МИНИСТЕРСТВО ЗДРАВООХРАНЕНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ
«ГОМЕЛЬСКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ»

Кафедра общей гигиены, экологии и радиационной медицины

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ОБЩАЯ ГИГИЕНА

Учебно-методическое пособие
для студентов 2, 3 курсов факультета по подготовке специалистов
для зарубежных стран с английским языком обучения
медицинских вузов

GENERAL HYGIENE

Teaching workbook
for 2, 3nd year English medium medical students
of the Faculty of preparation of experts for foreign countries
of medical higher educational institutions

Гомель
ГомГМУ
2015

УДК 613(0.75.8)=111
ББК 51.2я7
Б 83

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Б 83 Общая гигиена: учеб.-метод. пособие для студентов 2, 3 курсов факультета по подготовке специалистов для зарубежных стран с английским языком обучения медицинских вузов = General hygiene: Teaching workbook for 2, 3nd year English medium medical students of the Faculty of preparation of experts for foreign countries of medical higher educational institutions / В. Н. Бортновский, А. А. Лабуда. — Гомель: ГомГМУ, 2015. — 224 с.

ISBN 978-985-506-771-7

Учебно-методическое пособие охватывает основные темы общей гигиены и включает наиболее значимые сведения по данной дисциплине. Издание соответствует требованиям современного образовательного стандарта по подготовке специалистов для зарубежных стран по специальности «Лечебное дело» и дает возможность повысить уровень гигиенических знаний студентов, а также способствует их более эффективной самостоятельной подготовке к практическим занятиям и экзаменам.

Предназначено для студентов 2, 3 курсов факультета по подготовке специалистов для зарубежных стран с английским языком обучения медицинских вузов.

Утверждено и рекомендовано к изданию научно-методическим советом учреждения образования «Гомельский государственный медицинский университет» 24 июня 2015 г., протокол № 4.

УДК 613(0.75.8)=111
ББК 51.2я7

ISBN 978-985-506-771-7

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THE LIST OF BASAL ABRIDGEMENTS

BMI	— body mass index
CET	— corrected effective temperature
CFU	— colony forming units
CIS	— Commonwealth of Independent States
CNS	— central nervous system
CPE	— Clostridium perfringens enterotoxin
CVS	— cardiovascular system
DF	— decompression frustration
EFA	— essential fatty acids
ET	— effective temperature
FPA	— factor of physical activity
GIT	— gastrointestinal tract
Gy	— gray
HDD	— high-altitude decompression disease
IBM	— body mass index
IL	— incandescent lamps
LC(LF)	— luminosity coefficient (factor)
LL	— luminescent lamps
MCL, MLL	— maximum concentration/level
MED	— minimal erythematous doze
MSS	— musculoskeletal
NIF	— natural illumination factor
NS	— nutrition status
PCD	— protein-calorie deficiency
PCI	— patient care institution
PNF	— protein nutrition factor
PNS	— peripheral nervous system
SanR&N	— sanitary rules and norms
VA	— vocal apparatus
UV	— ultraviolet
UVR	— ultraviolet radiation
VS	— visual system
WHO	— World Health Organization
ZSP	— zones of sanitary protection

FOREWORD

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.

The purpose of medicine is restoration, preservation and strengthening of human health. This purpose is achieved by the two methods: the first — treatment of human diseases, the second — prevention of diseases and premature aging of an organism, i.e. prophylactics. According to this two directions in medicine were formed: medical and preventive.

The source of medical direction is therapy, the source of preventive direction is hygiene. The word «hygiene» originates from the name of ancient Greek goddess of health Hygeia — daughter of doctoring god Aesculapius. Hygiene is a science of human health.

Apart from the term «hygiene» which means «radiant in health» there exists the term «sanitary» (originating from the Latin «Sanitas», or health, which denotes the practical part of hygiene). Now, both therapy and hygiene are divided into the number of medical (therapy) and preventive (hygiene) scientific disciplines and the areas of practical activities united by the common goal but with various methods of its reaching.

The structure of preventive direction includes general hygiene, social hygiene, municipal hygiene, hygiene of labor, hygiene of a nutrition, radiation hygiene, naval hygiene, hygiene of physical culture and sports, sanitary toxicology, sanitary microbiology, parasitology and, finally, important enough preventive discipline — epidemiology of infectious diseases.

