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THE GENERAL HYGIENE AND ECOLOGY DEPARTMENT

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CHAPTER 1. INTRODUCTION IN HYGIENE

Study Questions.

- 1. Principles of a state policy in the field of public health care in the republic of Belarus.*
- 2. Hygiene as a science, its purpose, tasks.*
- 3. Differentiation of hygiene, communication with other sciences.*
- 4. Methodology and theoretical bases of hygiene.*
- 5. History of hygiene development.*
- 6. Features of hygiene development at the present stage.*
- 7. Value of hygiene in population's health maintenance.*
- 8. Value of hygiene for doctor of medicine.*

An individual, who is not infirm, weak or feeble, may or may not be healthy. An individual is said to possess complete physical, bodily, organic or somatic health if the following conditions are satisfied: All his parts, organs, tissues, systems, and senses are intact and functioning normally. He possesses enough bodily reserves to meet any emergency. His appetite is good, bowel, micturition and sexuality are normal and sleep is sound. His temperature, pulse rate, respiratory rate, blood pressure and exercise tolerance are normal.

According to WHO, "health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity." A person who is not diseased may not be healthy.

An individual is said to possess mental, psychic, or psychological health if the following are true of him: His perception of the surroundings is realistic. His intelligence, memory, learning capacity and reasoning faculty are normal. His emotional reactions are proportional to the intensity of the stimulus concerned. His confidence in himself is high and his realization of his innate potentialities is maximal. A person is said to possess complete social health if he communicates effectively with his family, friends and colleagues; if he discharges his obligations toward family and state; and if he contributes constructively to the progress of society.

1. Principles of a state policy in field of public health care in the republic of Belarus.

Essential health care is made up of the following components:

- Food supply and nutrition;
- Water supply and basic sanitation;
- Maternal and child health including family planning services;
- Immunisations;
- Prevention and control of the locally endemic diseases;
- Health education;
- Appropriate treatment of common diseases and injuries;

- Provision of essential drugs.

The state policy in field of public health care in RB is based on **following principles**:

- preventive orientation;
- availability of medical aid and pharmaceutical maintenance;
- responsibility of the state and employers for people's health;
- equal possibilities of public health services development irrespective of a departmental accessory and patterns of ownership;
- economic interest in health preservation;
- participation of public and people in health protection.

Basic principle of health protection is the preventive orientation.

Prevention – is the system of state, public and medical actions directed on creation of optimum life conditions for person, to full meeting its physiological requirements.

There are primary, secondary and tertiary prevention.

Primary prevention is directed on maintenance and strengthening of healthy people health, elimination of disease reasons.

Secondary prevention serves for early diagnostics of diseases, increase of host defenses in adverse ecological conditions.

Tertiary prevention is applied for prevention of complications, maintenance and strengthening of patient's health.

A studying object of preventive medicine is separate healthy person and collectives of practically healthy people. A scientific basis of preventive medicine is hygiene which specifies ways of maintenance and strengthening of health, prevention of illnesses.

2. Hygiene as a science, its purpose, tasks.

Hygiene - is a science about laws of environment factors' influence on individual and public health and conditions of its maintenance and strengthening.

Hygiene provides maintenance and strengthening of individual and public health by:

- optimization of environmental factors,
- prevention of their negative influence,
- strengthening of their positive influence on a person.

Hygiene carries on subjects of preservation and strengthening of individual and public health by optimization of environmental factors, prevention of their negative and strengthening of positive influence on a person.

Subjects of hygiene is health and environment.

Person's health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity.

Physical well-being - harmony of physiological processes and maximum adaptation to factors of environment, mental - negation of illnesses, physical defects and its overcoming, social - active relation to society, all world around.

Population's health is a condition of full well-being according to demographic indications, morbidity, physical inabilities, traumatism and physical development.

Demographic indications:

- birth rate;
- death rate;
- population natural increase;
- average lifetime.

Primary, general and professional *morbidity* are distinguished.

Physical development is characterized by somatoscopical, anthropometrical and physiometrical indicators.

Following are the important **statistical indices** of a country's health status:

- Crude birth rate,
- Crude death rate.
- Specific death rates.
- Standardized death rates.
- Proportional mortality rate.
- Age proportional mortality rates.
- Maternal mortality rate,
- Infant mortality rate.
- Neonatal and post-neonatal mortality rates.
- Percentage of low birth weight babies.
- Perinatal mortality rate.
- Pre-school child mortality rate,
- Life expectancy,
- Disability days.
- Sullivan's index,
- Physical quality of life index,
- Disability adjusted life years,
- Blindness incidence rate,
- Human development index.

Determinants of health are the factors that influence on health of a person. These are diverse. Some of the factors relate to the person; these are known as *host factors*. Others are outside the person, and are referred to as the environmental factors. Host determinants are of two types:

1. Biological.
2. Non-biological.

Biological factors are beyond the person's control; examples are age, gender, heredity and race. *Non-biological determinants* are the learnt and

acquired factors. They depend on training education, stimulation and encouragement the person receive from parents, school teachers, friends and role models-real and fictional. Also they are influenced by the family traditions, food habits, social norms, customs, folkways and more.

Agent Determinants

Pathogenic micro- and macro-organisms, nutrient, dusts, physical factors and chemical substances are the agent determinants. The lodgment of pathogenic micro-organisms followed by their multiplication and toxin elaboration initiates infectious diseases. Lack of nutrients produces deficiency disorders. Chronic inhalation of dusts gives rise to pneumoconiosis. Ultraviolet rays and ionizing radiation produce somatic and genetic damage. Lead, arsenic, iodine, fluorine are some of the chemicals that affect human health.

Environmental determinants are of two types:

1) Physical environmental determinants. These include climate, air quality, water quality, soil, natural resources, biological diversity, etc.

2) Socio-political environment. This is made up all the visible and invisible, tangible and intangible things around a given person at a given moment.

Some of the determinants of health:

Age: Certain diseases are common in certain age groups and rare at other ages. Communicable diseases and nutritional deficiencies are common in children. Typhoid, pellagra, Kyasnur Forest Disease and sexually transmitted diseases including AIDS are common in adults. Heart diseases, cancers and chronic degenerative diseases are common in aged individuals,

Sex: Reproductive system disorders are separate for the two sexes. Cardiovascular diseases, cerebro-vascular accidents, Turner' syndrome and haemophilia are common in men whereas schizophrenia, Klienfelter's syndrome, and caries are common in women.

Heredity: Parents who have genetic diseases pass on their defective genes to the progeny Blood groups inherited from parents are also determinants of health. Persons with blood groups other than A are less susceptible to stomach cancer than those with that blood group.

Race: The dark skin of Negroes protects them against the harmful effects of ultraviolet radiation

Immunity: Infants having maternally transferred antibodies, measles and tetanus do not suffer from these.

Nutritional Status and Fitness: Good nutritional status and a body made strong through regular moderate exercise and/or yoga promote the natural defences of the body and make it resistant to diseases.

Life Style: Those who follow healthy life styles are much healthier than those who follow injurious life styles. Some examples of good life styles are washing hands with soap and water before eating, avoidance of excess salt, fats, sweets and cholesterol-containing items consumption of fiber-rich foods,

abstaining from tobacco, alcohol and drugs of addiction indulgence in safe sex practices, and practicing relaxation techniques,

Physical Environment: Air - both outdoor and indoor - that is free of pollutants, water that is safe to drinking and soil which is free of harmful chemical and parasitological agents are guarantee of good health.

Poverty, Unemployment, Bad housing and Illiteracy: General morbidity and mortality, perinatal mortality, infant mortality and maternal mortality are higher in the poor, the unemployed, the slum dwellers and the illiterate than in the rich, the well employed, the dwellers of good houses and the literate.

Health Services: Health services that are equitably distributed and easily accessible to all and that lay stress on prevention of diseases promote the health of the population.

Child Rearing Practices/Trust: A few days' delay in commencing breast-feeding deprives the baby of the rich nutrients and protective antibodies that are in abundance in colostrums, and thus makes it prone to suffer from infections. Failure to show love and affection on the child, too much or too less disciplinary control over him, and lack of parent-child communication and interaction lead to the child developing psychological and sociopathic conditions. Interpersonal interactions based on trust and good will promote health.

Risk factors for health are superfluous body weight, irrational food, mental overstrain, abusing alcohol, nicotine, etc.

The hygiene purpose is substantiation of hygienic norms, specifications, rules and actions which realization will provide optimum conditions for ability to live, strengthening of health and diseases prevention.

Tasks of hygiene:

- studying of factors influence on an organism;
- revealing of risk factors and carrying out of hygienic diagnostics;
- working out and introduction of specifications on safety and harmlessness of factors for an organism;
- working out and introduction of actions for population and environment improvement;
- forecasting of situation for nearest and remote prospect.

Sanitary - set of practical actions directed on carrying out in life hygiene requirements. There are school, industrial, housing-municipal and food sanitary.

3. Differentiation of hygiene, communication with other sciences.

Hygiene as a science subdivides into general and private.

The *general hygiene* includes:

- methodology;
- theoretical bases;
- hygienic rationing;
- hygienic toxicology and other sections.

The *private hygiene* includes:

- hygiene of work;
- hygiene of children and teenagers;
- hygiene of food;
- municipal hygiene;
- radiating hygiene;
- hygiene of hot climate and other sections.

Hygiene of work is a section of hygiene about influence of labour activity and industrial environment on worker's organism.

Hygiene of children and teenagers studies influence of environment factors on children's organism.

Hygiene of hot climate studies influence of environmental factors of hot climate on population's health.

Hygiene of food considers questions of food substances and diets influence on person's health.

Radiating hygiene studies influence of ionizing radiation on a person.

Municipal hygiene studies influence on a human body of environment factors in conditions of populated area.

The private hygiene are also divided into *personal*, developing questions of preservation and strengthening of concrete person's health, and *public*, studying preservation and strengthening of populations' health.

Hygiene is connected with all medical sciences, and also with chemistry, physics, biology, epidemiology, mathematics, social studies. At the present stage close connection of hygiene with ecology and anthropocenology is marked.

4. Methodology and theoretical bases of hygiene.

Hygiene uses laws of personal development, the basic ecological law, the law of dynamic balance, laws of influence of ecological factors on organisms.

Basic hygienic laws:

1. the law about health failure - health failure by influence of environmental factors occurs at the presence of etiological factor, mechanism of influence and sensitive organism;
2. the law about environment influence on health - natural environment at rational use promotes preservation and health strengthening, and polluted environment causes health deterioration;
3. the law about person's influence on environment - during industrial and household activity a person negatively influences upon environment, polluting and destroying it, and during improvement of working conditions and life influences positively, protecting and improving it.

Methods of studying:

- a. hygienic method of health studying;
- b. method of hygienic inspection;
- c. method of hygienic experiment;

d. method of hygienic examination.

The hygienic method of health studying (allows to study the state of population's health depending on social and natural factors):

- statistical research of health;
- epidemiological studying of health;
- medical examination of population;
- clinical supervision over separate groups.

The method of hygienic inspection (allows to estimate the observable factor visually, and also by means of interrogation, questionnaires, and interviews):

- sanitary and sanitary-topographical description;
- sanitary-hygienic inspection.

Laboratory and tool researches with application of physical, chemical, biological, bacteriological and mathematical methods can be used.

Physical methods allow to take temperature, humidity, pressure, noise levels, vibrations, radiation.

Chemical - to define chemical compound of water, soil, air, food, maintenance in them of toxic substances.

By means of *biological* methods it is possible to study distribution of viruses, mushrooms, seaweed, elementary and arthropods in environment and dwelling.

Bacteriological methods give the chance to define bacterial impurity of water, soil, air, food products, medicines, equipment, personnel hands.

Mathematical - to spend processing of the received data, to calculate average and relative sizes, correlation and regress factors, to deduce certain laws.

The method of hygienic experiment:

- natural researches - allow to study population's health in real conditions of labour and household activity;
- laboratory researches - allow to study influence of environmental factors at carrying out of researches at volunteers, animal, mathematical models and laboratory installations.

The method of hygienic examination is applied in a course of precautionary and current state sanitary inspection, at research of food products, children's toys etc. (hygienic registration, regulation and certification).

4. History of hygiene development.

The history of hygiene development is subdivided into *the empirical and scientifically-experimental periods*.

During the empirical period hygienic skills have received greatest development in the Ancient Greece and Ancient Roman empire. At the this time the founder of medicine Hippocrates has created the treatise «About air,

waters and districts» in which influence of environment factors on health was described.

Elaborate codes of hygiene can be found in several Hindu texts, such as the Manusmriti and the Vishnu Purana. Bathing is one of the five Nitya karmas (daily duties) in Hinduism, not performing which leads to sin, according to some scriptures. These codes were based on the notion of ritual purity and were not informed by an understanding of the causes of diseases and their means of transmission. However, some of the ritual-purity codes did improve hygiene, from an epidemiological point of view, more or less by accident.

Regular bathing was a hallmark of Roman civilization. Elaborate baths were constructed in urban areas to serve the public, who typically demanded the infrastructure to maintain personal cleanliness. The complexes usually consisted of large, swimming pool-like baths, smaller cold and hot pools, saunas, and spa-like facilities where individuals could be depilated, oiled, and massaged. Water was constantly changed by an aqueduct-fed flow. Bathing outside of urban centers involved smaller, less elaborate bathing facilities, or simply the use of clean bodies of water. Roman cities also had large sewers, such as Rome's Cloaca Maxima, into which public and private latrines drained. Romans didn't have demand-flush toilets but did have some toilets with a continuous flow of water under them.

Until the late 19th Century, only the elite in Western cities typically possessed indoor facilities for relieving bodily functions. The poorer majority used communal facilities built above cesspools in backyards and courtyards. This changed after Dr. John Snow discovered that cholera was transmitted by the fecal contamination of water. Though it took decades for his findings to gain wide acceptance, governments and sanitary reformers were eventually convinced of the health benefits of using sewers to keep human waste from contaminating water. This encouraged the widespread adoption of both the flush toilet and the moral imperative that bathrooms should be indoors and as private as possible.

Islamic hygienical jurisprudence

Since the 7th century, Islam has always placed a strong emphasis on hygiene. Other than the need to be ritually clean in time for the daily prayer through Wudu and Ghusl, there are a large number of other hygiene-related rules governing the lives of Muslims. Other issues include the Islamic dietary laws. In general, the Qur'an advises Muslims to uphold high standards of physical hygiene and to be ritually clean whenever possible.

Hygiene in Ancient Europe

Contrary to popular belief and although the Early Christian leaders condemned bathing as unspiritual, bathing and sanitation were not lost in Europe with the collapse of the Roman Empire. Soapmaking first became an established trade during the so-called "Dark Ages". The Romans used scented oils (mostly from Egypt), among other alternatives.

Bathing did not fall out of fashion in Europe until shortly after the Renaissance, replaced by the heavy use of sweat-bathing and perfume, as it was thought in Europe that water could carry disease into the body through the skin. (Water, in fact, does carry disease, but more often if it is drunk than if one bathes in it; and water only carries disease if it is contaminated by pathogens.) Medieval church authorities believed that public bathing created an environment open to immorality and disease. Roman Catholic Church officials even banned public bathing in an unsuccessful effort to halt syphilis epidemics from sweeping Europe. Modern sanitation was not widely adopted until the 19th and 20th centuries.

In Renaissance *in Russia* Peter I has created Medical office, has published decrees on public health care, watched by sanitary condition and food of armies. The big attention was given to hygienic skills in the Great Princedom Lithuanian.

Particularly as the science hygiene has started to be formed during an capitalism epoch in the end of XVIII century with occurrence in the press of medical works of P.Franka, H.Gufelanda, M.V.Lomonosova, M.J.Mudrova, Z.E.Zhilibera, etc. During this period hygiene represented a science which is based only on supervision and descriptions.

In the middle of XIX century the big contribution to development of experimental hygiene have brought M.Pettenkofer, A.P.Dobroslavina, F.F.Erisman, working in the field of hygiene of environment, food, work, school and military hygiene.

Fast rates hygiene in the Soviet state developed. Its successes after revolution are connected with works of N.A.Semashko, Z.P.Soloveva, A.N.Sysina, G.V.Hlopina which a lot of attention gave the public health services organisations, to questions of hygiene of water, work and food, methods of hygienic researches, military hygiene.

In post-war years the big attention was given to treatment-prophylactic establishments, air environment of industrial and residential buildings, to accomplishment of objects, water and soil structure, foodstuff, village problems, introduction of new technics. F.G.Krotkov, V.A.Rjazanov, S.N.Cherkinsky, A.A.Minh, G.N.Serdjukovskaja, G.I.Sidorenko, N.F.Izmerov, R.D.Gabovich, M.G.Shandala, E.I.Goncharuk, G.I.Rumjantsev, J.P.Pivovarov, and also Belarus scientists-hygienists Z.K.Mogilevchik, P.V.Ostapenja, I.B.Kardash, D.P.Beljatsky, etc. were engaged in scientific working out of these questions, etc.

6. Features of hygiene development at the present stage.

At the present stage of hygiene development the increased role in the general system of populations' health maintenance and strengthening is marked.

Abrupt health decline can be caused by:

- occurrence of new chemical, physical and biological components in water, air, food products and soil;
- intensive environmental contamination;
- irrational food.

Actual is:

- substantiation of recommendations about healthy lifestyle and personal hygiene;
- effective primary and secondary prevention of the most widespread diseases;
- working out of modern hygiene theory questions;
- decision of problems of hygienic rationing, hygienic diagnostics, urbanization, acceleration;
- forecasting of environment influence on a person.

Hygienic normalization - setting of harmless and safe levels of environment harmful influence on a person: maximum permissible concentration (MPC) of chemical substances and dust, maximum permissible levels (MPL) of physical factors.

Hygienic normative - quantitative level of harmful factor that is the highest possible physiologically safe for an organism. There are optimum, admissible, as much as possible admissible and as much as possible transferred levels of hygienic normative.

The purpose of **hygienic diagnostics** - is setting of cause-effect relation between influence of environment factors and state of health. Doctor of any speciality should possess hygienic thinking for correct choice of diagnostics methods and ways of illness treatment.

Hygienic diagnostics includes:

- diagnostics of environment condition,
- estimation of exposition and its levels,
- diagnostics of person's health state and population as a whole,
- communication diagnostics between environment factors and health,
- setting of environment factors contribution in etiology of health infringements.

Hygienic beforenosology diagnostics directed on research of organism functional state, being in premorbidal, or prepainful status. At correctly organized hygienic diagnostics and social and economic maintenance of environment improvement programs it is possible to operate formation of society health.

One of the major moments in hygienic diagnostics is risk estimation of environment factors adverse influence on health. The risk for health - is probability of disease occurrence for person during a certain period of time. The risk size is in direct dependence on an environment condition.

Socially-hygienic monitoring - system of organizational, social, medical and sanitary-hygienic actions providing continuous supervision, estimation and

forecast of health state and environment, and also prevention, revealing and elimination of harmful influence of factors on populations health.

Socially-hygienic monitoring includes:

- ecological supervision over air environment and water;
- supervision over radiating air pollution, soils and waters;
- supervision over social-labor sphere;
- sanitary-epidemiologic supervision over food and water supply of population;
- supervision over morbidity, physical development, demographic indicators of population.

7. Value of hygiene in maintenance of population's health.

Hygiene and sanitary possesses the leading part in preservation and strengthening of populations' health.

Now in formation of populations' health level 47-53 % belongs to lifestyle, 18-20 % - to genetic factor, 17-20 % - to environmental contamination factors, 8-10 % - to medical factors.

The public health services should make the basic support on formation of healthy lifestyle, and then on struggle against environmental contamination.

The important role in preservation and strengthening of population health belongs to the state sanitary inspection which primary task is control over carrying out sanitary-epidemiological and sanitary-hygienic actions directed on prevention and liquidation of environmental contamination, improvement of working conditions, training, populations' life and rest, sickrate decrease.

The Main state health officer of the republic of Belarus heads sanitary-epidemiologic service. The basic establishment of sanitary-epidemiologic service is centre of hygiene and epidemiology, carrying out sanitary-epidemiological actions on controlled territory. The centre of hygiene and epidemiology includes sanitary-hygienic, epidemiological and disinfection departments.

In a basis of sanitary epidemiological service activity lay preventive and current sanitary control.

Preventive sanitary control is carried out by three directions:

- at designing, construction and reconstruction;
- on protection of atmospheric air, reservoirs, water supply, ground;
- at establishment of sanitary hygienic norms and rules.

Current sanitary control assumes:

- a. studying of sanitary-hygienic working conditions. hygienic estimation of industrial sphere;
- b. laboratory control. supervision over condition of objects;
- c. detection and elimination of sanitary disutility;
- d. studying of morbidity and traumatism;
- e. organization of preventive inspection;

- f. control over observance of sanitary legislation concerning work of women and teenagers;
- g. control of physical development of children and teenagers;
- h. control of hygienic conditions of training, regimen of day of schoolboy and children in other establishments;
- i. control of condition of air environment, reservoirs, ground;
- j. maintenance of sanitary-hygienic requirements at development of regulations;
- k. supervision over state of populations' health;
- l. development of tasks and offers on elimination of sanitary lacks and improvement sanitary condition of object;
- m. organization of sanitary-educational work and sanitary-engineering training;
- n. application of sanctions (summary punishments, penalties, withdrawal of products, a suspension of work of object or shop, discharge from work, etc.);
- o. observance of sanitary-hygienic norms by manufacture, transportation, storage and realizations of food products;
- p. organization of balanced diet of population;
- q. control of improving actions stipulated by comprehensive plan;
- r. presentation of plans-tasks on improvement and reduction conformity with sanitary hygienic norms.

The sanitary-epidemiologic service includes:

1. Central administrative board of hygiene, epidemiology and prevention of Ministry of Health Service of the republic of Belarus.
2. The republican center of hygiene and epidemiology.
3. Regional, city centers of hygiene and epidemiology.
4. Centers of disinfection and sterilizations.
5. The scientific research institute of hygiene and epidemiology.

The sanitary-epidemic service provides:

- gathering and analysis of information about sanitary-epidemiologic, ecological and demographic situation;
- revealing factors of environment and reasons influencing on populations' health;
- registration and analysis of infectious and professional diseases;
- supervision for observance of sanitary legislation, sanitary norms and rules;
- suppression of infringements of sanitary legislation and rules;
- entering offers on performance of sanitary legislation and maintenance of sanitary-epidemic well-being of population;
- normalization of factors of inhabitancy, regulation and registration of chemical and biological substances and also products from them;
- social-hygienic monitoring for quality of inhabitancy and state of populations' health;

Basic functions of CHE:

- a. studying of basic questions of economic construction and sanitary condition of region;
- b. studying state of populations' health (demographic parameters, parameters of morbidity, and parameters of physical development);
- c. systematic sanitary-hygiene investigation of water, air, ground and food products (milk, vegetables, meat, fruits etc.);
- d. precautionary sanitary supervision at construction of local objects;
- e. current sanitary inspection for objects of area;
- f. carrying out of antiepidemic actions: processing of seat of disease, inspection of seat of infectious disease with purpose of finding-out of source, ways of transfer - operative work; preventive work - regular carrying out or control of preventive inoculations; struggle with carriage of bacilli; struggle against carriers of infections (mosquitoes, flies, etc.);
- g. development of offers on realization of basic improving actions and entering into directing bodies of projects, decisions.

8. Value of hygiene for doctor of a medical profile.

Special value for doctor hygiene of treatment-preventive organizations, or hospital hygiene which studies questions of placing, planning, sanitary-technical accomplishment and maintenance of treatment-preventive organizations and develops the actions directed on increase of medical-improving process efficiency, and also creation of optimum conditions for treatment of sick and favorable working conditions of medical personnel.

Medical aid for population of the Republic of Belarus is rendered by wide network of the treatment-preventive organizations:

- a. hospitals (republican, regional, city, regional, local);
- b. dispensary (antituberculous, dermatovenerologic, oncological etc.);
- c. polyclinic (city and district clinics, health centres, ambulance stations);
- d. motherhood and childhood protection (maternity hospitals, children's consultations, day nursery, children's homes);
- e. sanatorium (sanatoria);
- f. fast and urgent medical aid (station of the fast and urgent help).

At training of medical specialists studying of food hygiene is obligatory, as food is one of powerful tools at treatment of many diseases. The knowledge of food hygiene for doctor-dietician has important meaning.

Problem of any medical worker is protection and improvement of environment which pollution makes negative impact on populations' health.

CHAPTER 2. HYGIENIC VALUE OF ENVIRONMENT

Study questions.

1. *Influence of environment on a person.*
2. *Hygienic characteristic of atmospheric air.*
3. *Hygienic characteristic of water.*
4. *Hygienic characteristic of soil.*
5. *Environmental contamination and its hygienic value.*
6. *Prevention of adverse influence of factors and environment pollutants on health.*

The knowledge of questions of environment hygiene has great value for a doctor of medical profile, first of all, a doctor-therapist of polyclinic and a doctor of general practice. Therapist and doctor of general practice at finding-out of illness etiology should pay attention to environment factors, pollutants and sources of pollution and give recommendations to patients on prevention of harmful factors influence on health and protection of environment from pollution.

1. Influence of environment on a person.

During all life a person is under the influence of natural physical, chemical and biological factors of environment, and also various pollutants.

More often environment factors influence on a person in common. **Joint influence** of environment factors is carried out in the form of **combined** (influence of several factors of one nature), **associative** (influence of factors of the different nature) and **complex** (influence of factors by different ways) influences. As a result of interaction among themselves one factors can strengthen or weaken action of others, be summarized or remain indifferent.

In reply to change of an environment's condition in a human body functional reorganization of physiological, biochemical and biophysical processes is carried out. In the result of functional reorganization an adaptation to new conditions is carried out. If intensity of environment factors for a person is optimum we can speak about **hygienic comfort**.

An organism can adapt for the factors which are overstepping the norm's limit, or to be in a resistance condition to any factor. Some functional infringements caused by environment factors, an organism can compensate. If it is not enough protective forces of an organism for restoration of the broken functions the condition of decompensative develops, leading to illnesses.

Hygiene of environment studies laws of influence of atmospheric air, water and soil factors on a person and population as a whole and develops actions for the prevention of adverse influence of factors on health and protection of environment from pollution. Its **purpose** - a scientific substantiation of general principles and approaches to improvement of working

conditions, life and rest, protection and strengthening of people's health in continuously changing conditions of environment.

As discussed throughout, numerous human diseases and conditions have been linked with exposures to environmental contaminants, some more strongly than others. Identifying diseases that might be associated with environmental contaminants, and determining the existing data sources available for them, is a key part of the effort to better characterize links between environmental exposures and adverse health outcomes.

Environmental Protection Agency has selected those human diseases and conditions with well-established associations with exposures to environmental contaminants and for which national data are available, recognizing again that in most cases risk factors are multi-factorial and that the development of a particular disease or condition depends on the magnitude, duration, and timing of the exposure. Covered health outcomes fall into the following five broad categories: cancer, cardiovascular disease, respiratory disease, infectious disease, and birth outcome. The reasons for the inclusion of each are highlighted below.

Development of some **ecological diseases** is connected with influence of environment factors, in particular, acrodynia (poisoning by mercury), illnesses of the Minimat (intoxication by the methyl-mercury), illnesses of Yusho (influence of polychlorinated biphenyls), illnesses of itaj-itaj (cadmium osteomalacia). Environment factors make also harmful impact on reproductive function, promote development of malignant new growths and allergic illnesses.

Except "classical" ecological diseases, attention of doctors ecologically caused diseases («syndrome of chronic weariness», «syndrome of plural chemical sensitivity» etc.), involve.

2. Hygienic characteristic of atmospheric air.

Knowledge of bases of atmospheric air hygiene very important for a doctor as a premises microclimate depends from atmospheric air condition. At influence of atmospheric air factors at person diseases and pathological conditions can develop, and a doctor needs to be able to develop actions for their prevention.

Value of **atmospheric air** for a person:

- participates in breath, secretion, heat exchange and other physiological processes;
- forms air environment of inhabited and industrial premises;
- is the reservoir of accumulation of harmful substances, a source of water and soil pollution;
- is a climateformation factor;
- it is used as means of tempering;

- some components it is applied for treatment (infra-red and ultra-violet beams - for treatment of inflammatory processes, low temperatures - in surgical practice, hyperbaric oxygenation - in therapy of internal and nervous illnesses).

Physical factors of atmospheric air - solar radiation, atmospheric pressure, humidity, air movement, electric field concern to meteorological and participate in weather formation. Weather is a condition of atmosphere in a given place during the certain moment. Except specified factors, in weather formation certain value belongs to cloudiness, precipitation, fogs.

A person, who has moved to new climatic area, is compelled to acclimatise. **Acclimatisation** is a process of the adaptation to new climatic conditions.

Acclimatisation to a cold climate is accompanied with:

- increase of a metabolism;
- increase volume of circulating blood;
- decrease in maintenance of vitamins C, B and D.

Acclimatization to a hot climate is accompanied by reduction of pulse rate, blood pressure, temperatures, metabolism.

In the course of acclimatization the role of favorable working conditions, life, food, clothes and footwear, personal hygiene, tempering and trainings is great.

Properties of atmospheric air:

1. Physical (temperature, humidity, pressure, movement, electric condition, radio-activity);
2. Chemical (nitrogen, oxygen, inert gases, carbon dioxide, ammonia, methane, hydrogen sulphide, sulfurs dioxide);
3. Biological (bacteria, fungi, monocelled seaweed, viruses, spore, pollen of plants).

Air temperature is defined by quantity of heat received from heat up by the sun of bedrock and water. It depends on geographical width, height above sea level, season, time of days.

Temperature biological effect consists in boring of skin's receptor and influence through central nervous system on respiratory and cardiovascular systems, metabolism, thermoregulation.

Long influence of a heat can lead to thermal hyperthermia (body's temperature rises, headaches, vomiting, infringement of light perception, consciousness loss).

Cold action causes:

- vasomotor spasms;
- fever;
- loss of skin's sensitivity;
- numbness;
- swelling of fingers of hands, feet;
- frostbiting;

- hypothermia which conducts to increase of acute catarrhal diseases or to an aggravation of chronic bronchitis, myosites, neuritis, rheumatism, tuberculosis, pneumonia, etc.

Hypothermia is a core body temperature $< 35^{\circ}\text{C}$. Hypothermia results when body heat loss exceeds body heat production. Hypothermia is most common during cold weather or immersion in cold water, but it may occur in warm climates when people lie immobile on a cool surface (eg, when they are intoxicated) or after very prolonged immersion in swimming-temperature water (eg, 20 to 24°C).

Hypothermia slows all physiologic functions, including cardiovascular and respiratory systems, nerve conduction, mental acuity, neuromuscular reaction time, and metabolic rate. Thermoregulation ceases below about 30°C ; the body must then depend on an external heat source for rewarming. Renal cell dysfunction and decreased levels of ADH lead to production of a large volume of dilute urine (cold diuresis). Diuresis plus fluid leakage into the interstitial tissues causes hypovolemia. Vasoconstriction, which occurs with hypothermia, may mask hypovolemia, which then manifests as sudden shock or cardiac arrest during rewarming (rewarming collapse) when peripheral vasculature dilates.

Symptoms and Signs: Intense shivering occurs initially, but it ceases below about 30°C , allowing body temperature to drop more precipitously. CNS dysfunction progresses as body temperature decreases; people do not sense the cold. Lethargy and clumsiness are followed by confusion, irritability, sometimes hallucinations, and eventually coma. Pupils may become unreactive. Respirations and heartbeat slow and ultimately cease. Initially, sinus bradycardia and slow atrial fibrillation are present; the terminal rhythm is ventricular fibrillation or asystole. However, these rhythms are potentially less ominous than in normothermia.

Humidity is defined by quantity of steams of water in air. Distinguish absolute, maximum and relative humidity and also deficiency of saturation and dew point. Absolute humidity perceive elasticity of water steams at present time, maximum - elasticity of water steams at full saturation of air by a moisture at given temperature, relative - percentage of absolute humidity in relation to maximum. Deficiency of saturation is difference between maximum and absolute humidity and dew point is a temperature at which air is as much as possible sated by water pairs. Humidity depends on a season of year, time of days, air temperature.

The humidity biological effect consists in influence on thermoregulation, humidification of mucous. For person relative humidity 50 % (40-60 %) is optimum.

At humidity less than 20 % there is thirst, drying mucous, organism dehydration. High humidity conducts to thermoregulation breaking. Dry air is tolerated by human body easier, than crude. At relative humidity below 20 % mucous membranes of nose, pharynx, mouth, eyes dry up. Relative humidity

more than 90 % leads to the termination of sweat evaporation and organism overheating. High humidity reduces stability of an organism to tuberculosis, rheumatic and catarrhal illnesses.

Air movement is characterized by direction and rate. It is caused by moving of air masses because of temperature and pressure difference. For revealing of patterns of direction of locomotion wind rose representing lines of points for which pieces corresponding on length and number to winds of certain direction are postponed, expressed in percentage in relation to their general number is used. During finding on open air it is necessary to consider wind direction, as north colder and southern warmer.

The biological effect of air movement rate consists in influence on thermoregulation, breath processes, psychological status, metabolic cost, skin receptors. Optimum for person rate of locomotion is 2.5 (1-4) m/s.

Weak wind or its absence reduces return of heat by an organism.

At the raised speed of air movement:

- Increases thermolysis by convection and sweat evaporation;
- psychological state and general state of health worsens;
- Performance of physical work is at a loss.

Optical part of **solar spectrum** including infra-red long-wave (2800-1500 nanometers) and short-wave (1500-760 nanometers) beams, visible beams (760-400 nanometers) and also ultra-violet A-radiation (400-315 nanometers) and B-radiation (320-280 nanometers). At a surface of the Earth infra-red beams - 59 %, visible - 40 %, ultra-violet - 1 %.

Hygienic role of **solar radiation** - stimulation of physiological processes, improvement of health state, increase of general tone and working capacity. Biological action is caused by warming up of skin and tissues.

At the raised intensity infra-red radiation can lead to skin erythema, cataract of eyes. In heavy cases the sunstroke develops which is accompanied by strong excitation, consciousness loss, spasms. At the influence of intensive ultra-violet beams there is skin erythematic irritation, headache, temperature rise, in heavy cases - burns, dermatitises, photo-ophthalmia, malignant tumors.

At insufficient ultra-violet radiation tone and resistance of an organism decreases, D-avitaminosis leading at children to rickets, at adults - to an osteoporosis can develop. At insufficient visible radiation vision functions worsen, daily rhythms are broken, at raised - there can be a blinding, retinitis.

Ultra-violet radiation with length of wave 400-315 nanometers has weak biological action, area of waves 315-280 nanometers is characterized by strong influence on skin and antirachitic action. Waves of 280-200 nanometers has bactericidal action.

Biological action of ultra-violet radiation consists in influence on an organism and can cause dermatitis with eczema, puffiness and itch, burns, headaches, hypertermia, nervous excitation, photo-ophthalmia.

Joint influence of temperature, humidity and air movement on a thermoregulation is well studied.

It is established, that heat is easier tolerated at low humidity and strong wind.

Low temperature together with high humidity and strong wind can lead to frigorism, heat with high humidity and absence of air motion - to overheat.

