIVES, ALLOWED To APPLICATION In the COUNTRIES EUROPEAN UNION

- E 100 - E 200 - stains
- E 200 - E 300 - preservatives
- E 300 - E 400 - antioxidants, regulators acidity
- E 400 - E 600 - emulgents, stabilizers consistence,

materials handicapping conglomeration

- E 600 - E 900 - amplifiers taste, flavors
- E 900 - E 1000 - materials enriching quality of a grain and bread

Such alimentary additives are recommended EU for the blanket market, but each country asserts the list of allowed materials.

On Ukraine the List allowed alimentary additives predicated by the Decision Cabinet of Ministres and the addition into it new alimentary additives is admitted only under the resolution Ministry of Helth of Ukraine.

More than 5000 chemical substances are now use as food additives - dyes, aromatics, emulgators, preservatives, fluffers etc. Poisonings occur at application non-authorized additives or excess it permissible amount.

Example: using food additives to sausages as paintings - nitrates (at high levels action at the person - see higher).

3. Mycotoxicoses.

The food poisonings caused by toxins of microscopic mushrooms' mould on bakeries (on grain, on flour) when stored in humid conditions. It is a characteristic for a countryside: bad conditions of storage a flour, during wars etc. - use any grain. Now it may be in connection with a making of bread in private manufacturers from a unchecked flour.

Ergotism. At infection grain by ergot. In food can products toxins – ergotoxine, ergotamine, ergometrine. Cause a spasm of smooth, then - other muscles.

The are three clinical forms:

a) Convulsive - paresthesias, dizziness, spasmes, sometimes - gasthroenteritis. Duration 3-6 weeks,

b) Gangrenous (" fire St. Antonio ") - forming necrotic centers in skin with tearing away lifeless sites, strong pains in these sites. In heavy cases - death in 1-2 day – accompanied by secondary infection (sepsis)

c) Mixed - combination of 1 and 2 forms.

Ergotism is especially dangerous for pregnant - a spasm of smooth muscles of uterus - abortions, premature birth.

Fusarios. A poisoning with "drunk bread". The mould mushroom sort Fusarium graminearum. In clinic - gasthroenteritis and defeat CNS as alcohol intoxication. Endemic disease on the Far East.

Alimentary-toxic aleukia. Up to 1944 year named "septic quinsy". Sort Fusarium - develops in the grain, which has wintered under snow. Deep violations of blood-forming, leuko- and trombocytopenia. The main feature is aleukia (in 1-2 weeks) - sharp decrease of leukocytes and erytrocites, increase of lymphocites. Heavy necrotic quinsy and a sepsis. Mortality is 50-80 %.

Aflotoxicoses. Sorts of Aspergillis is found on a peanut and araxis flour, on a grain, corn, nuts, rice at storage in wet conditions at the increased temperature. Recently was found in Spain red wine. Cause heavy defeat of liver and have cancerogenic effect on a liver – initial cancer of a liver (earlier - basically in Africa and Asia). Now – are often in Crimea and on South Ukraine.

FOOD POISONINGS INSUFFICIENTLY INVESTIGATED AETHYOLOGY

Urov illness (Kashin – Beck illness). Now it is established, that it hyperpolymicroelementosis (strontium rickets). Endemic disease - the river Urova in Eastern Siberia and some other territories on the Earth. Deformation skeleton during growth, heavy violations of exchange.

Gaffen illness. Gaffen gulf in Holland. Arise at the use of fish from some reservoirs in some periods. The reason is not established, possible - at flowering water toxic seaweed are formed, toxins collect in a fish.

The official diagnosis – it is alimentary paroxysmal-toxic myoglobinuria (exit of muscular protein myoglobin in blood and in urine). Attacks of sharp muscular painsand sharp renal insufficiency in view of мyoglobinaemia. It is necessary haemodialis.

Poisoning with meat of female quail. Sometimes - gasthroenteritis a different degree of weight. The reason is not established.

TACTICS OF THE DOCTOR AT SUSPICION ON FOOD POISONING

1. Statement the preliminary diagnosis on the basis:

a) Gathering the food anamnesis (what products eat the patient) at the patient or relatives,

b) Clinic with characteristic symptoms

2. Rendering emergency medical service under vital indications - cardiacs, respiratory analeptics, etc.

3. Confirmation the diagnosis:

a) Gathering and sending in laboratory of hygiene of nutrition of SES the rests of food, washing waters of stomach, emetic weights, faecalies, blood, urine.

b) Write "Accompanying direction on laboratory research" with the indication the reason of selection test products and on what method of laboratory researches products.

- 4. Desintoxication therapy: gastric lavage, much drink, antibiotics, droppers. In case of botulism - antibotulinic serum, anatoxine.
- 5. Prevention of mass food poisoning – to send "Emergency notification about food poisoning" - to SES and to inform SES by the phone (it is important if a poisoning is at a public nutrition establishment).
- After reception of the emergency notification doctors of SES within 24 hours will carry out thr investigation of food poisoning - sanitary inspection of public nutrition establishment. Survey the personnel.
- 6. At the appropriate indications - hospitalization in infectious department of hospital by first aid.