Thus, the modern hygiene represents the unique direction in medicine. It includes the number of preventive scientific disciplines and areas of practical activities of doctors. Similar to medicine, hygiene is founded on the theoretical base of philosophy, exact (physics, chemistry, mathematics) and biological (general biology, normal and pathological physiology) sciences.

1. HYGIENE AS THE MEDICAL SCIENCE OF THE PREVENTIVE ORIENTATION

Hygiene — is a science about laws of environment factors influence on individual and public health and conditions of its maintenance and strengthening. The word *hygiene* comes from *Hygeia,* the Greek goddess of health, who was the daughter of Aesculapius, the god of medicine.

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.*

Purpose, subject, object and method of hygiene

The purpose of hygiene as of science is protection and boosting of public and personal health by improvement of natural and social environment consisting of the concrete working conditions, life and behavior of the man. By contemporary representations (the Charter of the World Health Organization), health means not only the absence of diseases but also the maximal physical, mental and social wellbeing allowing the person to most effectively carry out the public and labour functions. Hence, the health of a man is a biosocial concept at the leading part of a social.

The subject of hygiene is studying of laws of interaction of factors of natural and social environment and an organism of a person, research of cause-and-effect relations within system «environment – human health» as the majority of cases of health disorder, diseases and early ageing of the organism is the result of interaction of the person with unfavorable influence of the environment.

The basic objects of survey in hygiene are a healthy person (social group, population, the population of a region) and the environment. By origin, environmental factors are divided into natural, industrial and domestic. By their nature environmental factors are divided into physical (climate, microclimate in rooms, atmospheric electricity, noise, vibration, ionizing and non-ionizing irradiation, and others), chemical (chemical compound of atmospheric air at homes and business premises), biological (microorganisms, plants, mushrooms, insects, animals and products of their life activity) and social (conditions of accommodation and rest of people, nutrition, water supply).

The method of hygiene differs in specific preventive orientation consisting in prevention or reducing of harmful factors impact and the application of useful factors of the natural and social environment for the achievement of the purpose — preservation and boosting of public health.

Specificity of the hygiene method consists not only in its orientation on elimination of negative environmental influence on the person but also in the

way of it realizes this orientation: not by direct influence on the person (treatment) but through regulation of a complex of scientifically grounded legal, administrative, technical, economic and other measures.

In hygiene the following concrete methods of research are applied:

1. The method of hygienic inspection of an object in which people live or work. This method consists of natural research of working conditions, life and rest, in comparison of the revealed conditions with hygienic specifications and in the development of recommendations on elimination of the revealedsanitary infringements.

2. The instrumental-laboratory method which played a big role in transformation of hygiene into scientific discipline. The significant number of partial techniques for research of physical, chemical, biological factors of environment, and also functional shifts giving understanding of the influence of these factors on an organism is used.

3. The sanitary-statistical method allowing to assess the level of public health in any collective, group of population in connection with influence of factors of natural and social environment by three basic groups of parameters:

— sanitary — demographic parameters describing reproduction of the population (birth rate, death rate, reasons of death, average life duration, final results of reproduction);

— parameters of morbidity and disability (initial applications for medical assistance, hospitalization, disability);

— parameters of physical development (growth, body mass, functional parameters).

4. The experimental method used in scientific research for hygienic normalization, including laboratory and natural research.

Summing up, modern hygiene can be determined as a complex of medical preventive scientific disciplines and areas of practical activities of doctors aimed at preservation and boosting of human health by means of prevention of illnesses and premature aging.

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 psychometrical 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 ate 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.

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) hhysical 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, Klienfelter's syndrome, Turner' syndrome and haemophilia are common in men whereas schizophrenia, 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 suiter 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 breastfeeding 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 goodwill promote health.

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

The hygienepurpose 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.

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 adolescents;

— 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 adolescents 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 maintenance 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.

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 maintenance 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).

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 spe-

ciality 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 before nosology diagnostics directed on research of organism functional state, being in primordial, 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.

Value of hygiene in maintenance of population's health

Hygiene and sanitary possesses the leading part in maintenance 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 maintenance and strengthening of population health belongs to the state sanitary inspection which primary task is control over carrying out sanitary-epidemical and sanitary-hygienic actions directed on prevention and liquidation of environmental contamination, improvement of working conditions, training, populations' life and rest, sick rate 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 desinfection 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 adolescents;

g. control of physical development of children and adolescents;

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 center of hygiene and epidemiology:

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.