Thermolysis it is carried out:

- conducting (basically by convection) owing to difference of body temperature of person and air;
- radiation owing to difference of temperatures of surface of person body and surrounding subjects;
- evaporation of moisture from skin surface, lungs and respiratory tracts depending on difference in pressure of water steams on these surfaces and in air.

Biological role of oxygen - participation in breath and processes of energy balance. Decrease of oxygen in air to 17 % leads to pulse and breath increase, to 11 % - to working capacity decrease, to 7-8 % - to death. Central nervous system is especially sensitive to hypoxia.

Biological action carbon dioxide, or carbonic gas - excitation of respiratory centre. Reduction of its contents in inhaled air causes apnoea. The increase of carbon dioxide to 0,1 % leads to discomfort, to 3 % - to headache, dyspnea, working capacity decrease, to 4-5 % - to face reddening, strong headaches, sonitus, increase of blood pressure, excitation, to 8-10 % - to formation in blood carbohaemoglobin, fast loss of consciousness and death.

Ozone takes part in oxidizing processes proceeding in an organism. At the raised concentration it causes irritation of respiratory tract mucous, dizziness, increase of adrenaline level, edema of lungs.

Microbiological objects of air are presented by bacteria, fungi, monocelled seaweed, viruses, spores and pollen of plants, elementary, helminths eggs.

In air contain basically saprophytes, but there can be also pathogenic microorganisms. Saprophytes, spores, pollen at hit in an organism can cause allergic reactions, and pathogenic microorganisms - diseases.

3. Hygienic characteristic of water.

The knowledge of bases of water hygiene has great value for a doctor as allows to provide rational water supply of organizations. At the influence of water factors at a person some diseases can develop, and a doctor needs to be able to develop actions for their prevention.

Value of water:

- provides a normal current of digestion, secretion and other processes of ability to live;
- participates in thermoregulation;

- promotes maintenance of colloidal conditions of blood plasma and turgor of cells;
- it is necessary for maintenance of cleanliness of body, clothes, dwellings, public buildings, streets;
- it is necessary for organisation of heating and removal of a sewage, watering of green plantings;
- it is necessary for washing of ware, kitchen stock, vegetables, berries and fruit, culinary processing of food;
- water of mineral underground sources is used as medical means at many diseases;
- it is applied for an organism tempering.

Hygienic requirements to water:

- a) should be colourless;
- b) transparent;
- c) not to have a smell;
- d) to possess pleasant freshening taste;
- e) to have a natural chemical compound;
- f) should not contain toxic chemical and radioactive substances, pathogenic microorganisms, helminths eggs.

Water factors:

1. Physical (smell, taste, color, muddiness, temperature);
2. Chemical (contents of hydrogen, oxygen, sodium, fluorine, iodine, chlorides, sulphates, carbonates and other chemical elements and connections);
3. Biological (bacteria, fungi, Protozoa, seaweed and other microorganisms, and also plants and animals).

Superfluous receipt in an organism with potable water of **chlorides** causes oppression of gastric secretion, reduction of diuresis, increase of blood pressure, **sulphates** - causes infringement of a water-salt exchange and dyspeptic phenomena.

Essential influence on an organism is rendered by **the calcium and magnesium salts** causing natural rigidity of water. In rigid water vegetables and meat badly boil soft, tea is badly infused. At the regular use of water with high rigidity a person has an urolithic illness is more often.

The raised quantity of **nitrates** in potable water can cause in children water-nitrate methemoglobinemia.

Endemic diseases connected with water consumption

Water is the basic source of fluorine and strontium receipt in an organism.

Fluorine participates in development of skeleton, teeth, stimulates hemopoiesis, immunity. At superfluous receipt of fluorine in an organism develops endemic illness fluorosis, insufficient - caries. **Strontium** participates in ossification processes. The raised introduction of strontium oppresses

osteogenesis and leads to occurrence of biogeochemical endemia «strontic rickets».

Prevention of endemic diseases:

- additive of necessary chemical elements in water and food;
- creation of special mineral preparations (iodination of salt, fluorination of waters, application of tooth-pastes with fluorine);
- dispensary supervision of population supervision in polyclinics, improvement of water quality.

Water indicators:

- a) organoleptic (smell, smack, turbidity, chromaticity, temperature);
- b) chemical (pH, chlorides, sulphates, iron, nitrates, fluorine, etc.);
- c) microbiological (microbic number, coli-index).

Water indicators of underground sources 1 class:

- color - no more 20°
- turbidity - no more than 1,5 mg/dm³
- iron - no more than 0.3 mg/dm³
- manganese - no more than 0.1 mg/dm³
- fluorine - no more than 1.5 mg/dm³
- number of bacteria of intestinal bacillus group - no more than 3 in 1 dm³
- dry residue should not exceed 1000 mg/dm³
- chlorides - 350 mg/dm³
- sulphates - 500 mg/dm³.

Water also should not contain activators of intestinal infections, toxic chemical substances.

There are two systems of **water supply**: decentralized, or local, and centralized.

Decentralized water supply is carried out from wells. The well should have a cover, filter, clay lock, asphalt or concrete platform with drainage flutes and a public bucket or the water pump. The well should be cleared and disinfected periodically.

Centralized water supply - from underground or open water sources.

The waterpipe consists of underground sources from:

- water fence;
- pumps of the first lifting;
- modular tank;
- pumps of the second lifting;
- water tower;
- delivery network.

Water is considered suitable for drink if the general microbic number no more than 50/sm³, thermotolerant and the general coliform bacteria are absent in 300 sm³, coliphage - in 100 sm³.

Open sources, or land waters can be divided on natural and artificial. Natural open sources: rivers, lakes and ponds. Artificial - water basins and channels. River water is characterized by a large quantity of the weighed substances, a low transparency and large microbial in-seminating. Lakes and ponds are exposed to large pollution by chemical, physical and biological agents and possess poorly expressed ability to self-cleaning. Water basins arrange on the rivers which have been partitioned off by dams.

Underground sources are resulted from atmospheric precipitation or water of open reservoirs filtration. Underground sources: soil, ground and interstratal waters.

Soil waters lie down close to a earth's surface, therefore its composition is exposed to sharp changes.

Subsoil waters are colourless, transparent, are characterized by good taste. Between soil and ground water there is a water exchange. Depth of soil water - 2-20 m. Soil waters are used for water supply in a countryside at the decentralised water supply.

Interstratal water is concluded between two water-proof lays. interstratal water have steady physical properties, chemical and microbial content.

It is equally important to ensure the safety of water and provide adequate quantities.

Methods of water quality improvement:

1. Treating.
2. Disinfecting.
3. Special methods of processing.

Treating is directed on clarification and water decolouration, disinfecting - on destruction of microorganisms. Special methods are directed on improvement of separate indicators of water.

Water treating:

- a) mechanical (upholding);
- b) physical (filtering);
- c) chemical (coagulation).

Water disinfecting:

- a) chemical (chlorine and its connections, ozone, iodine, silver, etc.)
- b) physical (boiling, ultra-violet irradiation, ultrasound, ionizing radiation).

Special methods:

- a) deodorization - is a removal of extraneous smells and smacks of water;
- b) decontamination - elimination of the dissolved harmful gases;
- c) hardness removal- full or partial clearing of water from cationes of calcium and magnesium;
- d) desalination- removal of salts;
- e) iron removal;

- f) deactivation - removal of radioactive substances;
- g) fluorination - fluorine addition.

4. Hygienic characteristic of soil.

The great value has knowledge of bases of soil hygiene for a doctor. Soil pollution by chemical and radioactive substances can lead to high maintenance of toxic substances and radioactive nuclides in herbs. These products can make negative impact not only on biological activity of a preparation, but also is direct on a human body. At the influence of soil factors at a person some diseases can develop, and the doctor needs to be able to develop actions for their preventive maintenance.

Soil is a natural body consisting of layers (soil horizons) of mineral constituents of variable thicknesses, which differ from the parent materials in their morphological, physical, chemical, and mineralogical characteristics. It is composed of particles of broken rock that have been altered by chemical and environmental processes that include weathering and erosion. Soil differs from its parent rock due to interactions between the lithosphere, hydrosphere, atmosphere, and the biosphere.

Value of soil:

- influences person's health through products of a vegetative and animal origin;
- is a primary factor of biogeochemical provinces formation;
- is environment for neutralisation of garbage;
- is a climateformation factor;
- some soils possess medical effect and are applied in medical practice at fangotherapy;
- influences chemical and bacterial structure of water (can become soiled toxic substances and pathogenic microbes).

Soil factors:

1. Physical (porosity, air permeability, moisture capacity, thermal capacity and thermal mode);
2. Chemical (contents of mineral and organic substances);
3. Biological (live organisms).

Silicon, iron, aluminium and some other chemical elements are part of soil dust which can cause irritation of skin and mucous, disease of lungs, to injure eyes.

Biogeochemical provinces - insufficient or superfluous content in soil of variety of chemical elements (iodine, cobalt, molybdenum, manganese, zinc, selenium, etc.) is marked.

Insufficient or superfluous content of mineral substances is reflected in chemical compound of water and plants and can lead to development of **biogeochemical endemias** at a person.

Biogeochemical endemic diseases are characterized by metabolism infringements. Endemic goitre developing owing to insufficient receipt of iodine in a human body. Molybdenosis caused by the high content of molybdenum in soil.

Prevention of endemic diseases:

- At a lack of microelements in soil it is recommended food with addition necessary elements;
- Reception of the medical products containing mineral substances;
- At surplus of microelements reception of defective foodstuff decreases and their replacement on good-quality is spent.

5. Environmental contamination and its hygienic value.

Environmental contamination is a risk factor and adverse impact on health that is expressed in infringement of functions of bodies and systems, occurrence of acute and chronic poisonings, disease increase, development of the remote consequences, delay of physical development, deterioration of demographic indicators makes. Also sanitary living conditions worsen.

One of environment problems is its pollution. **Pollution** is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem i.e. physical systems or living organisms. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the elements of pollution, can be foreign substances or energies, or naturally occurring; when naturally occurring, they are considered contaminants when they exceed natural levels. Pollution is often classed as point source or nonpoint source pollution.

In the late industrial age, the term **overpollution** was common, representing a view that was both critical of industrial pollution, but likewise accepted a certain degree of pollution as nominal industrial practice.

Forms of pollution

- Air pollution, the release of chemicals and particulates into the atmosphere. Common gaseous air pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. Particulate matter, or fine dust is characterized by their micrometre size PM_{10} to $PM_{2.5}$.
- Water pollution, by the release of waste products and contaminants into surface runoff into river drainage systems, leaching into groundwater, liquid spills, wastewater discharges, eutrophication and littering.
- Soil contamination occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, herbicides, pesticides and chlorinated hydrocarbons.
- Littering.

- Radioactive contamination, resulting from 20th century activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment. (See alpha emitters and actinides in the environment.)

- Noise pollution, which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.

- Light pollution, includes light trespass, over-illumination and astronomical interference.

- Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash or municipal solid waste.

- Thermal pollution, is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.

A **pollutant** is a waste material that pollutes air, water or soil. Three factors determine the severity of a pollutant: its chemical nature, the concentration and the persistence. **Pollutants** by origin can be chemical, physical and biological nature.

Sources and causes

Air pollution comes from both natural and man made sources. Though globally man made pollutants from combustion, construction, mining, agriculture and warfare are increasingly significant in the air pollution equation.

Motor vehicle emissions are one of the leading causes of air pollution. China, United States, Russia, Mexico, and Japan are the world leaders in air pollution emissions. Principal stationary pollution sources include chemical plants, coal-fired power plants, oil refineries, petrochemical plants, nuclear waste disposal activity, incinerators, large livestock farms (dairy cows, pigs, poultry, etc.), PVC factories, metals production factories, plastics factories, and other heavy industry. Agricultural air pollution comes from contemporary practices which include clear felling and burning of natural vegetation as well as spraying of pesticides and herbicides

About 400 million metric tons of hazardous wastes are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the world's population, but produce roughly 25% of the world's CO₂, and generate approximately 30% of world's waste. In 2007, China has overtaken the United States as the world's biggest producer of CO₂.

Some of the more common soil contaminants are chlorinated hydrocarbons, heavy metals (such as chromium, cadmium-found in rechargeable batteries, and lead-found in lead paint, aviation fuel and still in some countries, gasoline), zinc, arsenic and benzene. Ordinary municipal landfills are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have

been subject to little control in the U.S. or EU. There have also been some unusual releases of polychlorinated dibenzodioxins, commonly called *dioxins* for simplicity, such as TCDD.

Pollution can also be the consequence of a natural disaster. For example, hurricanes often involve water contamination from sewage, and petrochemical spills from ruptured boats or automobiles. Larger scale and environmental damage is not uncommon when coastal oil rigs or refineries are involved. Some sources of pollution, such as nuclear power plants or oil tankers, can produce widespread and potentially hazardous releases when accidents occur.

In the case of noise pollution the dominant source class is the motor vehicle, producing about ninety percent of all unwanted noise worldwide.

Human health

Adverse air quality can kill many organisms including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. An estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrhoeal sickness every day. Nearly 500 million Chinese lack access to safe drinking water. 656,000 people die prematurely each year in China because of air pollution. In India, air pollution is believed to cause 527,700 fatalities a year.

Oil spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to developmental deficits in children and neurologic symptoms. Older people are majorly exposed to diseases induced by air pollution. Those with heart or lung disorders are under additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems. Chemical and radioactive substances can cause cancer and as well as birth defects.

Atmosphere pollution - it is process of introducing new, not characteristic components for it (physical, biological, chemical agents or energy kinds), or excess of their natural level in quantities having negative influence on a person, animals or plants.

WHO reports that outdoor air pollution accounts for more than 800,000 deaths a year worldwide.

Sources of pollution of atmosphere can be natural and anthropogenous origin. Natural origin: space dust, volcanic, soil dust, fires, evaporations from a water, etc. Anthropogenous origin: industrial enterprises, boiler-houses, transport, agricultural enterprises, household objects, etc.

Atmospheres pollutants:

1. chemical nature (carbonic oxide, carbonic gas, oxides of sulfurs, nitrogen, ammonia, hydrocarbons, aldehydes, heavy metals, organic substances, etc);
2. physical nature (solar radiation, electromagnetic and an ionising radiation, noise, dust, ashes, soot);
3. biological nature (pathogenic microorganisms).

Sources of pollution of natural waters:

- *Atmospheric waters* carrying pollutants of an industrial origin washed away from air.
- *City sewage* including mainly household drains, containing excrements, detergents (surface-active substances), microorganisms, including pathogenic.
- *Industrial sewage* formed in the various branches of manufacture, consuming water.
- *Agricultural objects*.

Pollutants, arriving in sewage on a physical condition can be insoluble, colloidal, dissolved impurity, mineral, organic, bacterial and biological.

Use of water polluted by **benzene, arsenic, strontium, selenium, lead, mercury, pesticides** at a person can lead to defeat of digestive, blood and nervous systems, parenchymatous bodies, and polluted nitrose amines, **polycyclic and aromatic amines, surface-active substances** - to remote cancerogenic effects.

Contaminants of the biological nature can cause occurrence at a person:

- Intestinal infection contaminations (a cholera, a belly typhus, a paratyphus, a dysentery);
- Virus illnesses (infectious hepatitis, poliomyelitis);
- Zoonoses (tularemia, brucellosis);
- Protozoonoses (amebiasis, balantidiasis);
- Helminthiasises (ascariasis);
- Fungus diseases (epidermophytosis).

Soil contamination (soil pollution) is caused by the presence of xenobiotic (human-made) chemicals or other alteration in the natural soil environment. This type of contamination typically arises from the rupture of underground storage tanks, application of pesticides, percolation of contaminated surface water to subsurface strata, oil and fuel dumping, leaching of wastes from landfills or direct discharge of industrial wastes to the soil. The most common chemicals involved are petroleum hydrocarbons, solvents, pesticides, lead and other heavy metals. This occurrence of this phenomenon is correlated with the degree of industrializations and intensities of chemical usage.

The concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapors from the contaminants,

and from secondary contamination of water supplies within and underlying the soil.

Contaminated or polluted soil directly affects human health through direct contact with soil or via inhalation of soil contaminants which have vaporized; potentially greater threats are posed by the infiltration of soil contamination into groundwater aquifers used for human consumption, sometimes in areas apparently far removed from any apparent source of above ground contamination.

Health consequences from exposure to soil contamination vary greatly depending on pollutant type, pathway of attack and vulnerability of the exposed population. Chronic exposure to chromium, lead and other metals, petroleum, solvents, and many pesticide and herbicide formulations can be carcinogenic, can cause congenital disorders, or can cause other chronic health conditions. Industrial or man-made concentrations of naturally-occurring substances, such as nitrate and ammonia associated with livestock manure from agricultural operations, have also been identified as health hazards in soil and groundwater.

Chronic exposure to benzene at sufficient concentrations is known to be associated with higher incidence of leukemia. Mercury and cyclodienes are known to induce higher incidences of kidney damage, some irreversible. PCBs and cyclodienes are linked to liver toxicity. Organophosphates and carbamates can induce a chain of responses leading to neuromuscular blockage. Many chlorinated solvents induce liver changes, kidney changes and depression of the central nervous system. There is an entire spectrum of further health effects such as headache, nausea, fatigue, eye irritation and skin rash for the above cited and other chemicals. At sufficient dosages a large number of soil contaminants can cause death by exposure via direct contact, inhalation or ingestion of contaminants in groundwater contaminated through soil.

Sources of pollution of soil – household and industrial enterprises, power system, agriculture, transport, etc.

Harmful influence on soil structure and person's health renders not controllable application of pesticides, capable to collect in soil and possessing stability to decomposition. Pesticides can lead to poisonings of a person with affection of digestive, nervous and secretory systems and parenchymatous bodies.

Action of pesticides on person's health:

- cancerogenic;
- mutagen;
- negative influence on nervous and cardiovascular systems;
- infringement of adaptation-protective mechanisms of organism;
- decrease in immune resistance.

Diseases, transferred to a person through the polluted soil:

- Tetanus;
- Gas gangrene;

- Botulism;
- The Siberian ulcer;
- Tuberculosis;
- Poliomyelitis;
- ECHO;
- Ascariasis;
- Balantidiasis;
- Balantidiasis;
- Amebiasis.

6. Prevention of adverse influence of factors and environment pollutants on health.

For the prevention of adverse influence various pollutants of atmospheric air, water and soil on population health the big attention is given to protection of environment from pollution.

Protection of environment from pollution is a system of the actions directed on elimination of negative influence of a person in the form of emissions in air, dumps in water and garbage in soil, containing new agents, or exceeding their natural level. It is spent in many directions and includes performance of legislative, technological, sanitary-engineering, planning and organizational actions.

Protection actions from pollution.

1. Legislative actions for environmental protection - working out of Hygienic Standards (maximum permissible concentration for chemical substances and dust; maximum permissible level/dose for physical and biological pollutants).

2. Technological actions for environmental protection - working out and creation of the closed technological processes, technologies without waste, replacement of harmful substances of less harmful substances.

3. Planning actions for environmental protection - zoning of territory of a city, planning of residential area, its gardening, sanitary-protective areas (50-1000 m according to the damage class of an enterprises).

4. Sanitary-engineering actions for environmental protection - clearing of atmospheric emission, hydrospheric dumping, litospheric garbage by means of clearing devices, effective clearing of the occupied places of garbage, their gathering, removal, neutralization and recycling

5. Organizational actions for environmental protection - dumps at various times of day, monitoring.

CHAPTER 3. HYGIENE OF POPULATED AREAS AND DWELLING

Study questions.

1. *Planning of populated areas at the present stage.*
2. *An urbanization and its hygienic value.*
3. *Hygienic requirements to the territory choice for building of populated areas. Functional zoning of a city.*
4. *Hygienic requirements to a planning and building of residential settlements and microdistricts.*
5. *Features of a rural populated areas planning.*
6. *Hygienic requirements to a dwelling.*
7. *Features of planning, sanitary-technical accomplishment, equipment and maintenance of hostels.*

Correct from the hygienic point of view the planning of cities and rural settlements, their accomplishment and content in an appropriate sanitary condition have huge value in public health care.

The knowledge of hygiene questions of populated areas and dwelling has great value for doctors, first of all, a local doctor-therapist of polyclinic and a doctor of the general practice. A local therapist and a doctor of the general practice at finding-out of etiology of illness should pay attention to conditions of population's residing, condition of environment of populated areas, presence of pollutants and sources of pollution and to give recommendations about person's and environment improvement.

The notion of **sustainable development** is a fairly recent concept and somewhat controversial. Wheeler, in his 1998 article, suggests a definition for sustainable urban development to be as "development that improves the long-term social and ecological health of cities and towns." He goes on to suggest a framework that might help all to better understand what a 'sustainable' city might look like. These include compact, efficient land use; less automobile use yet with better access; efficient resource use, less pollution and waste; the restoration of natural systems; good housing and living environments; a healthy social ecology; sustainable economics; community participation and involvement; and preservation of local culture and wisdom.

1. Planning of populated areas at the present stage.

A city is a relatively large and permanent settlement, particularly a large urban settlement. Cities generally have advanced systems for sanitation, utilities, land usage, housing, and transportation. The concentration of development greatly facilitates interaction between people and businesses, benefiting both parties in the process. A big city, or metropolis, usually has associated suburbs.

Such cities are usually associated with metropolitan areas and urban sprawl, creating numerous business commuters traveling to urban centers of employment. Once a city sprawls far enough to reach another city, this region can be deemed a conurbation or megalopolis.

For cities illnesses of "urbanization" are characteristic, «the diseases connected with a building», «syndrome of a sick building» are registered.

A planning of cities and rural settlements is carried out according to SNaR 2.07.01-89 «Town-planning. A lay-out and building of city and rural settlements». Depending on a population a populated areas subdivide into largest, large, big, average and small.

The basic point of populated areas building is creation of maximum hygienic well-being for population providing expedient combination of possibilities for effective industrial activity and rest in the conditions of optimum comfort.

City-formation factors (which directly cause development of populated areas and building of new cities and settlements) are: industrial and agricultural enterprises, warehouses and bases of logistics, enterprise and establishment of external transport, construction organisations, administrative, public, research and cultural establishments.

A city population group:

- city-formation (workers of enterprises and establishments of city-formation values);
- serving (workers of enterprises and establishments, serving a population of given settlement);
- not amateur (children of preschool and school age, pensioners, pupils of higher educational institutions, technical schools, technical training colleges, housewives).

2. An urbanization and its hygienic value.

Urbanization is the physical growth of urban areas as a result of global change. Urbanization is also defined by the United Nations as movement of people from rural to urban areas with population growth equating to urban migration.

Urbanization occurs naturally from individual and corporate efforts to reduce time and expense in commuting and transportation while improving opportunities for jobs, education, housing, and transportation. Living in cities permits individuals and families to take advantage of the opportunities of proximity, diversity, and marketplace competition.

People move into cities to seek economic opportunities. In rural areas, often on small family farms, it is difficult to improve one's standard of living beyond basic sustenance. Farm living is dependent on unpredictable

environmental conditions, and in times of drought, flood or pestilence, survival becomes extremely problematic.

Cities, in contrast, are known to be places where money, services and wealth are centralized. Cities are where fortunes are made and where social mobility is possible. Businesses, which generate jobs and capital, are usually located in urban areas. Whether the source is trade or tourism, it is also through the cities that foreign money flows into a country. It is easy to see why someone living on a farm might wish to take their chance moving to the city and trying to make enough money to send back home to their struggling family.

There are better basic services as well as other specialist services that aren't found in rural areas. There are more job opportunities and a greater variety of jobs. Health is another major factor. People, especially the elderly are often forced to move to cities where there are doctors and hospitals that can cater for their health needs. Other factors include a greater variety of entertainment (restaurants, movie theaters, theme parks, etc) and a better quality of education, namely universities. Due to their high populations, urban areas can also have much more diverse social communities allowing others to find people like them when they might not be able to in rural areas.

Reasons of urbanization:

- easier to develop industry, science, technics;
- easier to get a job;
- best condition for education, improvement of professional skills;
- cultural life is richer;
- better level of municipal comfort (waterpipe, water drain, central heating, gaz- and electrosupply, etc.);
- health service is better.

Adverse consequences of urbanization:

- increase of chemical, physical, psychological and information loading on person;
- high population density, overpopulation;
- insufficient housing;
- large city changes all environment components: atmosphere, water, soil, flora, fauna, climate.

A. Air pollution

The main air pollution sources are industrial enterprises; automobile, railway and water transport; thermal power-stations; boilers and other household objects.

The main air pollutants are oxides of sulfurs, nitrogen and carbon; hydrocarbons; and heavy metals.

Air pollution leads to:

- decrease of air transparency;
- reduction of natural illumination;

- fog increase;
- formation of "toxic fogs".

B. Water pollution

In cities intensive water pollution is marked. Household sewage contain considerable quantity inorganic, organic and biological pollutants.

Sewage contains pathogenic microorganisms; viruses; parasites; petrochemicals; phenols; heavy metals; pesticides; mineral and organic suspensions.

City soil becomes soiled by:

- food waste;
- packing materials;
- waste from apartments cleaning and repairing;
- garbage from hospitals, polyclinics, hotels, schools, restaurants, shops and other public buildings;
- waste matter and liquid waste of industrial enterprises (salt of nonferrous metals, benzine, aether, phenol, polystyrene, cancerogenic pitches, methyl spirit, etc.)

C. City pollution

Firm household garbage of residential buildings including a food waste, packing materials, waste from cleaning and operating repair of apartments, and also dust of hospitals, polyclinics, hotels, schools, restaurants, shops and other public buildings have great value.

A city soil becomes soiled a firm and liquid waste of the industrial enterprises which contain salts of nonferrous metals, gasoline, aether, phenol, polystyrene, cancerogenic pitches, methyl spirit, etc.

D. Noise leads to:

- fatigue increase;
- decrease of intellectual activity;
- growth of cardiovascular diseases;
- noise stresses;
- hearing deterioration;
- dream frustration;
- working capacity decrease;
- sensibility to diseases.

Most frequent reasons of raised noise level:

- Infringement of standard documents or absence of account of sanitary norms at building and designing of main and railway lines, places of airports;
- Increase of noise level because of absence of new silent types of transport, increases of jet planes' engines power;
- High cost of noise protection constructions, absence of workings out of technical-economic character in this area.

Admissible noise of traffic at walls of houses should not exceed in the afternoon 50 decibel and at night 40 decibel, and general noise level in premises 40 decibel in the afternoon and 30 decibel at night.

Noise control:

- Modernisation of noisy sources;
- Replacement of trams by trolley buses;
- smooth covering of streets is arranged;
- For equipment creating noise, are applied noise isolation jackets, noise reduction installations, etc.;
- sufficient width of streets is planned;
- human settlement zoning is carried out;
- bypass main roads are arranged;
- noisy industrial enterprises for residential zone limits are taken out;
- gardening is spent;
- in streets transport signals are limited, its movement is ordered.

In cities on person render harmful influence electromagnetic radiations from electric mains, transformers, electrohome technical equipment, cellular telecommunication, etc.

Pollution of city environment breaks biological balance of flora and fauna. Chemical, physical and biological pollutants lead to infringement of biological cycles and destruction of plants and animals.

Urbanization lead to:

- increase of morbidity of bronchitis, pneumonia, cardiovascular illnesses, conjunctivitis, skin illnesses and bronchial asthma
- increase of neuroses, psychoses, vascular defeats of brain
- At high level there is disease of acute respiratory infections, venereal illnesses, intrahospital infections.

Climatic conditions in cities considerably differ from surrounding areas.

Meteorological regimen of city is influenced by following factors:

1. Change of reflective ability of earth's surface which for built-up areas is less than in country district;
2. Reduction of average size of evaporation from earth's surface;
3. Allocation of heat created by various kinds of economic activities;
4. Increase of earth's surface roughness in city ;
5. Atmosphere pollution by various impurity from economic activities.

3. Hygienic requirements to the territory choice for building of populated areas. Functional zoning of a city.

Correct choice of territory for building of new human settlement promotes improvement of sanitary well-being and populations' life conditions.

Requirements to choice of territory for building of populated area:

- territory should not be rivers boggy and flooded at flood of rivers, lakes, rain and melt waters;
- soil should be not polluted, dry, with low standing of subsoil waters (1 m from surface of soil and not less than 0.3 m from base sole);
- sites where were cattlegraves, dumps and cemeteries, are not used for building, and recommended for gardening;
- bias of lay of land from 10 % to 20 %;
- air pollution sources were on lee side from human settlement.

To locate settlement it is necessary upstream the rivers above sources of possible pollution.

Territory for settlement choose taking into account winds so that air pollution sources were on a leeward side from settlement. The territory should be whenever possible protected from cold and hot dry winds.

Natural green files weaken winds, are the huge tank of pure air, improve a microclimate, serve as population vacation spot, therefore at a place choice under settlement consider presence of woods.

Functional zoning of city territory:

- residential zone (residential areas, public centres with administrative, scientific, educational, medical and sports buildings take places);
- industrial zone (industrial enterprises, bases, warehouses, garages, transport depots, trolleybus and bus fleets, passenger and cargo stations, ports, landing stages are located);
- landscape-recreational (placing of industrial, agricultural and other enterprises connected with service of city (sorting and cargo stations, airdromes and airports, water folding and treatment facilities, cemeteries)
- green zone are used (it is intended for placing of country parks, gardens, nurseries, rest houses, boarding houses, wood schools, camps, sports, sports and other establishments for population rest).

Between borders residential territories and enterprises will be organized sanitary-protective zones (50-1000 m) established according to sanitary classification of enterprises and manufactures.

Hygienic value of green plantings for populated area:

- reduce dust content of air and reduce its gassed condition;
- improve microclimate of territories and premises;
- enrich air by oxygen;
- render phytoncidal and wind-shelter action;
- reduce noise;
- serve as rest zone.

In residential zone of city not less than 40-50 % of its territory it is planted trees and shrubs. On 1 inhabitant it should is necessary 30-50 m² intracity green planting.

4. Hygienic requirements to a planning and building of residential settlements and microdistricts.

Planning of residential zone should provide:

- rational residential construction;
- optimum placing of establishments and enterprises of service, public centres, street network and green plantings.

Basic structural element of residential zones - microdistrict with population 6000-18000 persons. A microdistrict includes:

- residential buildings;
- preschool centres, schools;
- drugstores;
- food shops;
- green area with platforms for populations' rest, employment by physical culture and sports;
- garages and parking for individual transport, etc.

Residential areas with population 100000-200000 persons consist of 3-8 microdistricts and public centre with establishments and service enterprises.

Residential area establishments:

- Polyclinics;
- Sports halls and pools;
- Cinemas;
- Libraries;
- Supermarkets, shops;
- Public feed establishments.

In residential areas and microdistricts provide creation of favorable conditions of microclimate, insolation, aerations, protection against noise and pollution sources, organization of rest and employment by physical culture and sports, accomplishment and gardening of territory.

Building methods - system of arrangement of buildings on site, their extent, configuration and placing.

Systems of building:

- Continuous (territory of quarter is built up almost entirely as in area of streets, and inside);
- Closed (or peripheral, on perimetre there is continuous building and in quarter yard settle down);
- Ordinary (buildings are under construction entirely on two opposite side of quarter);
- Group (buildings are under construction groups between which there are breakings);
- Line (buildings settle down on axis of meridian taking into account necessary breakings, in this case both parties of building receive enough of sunlight and are well aerated).

A microdistrict area makes 4-5 hectares on 1000 inhabitants (40-50 m² on 1 person). For good insolation and airings of dwellings between facades of buildings are established breakings not less than 2-2.5 heights of higher building and between butt ends - not less than 1 height.

Not less than 40 % of microdistrict area are taken away to green plantings. In microdistrict children's playgrounds and platforms for gymnastics, volleyball, tennis, basketball are arranged. Their total area in microdistrict should make not less than 1 m² on 1 inhabitant. In microdistrict construct a sports centre with stadium and swimming pool.

5. Features of a rural populated areas planning.

Features of planning and building of village occupied places:

- building density should not exceed 5-6 %;
- population - 20-25 persons on 1 hectare (400-500 m² on 1 person);
- area for village building choose on equal, not flood territory , on sandy or loamy soil

- area should not be crossed with highway or railroad track.

At village planning allocate 2 zones:

- Inhabited with public centre (inhabited quarters with residential buildings and private plot with area of 0.25-1 hectares, cultural-community and treatment-prophylactic establishments, green plantings of general using, street)

- Industrial (constructions of industrial appointment united in industrial complexes).

Specificity of planning and accomplishment of villages are low-rise buildings, presence of private plots and premises for cattle and bird.

Compact building facilitates and reduces the price of the device of waterpipe, water drain, central heating, gasification.

In the central part of settlement a public centre is arranged (area on which place buildings of village council, mails, houses of culture, table, shop, hotel, is arranged) Schools, kindergartens it is expedient to have away from the central area, is possible further from roads on which motor transport moves.

Residential buildings usually settle down in 100 m from a reservoir.

Specificity of a lay-out and accomplishment of villages are low-rise building, presence of personal plots and premises for cattle and bird.

An industrial zone of rural settlement is a part of territory on which constructions and constructions of industrial appointment united in industrial complexes take places. Complexes concern: preparation of forages and preprocessing of agricultural products, mechanical-repair objects, complexes on manufacturing of building materials, warehouses, economic court yard cattle-breeding, poultry-farming. Roads for entrance to an industrial zone of agricultural cars and cattle run should pass out of settlement.

Between inhabited and industrial zones create a sanitary-protective zone in width of 100-300 m which plant trees.

6. Hygienic requirements to a dwelling.

Dwelling - difficult system of natural also is artificial created inhabitancy in which on a person associative influence is rendered by factors of physical, chemical and biological nature.

Optimum size of a floor space, microclimate, life and communication with environment create «housing comfort», promote person's health maintenance and active participation in industrial activity and public life.

Crude and cold premises play a part in an etiology of catarrhal diseases, quinsy, rheumatism. The domestic noise can be etiological moment in development of different painful conditions. Sources of noise, vibration, rise of air temperature, electromagnetic radiations are home appliances subjects. In modern dwellings polymeric and synthetic materials owing to what air becomes soiled toxic substances are widely used, level of an electrostatic electricity raises that can cause adverse changes in an organism, diseases of inflammatory, allergic and other character.

The hygienic requirements to dwelling:

- favorable spatial parameters;
- optimum microclimate;
- rational natural and artificial illumination;
- favorable condition of the air environment;
- favorable conditions for housekeeping, rest, dream, family, education of children.

Distinguish one-apartment one-storeyed, one-apartment two-storeyed (cottages), multiroom low-rise, multiroom many-storeyed and high-rise residential buildings.

Building of one-apartment one-and two-storeyed houses is widespread in a countryside. From the hygienic point of view it possesses a number of advantages as creates low population density, good insolation and aeration, favorable microclimate.

Formation of many-storeyed houses causes decrease in cash expenditures for engineering preparation of territory and underground communications, allows to use the earth rationally. However building of this houses increases density of building and loading by serving establishments and enterprises.

Structural element of house is a inhabited section which unites group of apartments on one stair enclosure.

Apartment houses it is necessary to have in district with well shined and accessible to airing, having convenient drain for an atmospheric precipitation. Soil should be dry, not polluted, with level of standing of subsoil waters 2 m from earth surface or 0.3 m from foundation level of building. Area of building

should be no more than 25 %, and gardening - not less than 20-35 % of all territory area.

Foundation necessarily should be moisture-proof. **Walls** should possess sufficient sound-proof properties, fire resistance, minimum weight, low factor of heat transfer, good thermal stability. Dwelling can have roof **covering** combined and not combined with ceiling.

For **internal refinishing** of houses premises materials resolved by state sanitary inspection of the Republic of Belarus in housing construction are used. It is necessary to papering walls of living rooms or to paint by glue colour. In premises with damp regimen a wall should be covering by ceramic tile or are covered by moisture resistant materials.

In premises it is necessary to finish ceilings with cretaceous or limy whitewashing.

Floors should be warm, equal, non-slip, suppose easy clearing. Timber floors should be in premises, the most perfect - parquet floor. In premises with damp regimen floors from ceramic tile and other moisture resistant materials are established.

Dwelling's basic element is the **apartment**. Apartments of apartment houses are recommended to be occupied one family from calculation 9-13 m² on one person.

Planning of inhabited apartment should provide good insolation of living rooms. A apartment's planning can be one-and bilateral. The bilateral planning when premises are guided on two parties of house is most expedient.

An apartment structure usually includes inhabited, subsidiary and open premises. Inhabited premises include bedroom, children's room, office and hall, subsidiary - lobby-hall, dining room, kitchen, bathing, toilet and pantries, and opened - loggias, balconies, verandahs.

All rooms, except for a hall, should be isolated. A kitchen is necessary for separating from living rooms transition. A lavatory with bathroom and toilet take places in one place for convenience a waterpipe and water drainage in a sewer network. The minimum size of kitchen with a gas cooker should be 7, a lobby - 6, a toilet - 1.5, a bathroom - 2.5 m². Bedrooms, children's rooms are guided by southern points, kitchen - on northern.

Sanitary-technical accomplishment of dwelling provides:

- water supply;
- clearing of liquid and firm garbage;
- illumination;
- heating;
- ventilation.

In dwelling electrosupply and other necessary engineering communications also is arranged.

Dwelling should be provided by cold and hot water for the economic-drinking purposes. In a settlements not having internal waterpipe and water drain and using water from water folding columns, water consumption is 30-60 dm³ a day on a person. In settlements with a waterpipe, water drain, baths, centralised hot water supply water consumption is 250-350 dm³ a day on a person.

Removal of liquid garbage is carried out by system of economic-faecal water drain. Removal of firm garbage from dwelling is made on according to plan-room or to plan-household system of clearing. Removal of dust from apartments in refuse chutes and its daily export in disinfecting places is optimum.

One of basic hygienic requirements to dwelling is illumination. In mid-latitudes the best natural illumination of premises is observed at southeast, southern and southwest orientation. Optimum efficiency of insolation is reached at maintenance of daily continuous 2.5-3-hours irradiations of premises by direct solar beams. In premises a light factor is recommended 1/7-1/8, an angle of light incidence - not less 27°, an aperture corner - not less 5°, factor of natural illumination - not less than 0.5 %. Artificial illumination is provided in all premises. From the hygienic point of view it is better to use fixtures of absent-minded and reflected light which provide uniform illumination of premise, do not create blinding action, shades.

For maintenance of higher level of light exposure on a desktops local illumination is applied. Sometimes in apartment the combined illumination as a combination of the general and local is applied. Recommended artificial light exposure in premises – 200-400 lx.

Central water or radiant heating is optimum. In dwelling local and central systems of heating are possible. The central water or radiant heating is optimum. From the hygienic point of view radiant heating is better, as the heating devices located in walls, floor or ceiling, in regular intervals warm a premise, temperature differences across and verticals are minimum. At rather low temperature of air the thermal comfort in indoors is provided.

Dwelling **microclimate** should provide the conditions favorable for heat exchange and ability to live of a human body. Dwelling microclimate: temperature - 18-22°, relative humidity - 30-60 %, speed of air movement no more than 0.25 m/s.

In the summer the big hygienic value has overheat prevention of dwellings. The overheat of premises is negatively reflected in state of health of inhabitants, creates adverse conditions for house employment, rest, dream.

To reduce an overheat of premises it is possible proper orientation of windows on parts of the world, increase of thickness of insulated walls and increase of premises' height. Walls and windows can be protected from solar beams by verandahs and green plantings. For the best reflexion of solar beams

external walls paint in white colour. Windows are equipped with shutters, jalousie or curtains. Indoors use fans and conditioners, carry out through airing.

Dampness in premises can arise owing to a wrong choice of territory for building, an insufficient waterproofing of walls, inefficient heating and ventilation. Dampness leads to decrease of resistibility of an organism, increase of disease level of respiratory ways, aggravation of tuberculosis, rheumatism and other chronic diseases.

For struggle against dampness make a waterproofing of base and walls, drain a site before building, warm walls, arrange rational heating and ventilation. Air of premises can polluted products of person's physiological exchange processes, combustion of gas, washing of linen and clothes, cooking and destruction of polymeric finishing materials.

Internal sources of air pollutants: anthrotoxins, ammonia, asbestos, household dust, benzene, nicotine, radon, formaldehyde.

External sources of air pollutants: sulphur oxides, products of photochemical reactions (photooxidizers), products of cars exhaust gases, pollen of plants, lead and other metals.

Indicators of air cleanliness in premises:

- content of carbon dioxide - 0.05 %;
- oxidability of air - 4 mg/m^3 ;
- general microbic dissemination - 2000 CFU/m^3 (colony forming units);
- content of hemolytic streptococci - 10 CFU/m^3 .

The important action for struggle against air pollution of premises is ventilation which is directed on change of dwelling's air by pure atmospheric air.

Dwelling should have natural ventilation - airing of premises is carried out through windows, doors, window leaves, transoms. Artificial ventilation is applied on kitchen where window fans are used, mechanical fans and ventilating cowl above gas cooker and electric stoves, and also in lavatories. Ventilation rate of living rooms on extract not less than $3 \text{ m}^3/\text{hour}$ on 1 m^2 , in kitchens - not less than 60. In a bathroom, toilet, kitchens arrange ventilation with prevalence of extract over inflow.

Necessary conditions of temperature, humidity, movement and cleanliness of air indoors can automatically be maintained by conditioners which combine in itself heating and ventilation function. With their help air heats up or cooled, humidified or dries, gets certain speed of movement. By means of conditioners air is cleared of dust, deodorized, ozonized, ionized.

7. Features of planning, sanitary-technical accomplishment, equipment and maintenance of hostels.

A hostel is intended for residing of lonely workers, pupils of technical schools and students.

Features of hostel's planning:

- big quantity of berths;
- floor space on 1 person is underestimated;
- presence of reading rooms, rooms of day stay and other premises of the general using;
- there are wardrobe, kitchens, still-rooms, pantries for storage of personal things, lavatories, washing room, etc.;
- presence of isolator (1 cot on 40 living person).

In hostels-complexes on 1500 and more places provide the general premises for studies, cultural-mass and sports actions, consumer services and public catering which are placed in separate block or building with warm transition. In such hostels provide a medical aid station including lobby, office of a doctor, treatment room, physiotherapy office, dental surgery, room of medical personnel and isolator.

Hostels build in the form of separate buildings or hostels-complexes in territories having convenient communication with a place of work and educational institutions. The site area on one living person in hostels depends on its capacity (50 persons - 45 m²; 100 persons - 35 m²; 200 persons - 30 m²; 400 persons - 25 m²; 600 persons - 20 m²; 1000 persons - 17 m²).

On a hostel's ground area platforms for rest, games and employment by physical culture are provided.

Living rooms of hostels build on 2-3 persons at the rate on one person 6 m². Rooms group, providing on each group of rooms lavatories with toilets, shower and washroom, and also kitchen, room for employment and rest room. The area of premises for employment of students and pupils makes 0,3 m² on 1 person, for workers - 0,15 m² on 1 person.

In hostels natural illumination is provided. The factor of natural light exposure for living rooms makes 0,5 %, light factor - 1/4,5-1/8.

Recommended artificial light exposure in premises of hostels 100-300 lux.

Air temperature in living rooms should be in limits 20-22°C at relative humidity 30-45 % and speed of air movement 0.1-0.15 m/s during the cold period of year and 22-25°C at relative humidity 30-60 % and speed of air movement no more than 0.25 m/s during the warm period of year.

Frequency rates of air exchange in hostels are accepted the following: for living rooms an exhaust ventilation 3, for kitchens - 60-90 m³/h on 1 m² of areas. In all hostels exhaust ventilation from premises of kitchens, toilets, bathrooms, shower through ventilating channels should be provided.

In basement storey it is supposed to place pantries for storage of dirty linen, sports and economic stock, washing room, premises for clothes and footwear drying, technical premises.

Living rooms of hostels should be not checkpoints, width 2.2 m, height - 2.5 m, depth - 6 m. From each room provide an exit in a corridor directly or

through a sluice-lobby. Doors of living rooms should open inside. Living rooms equip by built-in wardrobe for storage of house clothes, linen and footwear, and also hangers for street clothes.

In rooms of cleaning and ironing of clothes provide lavatory basin, tables for ironing and built-in wardrobe for storage of accessories. Washing room separate from corridors by sluice.

Kitchens equip by cookers, sinks, tables-cases, cases.

All premises of hostel daily clean by the damp way. Floors wash 2 times per week and as required. General cleaning of all premises spend 1 time per month. All premises of hostels, especially sleeping rooms, should be aired through window leaves or transoms in the winter and through windows in the summer during 20-30 min in the morning, in the afternoon during cleaning and in the evening before a sleep.

In a hostel current disinfection should be spent regularly. Premises of toilets should be cleaned several times within day by the damp way, and in the end of day carefully wash out by 0.5 % solution of chlorinated lime. Stock for cleaning of toilets disinfect by boiling or chemical way and store separately.

CHAPTER 4. NUTRITION HYGIENE

Study questions.

1. *Nutrition and its hygienic value.*
2. *Nutritional features at the present stage.*
3. *Nutritional status, it's characteristic.*
4. *Hygienic characteristic of balanced diet. Laws of balanced diet.*
5. *Hygienic characteristic of nutrients.*
6. *Physiological norms of feed.*
7. *Malnutrition and its prevention.*
8. *Hygienic characteristic of basic food products.*
9. *Food poisonings, their prevention and investigation.*
10. *Hygienic bases of therapeutic and preventive diets organization.*

Doctor in his work constantly solves questions of feed of healthy, practically healthy or sick persons. Thus he should define status of person's food, communication of some symptoms with food character, and help a patient with planning of rational individual nutrition, medical and preventive nutrition.

In hospitals and some other establishments a doctor should carry out control over work of nutrition unit. Also he should have skills of foodstuff sampling, know an order of food poisonings investigation and be able to carry out food poisonings prevention.

1. Nutrition and its hygienic value.

Food means a substance or a mixture of substances which serves to nourish or build up the tissues or supply the energy, essential for body. Food serves this purpose when it is taken into the body. When energy requirements are completely met by caloric intake in food, people maintain that activity levels without weight change. If the number of calories ingested exceeds energy needs, people gain weight. When the calories in sted fail to meet energy requirements, people lose weight.

Functions of food

1. **Growth and Repair.** Foods provide the raw materials for the growth of the body (from the birth weight and height of about 2.8 Kg. and 48 cm to the adult measurements of 55 Kg and 165 cm, respectively). Also they provide substance for the replacement of dead tissue (as cells constantly die and are replaced by new ones). Foods that principally serve this function are called the body building foods. These are the ones that are rich in high-class proteins such as milk, egg, meat, fish, etc.

2. **Regulation of Vital Processes.** Following are some of the functions for which foods are required:

- a. **The synthesis of hormones (such as insulin and thyroxin), pigments (haemoglobin, rhodopsin), enzymes (carboxylase, cytochrome**

oxidase, coenzyme A), biological lubricants (saliva, synovial fluid), plasma proteins and mucopolysaccharides.

- b. The coagulation of blood.
 - c. The contraction of muscles including cardiac muscle.
 - d. The transport of oxygen in the blood.
 - e. The regulation of heart beats.
 - f. The maintenance of the osmotic pressure.
 - g. The stimulation of the intestinal motility.
3. Supply of Energy. Energy is needed by the human body for the following purposes:
- a. Regulation of temperature of the body.
 - b. Elimination of the products of excretion.
 - c. Absorption and digestion of foods.
 - d. Physical activities.
 - e. The beating of heart and the contraction of the respiratory muscles.

Foods are **classified** according to their functions under the following heads:

1. *Protective foods*: These are foods rich in protein, vitamins, minerals and water, e.g., milk, egg, liver, green leafy vegetables, fruits, legumes. They provide material for repair in the body as wear and tear goes on constantly and are required for the maintenance and regulation of tissue functions.

2. *Energy producing foods*: These foods are rich in carbohydrates and fats e.g., cereals, sugar, honey, jellies. They supply heat and energy to the body.

3. *Body building foods*: These are foods rich in proteins e.g., meat, fish, pulses, oilseeds, eggs, nuts, milk. These are anabolic foods, required for body building.

2. *Nutritional features at the present stage.*

Features of modern food:

- thermal processing of food;
- clearing of food substances;
- mixture of animal and vegetative food;
- presence of spices and artificial additives in food.

Features of thermally processed food:

- food structure is broken;
- proteins, vitamins and enzymes are destroyed;
- mineral substances are washed away;
- bactericidal and anti-inflammatory properties of food are lost;
- contains few vegetative bioregulators that results in breaking of neurochemical mechanisms of saturation and in overeating;
- provokes reproduction of pathogenic microflora in intestine, reduction of intestine peristalsis, delay of feces passage that leads to constipation, colitis, polyps, cancer and other diseases.

Consequences of refined products usage:

- fall of thyroid gland and adrenal glands functions;
- disease of metabolism;
- cardiovascular, digestive, nervous diseases;
- overconsumption of the cleared sugar leads to asthenia, depressions, obesity;
- surplus of sugar causes rotting of proteins, fermentation of carbohydrates, flora suppression in intestines;
- destruction of dentine, caries and other stomatologic pathology;
- consequences of the mixed food;
- long stay of carbohydrates in a stomach leads to fermentation and rotting under the influence of the microorganisms which have arrived with food;
- formed harmful substances are soaked up in blood and complicate liver function and secretory function of kidneys;
- insufficiently digested proteins promote uric acid and urea increase in blood that leads to development of various pathological processes;
- changed digestion leads to infringement of intestinal flora, activation fermentation and rotting in intestines, to phenol, indol and other toxic substances occurrence.

Food additives are the legally permitted substances added to food to improve its appearance, flavor, colour, nutritive value or storage property. The term refers also to the non-nutritive substances that get incorporated into foods in the course of their packaging, storage, transportation and handling. The addition of substances not legally permitted or deliberate addition of substances for dishonest commercial gain is food adulteration. Such substances therefore are called food adulterants.

There are two kinds of food additives:

1. Direct or first category additives. These are the substance! deliberately added.
2. Indirect or second category additives. These find their way to food during its handling, packaging, transportation, etc. Examples are DOT, BHC, rodenticides, arsenic, lead, etc.

Following are the harmful effects of food additives:

1. Tartrazine gives rise, in the susceptible individuals, to asthma, rashes and migraine.
2. DOT, BHC, arsenic and lead give rise to poisoning.
3. Nitrites give rise to nitrosamine, which is a carcinogen.
4. Benzoic acid causes neurological symptoms.
5. Monosodium glutamate produces dizziness, burning sensations and chest tightness.
6. Rhodamine is responsible for tumors of lung, breast and ovary.

3. *Nutritional status, it's characteristic.*

The **nutritional status** - is a certain state of health which has developed under the influence of a previous actual food.

1. The **optimum** status is characterized by high level of health and presence of the adaptable reserves providing existence and work in extreme situations.

2. The **usual** nutritional status is observed at the majority of people with a balanced diet which health is characterized by absence of functional and structural changes and sufficient level of adaptation to usual conditions.

3. The **superfluous** nutritional status is observed at people with the raised body weight.

4. The **insufficient** status of a food takes place at power insufficiency of a food against decrease in adaptable reserves, working capacity and health level.

4. *Hygienic characteristic of balanced diet. Laws of balanced diet.*

Balanced diet is physiologically high-grade food which corresponds to power, plastic and biochemical requirements of an organism, provides a homeostasis and maintains functional activity of organs and systems.

Balanced diet laws:

The law of food adequacy includes power, enzymatic, biorythmic and plastic adequacy.

Power adequacy provides food power value conformity to organism's energy expenses.

Enzymatic adequacy provides food chemical components conformity to fermental systems of an organism.

Biorythmic adequacy of food means construction of food taking into account biological and social rhythms. Four food intakes within day is most physiologically. Thus breakfast should make 25 %, lunch - 35 %, mid-morning snack - 15 % and supper - 25 % from a daily diet.

Plastic adequacy of a food considers, that the food should contain proteins, fats, carbohydrates, vitamins and mineral salts in optimum amounts.

The law of food equation - proper correlations of food components.

For an adult person the ratio of proteins, fats and carbohydrates in food should be 1:1.2:4.7.

The law of food safety - food products should be good-quality, not contain bacteria, viruses and parasites and xenobiotics as well.

The law of food variety. Food should include broad set of products of animal and phytogenesis in correct proportions. The most rational for person is mixed food in which not less than 40 % it is taken away to products of an animal origin.

Following are the rules of prudent diet; these rules are sometimes referred to as dietary goals:

1. Proteins should constitute 15-20% of the food intake.

2. Total fats should constitute 20-30% of the food intake. But saturated type of fats should be limited to 10% of the energy requirement.

3. Not more than 5 G of salt per day should be consumed.

4. The following should be avoided:

(a) Highly refined carbohydrates like sugar, jaggery, candy, sweets, toffees, chocolates, honey, etc.

(b) Junk foods like burgers, fries, pizzas, bottled cool drinks, ketchup, packed salted snacks, etc.

5. *Hygienic characteristic of nutrients.*

Nutrients are foods that contain the elements, necessary which perform various functions in the body that food is consumed daily by any living organism. There are six categories of nutrients. There are six categories of nutrients.

They are carbohydrates, proteins, fats, vitamins, minerals, and water. Further, these nutrients can be grouped as macronutrients and micronutrients.

Macronutrients: are those which the body requires in relatively large amounts. Proteins, fats and carbohydrates are called *macronutrients* as they form the main bulk of food.

Micronutrients: are those which the body requires in small quantities. Vitamins and minerals are known as *micronutrients* due to their requirement in small quantity.

Proteins are complex organic nitrogenous compounds consisting of carbon, hydrogen, sulphur and occasionally phosphorous. Human body contains 16% protein. They are made up of a number of smaller units called *amino acids*. These amino acids are classified as:

Essential amino acids, e.g., Leucine, isoleucine, methionine, tryptophan, phenyl alanine, threonine, valine, lysine and histidine. They cannot be synthesized in the body and must be included in the diet.

Non-essential amino acids, e.g., Arginine, asparagine, cysteine, glutamic acid, proline, glycine, They can be synthesized by the body,

Sources of proteins: Milk, egg, meat, fish, beef, pulses, cereals, legumes, nuts, fruits etc.

1st class proteins: Protein foods which contains all the essential amino acids in correct proportions - meat, egg, fish, soyabean, milk.

2nd class proteins: They do not contain the entire essential amino in the correct proportion - peas, beans, pulses.

Proteins are required for body building, repair and maintenance of body tissues. These are required for biosynthesis of plasma proteins, haemoglobin, antibodies, enzymes and hormones. These play an important role in the constitution of all tissues including body fluids e.g., blood. These provide energy and heat. These are responsible for the cell-mediated immune response.

As per the recommendation of *Indian Council of Medical Research* (ICMR) the daily protein requirement for an adult is 1.0 gm per kilogram body weight. However, protein requirements are affected in growing children, pregnancy, lactation, burns, surgery, diabetes, worm infestation, emotional disturbances.

Fats are concentrated sources of energy containing carbon, hydrogen and oxygen. They are derived from animal and vegetable sources. Animal sources include milk, cheese, butter, egg, meat, oily fish, while Vegetable oils, nuts etc. are some vegetable sources. Fats are classified under the following heads:

1. *Simple lipids*, e.g., triglyceride, waxes.
2. *Compound lipids*, e.g., phospholipids, glycolipids.
3. *Derived lipids*, e.g., cholesterol. These are derivatives obtained from simple or compound lipids and still possess characteristics of lipids.

Fats are esters of glycerol with fatty acids. Fatty acids are classified into saturated and unsaturated fatty acids.

Saturated fatty acids, e.g., lauric acid, palmitic acid and stearic acid. These are mostly present in animal fat.

Unsaturated fatty acids, e.g., oleic acid, linoleic acid. These are mostly present in vegetable oils. Vanaspati contain high proportion of saturated fatty acids.

Linoleic is the most essential fatty acid. Essential fatty acids cannot be synthesized by human body and are derived from the food. The example of essential fatty acids (EFA) are linolenic acid, arachidonic acid. EFA promote growth as well as maintain dermal integrity. Deficiency of EFA leads to some abnormal skin conditions.

The functions of fatty acids are:

1. They provide energy and heat.
2. They support certain organs of the body like kidney, eyes.
3. Fatty acid transport fat soluble vitamin A, D, E, K.
4. They are helpful in storage of fat.

Carbohydrates are the compounds of carbon, hydrogen and oxygen. These compounds can be classified as monosaccharides, disaccharides or polysaccharides.

The *monosaccharides* include sugar like glucose, fructose and galactose. The other type of sugars i.e., *disaccharides* are sucrose, lactose and maltose.

The *polysaccharide* include starch, cellulose, etc.

Sources of carbohydrates: Cereals, millets, roots, tubers, cane sugar, beetroot, fruits,

They provide energy and heat. These act as a protein spares. Excess of carbohydrate is converted into fat. These are required for synthesis of certain non-essential amino-acids. They provide 4 kcals per gram of carbohydrate.

Vitamins are complex organic compounds required for vital metabolic functions in the body and are needed by the body in small quantities. They are grouped as:

1. *Fat soluble vitamins:* Vitamins A, D, E and K.

2. *Water soluble vitamins:* Vitamins B complex and C.

Vitamin A (Retinol) is essential for proper functioning of retina and vision. It also helps in the production of retinol pigments needed for vision in dim light. It is helpful to maintain functioning and integrity of glandular and epithelial tissues. It helps in skeletal growth and has an anti-infective action. Source: milk, butter, ghee, egg, yolk, fish liver oils, green leafy vegetables, mango, orange, carrot, papaya, tomato. Daily requirement: 750 mg (For Adult), 250-600 mg (For Children).

Vitamin D facilitates the absorption and utilization of calcium and phosphorous for healthy bones and teeth. Source: sunlight, milk, fish liver oils, cheese, egg, yolk and butter. Daily requirement: Adult - 2.5 mg, Children - 5 mg.

Vitamin E (Tocopherols) maintains healthy muscular system and act as a anti-oxidant. Source: Vegetable oils, wheat germ oil, egg yolk, milk, green vegetables, nuts. Daily requirement: Adult 3-10 mg.

Vitamin K (Phylloquinone) is essential for the formation of prothrombin in liver. Prothrombin is a second clotting factor. It is essential for the formation of clotting factors VII, IX and X in liver. Source: cabbage, cauliflower, fresh green vegetables, fruits, fish liver. Daily requirement: Adult 70-140 mg.

Vitamin C (Ascorbic Acid) has role in oxidative reaction in the tissue. It is needed for maintenance of the strength of the walls of the blood capillaries. It is required for development and maintenance of healthy bones and teeth. It is essential for formation of RBC. It facilitates Iron absorption by reducing ferric iron to ferrous form. It increases resistance of the body against infection. Source: citrus fruits and green leafy vegetables, Amla and Guava are the richest sources of ascorbic acid. Daily requirement: Adult - 60 mg.

Vitamin B Complex is a water soluble vitamin. It consists of thiamin (B₁), riboflavin (B₂), pyridoxine (B₆), vitamin B₁₂, vitamin B₇, niacin, folic acid, and pantothenic acid.

Vitamin B₁ (Thiamine) required for proper utilization of carbohydrates in food, nutrition of nerve cells. Source: unmilled cereals, pulses, oilseeds and nuts, rice polishings. Daily requirement: Adult: 1 -1.5 mg.

Vitamin B₂ (Riboflavin) acts as a coenzyme in the tissue oxidation and respiration. It is involved in the metabolism of carbohydrates, fats and proteins. Source: liver, yeast, milk, eggs, kidney and green leafy vegetables. Daily requirements: Adult: 0.6 mg.

Vitamin B₃ (Pantothenic Acid) is a component of Coenzyme A involved in carbohydrate metabolism. It is required for synthesis of cholesterol and fatty

acids. It is essential for biosynthesis of corticosteroids. Source: liver, egg, meat, milk, yeast. Daily requirement: Adult: 10 mg

Vitamin B₆ (Pyridoxine, Pyridoxal and Pyridoxamine) is required for protein metabolism. It is essential for formation of RBC and WBC. Source: vegetables (mainly legumes), bran of cereals, meat, egg yolk, pulses. Daily requirement: Adult - 1-2 mg.

Biotin (vitamin B₇ or Vitamin H) is required in carbohydrate and fat metabolism. Source: liver, egg yolk, yeast, pulses, nuts.

Vitamin B₁₂ (Cyanacobalamin) is necessary for the maturation of RBC's in red bone marrow. Source: liver, kidney, meat, fish, egg, cheese and fermenting liquors. In the human body, it is synthesized by the bacteria of colon. Daily requirement: 1 -15 mg. (Adult)

Vitamin M (Folic Acid) is needed for the formation of RBC. Source: green leafy vegetables, liver, egg, yeast, milk, fruits and cereals. Daily requirement: Adults - 100 m.g per day.

Nicotinic Acid (Niacin) serves as a component of coenzymes which are essential for the metabolism of carbohydrates, fats and proteins. It is needed normal functioning of skin and nervous system. Source: liver, groundnut, cereals, pulses, meat, fish.

Minerals are inorganic compounds necessary for the growth of vital body-functions and for repair of tissues. They are broadly classified in two groups :

1. *Major minerals*: e.g., Calcium, iron, phosphorous, sodium, potassium, magnesium.

2. *Trace elements*: Required in small quantity by the body, e.g., iron, iodine, fluorine, zinc, copper, cobalt, chromium, manganese etc.

Calcium is required for hardening of bone and teeth, coagulation of blood, muscle contraction, activation of some important enzyme reactions in body, also needed for muscle and digestive system health, some forms neutralizes acidity, may help clear toxins, and provide signaling ions for nerve and membrane functions. Source: milk, cheese, eggs, green vegetables, fish. Daily requirement: 400-500 mg (Adult). 1000 mg/day (Pregnancy and lactation), 500-600 mg (Children).

Phosphorous is associated with calcium and vitamin D in the hardening of bones and teeth; essential for energy processing. It maintains the constant composition of body fluids. Source: cereals, pulses, nuts, oilseeds, cheese, meat, liver.

Sodium is required for contraction of muscle, transmission of nerve impulse in nerve fibres, maintenance of electrolyte balance in the body. Source: most of the foods especially fish, meat, egg, milk, artificially enriched bread, cooking and table salt. Daily requirement: 2-5 gm.

Potassium is essential for contraction of muscles, transmission of nerve impulse, maintenance of electrolyte balance in the body. Source: Widely distributed in all foods. Daily requirements: 5-7gm.

Fluorine is essential for the normal mineralization of bones and formation of dental enamel. Ingestion of large quantities causes - dental and skeletal fluorosis. Source: Drinking water, sea fish and tea. Daily requirement: Optimum level of fluoride in drinking water is 0.5 - 0.8 mg/ litre.

Zinc is widely distributed in foodstuffs, both animal and vegetable. It is constituent of insulin and many enzymes. Daily requirement: 12 mg.

Iron is required for the formation of haemoglobin in RBC, myoglobin. It is essential for cell respiration, transport of oxygen and tissue oxidation. It is required for brain development and muscle activity. It is required for the regulation of body temperature and for the metabolism of catecholamines. It is also required for the maintenance of immune system. Source: liver, meat, kidney, egg yolk, cereals, pulses, green leafy vegetable, legumes. Significant quantity of iron can be derived from cooking in iron utensils. Daily requirements: 24 - 30 mg daily. However requirement is increased up to 60 mg during growth, menstruation, pregnancy and lactation.

Iodine required for formation of thyroxine, triiodothyronine the hormones secreted by the thyroid gland. Source: sea fish, shell fish, iodized salt, vegetables grown in soil containing iodine. Daily requirement: 100-200 p.g.

Magnesium, required for processing ATP and related reactions (builds bone, causes strong peristalsis, increases flexibility, increases alkalinity)

Sulfur for three essential amino acids and therefore many proteins (skin, hair, nails, liver, and pancreas).

Phosphorus required component of bones; essential for energy processing.

Cobalt required for biosynthesis of vitamin B₁₂ family of coenzymes.

Copper required component of many redox enzymes, including cytochrome C oxidase.

Chromium required for sugar metabolism.

Molybdenum required for xanthine oxidase and related oxidases.

Selenium required for peroxidase (antioxidant proteins).

Water is the most important nutrient because the functions of cells depend on a fluid environment. Water composes 60 percent to 70 percent of total body weight. Lean people's body contains more water than obese people's bodies. Infants have the greatest percentage of total body weight as water and older people have the least. As a result, they are most vulnerable to water deprivation or loss. Yet, no one when deprived of water can survive more than a few hours in a desert or few days in the most protective environment. Fluid needs are met by consumption of liquids and solid foods such as fresh fruits and vegetables, and water is produced when food is oxidized during digestion. In healthy individual the fluid intake from all sources equals the fluid output

through elimination, respiration, and sweating. An ill person can have an increased need for fluid (e.g., fever). An ill person can also have a decreased need for fluid (e.g., cardio-pulmonary or renal disease).

6. *Physiological norms of feed.*

Requirement of a person for food substances and energy depends from:

- daily power expenses;
- weight and intensity of labour process;
- sex;
- age;
- climate;
- physiological and other features.

According to «Norms of physiological requirement for food substances and energy for various groups of population» № 5786-91, rationing of physiological requirement for food substances and energy of adult population is made by five groups of work intensity.

1 - workers mainly brainwork with physical activity factor 1.4 (teachers, workers of a science, therapists, neuropathologists, pharmacists, secretaries).

2 - workers perform easy physical work with physical activity factor 1.6 (clothing manufacturer, agriculturists, zootechnicians, veterinary surgeons, medical sisters, trainers).

3 - workers perform work of average weight with physical activity factor 1.9 (machine operators, chemists, surgeons, textile workers, drivers).

4 - workers perform heavy physical work with physical activity factor 2.3 (machine operators, agricultural and building workers).

5 - workers perform especially heavy physical work with physical activity factor 2.5 (colliers, first helper, fellers, navies).

For workers of mental work (first group) low impellent activity and insufficient muscular work is characteristic. Ratio between proteins, fats and carbohydrates in age groups 18-29 and 30-39 years is recommended 1:1.1:4.9 for men and 1:1.1:4.7 for women.

Quantity of protein of animal origin should be not less than 55 % from daily requirement, it is necessary to provide its half due to milk protein. In a diet there should be fats of animal and vegetative origin. The content of sugar in food should not exceed 15 % from total of carbohydrates.

An optimum diet for persons of mental work - 4-5-times per day.

For pregnant women the requirement for energy increases on 350 kcal, proteins - on 30 g, fats - on 12 g, carbohydrates - on 30 g.

Table 1 - Norms of physiological requirement for nutrients and energy for men and women of the first group.

Nutrient	Daily requirement	
	Men	Women
Energy, kcal	2450	2000
Proteins, g	72	61
Fats, g	81	67
Carbohydrates, g	358	289
Calcium, mg	800	800
Phosphorus, mg	1200	1200
Magnesium, mg	400	400
Iron, mg	10	18
Zinc, mg	15	15
Iodine, mg	0,15	0,15
Vitamin C, mg	70	70
Vitamin A, mkg	1000	800
Vitamin E, mg	10	8
Vitamin D, mkg	2,5	2,5
Vitamin B ₁ , mg	1,2	1,1
Vitamin B ₂ , mg	1,5	1,3
Vitamin B ₆ , mg	2	1,8
Niacinum, mg	16	14
Folate, mkg	200	200
Vitamin B ₁₂ , mkg	3	3

7. *Malnutrition and its prevention.*

Malnutrition implies the result of imperfect assimilation nutrition or both. It has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients.

Malnutrition may be in the following forms:

Undernutrition: It is due to insufficient food eaten over an extended period of time due to poverty or ignorance;

Overnutrition: It is due to consumption of excessive quantity of food over an extended period of time due to excessive food or ignorance;

Imbalance: it is due to imbalance such as quantitative imbalance of calcium, phosphorus and vitamin D.

Specific deficiency: It is due to specific deficiency such as goiter in iodine deficiency.

Malnutrition is a condition that is most prevalent in our country. It is more common among children, pregnant ladies and nursing mothers. Its effects are kwashiokor, marasmus, xerophthalmia, beriberi, pellagra, goiter, rickets, etc. (table 2).

This malnutrition condition predisposes to diseases like tuberculosis, diarrhea, parasitic infestation leads to high sickness rate and increased infant mortality rate.

Table 2 - Malnutritions forms.

Nutrients	Deficiency	Excess
Energy	starvation, marasmus	obesity, diabetes mellitus, cardiovascular disease
Simple carbohydrates	none	diabetes mellitus, obesity
Complex carbohydrates	none	obesity
Saturated fat	low sex hormone levels ^[11]	cardiovascular disease (claimed by most doctors and nutritionists)
Trans fat	none	cardiovascular disease
Unsaturated fat	none	obesity
Fat	malabsorption of fat-soluble vitamins, rabbit starvation (if protein intake is high)	cardiovascular disease (claimed by some)
Omega 3 Fats	cardiovascular disease	bleeding, hemorrhages
Omega 6 Fats	none	cardiovascular disease, cancer
Cholesterol	none	cardiovascular disease (claimed by many)
Protein	kwashiorkor	rabbit starvation
Sodium	hyponatremia	hypernatremia, hypertension
Iron	anemia	cirrhosis, heart disease
Iodine	goiter, hypothyroidism	iodine toxicity (goiter, hypothyroidism)
Vitamin A	xerophthalmia and night blindness, low testosterone levels	hypervitaminosis a (cirrhosis, hair loss)
Vitamin B ₁	beri-beri	
Vitamin B ₂	cracking of skin and corneal unclearation	
Niacin	pellagra	dyspepsia, cardiac arrhythmias, birth defects
Vitamin B ₁₂	pernicious anemia	
Vitamin C	scurvy	diarrhea causing dehydration
Vitamin D	rickets	hypervitaminosis d (dehydration, vomiting, constipation)
Vitamin E	nervous disorders	hypervitaminosis e (anticoagulant: excessive bleeding)
Vitamin K	hemorrhage	
Calcium	osteoporosis, tetany, carpopedal spasm, laryngospasm, cardiac arrhythmias	fatigue, depression, confusion, anorexia, nausea, vomiting, constipation, pancreatitis, increased urination
Magnesium	hypertension	weakness, nausea, vomiting, impaired breathing, and hypotension
Potassium	hypokalemia, cardiac arrhythmias	hyperkalemia, palpitations

Deficiency of Proteins

Protein-calorie malnutrition (PCM) is the most prominent form of protein deficiency state. It is common among children during the first few years of life (i.e., between 1-3 years of age). PCM occurs primarily due to poverty, and infections like diarrhea, respiratory infection, measles and intestinal worms. These infection increase the demand for calories and decrease the absorption and utilization of proteins.