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.

Hygiene as fundamental science.

Regarding practice, sciences can be divided into fundamental and applied. The word «fundamental» (of Latin «fundamentus» — «basis») has two meanings: the basic, main and substantial, deep.

As possible meanings of this word the Webster's Dictionary tells: «theory or principle underlying something» and «something basic for scientific and technological progress».

Considering all this, hygiene can be qualified as an equivalent fundamental and applied since it both has to ground healthy conditions of life and work and is a scientific basis for sanitary practice, and its developed scientific recommendations have direct practical introduction.

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 conditionsfor 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.

Laws of hygiene

For the first time the fundamental preventive science with a centuries-old history whose subject of studying is a system "healthy person — environment", has formulated its laws.

So, the *first law* of hygiene determines that affection of health of people caused by physical, chemical, biological or social factors, can arise only at presence of three conditions: a source of harm (danger) of the environment, mechanism of its transfer and susceptibility of an organism.

The *second law* of hygiene reflects negative ecological influence of the human activity on the environment which occurs regardless his will and consciousness. Without taking into account corresponding sanitary-and-hygienic requirements there is a progressive environmental pollution and biosphere on the whole.

The *third law* of hygiene — the law of negative influence of the extreme natural phenomena (volcanic activity, geochemical anomalies, flashes on the Sun, earthquakes, cyclonic and anticyclonic activity, etc.) on the environment.

The *fourth law* of hygiene establishes positive influence of human society on the environment. Its observance at introduction of non-polluting technologies promotes augmentation of conditions which improve quality of human life.

The *fifth law* of hygiene characterizes negative influence of the polluted environment on human health. Action of this law is in certain dependence on the concrete display of requirements of the second and third laws. So, in the result of long pollution at unskilled land tenure of some agrocoenosis in the Gomel area with pesticides and nitrates combined with the high radioactive background and presence of polymetals in soil of theregion there were created conditions for occurrence of xenobiotic syndrome among pregnant women and the newborns, expressed in anemia, hypoxia, jaundice and microsymptoms of the central nervous system affection.

The *sixth law* of hygiene — positive influence of the natural environment on the human health which should not be limited but strengthened (ecologically

clean and good-quality food, drinking water, atmospheric air, natural insolation, UV (ultraviolet) radiation of the Sun, etc.).

These are scientific bases of hygiene, its 6 laws.

Differentiation of hygiene as subject matter

Sections of hygienic science are hygiene of labor, municipal hygiene, hygiene of children and **adolescents**, hygiene of nutrition, radiation hygiene, military hygiene with reference to investigated objects: industrial enterprises, living places, children's and school establishments, cafes and restaurants, enterprises of food industry, objects of military machinery.

Doctors-hygienists conduct the routine and precautionary sanitary-and-hygienic control over condition of the environment, conditions of life and work of the population.

Practical implementation of specifications and recommendations developed by hygienic science is carried out as sanitary measures. For example, hygienic standards of microclimate, maximum concentration limit of dust and toxic substances in air, airproofing of the equipment, mount of ventilation in workshops, applications of individual means protection, etc. Hygienic norms of water consumption and quality of water demand carrying out of the number of sanitary measures at choosing of water supply point, systems of water purification and disinfecting, development of a quality monitoring over efficiency of water treatment, etc. All these actions are surveyed by sanitary inspection.

2. THE CONCEPT OF HYGIENIC DIAGNOSTICS AT THE CONTEMPORARY STAGE

Concept «diagnostics» (recognition) usually connect with clinical, i.e. medical medicine. Obviously, this concept can be distributed and on other natural phenomena and societies, including factors of an environment. It was marked in the works by the founder of hygiene in Russia A.P. Dobroslavin which called on doctors to diagnose «sanitary illnesses» of societies, to form hygienic mentality under which he understood skill to diagnose and eliminate these illnesses. He counted a technique of recognition, studying and an estimation of environmental conditions identical those at definition and recognition of conditions of the person during diagnostics of illness.

Contemporary hygienic diagnostics represents system of thinking and the actions which are having for an object research of conditions of the natural and social environment, health of the person (population) and an establishment of interrelation between a condition of environment and health. It appears from this, that hygienic diagnostics has three objects of research - environment, health and connection between them. Now while the most investigated is the first object — an environment, it is worse — the second and very little — the third.

In the methodological and methodical relation hygienic diagnostics significally differs from diagnostics clinical.

Objects hygienic prenozological diagnostics is the healthy person (population), environment and their interrelation. Object of clinical (nozologic) diagnostics — the sick person and it is rather fragmentary, only in the familiarization plan, — conditions of his life and work. A subject of clinical diagnostics is illness, its size; a subject hygienic prenozological diagnostics — health, its size.

Hygienic prenozological diagnostics can begin with studying or, anyway, from an estimation of the available data on the natural person natural and social environment and then to pass to the person (population). Clinical diagnostics begins directly with the patient who already has both complaints, and symptoms. They should be coordinated in the logic circuit and to compare with existing one in textbooks, manuals and model of illness developed as a result of experience. The knowledge of environment plays a supporting role here, it directly for diagnostics is not necessary almost because the result of action of environment is available, and moreover in manifest form.

An ultimate goal of hygienic prenozological diagnostics is the establishment of a level, sizes of health, of clinical ones — definition of illness and its size. It appears from this, that at realization hygienic prenozological diagnostics the condition of adaptable reserves of an organism, and then functions and structures which in general can be not broken, especially structure first of all should be estimated. At clinical diagnostics on the contrary and more often infringements of structure, function and less often — conditions of adaptable reserves are revealed.

3. THE HISTORY OF THE HYGIENE DEVELOPMENT LINK OF HYGIENE WITH THERAPEUTIC MEDICINE

From ancient times hygiene possessed monopoly to studying of factors of the environment and their influence on the human health. Ancient Greeks believed that mythical doctor Aesculapius had two daughters — Panacea and Hygeia. The first daughter performed the role of treatment of ill people, the second one prevented illnesses in healthy people by elimination of harmful factors of inhabitancy, application of useful ones and formation of healthy way of life on this basis. This formation was first based upon empirical supervision over results of people's interaction with the environmental natural and social environment and was expressed as traditions, laws and religious rules. Later they were summarized in the first scientific manuscripts belonging to the well-known doctor of antiquity Hippocras (460–377 B.C.) such as «About water, air and districts» where he wrote, that disease is the result of the life contradicting to the nature, therefore the doctor, to execute the duties, should observe care-

fully how a person relates to food, drink and everything surrounding him. Since the 9th century, there was a University in Italy (Salerno) in which ideas of Hippocras and Roman Doctor Galen were widespread. In the East an outstanding role in the development of medicine and studying of influence of the environment on health was played by the well-known scientist Abu-Ali ibn-Sina known in Europe as Avicena. He developed many hygienic rules about the structure and treatment of homes, clothes, correct nutrition, child care, etc. He for the first time specified an opportunity of spreading of a disease through soil and water. 15th and 16th centuries were marked by the development of a capitalist industry which was followed by development of sciences and arts including modern natural sciences.

Medicine in general and hygiene in particular, overcoming religious, scholastic representations about the reasons of illness take the natural-science way of development. Environment and life conditions of people are admitted to be leading in occurrence and development of illnesses. Doctor and Astronomer Frakastro reports of supervision over ways of distribution of infections and writes the treatise «Of infectious illnesses» (1546), Doctor Rammatsini — «Treatise about the illnesses caused by trades of people» (1700).

The further progress in science, public life and culture put forward new problems before hygienic science and practice. Their decision demanded scientifically grounded positions based on accurate research of factors of the environment and experiment. The first large papers corresponding these requirements were manual in hygiene by Michel Levis published in 1844 in Paris, and the manual in experimental hygiene of an English doctor Parx published in 1854 in London. Experimental direction received further development in work and practical activities of the outstanding scientist — hygienist Max Pettenkofer (1818–1901) and the school of hygienists created by him.

In Russia, as well as in other countries, the beginning of empiric knowledge of connection between conditions of life and health arose long ago — in Kiev and Novgorod (Russia). They were reflected in «Domostroi» — the treatise about life of prosperous russian family. Later a number of decrees about protection of an environment and health of the population, in particular, about supervision of a sanitary condition of cities (1737), about sanitary conditions at cloth factories («Rules», 1741), about the obligatory notice is issued in case of infectious illnesses («the Order to governors and voevodes», 1743).