Clinically, PCM is manifested in two forms, these are: *Marasmus* and *Kwashiorkor*.

Marasmus - it is a clinical condition of protein energy malnutrition resulting from deficiency of total energy intake, usually occurs in the age group - 5 years. It is characterized by severe muscle wasting, severe growth retardation, wasting of muscles, failure to gain weight, child feels good appetite but irritable, marked wasting of skin and bones, diarrhea and modified hair texture,

Kwashiorkor - results from consumption of adequate calories but a relative protein deficiency. Symptoms are mental changes, edema, anemia, retarded growth, loss of appetite, diarrhea, changes in skin pigment, coma (late stage), decreased muscle mass, fatigue, hair changes (change in color or texture), increased and more severe infections due to damaged immune system.

Kwashiorkor is most common in areas where there is:

- famine;
- limited food supply;
- low levels of education (when people do not understand how to eat a proper diet);
- this disease is more common in very poor countries.

PCM can be treated by:

1. Giving adequate diet.
2. Treatment of infections and measures to prevent relapse.
3. Promoting health education.
4. Taking adequate care of the child's nutritional requirement.

Protein deficiency in Adults

Reduced weight, anaemia, greater susceptibility to infection, frequent loose motions, lethargy, edema, delay in healing of wounds are common protein deficiency sign in adults.

Vitamin A deficiency: stunted growth, night blindness - Inability to see in dim light, keratinization, xerophthalmia, corneal xerosis - cornea of eye becomes dry, dull.

Vitamin B₁ deficiency: loss of appetite, absence of ankle jerk or knee jerk and calf tenderness, ultimately leads to beriberi.

Vitamin B₂ deficiency disease: angular stomatitis - affection of the skin at the angles of mouth. Cheilosis - zone of red, denuded epithelium appears at

the line of closure of the lips. Dermatitis, corneal vascularization - small greyish white opacities may be seen on the surface of cornea.

Vitamin B₃ deficiency: burning-feet syndrome (itching and burning in the feet).

Vitamin B₆ deficiency disease: In infants - convulsions. In adults - dermatitis, glossitis, angular stomatitis.

Vitamin B₇ deficiency disease: dermatitis, conjunctivitis.

Vitamin B₁₂ deficiency disease: megaloblastic anaemia - deficiency of either vitamin B₆ or B₁₂ results in megaloblastic anaemia due to faulty erythropoiesis and maturation of RBC. The bone marrow contains abnormal cells, called megaloblast in place of normoblast. Pernicious anaemia - anaemia produced due to the deficiency of the intrinsic factor resulting in defective or decreased absorption of vitamin B₁₂. Degeneration of nerve fiber of spinal cord.

Vitamin C deficiency: defective formation of collagen in connective tissues. Defective formation of bones and teeth.

Vitamin D deficiency disease: rickets - it is characterized by bone deformation in growing children. Osteomalacia - generally found in pregnant, lactating mothers. It is a common metabolic disorder of bones and is characterized by chronic backache and generalized aches and pains.

Folic Acid deficiency disease: megaloblastic anaemia, glossitis, disturbances of GIT like diarrhea, distension and flatulence, severe deficiency may cause infertility or sterility.

Nicotinic Acid deficiency disease: dermatitis, diarrhoea, dementia.

Fluorine deficiency characterized by dental caries, which can be prevented by fluoridation of community water supplies.

Zinc deficiency disease: it is associated with liver disease pernicious anaemia, delayed wound healing, sexual dysfunction and alopecia.

Iron deficiency leads to anemia, impaired immunity and decreased resistance to infection.

Iodine deficiency leads to endemic goitre, hypothyroidism, impaired hearing and brain development, spontaneous abortions.

Preventive measures of malnutrition:

1. Increased food production by scientific cultivation.
2. Vulnerable group, i.e., infants, preschool children, expectant and lactating mothers should be protected by best utilization of locally available food substitution, midday cheap supplementary food, etc.
2. Fortification of arte (flour) with protein and calcium or milk should be fortified with vitamin A and vitamin D.
3. Improvement of environmental sanitation is necessary to prevent the parasitic infections.
4. Projects and programs in the field of food and nutrition including nutrition education should receive a high priority.
5. Applied nutrition program should be extended to all the affected areas

and it should run sincerely and should be beneficial to vulnerable groups.

6. Prevention of unnecessary loss of food in the fields, store, transport and cooking is necessary.

7. Education of public on fundamentals of diet and nutrition and help from voluntary and international organization are necessary.

8. Feed rationalization.

9. Addition lacking or to restriction of some food substances.

10. Rehabilitation of badly eating children.

11. Vitaminization of feed by preparations of vitamins.

12. Insolation.

Malnutrition is a disease of society, poverty and ignorance. In this, every one, i.e. teacher, nurse, physician, farmer and all organizations have to contribute much to combat this malnutrition. The steps have already taken by the Government of India to tackle the problem.

8. *Hygienic characteristic of basic food products.*

Foodstuffs may be broadly classified as the following:

1. Cereals, e.g., rice, ragi, wheat, maizejowar, etc., which produce carbohydrate.

2. Pulses, which give proteins.

3. Nuts and oilseed, e.g., groundnut, almond, cashewnut, mustard seed, soyabean, etc. provide protein and fat.

4. Vegetables, e.g., green leafy vegetables (spinach, amaranth which provide carotene), root vegetables, e.g., tapioca, potato, sweet potato, etc. provide carbohydrate, other vegetable (brinjal, lady finger, french beans) which provide vitamins.

5. Fruits, e.g., guavas, amia, citrus fruits, etc. provide vitamins. Mangoes, orange, papaya, etc. provide carotene. Dried fruits like dates and raisins provide iron.

6. Milk and milk products, e.g., milk, curds, cheese, which provide proteins.

7. Flesh foods, e.g., fish, poultry, meat provide class proteins.

The common **cereals** (from 'Ceres', the goddess of maize) are rice, wheat, maize, barley, rye, oats and millets. The millets - consist of jowar, bajra, and ragi. The bulk of man's food (staple diet) consists of one kind or other of cereals. Cereals are monocotyledons or single-grained seeds of the domesticated grasses. As harvested they are enclosed in a woody envelope called husk that is removed by milling.

The grain itself is spherical, ovoid or spindle-shaped varying in size from 0.5 mm in the case of ragi to 10 mm in the case of maize. The grain is divisible into four parts: germ (embryo) which is situated at the pole; bran, the outer protective covering; endosperm or the inner kernel forming 75% to 80% of the grain; and scutellum, the portion between the germ and endosperm.

Rice is the seed of *Oryza sativa*. Different natural as well as hybrid varieties are grown. The protein of rice is of better quality than that of wheat as it has less deficiency of lysine - an essential amino acid - than wheat. Iron and phosphorus are the important minerals in rice. However, iron is not available to the body because it combines with phytic acid (also present in rice) and is excreted in the feces. Among the cereals rice has the lowest amount of calcium. The outer coat of rice is a good source of thiamine, niacin, pyridoxine and riboflavin. Rice does not contain vitamin A (or its precursors) and vitamin C.

Wheat is the seed of *Triticum sativum*. Unlike rice, which is cooked as such, wheat is first ground to rava, flour or maida. Gluten, the wheat protein, lacks in lysine and is inferior to rice-protein. It is sticky and thus enables the flour to be made into bread.

Wheat is a good source of calcium, phosphorus, iron and other minerals. However, they are not properly absorbed because of their interaction with phytic and oxalic acids. Wheat supplies thiamine, niacin and riboflavin.

Pulses (from 'pulis', thick soup) are the dry seeds of leguminous plants. They are dicotyledons. A series of seeds are enclosed in a pod. Seeds, varied in hue, are spherical or ovoid, 2-10 mm in diameter. Pulses are used either as whole, or split into halves, called dais (dhals): Bengal gram (chana), green gram (moong), red gram (tur), black gram (urad), lentil (masur), and soya beans are the common pulses.

Pulse proteins are deficient in the amino acids methionine and tryptophane. Soya beans have 43% proteins, 20% fats, and 20% carbohydrates. Their protein is qualitatively the best among the vegetable proteins. Because of their high protein content, pulses are referred to as the poor man's beef. Whole pulses are good source of iron, calcium, sulfur and potassium. Unfortunately most of these combine with phytic and oxalic acids and are not absorbed. Whole grains contain thiamine, niacin, riboflavin and pyridoxine. Sprouted ones (germinating seeds) contain vitamin C too.

Nuts are seeds enclosed in a hard shell: hazelnut, chestnut, walnut, almond, and pistachio. Oilseeds are a miscellaneous group used for the extraction of oil: groundnuts, coconut, sesame (til or gingelly), sunflower seeds, safflower seeds (kusum or kardi), linseed, and rapeseed. Coconut is not a nut but a stone fruit.

Groundnuts (peanuts, monkey nuts or goober) are actually pulses, being the underground fruits of a leguminous plant, *Arachis hypogaea*. They contain 27% protein, 25% carbohydrates, 40% fats and 2% minerals. Thiamine, niacin and riboflavin are present in groundnuts. The groundnut protein, predominantly 'arachin', lacks methionine and lysine. Groundnut cake is what is left of groundnuts after oil has been expressed. It contains 41% protein and 39% carbohydrates. Unfortunately, it is used as non-human (cattle) food.

Popular **Green Leafy Vegetables (GLVs)** are fenugreek (menthi), mint (pudina), spinach (palak), coriander (kothmir), amaranth (raj girha), and lettuce. Cabbage is a leafy vegetable but is not green.

GLVs are poor in carbohydrates (2-10%) and poorer in proteins (0.5%). On the other hand, they are a good source of minerals - calcium, iron, sodium, chlorides and vitamins - ascorbic acid, thiamine, riboflavin and folates. They do not contain vitamin A as such, but contain its precursor, beta-carotene. They afford flavour to food. The cellulose in them provides roughage and helps the motility of the large intestines. In addition, GLVs help maintain the blood alkalinity.

Examples of **roots and tubers** are potato, carrot, yam, colocasia, sago, radish and tapioca. **Other vegetables** include brinjal, cauliflower, lady's fingers, pumpkin, cucumber, bitter gourd and ridge gourd.

Roots and tubers have 10-20%, and other vegetables 3-8%, carbohydrates. Both groups have only 0.5% proteins. Their importance lies in the fact that they contain minerals-calcium, phosphorus and iron-and vitamins, particularly beta carotene and ascorbic acid.

Fruits such as banana, mango, papaya, orange, grapes, etc., contain 70-90% water, negligible fats and proteins, and 5-20% carbohydrates in the form of fructose and sucrose. The riper the fruit, the greater the carbohydrate content.

Fruits are good source of iron, calcium, sodium and potassium. They contain beta-carotene, thiamine and ascorbic acid. They promote the movements of the large intestines and thus exhibit laxative properties. Finally, they help maintain acid-base equilibrium of the body fluids.

Meat is the skeletal muscle of animals and such birds as chicken, pigeon and duck. The common edible organs are tongue, liver, kidney, thymus, brain and heart. Meat contains 18-22% proteins, 10-20% fats, and 1.5% minerals. It does not contain carbohydrates. The proteins of meat are myosin, myoalbumin and haemoglobin. They are of high biological value as they contain all the essential amino acids in the right proportions. The minerals of note in meat are iron, phosphorus and potassium. Liver contains thiamine, niacin, cyanocobalamin, and vitamins A and D. Meat is poor in all vitamins except thiamine and niacin.

Fish are aquatic scaly vertebrates possessing fins and gills. Some of them are found in sea, others in fresh waters. Most are edible but a few are poisonous. Fish contain 15-20% protein of high biological value. 'Lean' fish contain less than 2%, and 'fat' fish, 2-10% of fat. Fish do not contain carbohydrates. Calcium (present in bones), phosphorus, manganese, iron and copper I are the minerals found in fish. Salt-water fish contain iodine and fluorine too. Fish are good source of vitamins A and D, thiamine, niacin, riboflavin and cyanocobalamin.

Eggs of hen, duck and turkey are commonly eaten. They contain 13.3% each of proteins and fats, 1 % minerals and no carbohydrates. Protein in the form of ovalbumin is present in the outer white part. It is of high biological

value (reference protein). A little protein (vitellin) occurs in the yellow part called yolk. Fat of egg is present in the yolk.

Milk (mammary secretion) of cows, buffaloes, goats, and occasionally, of ass, mare, yak, camel, and reindeer, is consumed. Milk is free of peculiar smell and taste. Its specific gravity lies between 1028 and 1032. On chemical analysis it has at least 3% fat and at least 8.5% "solids not fat (SNF)", in the case of cow's milk, and 6% fat and 9% SNF in that of buffalo's milk. With methylene blue reduction test, it takes at least 4V2 hours to reduce the dye. On microscopic examination it has less than 500,000 cells/ml.

Pasteurized milk is the milk subjected to "pasteurization", a process of heating milk to a temperature below its boiling point, for a definite period, and then chilling it to 50°C.

If milk has been adequately pasteurized, the "phosphatase test" will be negative, because the enzyme phosphatase in milk gets destroyed at the temperature-time combination employed for pasteurization.

Both boiling and pasteurization destroy the pathogenic organisms in milk. The advantages of pasteurization of milk over boiling are these:

- a. It does not affect the taste of milk;
- b. It results in less loss of iodine, calcium and phosphorus.

9. Food poisonings, their prevention and investigation.

Foodborne illness (also foodborne disease and colloquially referred to as food poisoning) is any illness resulting from the consumption of contaminated food.

Classification of food poisonings:

1. Microbic nature:

- 1.1. food infection (*E.coli*, *B proteus*, *Cl. perfringens*, *P. vulgaris*, etc.);
- 1.2. food intoxication – bacterial toxicoses (*S. aureus*, *Cl. Botulinum*);
- 1.3. alimentary mycotoxicoses (*Claviceps purpurea*, sort *Fusarium*, *Aspergillus*).

2. Not microbic nature:

- 2.1. poisonings by products, poisonous by nature (poisonous mushrooms, poisonous plants, poisonous fishes, poisonous molluscs);
 - 2.2. poisonings by vegetative products at certain conditions (green and sprouted potato, beans of string bean, kernel of stone fruit);
 - 2.3. poisonings by animal products at certain conditions (liver, caviar of burbot, pikes, perch, mackerel in spawning);
 - 2.4. poisonings by chemioxenobiotics (chemical compounds arriving from equipment, pesticides, food additives, heavy metals, nitrates and nitrites).
- ##### 3. Not specified (alimentary myoglobinuria).

In spite of the common term food poisoning, most cases are caused by a variety of pathogenic bacteria, viruses, prions or parasites that contaminate food, rather than chemical or natural toxins. Foodborne illness usually arises from

improper handling, preparation, or food storage. Foodborne disease can also be caused by a large variety of toxins that affect the environment.

Symptoms typically begin several hours to several days after consumption and depending on the agent involved, can include one or more of the following: nausea, abdominal pain, vomiting, diarrhea, gastroenteritis, fever, headache or fatigue.

In most cases the body is able to permanently recover after a short period of acute discomfort and illness. However, foodborne illness can result in permanent health problems or even death, especially for people at high risk, including babies, young children, pregnant women (and their fetuses), elderly people, sick people and others with weak immune systems.

Foodborne illness due to campylobacter, yersinia, salmonella or shigella infection is a major cause of reactive arthritis, which typically occurs 1-3 weeks after diarrheal illness. Similarly, people with liver disease are especially susceptible to infections from *Vibrio vulnificus*, which can be found in oysters or crabs.

Tetrodotoxin poisoning from reef fish and other animals manifests rapidly as numbness and shortness of breath, and is often fatal.

The delay between consumption of a contaminated food and appearance of the first symptoms of illness is called the **incubation period**.

This ranges from hours to days (and rarely months or even years, such as in the case of Listeriosis or Creutzfeldt-Jacob disease), depending on the agent, and on how much was consumed. If symptoms occur within 1-6 hours after eating the food, it suggests that it is caused by a bacterial toxin or a chemical rather than live bacteria.

During the incubation period, microbes pass through the stomach into the intestine, attach to the cells lining the intestinal walls, and begin to multiply there. Some types of microbes stay in the intestine, some produce a toxin that is absorbed into the bloodstream, and some can directly invade the deeper body tissues. The symptoms produced depend on the type of microbe.

Food infection (refers to the presence of bacteria or other microbes which infect the body after consumption) are extended everywhere.

A source of activators are animals and people, transfer mechanism - fekal-oral, transfer way - alimentary. Flashes of diseases occur at use of ready feed (salads, fish products, mashed potatoes and boiled potato). Its arise against infringements of sanitary-hygienic requirements at storage and cooking. Poisoning begins acute after short incubatory period (6-24 h) and comes to an end within 1-3 days.

C. perfringens - with poorly prepared meat and poultry the main culprits in harboring the bacterium. The *Clostridium perfringens* enterotoxin (CPE) mediating the disease is heat-labile and can be detected in contaminated food, if not heated properly, and feces.

Incubation time is between 6 and 24 (commonly 10-12) hours after

ingestion of contaminated food. Often times meat is well prepared but too far in advance of consumption. Symptoms typically include abdominal cramping and diarrhea - vomiting and fever are unusual. The whole course usually resolves within 24 hours. Very rare, fatal cases of clostridial necrotizing enteritis have been known to involve "Type C" strains of the organism, which produce a potently ulcerative β -toxin.

Food bacterial toxicoses, or intoxications - refers to the ingestion of toxins contained within the food, including bacterially produced exotoxins, which can happen even when the microbe that produced the toxin is no longer present or able to cause infection.

Staphylococcal toxicoses are caused more often enterostain golden and white staphylococcus, producing thermostable exotoxin which can collect in products and ready feed. They have the short incubatory period (1-6 h) and short current (20-25 h). Staphylococcal toxicoses are connected with use of milk products (cottage cheese, sour cream, creams, ice-cream, cheese) or ready meat and fish products prepared from forcemeat more often. An infection source - people with staphylococcal pustulous diseases of skin, quinsy, stomatitises, and also cows sick of mastitis.

Botulism - heavy food toxicosis proceeding with defeat of central nervous system. In an initial stage of disease the phenomena gastroenteritis are possible, then paralysis of soft palate, language, throat, speech disturbance, chewing and swallowing develop paralysis of eye muscles. A body temperature more often normal or subnormal. The incubatory period from 2 h till 8-10 days, more often 12-36 h. Without timely application of antitoxic Serum death attacks 2-8 day of disease.

For botulism occurrence vegetable and fruit canned food of house preparation, meat and fish house preparations (gammons, sausages, salty fish) are optimum.

The term **alimentary mycotoxicoses** refers to the effect of poisoning by Mycotoxins through food consumption. Mycotoxicoses develop at use in feed of products from grain and bean cultures containing toxic substances of microscopic mushrooms of sort *Fusarium*, *Claviceps* and *Aspergillus*. So, use of bread infected with toxic microscopic mushroom *Fusarium graminearum*, causes *fusarial toxicosis*, named «poisoning with drunk bread». Clinically it is shown by acute excitation, shaky gait, overall picture of heavy intoxication. Disease lasts 1-2 days.

Reception in food of tree nuts, peanuts, maize, sorghum and other oilseeds, including corn and cottonseeds containing toxins *Aspergillus flavis* (aflatoxins), leads to *aflatoxicosis*. For this poisoning defeats of liver, nervous and immune systems are characteristic.

Chemical food poisoning is caused by eating plants or animals that contain a naturally occurring toxin.

Chemical food poisoning often involves mushrooms, poisonous plants, or marine animals. Activated charcoal may be useful. Complications (eg, gastroenteritis, dehydration, renal or hepatic failure, respiratory insufficiency) are treated supportively.

Mushrooms:

Numerous species when ingested cause toxicity. If patients have eaten an unidentified mushroom, identifying the species can help determine specific treatment. All toxic mushrooms cause vomiting and abdominal pain; other manifestations vary significantly by mushroom type. Generally, mushrooms that cause symptoms early (within 2 h) are less dangerous than those that cause symptoms later (usually after 6 h).

Mushrooms that cause early GI symptoms (eg, *Chlorophyllum molybdites*, the little brown mushrooms that often grow in lawns) cause gastroenteritis, sometimes with headaches or myalgias. Diarrhea is occasionally bloody. Symptoms usually resolve within 24 h.

Mushrooms that cause early neurologic symptoms include hallucinogenic mushrooms, which are usually ingested recreationally because they contain psilocybin, a hallucinogen (*Psilocybe* genus). Symptoms begin within 15 to 30 min and include euphoria, enhanced imagination, and hallucinations. Tachycardia and hypertension are common, and hyperpyrexia occurs in some children; however, serious consequences are rare. Treatment occasionally involves sedation (eg, with benzodiazepines).

Mushrooms that cause early muscarinic symptoms include members of the *Inocybe* and *Clitocybe* genera. Symptoms may include the SLUDGE syndrome, miosis, bronchorrhea, bradycardia, diaphoresis, wheezing, and fasciculations. Symptoms are usually mild, begin within 30 min, and resolve within 12 h. Atropine may be given to treat severe muscarinic symptoms (eg, wheezing, bradycardia).

Mushrooms that cause delayed GI symptoms include members of the *Amanita*, *Gyromitra*, and *Cortinarius* genera. The most toxic *Amanita* mushroom is *Amanita phalloides*, which causes 95% of mushroom poisoning deaths. Initial gastroenteritis, which may occur 6 to 12 h after ingestion, can be severe; hypoglycemia can occur. Initial symptoms abate for a few days; then, hepatic and sometimes renal failure develops. Initial care involves close monitoring for hypoglycemia and possibly repeated doses of activated charcoal. Treatment of hepatic failure may require liver transplantation; other specific treatments (eg, *N*-acetylcysteine, high-dose penicillin, silibinin) are unproven.

Gyromitra mushrooms can cause hypoglycemia simultaneously with or shortly after gastroenteritis. Other manifestations may include CNS toxicity (eg, seizures) and, after a few days, hepatorenal syndrome. Initial care involves close monitoring for hypoglycemia and possibly repeated doses of activated charcoal. Neurologic symptoms are treated with pyridoxine; hepatic failure is treated supportively.

Most *Cortinarius* mushrooms are endogenous to Europe. Gastroenteritis may last for 3 days. Renal failure, with symptoms of flank pain and decreased urine output, may occur 3 to 20 days after ingestion. Renal failure often resolves spontaneously.

Poisonous plants:

A few commonly grown plants are poisonous. Highly toxic and potentially fatal plants include castor bean, jequirity bean, poison hemlock, and water hemlock, as well as oleander and foxglove, which contain digitalis glycosides. Few plant poisonings have specific antidotes.

Castor bean contains ricin, an extremely concentrated poison, but in a relatively impervious shell; thus, the bean must be chewed to release the toxin. Jequirity bean also has a concentrated cellular poison, which can cause death after swallowing or, in children, after chewing only 1 bean. Symptoms of either poisoning may include delayed gastroenteritis, sometimes severe and hemorrhagic, followed by delirium, seizures, coma, and death. Whole-bowel irrigation should be considered; it aims to remove all beans ingested.

Oleander, foxglove, and the similar but less toxic lily of the valley can cause gastroenteritis, confusion, hyperkalemia, and arrhythmias. The serum digoxin level can confirm ingestion but is not useful as quantitative information. K levels are closely monitored. Hyperkalemia may respond only to hemodialysis. Ca is not recommended for arrhythmias. Digoxin-specific Fab (fractionated antibody) fragments have been used to treat ventricular arrhythmias.

Hemlock poisoning can cause symptoms within 15 min. Poison hemlock has nicotinic effects, beginning with dry mouth and progressing to tachycardia, tremors, diaphoresis, mydriasis, seizures, and muscle paresis. Rhabdomyolysis and bradycardia may occur. Water hemlock appears to enhance aminobutyric acid (GABA) activity. Symptoms may include gastroenteritis, delirium, refractory seizures, and coma.

Fish:

There are 3 common types of fish poisoning.

Ciguatera poisoning may result from eating any of 400 species of fish from the tropical reefs of Florida, the West Indies, or the Pacific, where a dinoflagellate produces a toxin that accumulates in the flesh of the fish. Older fish and large fish (eg, grouper, snapper, kingfish) contain more toxin. No known processing procedures, including cooking, are protective, and flavor is unaffected. Symptoms may begin 2 to 8 h after eating. Abdominal cramps, nausea, vomiting, and diarrhea last 6 to 17 h; then, pruritus, paresthesias, headache, myalgia, reversal of hot and cold sensation, and face pain may occur. For months afterward, unusual sensory phenomena and nervousness may cause debilitation.

Scombroid poisoning is caused by high histamine levels in fish flesh due to bacterial decomposition after the fish is caught. Commonly affected species

include tuna, mackerel, bonito, skipjack, and mahimahi. The fish may taste peppery or bitter. Facial flushing and possibly nausea, vomiting, epigastric pain, and urticaria occur within a few minutes of eating and resolve within 24 h. Physical signs may include a diffuse blanching erythema, tachycardia, wheezing, and hypotension or hypertension. Symptoms are often mistaken for those of a seafood allergy. Unlike other fish poisonings, this poisoning can be prevented by properly storing the fish after it is caught.

Tetrodotoxin poisoning is most commonly due to eating the puffer fish (fugu), a sushi delicacy, but 100 fresh and salt water species contain tetrodotoxin. Symptoms are similar to those of ciguatera poisoning; potentially fatal respiratory paralysis can also occur. The toxin cannot be destroyed by cooking or freezing.

Shellfish:

Paralytic shellfish poisoning can occur from June to October, especially on the Pacific and New England coasts, when mussels, clams, oysters, and scallops are contaminated by the poisonous dinoflagellate responsible for red tide. This dinoflagellate produces the neurotoxin saxitoxin, which is resistant to cooking. Circumoral paresthesias occur 5 to 30 min after eating. Nausea, vomiting, and abdominal cramps then develop, followed by muscle weakness. Untreated respiratory paralysis may be fatal; for survivors, recovery is usually complete.

Prevention of food poisoning:

- timely revealing of sick persons and carriers among workers;
- storage of products is carried out with observance of temperature regimen, transportation - special transport, cooking - with observance of technology requirements;
 - sanitary-epidemiological supervision at public catering establishments;
 - correct conservation of foodstuff in house conditions;
 - control over pollution of grain and its correct storage, struggle against illnesses of agricultural plants;
 - good hygiene practices before, during, and after food preparation can reduce the chances of contracting an illness. There is a general consensus in the public health community that regular hand-washing is one of the most effective defenses against the spread of foodborne illness. The action of monitoring food to ensure that it will not cause foodborne illness is known as **food safety**.

The important role in prevention of food poisonings belongs to **hygienic rationing** of product's quality. **Hygienic rationing** – is ability to satisfy physiological requirements of person and to provide safety for life and harmlessness for health of people of present and future generations. In qualitative meat content of lead more than 0,5 mg/kg, arsenic - 0,1 mg/kg, nitrosamines - 0,002 mg/kg is not supposed, microorganisms – 10/g.

Content of nitrates in potato should be not above 150, tomatoes - 100, apples - 60, carrots - 200, cabbage - 400 mg/kg.

At food poisoning occurrence **investigation of food poisonings** is spent. A doctor should render first aid by a victim, if necessary hospitalize his, find out the conditions which have led to food poisoning, withdraw the suspicious products and direct the emergency notice about food poisoning to the centre of hygiene and epidemiology.

In an emergency notice about food poisoning settlement, poisoning date, place of food consumption, quantity of victims, quantity hospitalized victims, weight of disease, quantity of lethal cases, a suspicious product, prospective reason of a poisoning. For specification or statement of a diagnosis a physician directs on research to laboratory vomitive and fecal weights of patients, waters after gastric lavage, blood, urine.

10. Hygienic bases of therapeutic and preventive diets organization.

Diet therapy is the treatment of disease diet. It involves modifying diets in such a way as to meet the requirements created by disease or injury. A diet used as a medical treatment is called a *therapeutic diet*. If a patient needs a special diet, the physicians prescribe the diet and write the diet order in the medical record. The therapeutic diet is planned by the dietician and usually served and monitored by the nurse. Nurses and other health professionals should consult with the physician when conditions may necessitate a change in diet order.

Hospital food service must accommodate a wide range of patients from varying backgrounds. Many different therapeutic diets must be planned, and the number and type of meals to be served changes daily. It is no wonder hospital food does not always measure up to 'home cooking'. Nevertheless, hospital menus are planned to be nutritionally adequate and well balanced. Efforts are made to accommodate each individual patient. Patients sometimes have a negative perception of hospital food. If they are on a restricted diet, they may have even less of a desire to eat.

There are 15 therapeutic diets. Some of them are used during short period of time, during acute attack of some diseases, and some diets should be used for a long time, sometimes all life.

For the majority of the patients 4 meals per day is accepted: breakfast in 8-9 hr - 25-30 % of daily norm, dinner at 13-14 hr - 35-40 %, supper at 17-18 hr - 20-25 % and second supper in 21 hr - 5-8 %.

Each diet has its own indications, features of chemical structure, power value, list of the allowable and contra-indicated products and dishes and basic ways of its cooking.

A diet №0 contains mucous soups, diluted milk, kissel, jelly, vegetable and fruit juices, tea, sugar and glucose. Food intake is spent each 2-3 hours and even at the night, if the patient awake.

Table 3 - Therapeutic diets.

Diet	Indications
0	3-6 days after stomach and intestines surgery
1	Hyperacid gastritis, stomach and intestine ulcer, infectious diseases with a lesion of gastrointestinal tract, stomach surgery
2	Chronic gastritis with secret insufficiency in a recovery stage, acute gastritis, enteritis, colitis after and out of acute attack
3	Chronic diseases of intestines with constipations out of acute attack
4	Acute diseases and acute attack of chronic diseases of intestines with strong diarrheas
5	Acute and chronic hepatitis and cholestitis, liver cirrhosis, cholelithiasis
6	Gout, urolithiasis with formation of urine acid salts
7	Acute nephritis during recovery, chronic nephritis out of acute attack, renal failure
8	Obesity
9	Pancreatic [insular] diabetes
10	Diseases of cardio-vascular system with cardiovascular inefficiency I or IIA
11	Tuberculosis, undernutrition, exhaustion after illnesses, surgery, traumas
13	Acute infectious diseases
14	Urolithiasis with alkaline reaction of urine and phosphorus-calcium salts
15	Various diseases which are not require special treatment diets

In a diet №1 all products are given in mechanically crushed and boiled kind, the vegetable and fruit juices are added. The fried, salty, spicy dishes, canned food are excluded. Food intake is spent not less than 4 times per day.

The diet № 2 includes dishes of different degree of crushing and thermal processing. The cold dishes, difficultly digested, irritating are excluded.

The diet № 3 contains products and dishes, strengthening work of gastrointestinal tract.

In a diet № 4 there are mucous soups, porriges, steam outlets, kissel from bilberry, crackers, strong tea, broth of a dogrose. The fried, salty dishes, milk, vegetables are excluded.

In a diet № 5 the dairy and vegetative products, dish basically in grated and crushed kind are recommended. Fried, rough, rich by the extractive substances, cholesterol products are excluded.

The diet № 6 excludes products containing much purines, sorrel acid, increases quantity of alkaline products.

In a diet №7 the contents of albumens, salt, liquid is limited, meat and fish should be boiled.

In a diet № 8 the contents of carbohydrates and fats decreased at the normal contents of albumen.

The diet № 9 contains poorly easily digestive carbohydrates and animal fats. Sugar and sweets are excluded.

In a diet № 10 the contents of fats, carbohydrates, salt, liquid is reduced, the contents of calcium, magnesium is increased. Meat and fish should be boiled.

The diet № 11 includes the raised contents of albumens, especially milk, and also vitamins, mineral substances, fats and carbohydrates.

In a diet № 13 the reduced quantity of fats, carbohydrates and, to a lesser degree, albumens is recommended, the contents of vitamins and liquids raises. Rough, greasy, salty, difficultly digested dishes are excluded. Food prepare in minced and grated a kind.

The diet № 14 limits products of alkalizing action and rich of calcium. The products, varying the urine reaction into acid condition, are prevail.

In a diet № 15 all ways of culinary processing of food are supposed.

Preventive nutrition promotes absorption of harmful substances (e.g. xenobiotics) in gastrointestinal tract, its accelerated removing, increase of immunodefence. There are 5 rations of preventive nutrition

The ration №1 includes products, rich of metionin, lecitin and not polyunsaturated phospholipids, which normalize a fatty exchange and raise antitoxic function of a liver. Ration also contains vegetables, fruit, berry, which have pectines, promoting removing of radioactive substances and heavy metals. 150 mg of vitamin C is given daily, the plenty of a liquid is recommended, the salty and greasy products are excluded. Three meals per day are provided.

Table 4 - Diets of a preventive nutrition

Diet	The harmful factor
№ 1	Radioactive substances and ionizing radiation
№ 2	Strong nitric and sulfuric acid, compounds of chlorine, fluorine etc.
№ 3	Lead, varnishes, paint, tin
№ 4	Phosphoric compounds, aniline, benzene, arsenic etc.
№ 5	Sulphur-hydrate, dioxed of manganese, compounds of mercury

The ration №2 contains products, rich of animal albumen, calcium, potassium, magnesium, the salty and smoked products are excluded. 2 mg of vitamin A and 150 mg of vitamin C is given daily. Three meals per day are provided.

The ration №3 usually alternate with ration №2. This diet contains products, rich of sour mineral substances, and excludes milk and dairy products, vegetables, fruit, berry. 150 mg of vitamin C is given daily.

The ration №4 includes milk and dairy products, vegetable oils, and also products, having lipotropous properties. A lot of liquid is not recommended, the products, containing purinious substances, rendering adverse influence on function of a liver are excluded.

For workers with aniline, benzole 150 mg of vitamin C is given daily, and for workers with compounds of arsenic, phosphorus – 4 mg of vitamin B₁ and 150 mg of vitamin C are given daily. Three meals per day are provided.

In the ration № 5 the eggs, liver, dairy products, fish, meat, the vegetables and vegetable oil are used, salty and smoked products are excluded. 150 mg of vitamin C and 4 mg of vitamin B₁ are given daily. Three meals per day are provided.

CHAPTER 5. HYGIENE OF WORK

Study Questions.

1. *Hygienic characteristic of labour process. Fatigue and overfatigue prevention.*
2. *Hygienic characteristic of working conditions.*
3. *Health services of workers.*
4. *Hygienic characteristic of industrial enterprises.*
5. *Hygienic characteristic of dust and physical production factors.*
6. *Hygienic requirements to work on computer.*
7. *Hygienic characteristic of weight and intensity of work.*
8. *Hygienic characteristic of chemical factors.*
9. *Hygienic characteristic of biological production factors.*
10. *Prevention and investigation of professional diseases and poisonings.*
11. *Hygiene of work in separate industries.*
12. *Hygiene of work in agriculture.*
13. *Hygiene of work of medical officer.*

1. Hygienic characteristic of labour process. Fatigue and overfatigue prevention.

Hygiene of work - is a science about laws of influence of working conditions on a workers organism for purpose of substantiation and working out of improving actions and prevention of professional diseases and poisonings.

Work depending of size of muscular and nervous loading:

- a. light;
- b. moderate;
- c. heavy;
- d. very heavy.

Table 1 – Workload types

Workload	Examples
Light	Sitting with light manual work with hands or hands and arms, and driving; standing with some light arm work and occasional walking
Moderate	Sustained moderate hard and arm work, moderate arm and leg work, moderate arm and trunk work, or light pushing and pulling; normal walking.
Heavy	Intense arm and trunk work, carrying, shovelling, manual sawing; pushing and pulling heavy loads; and walking at a fast pace.
Very heavy	Very intense activity at fast to maximum pace.

Fatigue – is time decrease of working capacity.

It is subjectively perceived as weariness with deterioration of state of health, attention decrease, infringement of coordination of movements, phenomena of palpitation, dyspnea, pains in muscles.

Overfatigue– is pathological condition characterized by proof decrease of working capacity.

Fatigue prevention:

- rational organization of work and rest;
- mechanization and automation of productions;
- scientific organization of work;
- engineering psychology;
- an industrial design;
- industrial music;
- benevolent relations in collective.

2. Hygienic characteristic of working conditions.

Working conditions - is set of production factors influencing health and working capacity of person in the course of work.

Working conditions:

- a. chemical, physical and biological factors of industrial environment;
- b. character and work organization;
- c. planning and sanitary-technical accomplishment of premises;
- d. household maintenance of workers;
- e. psychological climate in collective, etc.

Working conditions:

1. **Optimum** (workers' health remains and preconditions for preservation of high level of working capacity are created);
2. **Admissible** (levels of environment factors and labour process do not exceed the established hygienic norms on workplaces, possible functional changes are restored to the beginning of following change and do not render adverse influence on a state of workers health and their posterity);
3. **Harmful** (presence of harmful production factors exceeding hygienic norms and having adverse effect on an organism of workers and its posterity);
4. **Dangerous** (presence of dangerous production factors, which influence during a labour shift creates threat for a life, high risk of development of sharp professional defeats).

Production factors:

1. **Physical** (microclimate, barometric pressure, noise, ultrasound, infrasound, vibration, infra-red, ultra-violet and laser radiations, insufficient or blinding illumination, radio-waves);

2. *Chemical* (organic solvents, mineral acids, caustic alkalis, formaldehyde, oxide of nitrogen, sulphur and carbon, iodine, chlorine and other industrial poisons);

3. *Biological* (microorganisms-producers, live cages and disputes in preparations, activators of infectious diseases of bacterial, virus and parasitic nature);

4. *Psychophysiological* (weight of work and intensity of work).

3. *Health services of workers.*

Occupational health and safety is a cross-disciplinary area concerned with protecting the safety, health and welfare of people engaged in work or employment. The goal of all occupational health and safety programs is to foster a safe work environment. As a secondary effect, it may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are impacted by the workplace environment. It may involve interactions among many subject areas, including occupational medicine, occupational (or industrial) hygiene, public health, safety engineering, chemistry, health physics, ergonomics, toxicology, epidemiology, environmental health, industrial relations, public policy, industrial sociology, medical sociology, social law, labour law and occupational health psychology.

The International Labour Organization (ILO) and the WHO have shared a common definition of occupational health. The definition reads: "Occupational health should aim at: the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job."

Workers represent half the world's population and are the major contributors to economic and social development. Their health is determined not only by workplace hazards but also by social and individual factors and access to health services. Despite the availability of effective interventions to prevent occupational hazards and to protect and promote health at the workplace, large gaps exist between and within countries with regard to the health status of workers and their exposure to occupational risks. Still only a small minority of the global workforce has access to occupational health services. Increasing international movement of jobs, products and technologies can help to spread innovative solutions for prevention of occupational hazards, but can also lead to a shift of that risk to less advantaged groups. The growing informal economy is often associated with hazardous working conditions and involves such

vulnerable groups as children, pregnant women, older persons and migrant workers.

«**Global Plan of Action on Workers' Health**» (GPA) 2008–2017 by WHO deals with all aspects of workers' health, including primary prevention of occupational hazards, protection and promotion of health at work, employment conditions, and a better response from health systems to workers' health. It is underpinned by certain common principles. All workers should be able to enjoy the highest attainable standard of physical and mental health and favourable working conditions. The workplace should not be detrimental to health and wellbeing. Primary prevention of occupational health hazards should be given priority. All components of health systems should be involved in an integrated response to the specific health needs of working populations. The workplace can also serve as a setting for delivery of other essential public-health interventions, and for health promotion. Activities related to workers' health should be planned, implemented and evaluated with a view to reducing inequalities in workers' health within and between countries. Workers and employers and their representatives should also participate in such activities.

The main objectives of the GPA are to:

- Strengthen the governance and leadership function of national health systems to respond to the specific health needs of working populations
- Establish basic levels of health protection at all workplaces to decrease inequalities in workers health between and within countries and strengthen the promotion of health at work.
- Ensure access of all workers to preventive health services and link occupational health to primary health care.
- Improve the knowledge base for action on protecting and promoting the health of workers and establish linkages between health and work.
- Stimulate incorporation of actions on workers health into other policies, such as sustainable development, poverty reduction, trade liberalization, environmental protection and employment.

The following actions are to be considered and adapted by countries, as appropriate, to their national priorities and specific circumstances in order to achieve the objectives described below.

- 1: to devise and implement policy instruments on workers' health;
- 2: to protect and promote health at the workplace;
- 3: to improve the performance of and access to occupational health services;
- 4: to provide and communicate evidence for action and practice;
- 5: to incorporate workers' health into other policies.

Structure of **medical-sanitary unit**:

- hospital;
- polyclinic;

- medical and medical assistant's health centres;
- children's day kindergartens;
- sanatorium-dispensary.

Medical-sanitary unit can have ground area and can be also in enterprise territory.

Unlike incorporated hospital, in structure of medical-sanitary unit hospital there is department of professional pathology.

Sanitary-technical accomplishment of medical-sanitary unit includes presence of illumination, heating, ventilation, water supply and clearing.

Premises of medical-sanitary part should be kept clean and regularly be exposed to damp cleaning with washing and desinfectants. Personnel of medical-sanitary part should observe rules of personal hygiene, safety precautions and industrial sanitation.

At the heart of health services of workers in medical-sanitary units **the sectorial principle** lays. A sectorial doctor serves to 1000 workers at enterprises of petroleum-refining industry and to 2000 workers at other enterprises.

Duties of sectorial doctors:

- a. rendering of qualified medical assistance to workers;
- b. organization and carrying out of preliminary and periodic medical inspections;
- c. realization of dispensary supervision over a state of patients health;
- d. participation in carrying out of against epidemic work;
- e. hygienic training and education.

Obligatory medical inspections are carried out for purpose of conservation and strengthening of workers' health, prolongation of their awake longevity.

Tasks of medical inspections:

- a. definition of suitability of workers and employees to work;
- b. maintenance of safety of work and prevention of distribution of infectious and parasitic diseases;
- c. revealing of persons with professional diseases or suspicion on it;
- d. recognition of general diseases at which work in contact to industrial harm can worsen their current;
- e. working out of individual medical-improving actions concerning patients or suspects on occupational disease;
- f. estimation of working conditions and working out of sanitary-hygienic actions directed on liquidation of reasons, causing professional disease

Obligatory medical surveys include preliminary and periodic surveys.

To *preliminary inspection* are exposed all again acting on work, connected with influence of harmful substances and adverse production factors. The basic task of preliminary medical inspection is revealing of diseases, which serve as contraindication to work in conditions of the given manufacture.

Further workers in harmful conditions pass *periodic medical inspections*.
They are directed on:

- duly revealing of early stages of diseases;
- prevention of professional pathology;
- definition of professional suitability;
- realization of effective treatment-preventive measures.

Times of realization of periodic inspections depend from kind of manufacture, trade and professional harms.

At realization of periodic medical inspections participation of qualified doctor-therapeut and all necessary experts and also realization of instrumental and laboratory researches should be supplied.

4. Hygienic characteristic of industrial enterprises.

Industrial platform of enterprises should be sufficient size, range on dry, well winded and insolation field with low standing of subsoil waters on distance of 50-1000 m from residential area. Density of building should be 20-65 %, gardening area - not less than 15 % of all field.

Zones of industrial platform:

- industrial buildings;
- office buildings;
- warehouse;
- rest;
- economic.

At enterprises necessary panel and sufficient areas of industrial, auxiliary and sanitary-household premises is projected. Volume of industrial premises on one worker should be not less than 15 m^3 , area - not less than 4.5 m^2 at height of 3.2 m.

Structure of sanitary-household premises:

- a. wardrobe;
- b. washroom;
- c. shower;
- d. rooms of personal hygiene of women;
- e. health centres;
- f. inhalator;
- g. arrangement of drinking water supply;
- h. premises for drying and clearing of clothes and footwear;
- i. specialized laundries for washing and neutralization of overalls and footwear.

In industrial premises **natural** (upper, lateral and combined) and **artificial illumination** (local, general and combined) by means of incandescent and luminescent lamps is arranged. Light sources are arranged by fixtures of direct, dispersed and reflected light. General artificial illumination of industrial premises should be dispersed.

For **heating** of buildings and constructions of industrial enterprises it is arranged central water, radiant, steam or warm-air heating. It is necessary to give preference to water or radiant heating.

At industrial enterprises **natural and artificial ventilation** is applied. Natural ventilation is carried out through transoms, window leaves, exhaust canals. In industrial premises mechanical ventilation is equipped affluent, exhaust, forced-exhaust local and general. Delivering of outside air of 20-30 m³/h on one working should be organized.

In some premises **air conditioning**, allowing to frame and maintain optimum temperature, humidity, pressure, gas and ionic composition, speed of air is recommended.

At industrial enterprises centralized **water supply** is arranged. For maintenance of optimum sanitary-hygienic and drinking regimen provide rational propagation of cold water in all premises, and hot - in all industrial, auxiliary and sanitary-household premises.

Clearing of industrial premises of liquid waste products carry out on water drain system. The sewage keeping toxicant and radioactive substances, before draining off in water drain should be exposed to pretreatment and neutralization. Solid waste products collect in metal, hermetically occluded waste containers, and regularly take out on dumps or waste process factories.

For **floors, walls, ceilings** and other surfaces, the materials preventing sorption and supposing regular clearing, damp and vacuum cleaning, disinfection are provided.

Equipment of industrial enterprises should have smooth surface, to be stable against chemical, medicinal and disinfectant materials, serviceable and safe.

Premises and equipment should be kept clean, be exposed to regular clearing and disinfection.

5. Hygienic characteristic of dust and physical production factors.

Professional diseases - is diseases arising as a result of influence on an organism of harmful production factors. There are acute and chronic professional diseases.

Hygienic value of **dust** - ability to render fibrogenic, toxic, irritating, allergenic, cancerogenic, radioactive action.

Dust professional diseases:

- a. pneumoconiosis (silicosis, silikatosis, pneumoconiosis from the mixed and organic dust);
- b. chronic bronchitis;
- c. diseases of top respiratory ways;
- d. antracosilicosis;
- e. antracotalcosis, etc.

Hygienic value of noise – can cause defeat of an ear, nervous, cardiovascular and some other systems.

Noise influence leads to:

- a. decrease in hearing;
- b. professional relative deafness;
- c. defeat of CNS;
- d. increase of blood pressure;
- e. painful sensations in heart;
- f. decrease of pulse rate;
- g. easing of resistance of an organism;
- h. metabolism infringement.

Hygienic value of **ultrasound** - ability to get into tissue of person's body.

Ultrasound influence leads:

- a. functional changes of central and peripheral nervous and cardiovascular systems and acoustic analyzer;
- b. loss of sensitivity;
- c. polyneuritis;
- d. general weakness;
- e. dream frustration;
- f. headaches;
- g. feeling of pressure in ears;
- h. uncertainty of gait;
- i. giddiness.

Infrasounds influence leads:

- a. changes in nervous, cardiovascular, respiratory, endocrine and other systems of an organism;
- b. weakness;
- c. fast fatigue;
- d. irritability;
- e. nervously and mental infringements;
- f. working capacity decrease;
- g. vestibular infringements;
- h. visual acuity and hearing decrease.

There are general, local and combined **vibration**. Basis of vibrating illness is made nervously-trophic and haemodynamic infringements.

Symptoms of local vibration:

- a. changes of painful and temperature sensitivity;
- b. spasm and atony of small vessels;
- c. cold snap of fingers of hands;
- d. pains in the field-of heart and stomach;
- e. raised thirst;
- f. weight loss;
- g. sleeplessness.

At general vibration at working are marked:

- a. easing of skin sensitivity;
- b. expressed changes from central nervous, osteomuscular and blood systems;
- c. dizziness;
- d. noise in ears;
- e. infringement of dream;
- f. spasm of coronary vessels;
- g. myocardial dystrophy;
- h. decrease in vascular tone;
- i. deformation of joints, etc.

Microclimate - is a climate of limited territory or space, differing from environment. It divide on *comfortable*, causing good heatsensation, an optimum functional status of central nervous system and high working capacity, and *discomfortable* - heating up and cooling.

Microclimate of industrial premises is defined by combination of temperature, humidity and motility of air, temperatures of environing surfaces and their caloradiance.

At influence of *heating up* microclimate:

- a. skin temperature raises
- b. water-salt exchange is broken
- c. there is organism dehydration
- d. loss of mineral salts and water-soluble vitamins
- e. activity of cardiovascular, respiratory and other systems variates.

Cooling microclimate can cause hypothermia promoting augmentation of catarrhal diseases, vasomotor spasms, freezing injuries. At hum of heating up or cooling microclimate harmful action of chemical, physical and biological factors of environment strengthens.

In cold and transitive season temperature in wards is recommended 20-25°C, during warm time - to 21-28°C.

Relative humidity should be 15-75 %, and speed of air movenment - 0.01-0.2 m/s.

Optimum microclimatic conditions provide general and local sensation of thermal comfort at minimum strain of thermoregulation mechanisms; do not cause deflections in health level.

Influence on person of lowered **barometric pressure** (at planes, at works, in mountains) leads to occurrence of hypobaropathy.

Hypobaropathy is characterized:

- a. headaches;
- b. infringement of coordination of movements;
- c. muscular weakness;
- d. sight and hearing frustration;
- e. depression;

f. deterioration of attention and drowsiness.

There can come coma and death from paralysis of respiratory centre.

Raised barometric pressure is marked at work in mines, caissons, performance of diving works.

In the conditions of raised pressure:

- a. pains in ears;
- b. dizzinesses;
- c. frequency of breath and pulse decreases;
- d. can lead to infringement of coordination of movements, excitation, memory easing, hallucinations, consciousness loss.

In fast decompression can cause caisson disease.

Influence of industrial ultra-violet radiation:

- a. photo-ophthalmia;
- b. dermatitises;
- c. puffiness;
- d. itch;
- e. burns;
- f. headaches;
- g. hyperthermia;
- h. nervous excitation.

Radio-waves cause functional frustration of nervous and cardiovascular systems.

At influence of laser radiation on a person it is marked:

- a. rupture of tissues and change of their properties;
- b. functional frustration of central nervous, cardiovascular and endocrine systems;
- c. changes of peripheral blood;
- d. cataract;
- e. blindness.

6. Hygienic requirements to computing.

Weak x-ray, ultra-violet, infra-red, microwave radiation, is low - also ultralow-frequency electromagnetic field, electrostatic field, air ionization are characterized.

Symptoms at computing:

- a. decrease in working capacity of eyes;
- b. development of asthenopia;
- c. headache;
- d. eye reddening;
- e. lacrimation;
- f. photophobia;
- g. hands' tendinitis;
- h. traumatic epicondylitis;

i. diseases of CNS, CVS, TRT, GIT.

Preventions of harmful influence of computer

- duration of continuous work should not exceed 25 min;
- each 10 min need to be taken away on 5-10 sec about a sight aside from the screen;
- performance relaxation exercises for eyes, muscles of neck, shoulders and palms;
- image on display screen should be accurate, contrast, not have reflexions from surrounding subjects;
- sizes of furniture should correspond to height of workers;
- placing of computers should exclude a cross irradiation of a workers.

Operation time with the computer:

- for students of 1 course – 1 h;
- for another students of older years – 2 h with break 15-20 min;
- for operators of computers – 6 h with break 20 mines through everyone 2 h;
- for teachers – 4 h with break 15-20 mines through everyone 2 h.

7. Hygienic characteristic of weight and intensity of work.

Weight of work - characteristic of labour process reflecting primary loading on locomotorium and functional systems of an organism, providing its activity.

It is characterized:

- physical dynamic loading;
- weight of lifted and moved cargo;
- quantity of stereotypic working-class movements;
- working pose;
- moving to space;
- static loading.

Intensity of work - characteristic of labour process reflecting loading mainly on central nervous system, sense organs, emotional sphere of workers.

It is characterized:

- intellectual loadings;
- sensor loadings;
- emotional loadings;
- monotony;
- work regimen.

Stress of **separate organs and systems** of organism at work is marked in cases of finding of workers in the compelled, inconvenient pose. The work connected with expressed stress of locomotorium, can lead to deformation of joints, chronic arthritises, myosites, neuritises, easing of muscular strength, decrease of muscles tone and touch frustration.

Compelled pose at work standing usually leads to development of platypodia, varicose expansion of veins.

As a result of **long work sitting** scoliosis, lordosis or kyphosis of backbone, hemorrhoids, colitises and chronic locks in some cases develops.

At the influence of work connected with **long stress of vision**, there is a vision infringement, asthenopia, headache, short-sightedness.

Prevention of weight of work:

- a. mechanization of manual operations;
- b. restriction of admissible weight at lifting and carrying over of weights;
- c. improvement of tools;
- d. rational regimen of work;
- e. correct arrangement of workplace;
- f. carrying out of industrial gymnastics;
- g. organization of preliminary and periodic medical inspections.

8. Hygienic characteristic of chemical factors.

Industrial poison – is chemical substance arriving from objects of industrial environment which can causes poisonings or alteration of state of health, found out by modern methods both in course of work with it, and in the remote terms of a life of present and subsequent generations.

Harmful influence of industrial poisons on a person is studied by **industrial toxicology**. Industrial poisons by origin **classify** on organic and inorganic, by properties - on hydrophile and hydrophobic nonelectrolyte and electrolits, by aggregate state - on firm aerosols, liquid aerosols and gases, by solubility - on soluble in air, water, oil and other liquids, by stability - on unstable and stable.

Industrial poisons by character of action on a human body are subdivided: toxic, irritating, sensitizing, cancerogenic, mutagen; by way of penetration to organism: inhalation, percutaneous, oral.

Toxicity - measure of poison compatibility with life.

Toxicity of industrial poisons depends from:

1. Chemical structure and physical properties;
2. Concentration and durations of action of harmful chemical substance.

On toxicity of industrial poisons influence:

- features of worker's organism;
- individual sensitivity;
- health level;
- physiological condition;
- sex and age;
- adverse working conditions.

Hazard - possibility of poisoning occurrence at manufacture.

Classification of harmful substances by hazard:

- a. extremely dangerous (1 class);
- b. highly dangerous (2 class);
- c. moderately dangerous (3 class);
- d. little dangerous (4 class).

Toxicometry - set of researches methods for quantitative estimation of toxicity and danger of poisons.

Way of receipt of harmful chemical substance to an organism:

- Through breath bodies;
- Through integuments and mucous membranes;
- Through a gastrointestinal tract.

Arrived in an organism industrial poisons intensively collect in bodies and tissue having good blood supply. The exit of poisons in a bloodstream occurs at diseases, nervous stress, cooling, overheating, alcohol reception.

In an organism industrial poisons interact with structural components, chemical substances of cells and an intertissue liquid and are exposed to metabolism. **Poisons metabolism** in an organism occurs by means of oxidation-restoration reactions microsomal enzymes, reactions of hydrolysis, dehydroxyalkylation, dehalogenation and other transformations. As result of metabolism in an organism less poisonous substances are formed. The basic body destroying harmful chemical substances is the liver.

Excretion of toxic substances from an organism occurs through lungs, intestines, kidneys, integuments and glands.

Industrial poisons have on an organism local and general effect.

Local effect - pathological effect develops before poison absorption in blood, is characterised by damage of tissues contact to poison, evident by skin inflammations, burns.

General (resorptive) effect - pathological effect develops in result of poison absorption in blood, affection of internal bodies is characteristic.

Action of poisons on an organism:

- toxic;
- psychotic;
- suffocating;
- lacrimatory;
- irritating;
- gonadotoxic;
- embriotoxic;
- teratogenic;
- cancerogenic;
- mutagenic.

Professional poisonings - diseases arising at the influence of industrial poisons. *Professional poisonings:*

- a. acute (arisen after unitary influence on a worker large quantities of industrial poison);

- b. subacute (arise at receipt in an organism of the big doses of poison, but develop more slowly and are characterized by a long current);
- c. chronic (developing after constant influence of industrial poison throughout long time in small concentration).

Organic solvents - methyl, ethyl spirits, some aethers, some ketones, benzene, benzole etc.

Processes of neutralization of organic solvents are carried out in liver, gastrointestinal tract and in other organs.

Symptoms of acute poisoning by organic solvents:

- a. easy intoxication;
- b. excitement;
- c. infringement of movements coordination;
- d. drowsiness;
- e. depression with headaches;
- f. nausea;
- g. spasms.

At chronic poisoning slow development of asthenovegetative syndrome with gradual organic changes in cerebral cortex and other organs is marked.

Sulfuric, nitric, hydrochloric and other mineral acids at skin action cause chemical burns. Water solutions of acids lead to dryness, hyperkeratosis of palms, dermatitis.

Caustic alkalis in high concentration cause heavy chemical burns.

Chlorine aspiration at easy acute toxic poisonings causes irritation and cauterization of mucous membranes of respiratory tracts and lungs with development of bronchitis, bronchial pneumonias, pulmonary edema.

Iodine makes irritating and cauterizing action on a skin and mucous, harmful influence on nervous system and blood.

Nitrogen oxides at an easy acute poisoning cause irritation of respiratory system, cough, general weakness. At chronic intoxications diseases of respiratory system, infringement of functions of nervous and blood systems are observed.

Hydrogen sulphide has irritating effect on mucous membranes of eyes and respiratory tract, causes infringement of heart activity.

Ammonia causes irritation of mucous membranes of upper airways and eyes.

Mercury arrives in an organism through lungs, gastrointestinal tract and skin. Acute inhalation mercury poisonings are characterized by presence of stomatitis, diarrhea, pains in a stomach, general weakness, defeat of gastrointestinal tract and kidneys.

At chronic poisoning by mercury, or mercurialism, headaches, dizzinesses, fast fatigue, emotional instability, depressive reactions, tremor of hands, changes of blood, liver, kidneys, metal smack in mouth, gingivitis, ulitis, fearfulness, shyness, lack of self-confidence (mercury eretism) are marked.

Sulfurs oxides possesses irritating action on mucous membranes and lungs.

Lead causes changes in nervous system, blood, cardiovascular system, metabolism.

At chronic intoxication of lead, or saturnism, observes an encephalopathy, anemic syndrome, gastroenteric syndrome, hepatic syndrome, cardiovascular syndrome, polyneuritis, lead border on edge of gums, lead colicis.

Manganese influences a metabolism, oppresses activity of cholinesterase, affect nervous system.

Carbon monoxide poisoning causes acute symptoms such as headache, nausea, weakness, angina, dyspnea, loss of consciousness, and coma. Neuropsychiatric symptoms may develop weeks later.

Symptoms tend to correlate well with the patient's peak blood carboxyhemoglobin levels. Many symptoms are nonspecific. Headache and nausea can begin when levels are 10 to 20%. Levels > 20% commonly cause vague dizziness, generalized weakness, difficulty concentrating, and impaired judgment. Levels > 30% commonly cause dyspnea during exertion, chest pain (in patients with coronary artery disease), and confusion. Higher levels can cause syncope, seizures, and obtundation. Hypotension, coma, respiratory failure, and death may occur, usually when levels are 60%.

Caustics (strong acids and alkalis), when ingested, burn upper GI tract tissues, sometimes resulting in esophageal or gastric perforation. Initial symptoms include drooling and dysphagia. In severe cases, pain and sometimes bleeding develop immediately in the mouth, throat, chest, or abdomen. Airway burns may cause coughing, tachypnea, or stridor.

Swollen, erythematous tissue may be visible intraorally; however, caustic liquids may produce no intraoral burns despite serious injury farther down the GI tract. Esophageal perforation may result in mediastinitis, with severe chest pain, tachycardia, fever, tachypnea, and shock. Gastric perforation may result in peritonitis. Esophageal or gastric perforation may occur within hours, after weeks, or anytime in between.

9. Hygienic characteristic of biological factors.

Pathogenic microorganisms can cause development of infectious diseases:

- a). bacterial (tuberculosis, brucellosis);
- b). virus (ornithosis, rabies);
- c). fungicide (actinomycosis);
- d). protozoologic (toxoplasmosis);
- e). gelmintosis nature (trichinosis).

Professional infections can arise at short or even unitary contact.

10. Prevention of professional diseases and poisonings.

Prevention of professional intoxications and diseases includes realization of some legislative, technological, sanitary-technical, planning, organizational and treatment-prophylactic actions.

Legislative actions: working-out of hygienic norms for harmful materials, labour legislation.

In air of working region should be ammonia - 20 mg/m³, hydrogen sulphide - 10 mg/m³, nitrogen oxide (IV) - 2 mg/m³, chlorine - 1 mg/m³, sulfuric acid - 1 mg/m³, alkalis - 0.5 mg/m³, benzene - 5 mg/m³, acetone - 200 mg/m³.

Technological actions - regulation of content in raw materials of toxic substances, replacement at manufacture toxic substance by less toxic, for example, use of benzine instead of benzole. Full removal of harmful substance from a work cycle practices.

Organizational actions - restriction of time of worker's stay in dangerous zone, in equipment and capacities with toxic substances, work and rest rationalization correct organization of workplace.

Sanitary-technical actions - rational system of a forced-air and exhaust ventilation, strict constant control over content of extremely dangerous substances in air of a working zone, rational illumination and optimum microclimate on workplaces.

Planning actions - equipment of sanitary-household premises (shower, wardrobe, laundries for washing of overalls, etc.).

Treatment-preventive actions - carrying out of preliminary and periodic medical inspections, preventive nutrition, sanatorium treatment.

In a case when it is not possible to decrease concentration of harmful substances in a working zone to safe level, workers should use **personal protective equipment** (ointments, mittens, gloves, oversleeves, goggles, masks, helmets, respirators, gas masks, overall, aprons, trousers, boots, special linen and clothes from the rubber and other materials steady against toxic substances).

11. Hygiene of work in separate industries.

Professional harm of a pharmaceutical industry:

- harmful chemical substances;
- dust;
- adverse microclimate;
- noise;
- vibration;
- compelled position of body;
- stress of separate organs.

Professional harm of radio-electronic industry:

- low light exposure;
- small contrast of object of distinction with a background;
- presence in sight of direct and reflected brightness;

- frequent light readaptation of eyes;
- electromagnetic fields of radio-frequency ranges and static electricity;

- polluted air environment aerosols of solders.

Professional harm of the mining industry:

- special microclimatic conditions;
- dust;
- gases;
- vibration;
- noise;
- absence of daylight in underground conditions keeps danger of traumatism.

Professional harm in machine construction:

- heating up microclimate;
- intensive noise;
- general and local vibration;
- ultrasound;
- currents of high frequency;
- harmful chemical substances;
- raised danger of an industrial traumatism.

Professional harm in oil-processing industry:

- air pollution of working zones by limiting, nonlimiting and aromatic hydrocarbons, hydrogen sulphide, oxides of sulfurs, ammonia, phenol, acetone;

- intensive industrial noise;
- nervously-emotional stress.

Professional harm in manufacture of polymers:

- harmful chemical substances;
- adverse microclimate;
- noise.

Professional harm in industry of building materials:

- dust;
- heating up microclimate;
- air gassed condition;
- noise;
- vibration;
- physical and psychological overloads.

Professional harm in building:

- meteorological conditions;
- physical overloads;
- dust;
- gases;
- steams of chemical substances;

- noise;
- vibration;
- psychological overloads.

Professional harm at the textile enterprises:

- dust;
- noise;
- adverse microclimatic conditions;
- pressure of visual and acoustical analyzers;
- high congestion industrial operations;
- absence of a constant workplace.

Professional harm at clothing enterprises:

- dust of a vegetative or animal origin on workplaces;
- considerable pressure of sight;
- professional harm at footwear manufacturing;
- chemical factor;
- noise;
- vibration;
- heating up microclimate.

12. Hygiene of work in agriculture.

Professional harm:

- original microclimatic conditions;
- air pollution of a working zone by dust, exhaust gases, microorganisms;
- noise and vibration presence;
- contact to combustive materials;

Basic adverse factors at work in field cropping:

- heating up microclimate
- air pollution of working zone by dust and exhaust gases, pesticides, mineral fertilizers, etc.
- noise and vibration presence
- contact with fuels and lubricants oils
- intense working pose

Adverse factors at work in animal industries:

- compelled working pose
- pollution of air environment,
- special microclimate of working premises,
- physical and nervously-emotional stress in an operating time,
- contact with toxic irritating substances,
- infringement of days regimen.

Toxic chemicals:

- organophosphate;
- organochlorine;

- organo-mercuric compound;
- derivatives of urea and phenol;
- preparations of sulphur, arsenic and copper, etc.

A cropduster spraying pesticide on a field. A **pesticide** is a substance or mixture of substances used to kill a pest. A pesticide is any substance or mixture of substance intended for: - preventing, destroying, repelling or mitigating any pest. A pesticide may be a chemical substance, biological agent (such as a virus or bacteria), antimicrobial, disinfectant or device used against any pest. Pests include insects, plant pathogens, weeds, molluscs, birds, mammals, fish, nematodes (roundworms), microbes and people that destroy property, spread or are a vector for disease or cause a nuisance. Although there are benefits to the use of pesticides, there are also drawbacks, such as potential toxicity to humans and other animals.

Pesticides can be classified by target organism, chemical structure, and physical state. Pesticides can also be classed as inorganic, synthetic, or biologicals (biopesticides), although the distinction can sometimes blur. Biopesticides include microbial pesticides and biochemical pesticides. Plant-derived pesticides, or "botanicals", have been developing quickly. These include the pyrethroids, rotenoids, nicotinoids, and a fourth group which includes strychnine and scilliroside.

Many pesticides can be grouped into chemical families. Prominent insecticide families include organochlorines, organophosphates, and carbamates. Organochlorine hydrocarbons could be separated into dichlorodiphenylethanes, cyclodiene compounds, and other related compounds. They operate by disrupting the sodium/potassium balance of the nerve fiber, forcing the nerve to transmit continuously. Their toxicities vary greatly, but they have been phased out because of their persistence and potential to bioaccumulate. Organophosphate and carbamates largely replaced organochlorines. Both operate through inhibiting the enzyme acetylcholinesterase, allowing acetylcholine to transfer nerve impulses indefinitely and causing a variety of symptoms such as weakness or paralysis. Organophosphates are quite toxic to vertebrates, and have in some cases been replaced by less toxic carbamates. Thiocarbamate and dithiocarbamates are subclasses of carbamates. Prominent families of herbicides include phenoxy and benzoic acid herbicides, triazines, ureas, and Chloroacetanilides. Phenoxy compounds tend to selectively kill broadleaved weeds rather than grasses. The phenoxy and benzoic acid herbicides function similar to plant growth hormones, and grow cells without normal cell division, crushing the plants nutrient transport system.^[12]³⁰⁰ Triazines interfere with photosynthesis. Many commonly used pesticides are not included in these families, including glyphosate.

- Algicides or algaecides for the control of algae
- Avicides for the control of birds
- Bactericides for the control of bacteria

- Fungicides for the control of fungi and oomycetes
- Herbicides (e.g. glyphosate) for the control of weeds
- Insecticides (e.g. organochlorines, organophosphates, carbamates, and pyrethroids) for the control of insects - these can be ovicides (substances that kill eggs), larvicides (substances that kill larvae) or adulticides (substances that kill adults)
 - Miticides or acaricides for the control of mites
 - Molluscicides for the control of slugs and snails
 - Nematicides for the control of nematodes
 - Rodenticides for the control of rodents
 - Virucides for the control of viruses

Fungicides are chemical compounds or biological organisms used to kill or inhibit fungi or fungal spores. Fungi can cause serious damage in agriculture, resulting in critical losses of yield, quality and profit. Fungicides are used both in agriculture and to fight fungal infections in animals. Chemicals used to control oomycetes, which are not fungi, are also referred to as fungicides as oomycetes use the same mechanisms as fungi to infect plants.

Fungicides can either be contact or systemic. A contact fungicide kills fungi by direct contact; a systemic fungicide has to be absorbed by the affected organism.

Most fungicides that can be bought retail are sold in a liquid form. The most common active ingredient is sulfur, present at 0.08% in weaker concentrates, and as high as 0.5% for more potent fungicides. Fungicides in powdered form are usually around 90% sulfur and are very toxic. Other active ingredients in fungicides include neem oil, rosemary oil, jojoba oil, and the bacterium *Bacillus subtilis*.

Fungicide residues have been found on food for human consumption, mostly from post-harvest treatments. Some fungicides are dangerous to human health, such as vinclozolin, which has now been removed from use.

Environmental effects of pesticides

Pesticide use raises a number of environmental concerns. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, including non-target species, air, water and soil. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. Pesticides are one of the causes of water pollution, and some pesticides are persistent organic pollutants and contribute to soil contamination.

In addition, pesticide use also reduces biodiversity and results in lower soil quality, reduced nitrogen fixation, contribute to pollinator decline, can reduce habitat, especially for birds, and can threaten endangered species.^[8]

Health effects

Pesticides can be dangerous to consumers, workers and close bystanders during manufacture, transport, or during and after use.

The American Medical Association recommends limiting exposure to pesticides and using safer alternatives:

Particular uncertainty exists regarding the long-term effects of low-dose pesticide exposures. Current surveillance systems are inadequate to characterize potential exposure problems related either to pesticide usage or pesticide-related illnesses. Considering these data gaps, it is prudent to limit pesticide exposures and to use the least toxic chemical pesticide or non-chemical alternative.

Prevention of professional pathology at workers of agriculture is spent by the same principles, as in industries and includes legislative, technological, sanitary-technical, planning, organizational and treatment-prophylactic actions, and also use of individual protective equipment. Special attention is given to **prevention of poisonings by pesticides:**

- pesticides should be stored in warehouses specially intended for it;
- all toxic chemicals should be packed into container with accurate marks;
- in an operating time in warehouse it is forbidden to accept food, to drink water and to smoke;
- to work it is necessary in overalls, respirators or gas masks and other individual protective equipment.
- for transportation of toxic chemicals and mineral fertilizers use special cars, barges, automobile and cartage.