The history of domestic medicine testifies to deep understanding of problems of hygiene by outstanding Russian clinical physicians.

One of founders of Russian therapeutic school M. J. Mudrov (1776–1831), being the professor of therapy of medical faculty in Moscow University, on June, 3, 1809 has made the well-known assembly speech under the name «the Word about advantage and subjects of military hygiene, or sciences to keep health of military men». In this speech are contained the ideas which have not lost the value today. He spoke: «In regiments and especially in fleet it is much

easier to protect than to recover the lost of health». And further: «Satisfied and healthy soldiers essence are brave, in works are tireless, and, hence, are invincible».

N. I. Pirogov's words are widely known: «I believe in hygiene. The future belongs to medicine precautionary». S. P. Botkin as chairman of the Society of Russian doctors considered necessary that «deep idea of improvement of sanitary conditions was more and more popularizated», that an idea about «...Improvement, about sewage disposal, the water drain of our cities — these centers of disease-breeder — it was made more and more possible». The professor of therapeutic clinic G. A. Zaharjin in 1873 in assembly speech in Moscow University has told: «Is victorious to argue with an illness of mass can only hygiene. Clearly therefore, that hygienic data more useful for everyone, than knowledge of illnesses and their treatment». Professor G. A. Zaharjin emphasized: «The more mature the practical doctor, the more he understands power of hygiene and relative weakness of treatment, therapy, the successes of therapy are possible only under a condition of observance of hygiene».

The cradle of the first faculty of hygiene in Russia was the Medical-and-surgical academy where it has been organized in 1871 by professor Alexey Petrovich Dobroslavin (1842–1889). Day of perusal of the first lecture by A. P. Dobroslavin — on November, 19, 1871 — is considered date of the basis of hygiene faculty. It has been named faculty of the general, military — overland and sea hygiene. The founder of domestic hygiene A. P. Dobroslavin is the pupil of the academy who have received improvement at well-known chemists N. N. Zimin, A. P. Borodin, A. Vjurts, L. Peblj, at physiologists N. M. Jakubovich and A. Rollet, at hygienists M. Pettenkofer and R. Fojt.

Figure 1 — A. P. Dobroslavin

A. P. Dobroslavin has written the first original textbooks in Russian, has based first hygienic magazine «Health» and a hygienic society. A. P. Dobroslavin has enriched hygiene with valuable experimental researches and practical recommendations in the field of hygiene of nutrition, military hygiene and in other areas of hygiene.

One of founders of domestic scientific hygiene by right is considered professor Feodor Fedorovich Erisman (1842–1915). The Swiss by origin F. F. Erisman most effectively worked in Moscow where in 1882 has based hygiene faculty in Moskow University, in 1879–1885 together with doctors A. V. Pogozhev and E. V. Dementjev has carried out detailed studying a sanitary condition of factories in the Moscow's provinces which results are published in 10 volumes.

Figure 2 — F. F. Erisman

F. F. Erisman is also the author of three-volume «Manual in Hygiene», «Professional Hygiene or Hygiene of intellectual and physical work». His sights at essence of the hygiene, stated in the introductory lecture published in «the Course of Hygiene» in 1887, have not lost the urgency today. F. F. Erisman counted hygiene a science about public health: «Deprive the hygiene of its public character, declare, that hygiene not is a science about public health, and that it should be engaged only by studying of private questions in walls of laboratory, — in front of you there will be only illusion of a science pro which and to work doesn't worth».

4. METHODICAL BASES OF HYGIENE

The concept of risk factors as the scientific basis of modern representations about prophylaxis of diseases

The concept of health assumes understanding of risk factors — states promoting appearance and development of diseases. To the number of those determining health, or main risk factors, they refer: factors of unhealthy way of life, environmental pollution, genetic risk, defects of the organization of public health care services, medical aid, etc. Risk factors can be both primary, or external: dependent on social and economic, political, environment; and secondary, or internal: dependent on the specific features of an individual determined first of all by its genotype, sex, age, and also pathological conditions promoting appearance and development of diseases.

The negative tendencies are typical for the situation with the health of the population. The number of patients with risk factors increases which makes especially actual the solution of problems of primary prophylaxis and its scientific basis — sanology.

The solution of problems of preventive medicine is promoted by the concept of risk factors representing methodological base for search of answers to practical questions of prophylaxis.