13. Hygiene of work of medical officer.

Features of doctors work:

- presence of diurnal and night watches;
- absence of fixed lunch break;
- big congestion of working day;
- infringement of work, rest and food regimen.

Doctors had harmful factors:

- big nervously-emotional stress;
- ionizing, laser and ultra-violet radiances;
- ultrasonic sound and fields of superhigh frequency;
- raised and depressed atmospheric pressure;
- influence of aerosols of antibiotics, anaesthetics and other medicine.

Adverse professional factors of doctors-surgeons:

- big nervously-emotional stress;
- forced posture;
- heating microclimate;
- sharp oscillation of light exposure;
- high operational load;
- night watches;
- narcotic and toxicants;
- anaesthetics;

- X-rays;
- microbial factor;
- hazard of infestation AIDS, syphilis, virus hepatitis.

As result of professional work at surgeons hypertonia, hypotension, varicose phlebectasia of inferior extremities, platypodia, stenocardia, ischemic heart disease, nervosism and other illnesses can educe.

Professional work of **obstetrics-gynecologists** is similar to activity of surgeons. Specificity of obstetrics-gynecologist job consists in constant readiness for arising difficult situations demanding strain of attention, exact coordination of touchsensitive and motor functions.

Adverse professional factors of doctors-anaesthesiologists:

- high nervously-emotional stress;
- influence of narcotic materials;
- irrational regimen of work;
- heating microclimate;
- x-ray irradiating.

Adverse professional factors of therapists:

- unfavorable environmental factors;
- work disturbance;
- possibility of infestation by infectious diseases from contact to patient.

Adverse professional factors of physiatrists:

- influence of ultrasonic sound;
- influence of infrasound;
- influence of fields of superhigh frequencies and magnetic field;
- influence of ozone;
- influence of electric current.

Adverse professional factors of roentgenologists and radiologists:

- insufficient light exposure;
- unfavorable microclimate;
- raised radioactivity;
- ozone and nitrogen oxide;
- external and internal irradiation.

For prevention of professional pathology and creation of favorable working conditions standard parameters of microclimate, air environment and air exchange should be provided. In procedural, inhalation, dressing-room and sterilizing premises fuming board with wash sink and drainage in water drain should be provided.

For medical personnel necessary composition of sanitary-household premises is provided:

- wardrobe;
- cases for storage house and working clothes;
- footwear and headdresses;
- shower;

- toilets;
- rooms of personal hygiene.

Providing of workers with hot food in hospitals is carried out in dining rooms or buffets. There should be rooms for personnel with area not less than 12 m², equipped with refrigerators, electrowater-heating devices and washstands. Medical personnel working in harmful working conditions, should pass preliminary and periodic medical inspections.

Protection principles of personnel working with occluded sources:

- quantity - reduction of source's radiation capacity;
- time - reduction of operating time with source;
- distance - increase of distance from source to working person;
- screens - application of materials absorbing an ionizing radiation.

The average annual effective dose for personnel directly working with ionizing radiation sources, should not exceed 50 mZv, and during labour activity 50 years - 1 Zv.

CHAPTER 6. HYGIENE OF HOSPITALS

Study Questions.

1. *Features of modern hospitals.*
2. *Hygienic requirements to choice and planning of hospital's ground area. Systems of hospital's build-up.*
3. *Hygienic requirements to internal hospital's planning. Ward section.*
4. *Hygienic requirements to planning of obstetric, gynecologic, infectious, children's and radiological departments' planning.*
5. *Hygienic requirements to planning of medical-diagnostic unit of hospital.*
6. *Hygienic requirements to planning of pathoanatomical department and polyclinic unit.*
7. *Hygienic requirements to hospital's sanitary-technical accomplishment and microclimate.*
8. *Hygienic requirements to equipment, refinishing and keeping of hospitals premises. Disinfection, disinsection and deratization.*
9. *Hygienic aspects of hospital-acquired infections prevention.*

1. Features of modern hospitals.

Hospital renders to population highly skilled and specialized stationary medical assistance and also carries out advisory and preventive activity.

Features of modern hospitals:

- a. new structural divisions (anesthesiology, functional diagnostics, intensive therapy, rehabilitation, etc.)
- b. enlargement of hospitals
- c. specialized hospitals (first aid, aftertreatment, children's, infectious, antituberculous, ophthalmological, oncological, radiological, etc.)
- d. organization of hospitals by monoblocks system (ward sections and medical-diagnostic units are placed in separate blocks)
- e. large hospital complexes, hospital small towns and medical-diagnostic centers.

2. Hygienic requirements to choice and planning of hospital's ground area. Systems of hospital's build-up.

Hygienic requirements to hospital ground area choice:

- a. territory should not be swamped and flooded by rivers, lakes, rain and melt waters;
- b. territory should be placed in the settle zone of the city;
- c. the area should be dry, on sandy or sabulous pure, safe soil;
- d. the proper level of subsoil waters is 1.5 m from earth surface and 0.3 m and more from foundation base;

- e. far from sources of noise and environmental contamination, railways, airports, high-speed highways;
- f. sanitary-protective zone should be 50-1000 m;
- g. in the residential zone of the city the distance between medical buildings and the street red line should be 50 m and more; and the distance between medical buildings and residential buildings should be 30-50 m;
- h. car park should be located at 40 m distance from the hospital territory.

It is forbidden to build a hospital on the area of:

- a. dump;
- b. cemetery;
- c. burial ground for animal refuse;
- d. sanitary disposal field.

Zones of territory of modern hospital:

- a. medical buildings (medical building for infectious patients, not infectious patients, pediatric, psychosomatic, radiological, obstetrical and polyclinic buildings);
- b. not medical buildings (pathoanatomical and administrative building, economic zone and zone of engineering constructions);
- c. landscape gardening.

Requirements to the hospital site:

- a. area of green plantings should be 60 % or more;
- b. landscape gardening zone - 25 m² per 1 bed;
- c. building area - 15 % or less of total area;
- d. green plantings strip of 15 m width into the perimeter of a hospital area;
- e. distance between medical building should be 24 m or more;
- f. distance between platform with garbage containers and medical-diagnostic building should be 25 m or more.

Hospital build-up systems:

- a. centralized - all medical, medical-diagnostic and auxiliary departments of hospital are united in one building or in blocked buildings;
- b. decentralized - different units are placed in separate buildings;
- c. mixed - basic somatic departments are placed in main medical building, and infectious, maternity, children's, polyclinic, pathologic-anatomy departments and administrative unit are placed in separate buildings.

Features of decentralized build-up system:

- a. good isolation of departments;
- b. prevention of hospital-acquired infection;
- c. optimum conditions for medical-protective regimen;
- d. lengthening of all communications;
- e. duplication of some premises and equipment;
- f. complication of patients care.

Features of centralized build-up system:

- a. convenient interrelation between different departments;
- b. centralization of medical-diagnostic departments;
- c. fast delivery of ready food from kitchen;
- d. irrational use of landscape gardening zone for walks;
- e. failure of medical-protective regimen in the hospital.

Mixed system combines benefits of decentralized and centralized systems.

3. Hygienic requirements to internal hospital's planning. Ward section.

Structural divisions of hospital:

- a. reception;
- b. ward units;
- c. medical-diagnostic units;
- d. pathologic-anatomy units;
- e. polyclinic;
- f. other.

Reception should be placed on the ground floor, in the isolated part of a main hospital building, near to main hospital entrance.

Reception structure:

- a. anteroom with toilet and inquiry office;
- b. registry;
- c. isolation ward;
- d. patient's examination room;
- e. (medical) treatment room;
- f. cloakroom;
- g. x-ray;
- h. operating room for urgent cases;
- i. urgent laboratory;
- j. sanitary room;
- k. managing office;
- l. duty doctor's room;
- m. head nurse's office;
- n. room of personnel.

In receptions of obstetric units it is additionally provided filter through which a parturient woman passes from anteroom, birth boxes for observation department.

Receptions for infectious patients are additionally equipped:

- a. 2-3 viewing isolation wards of 16 m² area
- b. diagnostic isolation ward for patients whose illness is not diagnosed yet
- c. premise for disinfectants storage

- d. boxing for transport cleaning and processing
- e. room of duty disinfecting persons
- f. sanitary room with separate entrance for personnel

In departments of children reception will be organized reception-viewing boxes.

Ward units (departments) are basic functional and structural element of a hospital. Diagnostics, treatment, and care of patients are carried out there.

There are some kinds of ward units:

- a. not infectious department for adult people and children (therapeutic, surgical and special);
- b. infectious department;
- c. radiological department;
- d. obstetrical department.

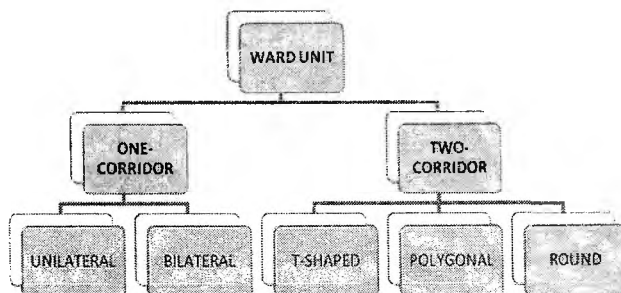
There are one- and twocorridors ward units. *Onecorridors* departments can be with one-and bilateral building of corridor.

Unilateral building of corridor allows to focus wards on southern points, *lateral* corridor - on northern.

Departments with *bilateral* building - on either side of central corridor placing wards and auxiliary premises.

In manycots hospital are formation *twocorridors* ward departments (there are two parallel corridors). Space between corridors is occupied by auxiliary premises, offices of doctors, cabinet for sanitary equipment. A lack of such planning is bad ventilation of premises of central part and absence of natural illumination.

There is also **compact twocorridors building** of department when wards are focused wherever one wishes light, and various variants of this building: T-shaped, polygonal, square, round.



At such planning of department have good visibility and economic.

Lacks of compact twocorridors building:

- unsatisfactory insolation in wards;
- absence of natural illumination in premises;
- difficulties of maintenance of favorable air regimen;
- additional noise from lifts.

Ward unit are calculated on 60 beds and consist of two ward sections.

Usually ward units have blind character. Ward unit has 60 beds and consists of two ward sections.

Ward section - is isolated complex of wards (20-30 beds) and general premises (medical-auxiliary, administrative, sanitary, recreational) meant for patients with similar diseases.

Ward is the basic premise of ward sections. Its height should be not less than 3.3 m, depth at unilateral natural illumination - no more than 6 m.

General premises of ward sections:

- a. managing office;
- b. head nurse's office;
- c. doctors' lounge;
- d. post of a duty nurse;
- e. (medical) treatment room;
- f. enema room;
- g. toilet for patients and personnel with sluice and washbasin;
- h. bathroom;
- i. patients' day room;
- j. stillroom;
- k. dining room;
- l. premises for dirty and pure linen storage;
- m. room for personnel.

Corridors connect premises with each others, and also they are an auxiliary area. Wide corridors are used as dining room, post for nurse, recreation room. Corridors are additional tanks of pure air that allows to ventilate wards.

Therapeutics departments are basic structural units of multifield hospital.

A typical therapeutics department is a ward section with usual set of premises, including a treatment room.

There are different types of therapeutics departments, such as:

- a. cardiological;
- b. rheumatological;
- c. neurologic;
- d. hematological;
- e. gastroenterological; etc.

Departments of surgery have usual set of premises as well, including a treatment room and a dressing room. Surgical departments can be divided into two large groups:

- septic (for patients with purulent inflammations);
- aseptic (free from contamination caused by harmful bacteria, viruses, or other microorganisms).

There are different types of surgical departments, such as:

- a. chest [thoracic] surgery;
- b. Orthopedical;
- c. casualty [traumatology];
- d. urological; etc.

4. Hygienic requirements to planning of obstetric, gynecologic, infectious, children's and radiological departments' planning.

In obstetric departments strict isolation of healthy pregnant women from sick gravidas is provided.

Obstetric unit includes:

- a. obstetric physiological department;
- b. pathologic pregnancy department;
- c. postnatal physiological department;
- d. observational department.

An obstetric physiological department is meant for pregnant women stay before childbirth, and for delivering a child. Usually it consists of:

- predelivery room;
- delivery room (1-2 bedded);
- treatment room;
- minor operating room;
- intensive therapy room;
- postoperative (recovery) ward.

A pathologic pregnancy department is meant for pregnant women with some abnormalities of pregnancy (e.g. transverse lie pregnancy). A prenatal diagnosis room should be in this department.

A postnatal physiological department is meant for women recently confined. Usually it consists of 1-2 bedded wards for women, 20-bedded nursery and wards for women with beds for newborns

An observational department is meant for pregnant women with infections (e.g. hepatitis, AIDS etc.) Pregnant women stay here before the childbirth; they deliver here and stay some days after the delivery. An observational department usually includes:

- delivery rooms;
- delivery isolation ward;
- postnatal wards;

- wards for newborns.

Gynecology department is similar to surgical units and includes:

- a. admission room;
- b. ward section;
- c. surgery room;
- d. intensive therapy room;
- e. postoperative (recovery) ward;
- f. physiotherapy room;
- g. economic, sanitary and recreational premises.

Infectious unit it is necessary to place in separately building. It can consist of two or more isolated sections, a section should have sluice, or «bactericidal lock», equipped with two doors, bactericidal lamp, washstand with disinfectant solution and hanger for medical dressing gowns and hats. In infectious department unilateral onecorridor building is optimum, in many-storeyed buildings each floor is used only for one infection and has sluice, lift and ladder, on top floors usually place patients with droplet infections.

For hospitalization of patients are applied boxes, halfboxes and wards with sluice.

Boxes structure:

- wards;
- entrance platform;
- bathroom;
- sluice - connects boxing with hospital corridor (have washstand, hanger for medical dressing gowns and case for transfer of food, linen, medicines).

Boxes can be planned for 1 and 2 beds. Halfboxes has no entrance platform.

In infectious unit is arranged operational where it is spent endoscopy, blood transfusion and other manipulations. In departments consisting of boxes and halfboxes, dining rooms, baths, toilets, rooms of day stay and other general premises are not arranged.

Children's not infectious departments take places in separate building and have reception.

In children's department are allocated:

- boxes for isolation of patients with suspicion on infectious diseases;
- dining room for children is more senior 3 years;
- pottery room;
- room for games of 1-6 years old children;
- premises for mothers (bedroom, rest room, dining room, lavatory, shower);
- premise for gathering and processing of mothersmilk;
- office of quartz irradiation of children;
- open verandah.

In section of not full-term and children till 1 year old place 24 cots and 3 posts of nurses. In wards have no more than 2 cots and establish tables for swaddling, weighings and feedings of children. Sections for children are more senior 1 year old are calculated on 30 cots. Capacity of one ward - no more than 4 persons.

All children 1-3 years old are place in boxes or halfboxes. 40-50 % of children of 3-7 years old and 10-20 % of children are more senior 7 years old place in boxes.

Radiological department take places in separate building or isolated block of hospital. Premises divide on "pure" and radiation dangerous, or "dirty".

In radiological department closed and open sources of radioactive radiation are applied. Closed sources are used for radiodiagnosis and radiation distance γ -therapies, therapies by radiations of quanta high energies, and also intracavitary, interstitial and applicationtherapies. Opened radionuclides are recommended for diagnostic and medical purposes.

Structure of radiological department:

- premises for medical application of closed sources of radiation;
- premises for open sources of radiation;
- premises for distance radiation therapy;
- premises for radio isotope diagnostics;
- medical-auxiliary;
- economic, sanitary and recreational premises.

Block of distance radiation therapy:

- procedural;
- room of management;
- office of doctor;
- office for intracavitary hardware γ -therapies;
- premise of reception and time storage of container with radiation sources;
- dressing;
- premise for manufacturing of phantoms and matrixes.

Block intracavitary and contact radiation therapy:

- storehouses of closed sources;
- manipulational room;
- procedural;
- operational for radio surgery;
- wards on 1-2 beds with sluice and lavatory.

Block of radiation therapy by open sources of radiation:

- storehouse of open sources;
- packing;
- washing;
- sanitary-radiating sluice;

- procedural;
- operational for radio surgery;
- wards on 1-2 beds with sluice and lavatory;
- sanitary room for personnel with checkroom;
- warsher;
- post of radiation control and room of personal hygiene.

Block of radio isotope diagnostics:

- storehouse;
- packing;
- washing;
- procedural;
- panel room;
- radiochemical room.

Protection principles:

- quantity - reduction of source's radiation capacity;
- time - reduction of operating time with source;
- distance - increase of distance from source to working person;
- screens - application of materials absorbing an ionizing radiation.

Protection from radiation exposure is accomplished through minimizing the time of exposure, maximizing the distance from the source, and using shielding. Shielding from a known discrete radioactive source can be reasonably achieved (eg, with lead aprons or commercially available transparent shields); however, shielding from most radionuclide contamination from large-scale disasters (eg, nuclear accident or attack) is not feasible. Thus, if at all possible after radiation release, evacuation of the area of exposure should be undertaken, with evacuation lasting 1 wk if the anticipated dose is 0.05 Gy and permanent resettlement if the lifetime dose is expected to be 1 Gy. When evacuation is not possible, taking shelter in a concrete or metal structure (eg, basement) can confer some protection.

People living within 16 km (10 miles) of a nuclear power plant should have ready access to KI tablets. These can be obtained from local pharmacies and some public health agencies. Many drugs and chemicals (eg, sulfhydryl compounds) increase survival rate in animals if given before irradiation. However, none are practical for humans.

All personnel working with radioactivity should wear dosimeter badges and be monitored for signs of excessive radiation exposure. The standard occupational limit is 0.05 Gy/yr. For emergency medical personnel, recommended dosage limits include 0.05 Gy for any non-lifesaving events and 0.25 Gy for any lifesaving event.

5. Hygienic requirements to planning of medical-diagnostic unit of hospital.

Medical-diagnostic unit of hospital:

- a. surgery block;
- b. department of regenerative treatment;
- c. department of functional diagnostics;
- d. anesthesiology;
- e. X-ray department;
- f. clinicodiagnostic laboratories

Surgery block:

- convenient communication with medical-diagnostic department;
- presence of conditions for carrying out of long narcosis and postoperative stay of patients;
- exception of patients contact with postoperative purulent complications and "pure" patients;
- rational placing as part of isolated medical-diagnostic buildings;
- premises of surgery block - not checkpoints septic and aseptic department including operational with auxiliary and office premises;
- 1 operational table on 30 beds of surgical profile is projected;
- height of operational should be not less than 3,5 m, area - 36-48 m².

Zones of surgery block:

- sterile zone – operational;
- zone of strict mode - preoperative, wardrobe of personnel, narcotic, equipment room, postoperative wards with post of duty medical sister;
- zone of limited mode - premises for diagnostic researches, sterilizing, material, premises of surgeons and anesthesiologists, monitor, gypsum room, premises for storage of blood and mobile x-ray device, photolaboratory, premises for preparation of disinfectant solutions, etc.;
- zone of general hospital regimen - office of manager, office of senior nurse, room of personal, pantries for gypsum storage.

Pathoanatomical department takes places in separate building in isolated zone and has access roads.

Structure:

- beforesection;
- section;
- laboratory of histologic researches;
- photolaboratory;
- mortuary;
- mourning hall;
- office-household premises;
- lobby-waiting premises.

Polyclinic unit place in separate building adjoining medical-diagnostic unit.

Structure:

- registry;
- prevention department (anamnestic and viewing female premises, premise of functional diagnostics, propagation of healthy lifestyle, centralized sterilize department);
- treatment-prophylactic unit (therapeutic department, surgical department, premise of narrow experts, premise of infectious diseases);
- auxiliary-diagnostic divisions;
- administrative part.

In children's polyclinics it is provided two inputs: for healthy children and sick children. In structure of children's polyclinic filter-boxing, boxing for isolation of patients with suspicion on infection, room for mothers and feeding of children by mother's milk will be organized in addition.

Anesthesiology and resuscitation department:

- are provided in multi-field hospitals on 500 and more beds;
- quantity of beds does not exceed 25;
- 2 divisions - 1 settle down on ground floor at hospital reception, 2 - in block of medical-diagnostic unit, near to surgery block;
- possibility of placing at bed of necessary equipment, making oxygen, vacuum, electric current, water to each cot is provided.

Structure:

- reanimation room;
- before reanimation room;
- wards of intensive therapy;
- laboratory for urgent analyses;
- premises for diagnostic and medical equipment.

X-ray department is intended for carrying out of medical radiological researches of patients.

- it is expedient to place on one of floors of medical-diagnostic building, on hospital and polyclinic joint;
- windows of procedural x-ray offices are expedient for focusing away from basic hospitals and residential buildings;
- procedural it is impossible to place over wards for children and pregnant women.

Structure of X-ray department:

- X-ray offices for general researches;
- offices of special researches;
- office for preparation of barium;
- office of managing;
- room of pictures viewing;
- room of personnel;

- other sanitary-household and subsidiary premises.

X-ray offices for general researches have:

- treatment room;
- room of management;
- doctor's office;
- photolaboratory.

Special researches include fluororoentgenography, tomography, roentgenangiography, etc.

Department of functional diagnostics.

In hospitals on 400 cots 2 departments also are more arranged: one for service of hospital patients, another - for polyclinic unit.

Basic premises of functional diagnostics department:

- electrocardiographic offices;
- oxyhemometry and capillaroscopy offices;
- electroencephalography offices;
- offices of standard metabolism definition;
- offices of inspection of breath bodies and endocrine systems;
- endoscopic offices, etc.

In department of regenerative treatment, or rehabilitation, all kinds of physiotherapy are carried out: elektro-, water-, treatment, fangotherapy, chromophototherapy

Premises:

- physiotherapy exercises;
- massage;
- work therapy;
- shower hall;
- premises for acceptance of baths;
- for underwater shower-massage;
- medical swimming pool;
- cabins for undressing and shower acceptance;
- rooms of rest for patients.

Clinicodiagnostic laboratories include following divisions:

- clinical;
- hematological;
- biochemical;
- bacteriological;
- serological;
- cytologic.

Divisions have separate premises:

- for reception and registration of analyses from patients of hospital and polyclinic;
- premises for photometry;
- for centrifugation;

- for colouring of tests and preparations;
- boxes for carrying out of researches;
- washing;
- autoclave for disinfecting of fulfilled material;
- checkroom for house and working clothes of personnel;
- rooms for personnel;
- toilet;
- pantries for laboratory ware.

6. Hygienic requirements to planning of pathoanatomical department and polyclinic unit.

Pathoanatomical department takes places in separate building in isolated zone and has access roads.

Structure:

- beforesection;
- section;
- laboratory of histologic researches;
- photolaboratory;
- mortuary;
- mourning hall;
- office-household premises;
- lobby-waiting premises.

Polyclinic unit place in separate building adjoining medical-diagnostic unit.

Structure:

- registry;
- prevention department (anamnestic and viewing female premises, premise of functional diagnostics, propagation of healthy lifestyle, centralized sterilize department);
 - treatment-prophylactic unit (therapeutic department, surgical department, premise of narrow experts, premise of infectious diseases);
 - auxiliary-diagnostic divisions;
 - administrative part.

In children's polyclinics it is provided two inputs: for healthy children and sick children. In structure of children's polyclinic filter-boxing, boxing for isolation of patients with suspicion on infection, room for mothers and feeding of children by mother's milk will be organized in addition.

7. Hygienic requirements to hospital's sanitary-technical accomplishment and microclimate.

Sanitary-technical accomplishment includes:

- a. illumination;
- b. heating;

- c. ventilation;
- d. water supply;
- e. clearing.

Insolation regimen is provided by solar radiation. Optimum efficiency of Insolation is attained at daily continuous insolation by direct solar beams of premises and territories. In the republic of Belarus an indicator of minimum Insolation time for hospital premises should be not less than 3 h.

In hospital premises there should be **natural and artificial illumination**.

Only artificial illumination is supposed in:

- pantries;
- lavatories at wards;
- baths;
- clyster rooms;
- rooms of personal hygiene;
- shower and wardrobe for personnel;
- preoperative and surgical;
- narcotic room.

Rational illumination:

- improves visual function;
- raises person's vitality;
- increases working capacity;
- promotes best sanitary maintenance of premises.

Natural illumination should be:

- sufficient;
- uniform;
- steady;
- not blinding.

Natural illumination depends from:

- sizes of light apertures;
- cleanliness of glasses;
- presence of curtains;
- orientations of windows in relation to parts of world.

Corridors of ward sections and hospital units should have natural illumination which is carried out through windows within the precincts of end face of buildings and in light halls. Distance between light ruptures should not exceed 24 m.

In wards light factor 1/5-1/6, natural illumination factor - 1 %, angle of light incidence - not less 27°, aperture angle - not less 5° is provided. Expediently is glassing of light apertures by uvio1 glasses that promotes completion of lack of ultra-violet beams for patients, it is long being in a hospital.

In middle and southern latitudes for hospital wards, rooms of day stay by best orientation providing sufficient light exposure and insolation of premises without overheat, are southern, and surgical block - northern points.

Artificial illumination should be:

- sufficient;
- uniform;
- steady;
- not blinding;
- on spectrum to come nearer to natural.

Artificial illumination should create cosiness in ward and reading possibility.

At organization of artificial illumination use **incandescent and luminescent lamps** which equip with lighting fixtures of direct, absent-minded and reflected light. From the hygienic point of view it is better to use fixtures with luminescent lamps and armature of diffused light which provide uniform illumination of premise, do not create blinding action, shades.

In hospital arrange **general, combined and local systems** of artificial illumination.

General artificial illumination is provided in all premises. At it lamps are in regular intervals distributed on ceiling or premise walls.

For illumination of separate functional zones and workplaces *local* illumination is arranged. Light exposure on surface of surgery field should be 3000-10000 lux. Desk lamps are applied for convenience of patients.

Combined illumination represents combination of general and local.

Wall combined lamps established at each bed at height 1.7 m from level of floor are applied for illumination of wards (except children's and psychiatric units). In each ward should be special lamp of night illumination established in niche at door at height 0.3 m from floor. In children's and psychiatric units lamps of night illumination of wards are established in niches over doorways at height 2.2 m from floor level. In medical offices it is necessary to establish wall lamps for survey of patient.

Heating:

1. *Central* - one system heats all premises, all building and some other buildings. The central heating system consists of thermal generator, heat-carrier, heat conductors and heating devices located indoors. Heating devices represent metal pipes (radiators) which give heat to a premise by convection and radiations.

- a) steam heating - creates a heat of heating devices that causes dust burning, unpleasant smell.
- b) hot-air heating - non-uniform heating, incoming air pollution possibility by dust and also raised mobility and dryness of air.
- c) water heating - provides maintenance of uniform temperature in premises by regulation of water temperature submitted to heating devices.

d) radiant heating - heating devices located in walls, floor or ceiling, in regular intervals warm a premise, temperature differences across and verticals are minimum. At rather low temperature of air indoors (17°C) the thermal comfort is provided. At this heating there are no acting pipes, radiators, on them the dust does not collect.

2. *Local* - fuel burning occurs in a heating device which transfers heat into a premise.

- a) stove;
- b) gas;
- c) electric.

Heating of premises is directed on maintenance in cold and transitive periods of year of optimum temperature and creation of artificial microclimate.

Hygienic requirements to heating:

- Should be sufficient,
- Should be regulated,
- Should be uniform,
- Should be safe,
- Should be silent,
- Not to pollute a premise.
- surface of heating devices should not exceed 80°C.

Hygienic requirements to ventilation:

- should exclude receipt of air from "dirty" premises in "pure";
- should delete polluted air completely;
- should fan enough of pure air,
- should be regulated;
- should be silent;
- should be safe.

Ventilation classification:

According to a way of air moving:

- **Natural ventilation** is caused by the difference of temperatures of external and room air and wind force. Airing of premises is carried out through windows, doors, window leaves, transoms. Draught airing which is carried out by simultaneous opening of windows or window leaves and doors in premise opposite sides is effective. In a winter exhaust ventilation on natural draught can provide 1.5-2 time of air exchange at 1 hour. Natural ventilation is arranged in all premises of hospital, except a surgery block.

- **Mechanical, or artificial, ventilation** has a number of advantages in comparison with natural:

- a) big radius of action;
- b) considerable speed in air lines;
- c) independence of inflow and extract from temperature of external air and speed of wind.

According to a way of giving and removal:

- *Forced ventilation* provides forcing of fresh air in a premise with fan, polluted air leaves from a premise naturally.
- *Exhaust ventilation* air from a premise is sucked away by means of fan and fresh air arrives in a premise naturally.
- *Forced and exhaust ventilation* carries out giving of atmospheric air through inflow channels in top zone of premises and an extract of air from a premise through apertures of exhaust channels at a floor simultaneously.

Mechanical forced-air and exhaust ventilation is projected in all unit, except for infectious

According to a destination:

- local – is carried out for normalization of air temperature on workplaces;
- general ventilation by dilution – is carried out for optimization of an air regimen in all premise.

In infectious unit forced ventilation with mechanical prompting and air giving in a corridor is arranged. Exhaust ventilation from wards is carried out by means of individual channels excluding an overflowing of air on a vertical.

Ventilation of premises is directed on organization of air regimen of premises, positively influences on microclimate and has antiepidemic value.

Sanitary indicators of air cleanliness:

- absence of smell;
- content of carbon dioxide no more than 0,7-1 %;
- oxidability of air no more than 5-6 mg/m³ of oxygen.

Air faned in surgical, narcotic, patrimonial, intensive care unit, postoperative wards, wards of intensive therapy and also in wards for patients with skin burns, should be cleared preliminary by bactericidal filters.

Premises which medical-technological process is accompanied by allocation in air of harmful substances, should be equipped local exhausts or fuming board.

In wards for adults and children, injured, baby and newborn, in postoperative and postnatal wards air exchange should make 80 m³/h on 1 bed.

Conditioners support necessary conditions of temperature, humidity, movement and cleanliness of air indoors. Conditioners combine in themselves heating and ventilation function.

By means of conditioners air heats up or cooled, humidified or dries, gets certain speed of movement. By means of conditioners air is cleared of dust, deodorized, ozonized, ionized.

However it is artificial created microclimate can lose the tempering and training action, some microorganisms living in conditioners, can cause «illness of legionaries», shown by defeat of lungs.

Air conditioning should be provided in surgical, narcotic, patrimonial, postoperative wards, wards of intensive therapy, intensive care, in wards with skin burns and also in wards for newborn, baby and injured children.

Systems of heating, ventilation and air conditioning should provide optimum conditions of a microclimate and air environment of hospital premises.

Microclimate - is a climate of limited territory or space, differing from the environment. It can be *comfortable*, causing good warmth sense, an optimum functional status of central nervous system and high working capacity, and *discomfortable* - heating up and cooling.

At influence of heating up microclimate:

- a. skin temperature raises
- b. water-salt exchange is broken
- c. an organism dehydration occurs
- d. loss of mineral salts and water-soluble vitamins
- e. activity of cardiovascular, respiratory and other systems changes

Cooling microclimate can cause hypothermia promoting augmentation of catarrhal diseases, vasomotor spasms, freezing injuries. At hum of heating up or cooling microclimate harmful action of chemical, physical and biological factors of environment strengthens.

Optimum microclimatic conditions provide general and local sensation of thermal comfort at minimum strain of thermoregulation mechanisms; do not cause deflections in health level.

Microclimate of premises is defined by combination of temperature, humidity and motility of air, temperatures of environing surfaces and their caloradiance. At hygienic setting in hospital optimum magnitudes of microclimate parameters are provided.

In cold and transitive season temperature in wards is recommended 18-21°C, during warm time - to 24°C. Relative humidity should be 55-60 %, and speed of air motion - not above 0.15 m/s.

Optimum microclimatic conditions provide general and local sensation of thermal comfort at minimum strain of thermoregulation mechanisms; do not cause deflections in health level.

For **prevention of unfavorable influence** of discomfortable microclimate are spent legislative, technological, sanitary-technical, planning and organizational actions.

Legislative actions include sanitary rules and norms in which, basic optimum indicators for microclimate parameters are resulted.

Technological - changing of out-of-date equipment and improvement of heating devices and ventilations indoors.

Sanitary-technical - methods and agents referred on elimination of an overheat or supercooling of an organism.

Planning - rational leveling and orientation of buildings.

Organizational - are referred on building of optimum conditions for comfortable stay sick in hospital organizations.

Also for prevention of unfavorable influence of microclimate factors employment by physical exercises, acceptance of tempering procedures, organization of balanced diet enriched by vitamins and trace substances is recommended.

Great value in maintenance of drinking and sanitary-hygienic regimen of hospitals belongs to **water supply**.

The water arriving in hospital, should be:

- colourless;
- transparent;
- not to have a smell;
- to possess pleasant freshening taste;
- to have a natural chemical compound;
- should not contain toxic chemical and radioactive substances, pathogenic microorganisms, cysts of Protozoa and helminthes eggs.

At irrational water supply and presence of water mismatching hygienic norms, personnel can have endemic illnesses, infectious and parasitic diseases and poisonings with toxic substances.

At the present stage in populated areas two **systems of water supply** are used: decentralized, or local, and centralized.

Decentralized water supply is carried out from wells, *centralized* - from underground and open sources. For water supply of hospitals fresh water (to 1 g/dm³ mineral salts) is used.

Hospitals should have centralized water supply due to of joining to waterpipe of populated areas. Quality of water should correspond to requirements of SanRandN 10-124 RB 99 «Potable water. Hygienic requirements to water quality of centralized systems of drinking water supply. Quality control». Cold water should be brought in all premises. Hospital is equipped also with hot water supply.

In hospital water expense a day on 1 somatic bed makes 250-400 dm³, on 1 outpatient reception hours - 15 dm³. In rural hospitals at absence of centralized hot water supply expense of water on 1 bed a day makes 100-150 dm³.

Rational **clearing** of hospital from liquid and solid waste is great importance, since they can contain activators of infectious diseases and represent danger to population. At infringement of rules of liquid and solid sewage clearing sanitary condition of premises worsens, conditions for reproduction of insects and rodents, occurrence of intrahospital infections and epidemics are created.

At the present stage **clearing of liquid wastes** is carried out by export and floatable (sewer) systems, **from solid wastes** - according to plan-household and plan-flat systems.

Clearing of hospital from solid wastes is rational for spending according to *plan-household system*. For this purpose in wards, offices of doctors, corridors, toilets and other premises dust collect in urns or pedal buckets with cover and daily delete in metal, hermetically closed containers established in yard on cementing or asphalted platforms. Containers are regularly taken out for neutralization and disinfecting on polygon of solid household waste or wasterecycle factories. Dust, blood-stained bandage, cotton wool and also other waste of surgery block, pathoanatomical unit burn in special furnaces.

Removal of liquid wastes of hospital is made in *sewer* system of populated area. Clearing and disinfecting of sewage is carried out at aeration station. In need of preliminary clearing and disinfecting of sewage from infectious, radiological and some other units on a hospital site local treatment facilities are arranged. In rural hospitals for sewage treatment it is possible to use fields of underground filtration.

On treatment facilities **mechanical clearing** by means of lattices, screen, sand separator, grease trap, sediment bowls, leading to clearing of sewage from mineral and organic substances is made.

Neutralization of suspended and dissolved organic matters is made by artificial or natural biological ways. At *artificial* ways of neutralization biofilters, aerofilters, aerotanks, *natural* - irrigated field, filtration field are more often used.

Neutralization of solid wastes is made by technical and soil ways. At *technical* way of neutralization usually dust subject to burning. Enrichment with compost of dust on dumps includes its laying with ground and is more perfect way of neutralization. Due to biothermal processes in compost a dust is disinfected, turns in humus and further is used as fertilizer.

8. Hygienic requirements to equipment, refinishing and keeping of hospitals premises. Disinfection, disinsection and deratization.

Hospital **equipment** should be serviceable and safe, and its surface - smooth, steady against influence washing and disinfectants.

Surface of **walls and partitions** is provided smooth, supposing damp cleaning, washing and chemical disinfection. A **floor** in surgical block, narcotic, patrimonial and other specialized premises cover with water-proof material easily cleared and supposing damp cleaning and disinfection. It should be convenient for transportation of patients and equipment.

In hospitals strict **sanitary-hygienic regimen** should be organized and observed. All premises and equipment of hospitals, according to Sanitary rules should be kept clean.

In hospitals the most responsible and labour-consuming operations providing performance of sanitary-hygienic regimen, **damp cleaning** with application of washing liquids and chemical disinfectants which is directed,

first of all, on destruction of pathogenic and opportunistic pathogenic microorganisms.

Current damp cleaning of premises (washing of floors, rubbing of furniture, equipment, window sills, doors etc.) is carried out constantly with application of washing liquids, but not less than 2 times per day, and in surgical and obstetrical departments not less than 3 times per day, including 1 time using disinfectants. After cleaning harvest stock disinfect and indoors include a bactericidal lamp and air. Airing of wards and other premises is spent not less than 4 times per day.

General cleaning of ward units' premises and other functional premises and offices is spent not less than 1 time per month. It includes washing of walls, equipment, floors. furniture and fixtures, processing by vacuum cleaner of blankets and mattresses. General cleaning in premises with aseptic work regimen is spent once per week, in obstetric hospitals - 1 time in 3 days. After cleaning harvest stocks disinfect, wash, dry and indoors include a bactericidal lamp and air.

Once per year **cosmetic repair** of premises is carried out. Elimination of current defects should be spent immediately. Major repairs of buildings with replacement of unusable equipment are spent depending on their sanitary-engineering condition.

For maintenance of sanitary-hygienic regimen in hospital disinfection, disinsection and deratization has special value.

Disinfection is a set of actions directed on destruction of pathogenic and opportunistic pathogenic microorganisms, being in environment. It is carried out by physical and chemical methods.

Physical method of disinfection is most reliable, ecologically pure and safe for personnel.

It is spent by:

- wipings;
- washing;
- airings;
- ultra-violet and ultrasonic irradiation;
- influences of heat, pair, hot air and water.

To processing by way of boiling subject products from glass, metals, heat-resistant polymeric materials and rubbers.

Chemical method is more widespread and standard method of disinfecting.

Disinfection with use of chemical agent spend:

- in the way of immersing in a solution;
- in the way of an irrigation;
- in the way of wiping.

For chemical disinfection it is recommended to use special capacities with covers that raises convenience of further processing and also reduces adverse influence of disinfectants on personnel.

In treatment-prophylactic organizations chemical disinfectants registered and resolved to application by Health Ministry of the republic of Belarus, having of conformity certificate and instruction on application are used.

At choice of chemical disinfectants it is considered:

- epidemiological situation in establishment;
- microorganisms circulating on objects of environment;
- sensitivity of microorganisms to disinfectants;
- objects of disinfecting, and also other factors.

Disinfectants should possess:

- wide spectrum of antimicrobial action;
- small toxicity (III or IV class);
- combinative action;
- long terms of use of working solution;
- slow formation of resistant variants of microorganisms;
- low aggression in relation to materials;
- ecological safety;
- stability at storage and transportation.

Haloid-, oxygen-, aldehyde-, phenolcontaining and other chemical compounds are applied for chemical disinfection. Most often use solutions of Chloraminum, chlorinated lime. Recently for disinfecting of medical products, surfaces, equipment it is used sodium hypochlorite which receive by electrolysis method on electrochemical installations from 4 % solution of sodium chloride.

In the republic of Belarus electrochemical installation «Akvmед» which is intended for simultaneous reception of a disinfectant solution of anolite neutral and washing solution of katolite is developed.

Disinfectant solution of anolite neutral receive from 0.3-0.5 % water solutions of chlorides. It represents a transparent liquid with a weak smell of chlorine and pH=6.2-7.2. Maintenance of active chlorine in anolite neutral makes 200-400 mg/dm³. Anolite neutral is intended for disinfection of surfaces in premises, ware, equipment, harvest stock.

Work with disinfectants should be spent in rubber gloves, points and four-layer gauze bandage.

For air disinfecting by **physical method** in premises with aseptic regimen at height of 2.0-2.2 m from a floor are established bactericidal irradiators with screened or notscreened lamps which join on 1 h after carrying out of current cleaning and on 2 h after general cleaning. In presence of personnel can be maintained only screened lamps. A switch of notscreened lamps is equipped before an input in premise with light board "not to enter".

In hospital bactericidal wall irradiators, ceiling and mobile irradiators are usually used. Application in hospitals premises bactericidal ultra-violet recirculators of air is worthy. Recirculators is an irradiator of closed type and it is intended for disinfecting of air of premises with volume 25-50 m³ in people presence. Thus bactericidal effect makes 95-99 % concerning *S.aureus*.

Last years for physical disinfection of air wide application finds creation of horizontal or vertical laminar streams of sterile air in all premises or in separate zones for protection of the most responsible sites or operations.

For hygienic estimation of air environment in premises determination of air oxidability, maintenance of carbon dioxide and microorganisms in 1 m³ of air is used.

Disinsection - set of actions directed on destruction of arthropods-carriers of activators of infectious and invasion diseases. Preventive disinsection it is directed on prevention of an attack of arthropods-carriers on a person. In disinsection physical, chemical and biological methods are used. *Physical* methods of disinsection assume application of boiling water, pair, hot air, *chemical* - application of chloroforsum, hexachlorane, decisum and others chemical disinsectants, *biological* - application of pathogenic bacteria and viruses for infection of arthropods.

Deratization - set of actions directed on destruction of rodents, being an activators of infectious and invasion diseases. *Precautionary* deratization is directed on creation of obstacles to penetration of rodents into premise, and *fighting* - on direct destruction of rodents. *Fighting* deratization is carried out with application of mechanical, biological and chemical methods. *Mechanical* methods include use of mousetraps and traps, *biological* - infection of rodents with pathogenic bacteria and viruses, use of cats, polecats and other natural enemies, *chemical* - application of zoocumrinum, ratindanum, zink phosphide and others chemical zoocydes.

Control over observance of sanitary-hygienic regimen is carried out by chemical and bacteriological methods. Bacteriological control is carried out 1 time per quarter and as required. It is directed on check of microbic air pollution of premises, surfaces, toolkit, overalls.

The great value in organization of sanitary-hygienic regimen has observance by patients and personnel of **rules of personal hygiene**.

At receipt in hospital patients pass sanitary processing in reception (shower or bath, haircut of nails, etc.) and receive complete set of pure underwear, pyjamas, slippers. Each patient is provided with individual towel and soap. Personal clothes and footwear is checked in special covers or polyethylene bags. Recently finding of patients in hospital in house clothes is supposed.

In department to patient a glass and if necessary - invalid's cup, cuspidor, bed-pan stands out. A patient is authorized to take in word subjects of personal hygiene (tooth-brush, paste, soap, razor, cup, spoon, etc.).

Hygienic washing of patients are spent not less than 1 time per week with note in case history. Patients' hairstyle and shaving is periodically spent.

Hospitals are provided with linen enough. Pure linen is marked and stored in linen room. Change of linen by patient is spent 1 time per 7 days and in process of pollution. Polluted linen is changed immediately. Change of bed-clothes to women in childbirth is spent by 1 time per 3 day, underwear and towels - daily. Gathering of dirty linen from patients in departments is spent to special container and transferred in central dirty linen. Washing of hospital linen is carried out centralize in hospital wash-house or special municipal wash-house. Pure and dirty linen is delivered in closed container by special transport.

After discharge of patients and also in process of pollution mattresses, pillows, blankets are changed, then processed in disinfecting chamber.

Medical personnel of hospitals are provided with special sanitary clothes (dressing gowns, hats or kerchiefs, jackets, trousers, footwear) which are daily changed. Storage it carry out in individual cases separately from house clothes. Washing of special clothes should be spent is centralized and separately from linen of patients. Shift footwear of personnel of surgery block, maternity blocks, reanimation, dressing and departments of newborns should be from nonwoven material accessible to disinfection.

All medical personnel should observe rules of personal hygiene, to be tidy and accurate. Technical and administrative personnel performing work in divisions of hospital should have shift clothes and footwear also. Doctors, nurses, midwives should wash hands necessarily at survey of each patient.

9. Hygienic aspects of hospital-acquired infections prevention.

One of the major tasks of hospital in modern conditions - prevention of nosocomial infections. Nosocomial infections are infections that are a result of treatment in a hospital or a healthcare service unit. Infections are considered nosocomial if they first appear 48 hours or more after hospital admission or within 30 days after discharge. This type of infection is also known as a hospital-acquired infection (or, in generic terms, healthcare-associated infection).

In the United States, the Centers for Disease Control and Prevention estimates that roughly 1.7 million hospital-associated infections, from all types of bacteria combined, cause or contribute to 99,000 deaths each year. In Europe, where hospital surveys have been conducted, the category of Gram-negative infections are estimated to account for two-thirds of the 25,000 deaths each year. Nosocomial infections can cause severe pneumonia and infections of the urinary tract, bloodstream and other parts of the body. Many

types are difficult to attack with antibiotics, and antibiotic resistance is spreading to Gram-negative bacteria that can infect people outside the hospital.

Nosocomial infections are commonly transmitted when hospital officials become complacent and personnel do not practice correct hygiene regularly. Also, increased use of outpatient treatment means that people who are hospitalized are more ill and have more weakened immune systems than may have been true in the past. Moreover, some medical procedures bypass the body's natural protective barriers. Since medical staff move from patient to patient, the staff themselves serve as a means for spreading pathogens.

Hospitals have sanitation protocols regarding uniforms, equipment sterilization, washing, and other preventative measures. Thorough hand washing and/or use of alcohol rubs by all medical personnel before and after each patient contact is one of the most effective ways to combat nosocomial infections. More careful use of antimicrobial agents, such as antibiotics, is also considered vital.

Despite sanitation protocol, patients cannot be entirely isolated from infectious agents. Furthermore, patients are often prescribed antibiotics and other antimicrobial drugs to help treat illness; this may increase the selection pressure for the emergence of resistant strains.

Table 1 - Main routes of transmission.

Route	Description
Contact transmission	the most important and frequent mode of transmission of nosocomial infections.
Droplet transmission	occurs when droplets are generated from the source person mainly during coughing, sneezing, and talking, and during the performance of certain procedures such as bronchoscopy. Transmission occurs when droplets containing germs from the infected person are propelled a short distance through the air and deposited on the host's body.
Airborne transmission	occurs by dissemination of either airborne droplet nuclei of evaporated droplets containing microorganisms that remain suspended in the air for long periods of time) or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled by a susceptible host within the same room or over a longer distance from the source patient, depending on environmental factors; therefore, special air handling and ventilation are required to prevent airborne transmission. Microorganisms transmitted by airborne transmission include <i>Legionella</i> , <i>Mycobacterium tuberculosis</i> and the rubeola and varicella viruses.
Common vehicle transmission	applies to microorganisms transmitted to the host by contaminated items such as food, water, medications, devices, and equipment.
Vector borne transmission	occurs when vectors such as mosquitoes, flies, rats, and other vermin transmit microorganisms.

The drug-resistant Gram-negative germs for the most part threaten only hospitalized patients whose immune systems are weak. The germs can survive for a long time on surfaces in the hospital and enter the body through wounds, catheters, and ventilators.

Contact transmission is divided into two subgroups: direct-contact transmission and indirect-contact transmission.

Table 2 - Routes of contact transmission.

Route	Description
Direct-contact transmission	involves a direct body surface-to-body surface contact and physical transfer of microorganisms between a susceptible host and an infected or colonized person, such as occurs when a person turns a patient, gives a patient a bath, or performs other patient-care activities that require direct personal contact. Direct-contact transmission also can occur between two patients, with one serving as the source of the infectious microorganisms and the other as a susceptible host.
Indirect-contact transmission	involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, such as contaminated instruments, needles, or dressings, or contaminated gloves that are not changed between patients. In addition, the improper use of saline flush syringes, vials, and bags has been implicated in disease transmission in the US, even when healthcare workers had access to gloves, disposable needles, intravenous devices, and flushes. ^[20]

Factors predisposing a patient to infection can broadly be divided into three areas:

- People in hospitals are usually already in a poor state of health, impairing their defense against bacteria – advanced age or premature birth along with immunodeficiency (due to drugs, illness, or irradiation) present a general risk, while other diseases can present specific risks - for instance, chronic obstructive pulmonary disease can increase chances of respiratory tract infection.
- Invasive devices, for instance intubation tubes, catheters, surgical drains, and tracheostomy tubes all bypass the body's natural lines of defence against pathogens and provide an easy route for infection. Patients already colonised on admission are instantly put at greater risk when they undergo an invasive procedure.
- A patient's treatment itself can leave them vulnerable to infection – immunosuppression and antacid treatment undermine the body's defences, while antimicrobial therapy (removing competitive flora and only leaving resistant organisms) and recurrent blood transfusions have also been identified as risk factors.

Prevention: In treatment-prophylactic organizations **nonspecific and specific prevention** of intrahospital infections is spent.

Nonspecific prevention is carried out by carrying out legislative, planning, technological, sanitary-technical and organizational actions.

According to hygienic specifications, bacterial dissemination of air environment in wards should be no more than 3000-4000, in postoperative wards - 750, in surgery block before work - 500, after work - 1000 microorganisms/m³.

In hospitals ward sections are isolated from surgery blocks, anesthesiology and resuscitation departments, etc., rational placing of departments on floors is spent. Premises are equipped with effective ventilation and conditioners. At performance of various procedures and manipulations personnel should observe rules of aseptics and antiseptics. Streams of patients are divided on «pure» and «dirty».

- Isolation. Isolation precautions are designed to prevent transmission of microorganisms by common routes in hospitals. Because agent and host factors are more difficult to control, interruption of transfer of microorganisms is directed primarily at transmission.

- Handwashing and gloving. Handwashing frequently is called the single most important measure to reduce the risks of transmitting skin microorganisms from one person to another or from one site to another on the same patient. Washing hands as promptly and thoroughly as possible between patient contacts and after contact with blood, body fluids, secretions, excretions, and equipment or articles contaminated by them is an important component of infection control and isolation precautions.

Although handwashing may seem like a simple process, it is often performed incorrectly. Healthcare settings must continuously remind practitioners and visitors on the proper procedure in washing their hands to comply with responsible handwashing.

All visitors must follow the same procedures as hospital staff to adequately control the spread of infections. Visitors and healthcare personnel are equally to blame in transmitting infections. Moreover, multidrug-resistant infections can leave the hospital and become part of the community flora if we do not take steps to stop this transmission.

In addition to handwashing, gloves play an important role in reducing the risks of transmission of microorganisms. Gloves are worn for three important reasons in hospitals. First, gloves are worn to provide a protective barrier and to prevent gross contamination of the hands when touching blood, body fluids, secretions, excretions, mucous membranes, and nonintact skin; the wearing of gloves in specified circumstances to reduce the risk of exposures to bloodborne pathogens is mandated by the OSHA Bloodborne Pathogens final rule. Second, gloves are worn to reduce the likelihood that microorganisms present on the hands of personnel will be transmitted to patients during invasive or other patient-care procedures that involve touching a patient's mucous membranes and nonintact skin. Third, gloves are

worn to reduce the likelihood that hands of personnel contaminated with microorganisms from a patient or a fomite can transmit these microorganisms to another patient. In this situation, gloves must be changed between patient contacts, and hands should be washed after gloves are removed.

Wearing gloves does not replace the need for handwashing, because gloves may have small, non-apparent defects or may be torn during use, and hands can become contaminated during removal of gloves. Failure to change gloves between patient contacts is an infection control hazard.

For prevention of intrahospital infections whole complex of **deinfection-sterilising actions** is carried out:

- underwear and bed-clothes are disinfected in laundry;
- blankets, pillows and mattresses are processed in deinfection chambers;
- bedside tables and beds are wiped by disinfectant solutions;
- regular damp cleaning of premises with application washing and disinfectants is spent.

Sanitizing surfaces is an often overlooked, yet critical component of breaking the cycle of infection in health care environments. Modern sanitizing methods have been effective against gastroenteritis, MRSA, and influenza. Use of hydrogen peroxide vapor has been clinically proven to reduce infection rates and risk of acquisition. Hydrogen peroxide is effective against endospore-forming bacteria, such as *Clostridium difficile*, where alcohol has been shown to be ineffective.

In prevention of intrahospital infections the great value belongs to revealing of carriers among personnel and patients and to their sanitation, hygienic training and education of patients, personnel and visitors.

Specific prevention is spent in planned and emergency order in form of passive and active immunization. The purpose of specific prevention - increase of patient organism's stability to intrahospital infections. Emergency specific prevention is directed on immunity creation to infections within incubatory period.

CHAPTER 7. HYGIENE OF CHILDREN AND TEENAGERS

Study Questions.

1. *Health services of children and teenagers. Hygiene of children and teenagers as a science, its purpose and tasks.*
2. *Anatomy-physiological features of growing organism.*
3. *Physical development of children and teenagers as one of health indicators. Acceleration of physical development of children and teenagers.*
4. *Hygienic problems of school maturity.*
5. *Features of feed of children and teenagers.*
6. *Hygienic requirements to planning, sanitary-technical accomplishment, microclimate, furnish, equipment and maintenance of preschool education centers and schools.*
7. *Hygienic requirements to organization of teaching and educational process.*
8. *Hygienic bases of labour training and professional orientation.*
9. *Physical training of children and teenagers. Tempering of children and teenagers.*

1. Health services of children and teenagers. Hygiene of children and teenagers as a science, its purpose and tasks.

Health services of children and teenagers should provide:

- doctors-pediatrists of children's hospital or children's department of general hospitals;
- doctors of children's polyclinics;
- school doctors;
- doctors of teenage offices;
- doctors of children's sanatoria;
- sports clinics;
- doctors of the centres of hygiene and epidemiology.

Health services of children and teenagers provides:

- during 1 year of a life mother with the child visits the doctor in a children's polyclinic monthly;
- the doctor examines children of two years 1 time a quarter;
- children of 3-7 years - 2 times a year.

School doctors duties:

- hygienic training and education;
- formation of a healthy way of life;
- planned revaccination;
- antiepidemic actions;
- actions for physical and labour education;
- actions for hygiene of training;
- professional orientation;

- carrying out of preventive inspections;
- control of childrens personal hygiene;
- control of childrens mode of day;
- organization of feed etc.

Medical inspections:

- In preschool centres - 2 times a year;
- Before school children of 6-7 years pass prophylactic medical examination with participation of doctors-experts;
- surveys at school once a year are spent.

Dispensary observation should examine:

- children with a tuberculosis;
- rheumatism;
- children with mental diseases;
- the lowered working capacity;
- locomotorium defects;
- sight, hearing and speech loss;
- Being ill often and for long period of time;

Hygienic training - is expansion of hygienic knowledges and skills at pupils of:

- improving value of physical training and tempering;
- hygiene of brainwork;
- hygiene of socially useful work;
- public and personal hygiene;
- prevention of infectious diseases;
- feed hygiene;
- traumatism prevention;
- hygienic aspects of sexual education.

Hygiene of children and teenagers - is a section of hygiene studying:

- laws of environment factors' influence on children's health up to 18-year-old age;
- condition of its maintenance;
- harmonious physical and intellectual development.

Purpose of hygiene of children and teenagers – maintenance and strengthening of children's health, and maintenance of their harmonious development.

Tasks of hygiene of children and teenagers:

- a. studying of environment factors (conditions of training, education, feed, house-keeping);
- b. revealing of risk factors;
- c. working out of hygienic specifications for environment factors;
- d. working out of actions for improvement children's health;
- e. prognosis of environment condition and children's health.

The basic directions in hygiene of rising generation:

- studying of state of health and health services;
- hygiene of training and education;
- hygiene of physical training;
- hygiene of educational and improving establishments;
- hygiene of food;
- hygiene of work.

2. Anatomy-physiological features of growing organism.

Determinants of growth and development

These are similar to those of health. The growth rate is very high in early infancy and declines gradually thereafter. The growth of brain is completed in 7 years, whereas the development of reproductive organs occurs at puberty. The height of the child depends on the height and race of the parents.

Infectious agents and chemical substances affect a person's growth both before and after birth. When the pregnant woman suffers from rubella or syphilis she tends to give birth to a baby suffering from congenital defects. Both defects and undernutrition severely retard the growth and development of the child. Other conditions during pregnancy that affect the growth of the future child are anaemia, alcoholism, and drug addiction. Iodine deficiency during pregnancy gives rise to cretinism and, later in childhood, to mental retardation, which in their turn affect growth and development seriously. Infections during infancy and early childhood promote undernutrition. Sensory handicaps too retard the child's growth and development.

The growth and development of a child depends on the way it is fed and cared for by its parents. Early and exclusive breastfeeding, weaning at the right time with the right foods, and provision of balanced diet to the child are crucial for its satisfactory growth and development. Love, care, and security are as important for the child as good food. Child's development is severely retarded if it is uncared for, neglected and denied opportunities of exploration, and of satisfaction of his curiosity. Quality education is also a determinant of child's development.

Some of the social factors that influence the child's growth and development are poverty, insanitary conditions, bad peer influence, caste tyranny, child labour and parental ignorance.

Laws of growth and development:

- a. dependence of growth and development processes on age;
- b. dependence of growth and development processes on sex;
- c. non-uniformity of growth and development processes.

Rule of growth and development of children and teenagers:
separate stages of development of a child are characterized by different

degree of maturity and functional features of organs and systems, and also various mechanisms of organism's adaptation to environment.

The specified laws can be tracked on an example of growth and weights, development of locomotorium, cardiovascular and nervous systems, sense organs, etc.

The **child height** increases on 47 % in relation to the initial to 1 year of life. At the age of 4-7 years old height increases annually on 7.5-5 %, 8-10 years - on 3 %. In puberty the fast increase of height is marked, to 16-17 years old is slowed down, to 18-20 years old - practically stops.

The **weight** of body to 4-5 months doubles and to 12 months - triples. At the age of 3-7 years old the annual increase occurs on 5-7.5 %. The next years intensity of increase of body weight decreases and again increases in puberty period.

Most intensively at early age there is a development of **locomotorium**. At children at wrong position of body and long stress various rachiocampsis, infringement of thorax form and pelvis are possible.

Development of **muscular system** also proceeds non-uniformly. Even at the age of 8-12 years old insufficient dexterity, coordination in muscular reductions is marked. Only by the end of puberty development of locomotorium comes to an end.

Features of **respiratory system** consist in underdevelopment of cavities of nose and respiratory muscles in comparison with adults, **cardiovascular** - in backlog of growth of heart from growth of vessels.

The **vision organ** is formed to 7-10 years old.

Sexual distinctions in physical development can be tracked on an example of basic sizes of body. So, height, weight of body and round of thorax at boys at birth usually above, than at girls. At girls in 12-13 years old height, weight of body and thorax round exceeds those at boys. In puberty intensive physical development of boys is marked and to 14-15 years old parameters of their body exceed those at girls.

3. Physical development of children and teenagers as one of health indicators. Acceleration of physical development of children and teenagers.

The criteria characterizing health level:

- chronic or acute diseases;
- functional state of organism systems;
- level and degree of a physical and mental development harmony;
- degree of organism's resistance.

Health groups of children and teenagers:

- 1 - healthy;
- 2 - healthy with functional and some morphological deviations;
- 3 - compensative chronic diseases, and children with some physical defects;

4 - subcompensative chronic diseases;

5 - decompensative chronic diseases, invalids of 1 and 2 groups.

The major indicator of health of children and teenagers is physical development. **Physical development** - is a set of morphological and functional properties of the organism characterizing process of its maturing.

For the characteristic of physical development are used *following criteria*:

- a. somatic (condition of bone and muscular systems, degree of sexual development);
- b. anthropometrical (height, weight, round of thorax);
- c. physiological (lungs vital capacity, muscular strength, blood pressure).

For an estimation of individual physical development methods of sigma deviations, regress scales are used. Great value for this purpose has standards of physical development.

Physical development:

- harmonious (normal);
- disharmonious;
- very disharmonious.

Estimation of physical development of collectives spend by method of comparison of average sizes by criterion of Student (t).

Acceleration - is an overspeed of physical development of children and teenagers.

Acceleration consists of:

- integration of the body sizes;
- earlier change of a milk teeth to constants;
- acceleration of skeleton ossification processes;
- earlier puberty.

Acceleration:

- doubling of body weight at modern city children occurs in 4-4.5 months;
- at children from 3 till 7 years old earlier change of dairy teeth on constants is marked;
- at schoolboys integration of body sizes, acceleration of processes of skeleton ossification and earlier puberty;
- decrease of terms of menses occurrence at schoolgirls (age of occurrence of first menses at girls of Moscow has moved with 15 for 11 years old).

Modern 17-year-old young men surpass adult men of 1920-1930th years in body height on the average on 5-6 sm, on thorax round, width of shoulders and length of feet - on 1.5-3 sm.

The acceleration reasons:

- the reasons caused by environment and operating on each generation during ontogenesis (improvement of food and its rationality, change of background of space radiation and lengthening of "light day», influence of a city way of life);

- endogenic reasons connected with change of heredity (strengthening of heterozygosis arising owing to increase of marriage communications between earlier isolated groups of the population).

4. Hygienic problems of school maturity.

School maturity - is functional readiness of a children's organism for regular training at school.

«School maturity» should provide training without harm for health. In this connection before receipt in school medical-pedagogical selection of children taking into account degree of functional maturity, physical development, state of health and psychophysiological development is spent. Selection determines children:

- a. children ready to training;
- b. children with development defects;
- c. risk group (children with backlog of physical and mental development, functional deviations and chronic diseases).

Children ready to training are accepted in 1 class, children with taping defects of development go to boarding schools. To children «risk groups» are appointed necessary medical and improving actions.

Repeated inspection carry out in February-March of the first year of training at school.

5. Features of feed of children and teenagers.

Features of a feed of children and teenagers:

- should correspond to all principles of a balanced diet;
- the parity between proteins, fats and carbohydrates in a diet of children and teenagers makes 1:1:4.

A food of children and teenagers should correspond to all principles of balanced diet. Food change should be carried out gradually, especially at the first year of a life.

Table 1 – Recommended consumption of foodstuff per day.

Age	Fruits (Cups)	Vegetables (Cups)	Grains (ounces)	Meats & Beans (ounces)	Milk (Cups)	Oils (tsp)
2-3	1	2	3	2	2	3
4-8	1-1½	1½	4-5	3-4	2	4
9-13 (females)	1½	2	5	5	3	5
9-13 (males)	1½	2½	6	5	3	5
14-18 (females)	1½	2½	6	5	3	5
14-18 (males)	2	3	7	6	3	6

Breast milk or formula will provide practically every nutrient a baby needs for the first year of life. From about four months to six months most babies are ready to start solid foods like iron-fortified infant cereal and strained fruits, vegetables, and pureed meats. Because breast milk may not provide enough iron and zinc when babies are around six to nine months, fortified cereals and meats can help breastfed babies in particular.

Within the first 3 years of a life a child receives all daily diet in the uniform portions within day. The food of preschool children should be various. At preschool age the first food intake (breakfast) makes 25 %, second (dinner) - 30-35 %, third (mid-morning snack) - 15-20 % and fourth (supper) - 20 % of daily power value.

Food and nutrients help to form strong teeth and bones, muscles and a healthy body; a good diet can also help to protect child against illness now and in the future.

Young children's need for energy and nutrients is high, but their appetites are small and they can be fussy, too, and it can be a challenge to get child's diet right.

Pre-school children can normally eat the amounts they want, even if it seems they're not taking in very much. At this age, children are often good at regulating their appetite. If they're not hungry, insisting on larger amounts of food can create a battle, which you're likely to lose.

Child has the following, every day:

1) At least one kind of starchy carbohydrate, such as bread, rice, pasta, noodles, cereals or potatoes. One or more of these should be served with all meals.

2) Use fruit in puddings and as snacks. Frozen and canned fruit and vegetables can be just as nutritious as fresh varieties. Vegetables can be eaten raw or cooked (serve crunchy rather than very soft to preserve the vitamins and minerals).

3) Milk and dairy foods are an important source of calcium. Child should be having the equivalent of about one pint (500 to 600ml) of milk a day. Milk can be used on cereals or in drinks, puddings and sauces, and cheese, fromage frais or yoghurt can be given instead of some milk. Grated cheese, cheese spread or cheese portions can be used on sandwiches or toast. Try yoghurts as a pudding or snack between meals, served alone or with fruit.

4) Meat, fish and alternatives should be eaten once or twice a day. The Food Standards Agency recommends at least two servings of fish a week, one of which should be oily. But don't give to a child more than four servings of oily fish a week for boys and two servings a week for girls (shark, swordfish or marlin should also be avoided, as these contain high levels of mercury, which might affect a child's developing nervous system).

5) Use eggs, either boiled, in sandwiches, as omelettes or scrambled. It is necessary try different beans and pulses, such as lentils, baked beans, peas and chickpeas.

6) It is necessary to limit the amount of fatty and sugary foods include spreading fats, cooking oils, sugar, biscuits, cakes, crisps, sweets, chocolate, cream, ice cream and sugary drinks. Sugary foods and drinks (including fruit juice) can also contribute to dental decay, especially when eaten or drunk between meals. Some sugar-free or diet drinks can also cause decay because of their acidity. Water is the best drink to have between meals.

7) For preschool children needed to use iron, Calcium, Vitamins A, C and D.

Norms of physiological requirement for energy and some nutrients for 6 years old children - energy - 1900-2000 kcal, proteins - 66-75 g, fats - 63-71 g, carbohydrates - 256-280 g.

For schoolboys rationally following distribution of the general caloric content of a daily diet on food intakes: breakfast - 25 %, dinner - 35 %, mid-morning snack - 15 %, supper - 20 %, second supper - 5 %.

The optimum form of balanced diet organization at school is preparation of complex breakfasts and dinners which should be tasty are prepared.

Although their growth is slower than in infancy, school-aged children still have high nutritional needs but fairly small appetites. So it's crucial all meals and snacks continue to be rich in nutrients and energy. The food choices children make during the crucial years of development can influence their future health risk and can also influence food habits in later life.

A structured eating plan with regular meals and snacks is important to establish good eating habits.

School children still have a high energy requirement for growth and activity, but increasing numbers are becoming overweight. This is because they're eating too many calories and not being active enough to use up the extra energy they've eaten.

Base meals and snacks on the five main food groups, but limit fatty and sugary snacks.

For schoolchildren needed to use Calcium, Folate, Iron.

Fatty and sugary foods includes spreading fats (such as butter), cooking oils, sugar, biscuits, cakes, crisps, sweets, cream and ice cream, chocolate and sugary drinks. These foods shouldn't be eaten too often and, when they are, should only be consumed in small amounts. They're loaded with calories, fat and sugar, and don't necessarily contain many vitamins and minerals. Also, sugary foods and drinks (including fruit juice) can increase the risk of dental decay. Limit the amount of sugar and sweets eaten, and offer them at the end of meals, rather than in-between. Some sugar-free or

diet drinks can also cause decay because of their acidity. Milk or water is the best drink between meals.

Teenagers' diets should sustain growth and promote good health. During this time, a number of physiological changes occur that affect nutritional needs, including rapid growth and considerable gains in bone and muscle (especially in boys). This is also a time when teenagers begin to develop real independence from their parents, including making decisions about the food they eat. Teenagers often choose food in response to peer pressure or as an act of defiance against parents.

Adolescence is a time of rapid growth, and the primary dietary need is for energy - often reflected in a voracious appetite. Ideally, foods in the diet should be rich in energy and nutrients. Providing calories in the form of sugary or fatty snacks can mean nutrient intake is compromised, so teenagers should be encouraged to choose a variety of foods from the other basic food groups:

- Plenty of starchy carbohydrates - bread, rice, pasta, breakfast cereals, chapattis, couscous and potatoes;
- Plenty of fruit and vegetables - at least five portions every day;
- Two to three portions of dairy products, such as milk, yoghurt, fromage frais and pasteurised cheeses;
- Two servings of protein, such as meat, fish, eggs, beans and pulses;
- Not too many fatty foods;
- Limit sugar-rich food and drinks;

Other important dietary habits to follow during adolescence include:

- Drink at least eight glasses of fluid a day.
- Eat regular meals, including breakfast, as it can provide essential nutrients and improve concentration in the mornings. Choose a fortified breakfast cereal with semi-skimmed milk and a glass of fruit juice.
- Take regular exercise, which is important for overall fitness and cardiovascular health, as well as bone development.

For young men of 14-17 years old it is necessary: energy - 2800-3000 kcal, proteins - 98-113 G, fats - 93-107 G, carbohydrates - 378-420 G.

For girls of 14-17 years old it is necessary: energy - 2400-2600 kcal, proteins - 84-98 G, fats - 80-92 G, carbohydrates - 336-364 G.

The control over a feed is carried out by medical workers of children's and teenage establishments.

The medical worker:

- supervises food allowance drawing up;
- checks quality of ready food;
- selects daily test;
- spends food C-vitaminization.

Food sanitary inspection is carried out by children's hygienist. He carries out actions for food rationalization and supervision of children's feed

In child care centers hygienists:

- survey nutrition units;
- supervise cooking, products transportation and storage condition;
- observance of realization terms.

6. Hygienic requirements to planning, sanitary-technical accomplishment, microclimate, furnish, equipment and maintenance of preschool education centers and schools.

Hygienic principles of designing and building:

- creation of group isolation in a building and on a site;
- maintenance of conditions for impellent activity of children;
- creation of a favorable air-thermal mode;
- maintenance sufficient insolation;
- creation of conditions for a balanced diet.

The preschool institution ground area:

- should be well aired and insolated;
- sufficient on size (30-50 m² per 1 child);
- distance from industrial enterprises, highway, railways and noise sources should be 50-1000 m;
- site should be with pure, dry soil;
- level of standing of subsoil waters not less than 1.5 m;
- the noise level on a site should not exceed 45 db.

Zones of preschool institution ground area:

- a. group platforms;
- b. general sports platform;
- c. kitchen garden;
- d. green plantings;
- e. economic with a platform for waste containers.

Green plantings - not less than 50 %, and building - no more than 12-15 % from all area of a site

The group platform (5-7 m² on 1 child) is equipped by sandbox, benches, shadow canopy and isolated by a green hedge.

Kindergarten usually has:

- group cells;
- general premises (musical and gymnastic halls);
- medical premises;
- service-household premises;
- laundry;
- nutrition unit.

Group cells of junior group (10-15 places) include:

- reception;
- playing;
- bedrooms;
- toilet;
- buffet.

Group cells of senior groups (20 places):

- reception;
- group-room with a rest zone;
- toilet;
- buffet.

The area of playing room is 4.3 m², group-room - 4 m² on 1 child.

Equipment of premises of preschool institutions should correspond to height and age features of children; consider hygienic and pedagogical requirements.

Groups of furniture:

- 00 - for children with height 85 sm;
- 0 - for children with height 85-100 sm;
- 1 - for children with height 100-115 sm;
- 2 - for children with height 115-130 sm;
- 3 - for children with height above 130 sm.

Each furniture group has the color marks. Tables should be placed at light wall at the distance of 0.5 m from each other. Distance from first tables to blackboard should be 1.6-2.4 m. Beds' sizes in bedrooms should correspond to children's age.

The school ground area:

- training zone (6-10 %) - vegetable and fruit crops, meteo- and geographical platform;
- sports zone (35-40 %) - gymnastic, basketball and other platforms;
- economic zone (6-8 %);
- rest zone (6-8 %).

Green plantings should be 50 % and building - 10-12% of all area.

School premises:

- a. basic (educational classes, educational offices of language, literature, history, geography, mathematics, plotting and drawing, laboratory of chemistry, physics and biology, workshops, sports hall, etc.).
- b. auxiliary (recreational halls and corridors, lobby with clothes, dining room and buffet, assembly hall, library, laboratory, shower, rooms of manuals, toilets, etc.).
- c. office (office of director and director of studies, teacher's room, office of doctor).

Areas of the basic premises of school:

- area of a class room 50-54 m² at depth 6m and length 8-8.4 m;

- premise's volume - 6 m³ per one pupil at height of 3 m;
- minimum area for 1 person in a class - 2 m².

Basic premises of preschool institutions should have **natural illumination**. Factor of natural illumination in a group room, playing room, bedrooms, musical and gymnastic halls should be not less than 1.5 %, depth of group premises - no more than 6 m.

Artificial illumination is arranged with use of lamps of diffused light. The illumination of group room, playing room, musical and gymnastic halls using luminescent lamps should be not less than 300 lux, in bedrooms - 150 lux, and using incandescent lamp - 150 lux and 75 lux accordingly. Children's preschool premises should be equipped by **waterpipe, hot water supply and water drain**.

Heating should be central, heating devices should be protected by wooden lattices. In basic premises **natural ventilation** should be arranged; in laundry, nutrition unit and gymnastic hall - **mechanical forced-air and exhaust ventilation**. Temperature in premises should be 19-22°, relative humidity - 30-60 %, speed of air movement – 0.1-0.25 m/s, frequency rate of air exchange – 1.5.

Floors and walls are arranged with furnish supposing washing and disinfection. It should have matte invoice of light tones. Using of polymeric materials in group rooms, playing rooms and bedrooms is forbidden.

Premises and site of preschool institution should *be kept clean and be exposed to regular cleaning*. The site equipment should be wiped daily. Site cleaning is made in the morning and in process of dirtying. Cleaning of all premises is spent by daily damp way with use of washing-up liquids. It is necessary to wash floors not less than 2 times per day. Furniture, radiators, window sills and children's lockers for clothes are daily to wipe and weekly to wash. General cleaning of all premises with washing and disinfection of floors, windows, doors, walls and lighting armature is spent monthly.

Buildings of schools are equipped by **heating, ventilation, waterpipe, hot water supply and canalization**, according to hygienic requirements. Quality of drinking water should correspond to hygienic norms. The basic premises of schools buildings should have **natural and artificial illumination**. A direction of basic light stream of natural illumination in educational premises is left-side. Factor of natural illumination in the most remote point from windows should be not less than 1.5 %, in plotting and drawing offices - not less than 2 %.

Finishing materials and covering of walls, ceilings and floors of educational premises should have matte surface of warm tones, ceiling should be white colored.

Equipment of schools:

- tables placed at the distance of 0.5 m from each other;

- the distance from first tables to blackboard should be 1.6-2.4 m;
 - children's placement should be taking into account height, visual acuity and hearing;
- All premises of school should be daily cleaned with application of washing-up liquids. General cleaning of all premises is spent monthly.

7. Hygienic requirements to organization of teaching and educational process.

Work of a child includes various kinds of activity. A 5-7 years old child can keep active attention during 15 min, 8-10 years - 20 min, 11-12 years - 25 min, 13-15 years - 30 min.

Working capacity of children and teenagers changes within day, week, quarter and year. For maintenance of high level of working capacity rest is very important. The main condition for exhaustion prevention is strict observance of **rational day regimen**. Day regimen - is a distribution of time to all kinds of activity and rest within day. Strict observance of day regimen leads to formation strong conditioned reflexes at children.

Throughout the first 3 years of life a child day regimen is directed on health strengthening, development of basic movements, formation of speech function.

Day regimen of preschool groups:

- 11-12.5-hours sleep (including 2 h day);
- stay on fresh air;
- games;
- classes.

Training in junior groups:

- directed on development of speech, movements;
- outdoor games, gymnastics, musical classes, didactic games;
- physical training, drawing, music.

Training in kindergartens:

- in younger group 10-15 min;
- in the senior group 2 lessons 25 and 20 minutes long within day;
- in preparatory group 3 lessons 20, 25 and 30 min long;
- Breaks should be 10-12 minutes long;
- Homeworks in all groups are not set.

Hygienic rationing of an academic load at school includes:

- a. correct organization of lesson;
- b. regulation of duration of lessons and breaks;
- c. duration and time of carrying out of a vacation;
- d. rationing of general number of daily and weekly lessons;
- e. rational construction of classes within educational day week, quarter, year.

Curriculum:

- lesson's duration in 1 class is recommended no more than 35 minutes, 2-11 classes - 45 minutes;
- difficult subjects on first and last school hours, and also on Monday and Saturday are forbidden;
- it is necessary to alternate the subjects;
- association of two lessons laboratory and examinations, work, the fine arts, computer science is allowed.

At school organization of studies in one session at 9 o'clock in the morning optimum. Realization of studies in the evening session in 1, 2 and 5 classes is not supposed. The volume of homework's performance for pupils of 2 classes should not exceed 1.5 h, 3-4 classes - 2 h, 5-6 classes - 2.5 h, 7 classes - 3 h, 8-11 classes - 3.5 h. Homework are not set by pupil of 1 classes, pupil of 1-4 classes - on the days off, all pupil - on a vacation.

8. Hygienic bases of labour training and professional orientation.

Physical work of children and teenagers:

- improves activity of cardiovascular, respiratory, muscular systems;
- raises persistence, working capacity;
- promotes perfection of movements' coordination and development of new conditioned-reflex communications.

Work lessons:

- lessons have training influence on the nervously-muscular device, coordination;
- muscular endurance of pupils after work lessons increases by 13-22 %;
- for pupils of 1-4 classes 2 times a week for 45 minutes;
- for pupils of 5-7 classes employment by work are spent once a week in the form of dual lessons;
- the general duration of practical work for pupils of 1-2 classes should not exceed 20-25 min, for pupils of 3-4 classes - 30-35 min of lesson time.

Structure of lesson of work:

- a. theoretical part;
- b. practical work;
- c. breaks in the course of independent work (three-minute breaks);
- d. final part.

Labour training of pupils of the senior classes is spent in school workshop and industrial practice combines. Work lessons promote working capacity increase at the subsequent lessons if they are spent on the third, fourth school hours of the first shift.

Professional orientation solves questions on studying of requirement of a society in experts of a various profile and their qualification. *Main principle* - creation of conditions of a free choice of a trade.

Doctors, physiologists, teachers, psychologists and economists take part in professional orientation. Doctors carry out **medical-professional consultation**. Its *purpose* to help teenagers to choose such trade which will not render negative influence on an organism, and will promote correct physical and mental development, both in training, and in work. In the course of medical-professional consultation a doctor should solve a question about suitability of teenager to the selected trade.

For carrying out of medical-professional consultation *a doctor should know*:

- features of teenage age;
- character and working conditions at manufactures;
- their possible influence on a growing organism and diseases;
- to know laws and instructions on a labour safety of teenagers.

At school medical-professional consultation is spent by the school doctor, since 7 classes.

9. Physical training of children and teenagers. Tempering of children and teenagers.

Physical training - is a system of the actions directed on education of healthy youth. It consists of those repeated exercises and the procedures promoting increase of functionality ability of an organism

Tasks of physical education of children and teenagers:

- strengthening health, improvement of physical development and resistance of organism;
- formation of the basic impellent skills, endurance, force and dexterity;
- education of activity, discipline, feeling of company;
- development of skill to regular employment by physical exercises and hardening;
- development of separate kinds of sports;
- acquaintance with rules of hygiene of physical culture and sports;
- prevention of traumatism.

Physical training principles:

- a. integrated approach;
- b. gradual transition from small loading to large;
- c. system;
- d. account of functionality's of organism;
- e. the favorable conditions of an environment.

Physical training means:

- massage;
- physical exercises;
- games;

- outdoor games;
- entertainments;
- physical and musical exercises;
- morning gymnastics;
- walks;
- excursions;
- physical training lessons.

The physical training lesson:

- introduction (5-7 min);
- preparatory (12-15 min);
- basic part (20-25min);
- final part (3-5 min).

Schoolchildren are divided into three groups:

- basic - healthy children and teenagers and also children with small functional deviations;
- preparatory - little trained with the small functional infringements, suffering gastritis, chronic bronchitis, transferred acute infectious diseases.
- special - children sick of rheumatism, with heart diseases in subcompensative stage, with considerable backlog in physical development, with defects of locomotorium.

Tempering - is a system of the procedures directed on development of stability of an organism to adverse meteorological influences

The main principles of tempering:

- systematic character;
- step-by-step dosage increase;
- considering of an organism's specific features;
- variety of means and forms of tempering;
- combination of general and local procedures;
- self-checking.

Tempering by means of air:

- twice a day the child should be bared at a room temperature (20-22°C);
- duration of a bath is increased gradually from 4 till 30-40 minutes within 10-14 days;
- for preschoolers and schoolboys initial level of air temperature - 16-18°C;
- in the course of tempering air temperature gradually decreases on 1°C every 3-4 day and can culminate 10°C.

Tempering by means of UV-beams:

- aged till 1 year begins tempering with duration of a solar bath no more than 2 minutes (1 minute on a stomach, 1 minute - on a back). each next day an exposition should be increased for 1 minute
- duration of an irradiation session of children from 1 till 6 months should not exceed 10 minutes

- from 6 months till 1 year - 20 minutes
- during session it is necessary to watch the state of health, to change a body position, to dry a body with a towel from sweat, to protect eyes and head from direct solar beams.

Tempering by means of water:

- till 6 months of the child is necessary to bathe in warm water;
- further (till 6-year-old age) tempering by water consists in washing of the child with cool water; daily it is necessary to wash not only a face and hands, but also a neck, feet, shins, forearms;
- it is possible to begin a regular tempering of all body with 6-year-old age, gradually increasing intensity of procedures: wiping, sponging down.

CHAPTER 8. HYGIENE OF A HOT CLIMATE

Study questions.

1. *Heat illness.*
2. *Features of placing in hot climate.*
3. *Malnutrition in countries of a hot climate.*
4. *Hygienic characteristic of food poisonings. Heat of a hot climate as a risk factor for food poisonings occurrence.*
5. *Sanitary-hygienic examination of foodstuff.*
6. *Features of water supply in tropical climate conditions.*
7. *Influence of work on an organism in conditions of a hot climate.*

Hygienic aspects of heats influence on an organism are connected with functional and pathological changes at its influence on a person. Changes of functional character are expressed in the following:

- 1) moderate rise of body's temperature;
- 2) increase of oxygen and water consumption;
- 3) increase of pulse rate (tachycardia) and decrease of blood pressure (hypotonia);
- 4) increase in blood viscosity, quantity of erythrocyte and blood haemoglobin;
- 5) easing of conditioned-reflex activity with infringement of movement coordination, decrease in attention and reactions on external stimulant, that as a result leads to fatigue.

The raised water consumption in the conditions of strengthened sweat secretion leads to gastric juice dilution, its antiseptic function decreases, that as a result can promote development of dyspepsia, colitis. At drink of the water infected by bacteria there are infectious diseases.

At long influence of heats, especially at combination to other adverse factors of environment, there can come pathological changes in an organism. Degree of expressiveness of these changes is influenced by an organism state, degree of adaptation, character of work and observance of rules of personal and public hygiene, timeliness and qualification of medical aid rendering, system of improving, hygienic actions. Rise in temperature at not adapted people promotes occurrence of alarm, depression, and high humidity increases drowsiness.

1. Heat illness.

Exposure to warm environments affects many physiologic functions and may cause dehydration. Most people experience mild but uncomfortable symptoms; however, effects may range from cramps and edema to syncope, heat exhaustion,

and heat stroke. Core temperature is elevated in some types of heat illness. Those with dehydration may have tachycardia, tachypnea, and orthostatic hypotension.

Pathophysiology

Heat input comes from the environment and metabolism. Heat output occurs through the skin by radiation, evaporation (eg, via sweat), and convection; the contribution of each of these mechanisms varies with environmental temperature and humidity. Radiation predominates at room temperature, but as environmental temperature approaches body temperature, evaporation becomes more important, providing essentially 100% of cooling at $> 35^{\circ}\text{C}$. However, high humidity greatly limits evaporative cooling.

Heat output is modulated by changes in cutaneous blood flow and sweat production. Cutaneous blood flow is 200 to 250 mL/min at normal temperatures but increases to 7 to 8 L/min with heat stress, requiring a marked increase in cardiac output. Also, heat stress increases sweat production; thus, significant dehydration can occur rapidly.

Etiology

Heat disorders are caused by some combination of increased heat input and decreased output. The elderly and the very young and people with cardiovascular disorders or electrolyte depletion (eg, due to diuretic use) are at highest risk.

Excess heat input typically results from strenuous exertion, high environmental temperatures, or both. Medical disorders (eg, hyperthyroidism, neuroleptic malignant syndrome) and use of stimulant drugs (eg, amphetamines, cocaine) can increase heat production.

Prevention

During excessively hot weather, the elderly and the young should not remain in unventilated residences without air-conditioning. Children should not be left in automobiles in the hot sun. If possible, strenuous exertion in a very hot environment or an inadequately ventilated space should be avoided, and heavy, insulating clothing should not be worn.

Weight loss after exercise or work is used to monitor dehydration; people who lose 2 to 3% of their body weight should be reminded to drink extra fluids and should be within 1 kg of starting weight before the next day's exposure. If people lose $> 4\%$, activity should be limited for 1 day.

If exertion in the heat is unavoidable, fluid should be replaced by frequently drinking water, and evaporation should be facilitated by wearing open-mesh clothing or by using fans. Fluids should be drunk every few hours regardless of thirst.

Heat cramps are exertion-induced contractions that occur during or after exertion in the heat.

Heat cramps can occur in physically fit people who sweat profusely and replace lost water but not salt, thereby causing hyposodiumemia. Heat cramps are common among manual laborers (eg, engine room personnel, steel workers, miners), basic military trainees, and athletes.

Cramping is abrupt, usually occurring in muscles of the extremities. Severe pain and carpedal spasm may incapacitate the hands and feet. Temperature is normal, and other findings are unremarkable. The cramp usually lasts minutes to hours.

Cramps may be relieved immediately by firm passive stretching of the involved muscle. Fluids and electrolytes should be replenished orally. Adequate conditioning, acclimatization, and appropriate management of salt balance help prevent cramps.

Heat exhaustion is a non-life-threatening clinical syndrome of weakness, malaise, nausea, syncope, and other nonspecific symptoms caused by heat exposure. Thermoregulation is not impaired.

Heat exhaustion is caused by water and electrolyte imbalance due to heat exposure, with or without exertion.

Symptoms are often vague, and patients may not realize that heat is the cause. Symptoms may include weakness, dizziness, headache, nausea, and sometimes vomiting. Syncope due to standing for long periods in the heat is common and may mimic cardiovascular disorders. On examination, patients appear tired and are usually sweaty and tachycardic. Mental status is typically normal, unlike in heatstroke. Temperature is usually normal and, when elevated, does not exceed 40° C.

Diagnosis is clinical and requires exclusion of other possible causes (eg, hypoglycemia, acute coronary syndrome, various infections).

Treatment involves removing patients to a cool environment, having them lie flat, and giving IV fluid and electrolyte replacement therapy, typically using 0.9% saline solution; oral rehydration does not provide sufficient electrolytes.

Heatstroke is hyperthermia accompanied by a systemic inflammatory response causing multiple organ dysfunction and often death. Symptoms include temperature > 40° C and altered mental status; sweating is often absent. Diagnosis is clinical. Treatment is rapid external cooling, IV fluid resuscitation, and support as needed for organ failure.

Heatstroke occurs when thermoregulatory mechanisms do not function and core temperature increases substantially. There are 2 variants: classic and exertional. Classic heatstroke takes 2 to 3 days of exposure to develop. It occurs during summer heat waves, typically in older, sedentary people with no air-conditioning and often with limited access to fluids. Exertional heatstroke occurs abruptly in healthy active people (eg, athletes, military recruits, factory workers).

Intense exertion in a hot environment causes a sudden massive heat load that the body cannot modulate.

Symptoms and Signs

Global CNS dysfunction is the hallmark, ranging from confusion to delirium, seizures, and coma. Tachycardia, even when the patient is supine, and tachypnea are common. In classic heatstroke, the skin is hot and dry. In exertional heatstroke, sweating is relatively common. In both, temperature is $> 40^{\circ}\text{C}$ and may be $> 46^{\circ}\text{C}$.

Prevention of adverse influence of a discomfortable microclimate:

- equipment perfection;
- working out of a rational mode of work and rest;
- organization of a drinking mode;
- air conditioning;
- arrangement of premises for rest;
- individual protection frames (overalls, helmets, points, masks);
- carrying out of preliminary and periodic medical inspections;
- preventive food;
- tempering.

2. *Features of placing in hot climate.*

Along with the general requirements, in town-planning in a hot climate conditions specific features which affect national and social-economic features of a country take place. The special attention should be given to the following points:

- aerations (airing);
- insolation;
- orientations of streets and buildings taking into account dominating wind direction;
- internal planning of inhabited, public and industrial building.

All complex of the given requirements is directed against concentration in air of populated areas of various pollution, including from motor transport and industrial enterprise, for free air moving and best airing of city streets so necessary in the heats conditions and humidity, prevention of phototoxic fogs (smogs). It is difficult to overestimate a role of the green plantings protecting from sun beams.

At build-up of southern buildings deep loggias are expedient, and planning of premises should provide draught airing. In office and industrial premises conditioners is required. Protective adaptations from entry to a dwelling of insects, mosquitoes, pincers and other carriers of infectious diseases are necessary.

3. *Malnutrition in countries of a hot climate.*

The recently completed **Demographic and Health Survey 2006/7** showed that 22 percent of **Sri Lankan** children below five years of age are underweight, 18

percent being too short (stunted), and 15 percent too thin (wasted) as measured by weight for height. There is an improvement, when you compare these figures with figures in 1987, when 38 percent of children under five were underweight, and 28 percent stunted. However, nutrition indices need to improve considerably more for Sri Lanka to achieve the Millennium Development Goal of halving the proportion of people who suffer from malnutrition. However, Sri Lanka has a growing number of overweight people among the higher income groups leading to higher incidence of diabetes, cardio-vascular diseases, strokes and certain types of malignancies. This has resulted in the seeming paradox of under-nutrition and over-nutrition.

The World Bank report recommends following combination of strategies to improve the country's nutrition status:

- a. Poverty reduction strategies specifically designed to reduce income inequalities;
- b. Strategies to improve access to safe water and sanitation (and good hygiene behaviors);
- c. Strategies to reduce food insecurity, especially among the poor in the plantation sector and in rural areas;
- d. Strategies to scale-up direct nutrition interventions through the health sector that would help to fast-track the improvements in nutrition outcomes.

Malnutrition implies the result of imperfect assimilation nutrition or both. It has been defined as a pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients.

Causes for malnutrition in India

- a. *Population growth*: The rapid growth of population leads to gap between food production and food consumption which causes malnutrition.
- b. *Agriculture and food production*: In India food production depends upon nature. There is no proper adequate source of timely irrigation. Farmers have to depend on natural rainfall, which is unpredictable. At one time unprecedented drought is followed by flood at another time. Fragmentation of land and bad socio-economic conditions are also responsible.
- c. *Prevalence of parasitic and infectious diseases*: These diseases responsible for decreased intestinal absorption and lack of proper work which is important for poor and inadequate diet.
- d. *Religious and cultural food fads*: These prevent the people from using the locally available nutritious -food. Cooking methods also differ according to tradition.
- e. *General illiteracy and ignorance*: About the importance of balanced diet and poverty.

f. *Economic barrier*: It is also resulted in malnutrition among the children of the nation.

Malnutrition may be in the following forms:

Undernutrition: It is due to insufficient food eaten over an extended period of time due to poverty or ignorance,

Overnutrition: It is due to consumption of excessive quantity of food over an extended period of time due to excessive food or ignorance,

Imbalance: it is due to imbalance such as quantitative imbalance of calcium, phosphorus and vitamin D.

Specific deficiency: It is due to specific deficiency such as goiter in iodine deficiency.

Malnutrition is a condition that is most prevalent in our country. It is more common among children, pregnant ladies and nursing mothers. Its effects are kwashiokor, marasmus, xerophthalmia, beriberi, pellagra, goiter, rickets, etc. This malnutrition condition predisposes to diseases like tuberculosis, diarrhea, parasitic infestation leads to high sickness rate and increased infant mortality rate.

Preventive measures of malnutrition

1. Increased food production by scientific cultivation.
2. Vulnerable group, i.e., infants, preschool children, expectant and lactating mothers should be protected by best utilization of locally available food substitution, midday cheap supplementary food, etc.
3. Fortification of arte (flour) with protein and calcium or milk should be fortified with vitamin A and vitamin D.
4. Improvement of environmental sanitation is necessary to prevent the parasitic infections.
5. Projects and programs in the field of food and nutrition including nutrition education should receive a high priority.
6. Applied nutrition program should be extended to all the affected areas and it should run sincerely and should be beneficial to vulnerable groups.
7. Prevention of unnecessary loss of food in the fields, store, transport and cooking is necessary.
8. Education of public on fundamentals of diet and nutrition and help from voluntary and international organization are necessary.
9. Feed rationalization,
10. Addition lacking or to restriction of some food substances.
11. Rehabilitation of badly eating children,
12. Vitaminization of feed by preparations of vitamins.
13. Insolation.

Malnutrition is a disease of society, poverty and ignorance. In this, every one, i.e. teacher, nurse, physician, farmer and all organizations have to contribute

much to combat this malnutrition. The steps have already taken by the Government of India to tackle the problem.

4. *Hygienic characteristic of food poisonings. Heat of a hot climate as a risk factor for food poisonings occurrence.*

The climate of tropical countries taking into account features of local population life, contains many risk factors for occurrence of food poisonings. The heat accelerates process of products damage, reduces terms of its realisation. High humidity creates more favorable environment for reproduction of activators of intoxications. Local customs of life, food character with use of many products (vegetables, fruit) in a raw kind at deficiency of water is an additional contributing social background for food poisonings.

Application of various pesticides for preservation of a crop without strict observance of agrochemical standard of farming leads to poisonings of chemical (not bacterial) nature. All is imposes special responsibility for work of a doctor in tropics on prevention of food poisonings.

Preventing bacterial food poisoning

- timely revealing of sick persons and carriers among workers;
- storage of products is carried out with observance of temperature regimen, transportation - special transport, cooking - with observance of technology requirements;
- sanitary-epidemiological supervision at public catering establishments;
- correct conservation of foodstuff in house conditions;
- control over pollution of grain and its correct storage, struggle against illnesses of agricultural plants;
- At home, prevention mainly consists of good food safety practices.
- Many forms of bacterial poisoning can be prevented even if food is contaminated by cooking it sufficiently, and either eating it quickly or refrigerating it effectively. Many toxins, however, are not destroyed by heat treatment.
- Good hygiene practices before, during, and after food preparation can reduce the chances of contracting an illness. There is a general consensus in the public health community that regular hand-washing is one of the most effective defenses against the spread of foodborne illness. The action of monitoring food to ensure that it will not cause foodborne illness is known as **food safety**.

The important role in prevention of feed poisonings belongs to **hygienic rationing** of product's quality - ability to satisfy physiological requirements of a person and to provide safety for a life and harmlessness for people's health of present and future generations. In qualitative meat the maintenance of lead more than 0,5 mg/kg, arsenic - 0,1 mg/kg is not supposed, microorganisms – 10/g.

The maintenance of nitrates in a potato should be not above 150, tomatoes - 100, apples - 60, carrots - 200, cabbage - 400 mg/kg.

5. *Sanitary-hygienic examination of foodstuff.*

Hygienic examination:

- 1) Studying of documents certifying an origin and quality of products.
- 2) External examination, finding out a condition of container.
- 3) Selective opening containers and sending products to organoleptical research.
- 4) Test sending on the analysis in a laboratory.

The product, suitable for a food without restrictions, meets all requirements of the corresponding standard, harmless to health, has good органолептические qualities.

The product, suitable for a food of the lowered quality, mismatches requirements of the standard or has the defect which essentially is not worsening it organoleptic quality. It supposes to the use with a condition, that the consumer will be informed on the lowered value.

Conditionally suitable product has lacks which do its unsuitable for a food without preliminary neutralization or improvement of organoleptic properties.

Substandard product is characterized by defects which do not suppose its use for a food.

Hygienic regulation includes the permission, restriction or manufacture and application prohibition, an establishment of maximum permissible levels of the maintenance of harmful substances and factors in various objects of environment and a quality monitoring.

Hygienic registration includes a preliminary expert estimation of the presented documents and product samples, definition of an order and examination volume, sampling, laboratory researches, registration and the certification about the state hygienic registration of production and it's entering into the State hygienic register of Ministry of Health.

Certification is a research of products on conformity their STst.

6. *Features of water supply in tropical climate conditions.*

In many regions of a planet there is no fresh water. Developing countries in hot climate conditions also experience deficiency of good-quality water. This circumstance attaches special sanitary-hygienic and epidemiological significance to the water factor. The polluted water from various open (superficial) water sources is a principal cause of distribution of infectious diseases.

In rural areas of tropical countries 3/4 patients are hospitalised concerning infectious illnesses from which 50 % are connected with usage of inadequately

water. It is promoted by low level of sanitary culture and sanitary-engineering accomplishment that is additional factor of distribution of infectious and parasitic illnesses.

In hot climate conditions hygienic value of water, is reduced to the decision of following main tasks:

- Rationing of water consumption for cities and villages with definition of the minimum norm in extreme situations; research of new sources of water usage, mainly, from underground sources;
- Working out of national criteria of quality of potable water;
- Building of waterpipes, systems of water drain and treatment facilities, i.e. increase of sanitary-engineering accomplishment of settlements;
- Rational water usage in interests of observance of personal and public hygiene.

For the tropical countries the special role is taken away to epidemiological value of water as to a potential source of infectious diseases, water epidemics, parasitic diseases and tropical illnesses transferred through insects-carriers. The period of the tropical downpours connected with plentiful pollution of rivers, channels, lakes, and open water sources is especially dangerous. But also in a drought population is compelled to drink the inadequately, polluted water.

From the hygienic point of view, especially in a hot climate, the underground (soil) waters protected from sources of pollution of anthropogenous, technogenic character, having a good chemical compound are optimum. The second place is taken away to superficial (open) reservoirs (rivers, lakes, artificial water basins). But in these cases water before usage is subject to disinfecting and clearing in all necessary cases (filtration, coagulation, special methods of water processing). During tropical downpours, summer monsoons population collects atmospheric water for time water usage. Such water can be used only in a boiled kind.

Maintenance of population by water is carried out basically centralized water supply system (waterpipe). But in a countryside, and also in cities with low degree of sanitary-engineering accomplishment, local water supply, especially in the form of various systems of wells and also springs is widely applied.

It is equally important to ensure the safety of water and provide adequate quantities.

The amount of water needed by each person varies with the setting, but the following are the approximate needs:

<i>Location/circumstances</i>	<i>Volume per person per day</i>
Clinics, field hospitals	40-60 litres
Feeding centres	30 litres
Personal needs	15-20 litres

Water should be collected from the cleanest available source. In the case of a well, installation of a simple pulley device and provision of buckets will make raising the water easier.

Water sources should be protected by the following measures:

- a. A fence or wall should be erected to keep animals away.
- b. Drainage ditches should be dug uphill from an open well to prevent storm water flowing into it.

People should not be allowed to wash in the water source; children should not be allowed to play in or around a source.

Latrines should not be located (or defecation allowed) uphill from or within 30 metres of a water source. In addition, families should be instructed to:

- a. collect and store water in clean containers;
- b. empty and clean out containers regularly;
- c. keep each storage container covered and not allow children or animals to drink directly from a container;
- d. prevent people (particularly children) from putting their hands into the containers;
- e. take water from a container using a dipper kept specially for the purpose.

Water can be made safe by **chemical treatment**, commonly chlorine and chlorine-releasing compounds. These are available in several forms:

- a. bleaching powder (25% by weight of available chlorine when fresh); this deteriorates quickly when stored in warm and damp places;
- b. calcium hypochlorite (typically 70% by weight of available chlorine); this is more stable than bleaching powder;
- c. sodium hypochlorite (normally sold as a solution of strength approximately 5%).

The chlorine dose should be carefully determined, and it may be necessary to seek the advice of sanitation experts. Moreover, the indiscriminate distribution of chlorine tablets usually does little good and may actually be harmful (the tablets are dangerous if swallowed).

Where chemicals are not available, water may be boiled for 1 minute to kill harmful organisms. If the local water source is known to be contaminated, it may be possible to arrange for large quantities of clean drinking-water to be brought from elsewhere in drums or tank-trucks.

When it seems likely that emergency conditions will persist for some time, more permanent facilities should be sought urgently, including artesian wells, boreholes, and pumping and filtration equipment. In any case it is essential to disinfect water, either at the source in the case of centralized production or in the household by chlorination or boiling.

7. Influence of work on an organism in conditions of a hot climate.

Working in hot environments or exposure to high temperature places stress on the body. This stress, combined with physical work, dehydration and fatigue, may lead to heat disorders.

The normal physiological responses to heat stress are vasodilation in the skin (i.e. widening of blood vessels) and a corresponding increase in the heart rate. These adjustments help to transfer heat by circulating blood from the centre of the body to the skin, where heat is lost by convection, radiation and evaporation (sweating). When the rate of heat loss from the body is inadequate, warming may occur. Excessive warming of the body can lead to heat stroke, which can be fatal unless treated promptly and properly.

The three major types of heat disorders or heat-related injuries, in increasing order of severity are: heat cramp, heat exhaustion and heat stroke.

The potential health hazards from work in hot environments depend strongly on physiological factors and the level of acclimatisation. Acclimatisation is a gradual physiological adaptation that improves an individual's ability to tolerate heat stress.

Acclimatisation to heat is fully developed within two weeks, with maximal effects in the first week. In a heat-stressful situation, a person acclimatised to heat will have a lower heart rate, a lower body temperature, a higher sweat rate, and a more dilute sweat than a person who is not acclimatised at the start of exposure to excessive heat.

Once acclimatised, personnel will retain most of their adaptation for about one week after leaving the hot environment. The acclimatisation will then decrease at a variable rate, the major portion usually being lost within three to four weeks.

In addition to temperature, heat stress is also affected by environmental factors such as humidity, and the radiant heat load (e.g. exposure to direct sunlight).

Agricultural work on fields and plantations on cultivation of a clap, corn, millet, rice, coffee, a peanut, fruit, etc. products is carried out within all year open-air and characterised by influence on an workers organism: heat and intensive solar radiation, high or low humidity, soil dust and chemical substances applied as fertilizers or means of pest control of agricultural production. Thus there is no regulation of work, works are carried out in a compelled pose with application of children's and female manual skills.

At work by various agricultural machines in field husbandry widespread diseases of peripheral nervous system and locomotorium, chronic bronchitis, pustulous diseases of skin, rhinitises, pharyngitises, and tracheitises, conjunctivitis.

Heavy manual skills in cotton growing lead to catarrhal diseases, neurovascular infringements in the arms and legs, diseases of locomotorium.

Catlivestock breeders have allergic diseases of breath bodies, eye is more

often, professional infections.

Special danger in agriculture is represented by pesticides, applied to control of illnesses of cultivated cultures, various pests, rodents, weed vegetation etc. Infringement of hygienic requirements at work with pesticides, especially in the conditions of heats, leads to heavy intoxications.

Work at industrial enterprises, manufactures and in workshops is carried out in conditions of complex influence on an organism of manufacture adverse factors and environment (heat of external air), especially when work manual, heavy, at absence or weak mechanisation and its bad organisation. Combination of production factors can be various: heat and high or low humidity, heat and absence of air movement (at inefficient ventilation), adverse meteofactors plus various harmful chemical compounds allocated in course of manufacture in a working zone, weak light exposure of workplaces can be combined with intensive noise, dust content or other physical and mechanical factors. Action of these factors on a worker's organism can be general or local, constant or time, during all labour shift or periodically within days etc. As a result there are infringements of thermoregulation mechanisms, adaptation processes, thus physiological (functional) changes in an organism can outgrow in pathological (painful) changes of acute or chronic character. Professional illnesses are more often registered at working in mining industry, at metallurgy and mechanical engineering enterprises, in chemical industry and in manufacture of building materials. In disease structure vibrating illness, industrial traumatism, pustulous diseases of a skin, professional neuritis, professional pneumoconiosis (silicosis) are prevail.

In addition to measuring the level of heat stress and adjusting the level and rate of work accordingly, the risks of heat stress can be managed by:

1. **Controlling the temperature**, e.g. by changing the processes, using fans and air conditioning and using physical barriers to reduce exposure to radiant heat.
2. **Providing mechanical aids** where possible to reduce the work rate.
3. **Regulating exposure** to hot environments by providing regular rest breaks, and specifying the duration that workers can work if there is a risk.
4. **Preventing dehydration** by providing cool water in the workplace and encouraging workers to drink frequently in small amounts (about 1 glass).
5. **Providing training**, including verbal and written information about the dangers of heat stress and the symptoms / treatment for the various disorders.
6. **Providing personal protective equipment**, e.g. personal cooling systems or breathable fabric to protect workers in certain hot environments.
7. **Allowing workers to acclimatise**, especially new workers or those who are back after a long period of absence.
8. **Identifying workers who are more susceptible** through pre-placement medical screenings.

9. **Monitor the health of workers at risk**, such as those who abuse alcohol or other intoxicants, and those who take medications that may compromise normal cardiovascular, blood pressure, body temperature regulation, and renal or sweat gland functions.

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