Formation of the concept «risk» is connected in medicine with reflection of relative, probabilistic laws in vital activity of an organism in interaction with outer world. It is known that for any event to appear, certain reasons and conditions exist. Depending on a concrete interaction, the event either comes or does not come. Formation of such unity of reasons and conditions reflects actions of probabilistic laws. Probability is a measure which gives the qualitative characteristic of an opportunity of occurrence of the phenomenon or realization of result. The probability varies from 0 when event never comes within the certain system of relations, to 1 when it comes inevitably.

For comparison of different probabilities of appearance of any condition depending on these or those conditions the method of risk assessment is used. In the basis of risk assessment lays a comparison of chance of event appearance within certain time interval under certain condition with the chance of its appearance within the same time interval under other condition.

The value of risk provides an opportunity of prediction, forecasting of event. Procedure of the forecast is based on the use of risk factors. The risk factor is, first of all, an attribute which is so closely associated with the occurrence of a phenomenon that can be used for its prediction. The role of a risk factor is played both by external conditions and internal features of an organism.

Why and with what purpose the concept of a «risk factor» arose? Its formation is connected, first of all, with the necessity of prediction. In the event when public health services deal with treatment of illnesses and do not predict diseases, the given category is not necessary. Really, to treat, it is enough to know the existing position, negative reasons valid at present. However, to achieve an appropriate effect in struggle against diseases, it is not enough to be oriented only to the available medical situation. Also, it is necessary to be able to look into the future in order of its forecasting and purposeful correction.

Thus one important feature was found out in the practical plan. It was found out, that for forecasting in some cases it is not necessary to know all reasons of the phenomena. Was to find out connection between them enough, to prove that it not casual, has steady character, sufficient force and takes the priority of illness. Moreover, appeared, that is possible to influence occurrence of illnesses in the future, not having exact theoretical description of their etiologic factors. Often by empirical selection of different variants it was possible to grope such ways of influence which warned appearance in the future of the un-

desirable phenomena. The practice stimulated of the theory, its development. As classical example it was the cholera warning of spreading in the last century in London. It was long before opening of cholera vibrio. It has been made on the basis of I. Snou's supervision which has shown necessity to isolate one city's source of water supply. In this case the use of water from the given source was a risk factor of a cholera spreading as associated with disease so that could be used as the indicator for its forecasting. By analogy the any property which is capable to predict disease or to prompt ways of struggle against it, it's understood by the person as a risk factor.

In what way risk factors descend detachment, their borders and quantitative criteria?

First, the assumption of risk factors arises at revealing the direct correlation between an attribute the investigated phenomenon.

As an example — direct dependence between a level of cholesterol and development of myocardial ischemia.

Second, such connection should be consecutive in time. For this purpose frequency of occurrence of new cases of disease for the certain period of time should be high. In one-stage research it is impossible to prove, that the observable sign is a risk factor.

The third — is stability, repeatability of the revealed connection in identical conditions. The impossibility of recurrence in the same situation or repeatability in different conditions forces to think of presence of other laws.

The fourth — the sign is considered a risk factor while its connection with disease appears as independent.

Summarizing the stated criteria it is possible to assume the following brief definition of a risk factor. The risk factor is a sign which is independently connected to probability of appearance of event so that can be used for its forecasting. The risk factor of disease is the sign previous to disease, having with it independent, steady, probable connection which has practical value as a minimum for its forecasting.

Unfortunately, parameters of health which are used in our public health services, basically do not include parameters of risk. Spreading among the population of the increased levels the arterial blood pressure is not taken into account, smoking, hypercholesterol in blood, etc. as is done in a number of the countries, for example in USA.

At the same time, the concept of risk factors has allowed is differentiated to approach to an estimation of health quantity, an opportunity of forecasting and the prevention of diseases.

The grouping of risk factors

According to the international formula of health, the basic part of risk factors concerns to conditions of life, i. e. to the social and economic sphere, determining a way of life. To this group of risk factors it is necessary to relate

smoking, an unbalanced nutrition, hypodinamia, bad material conditions of life, substance abuse, abusing medicines, fragility of family, loneliness, a low level of culture, excessively a high level of urbanization. As scientists consider, on a share of these factors 49–53 % forming a health state are allocated. 18–20 % health depends on a heredity, i.e. predisposition to hereditary illnesses. 18–20 % depends on an environment: impurities of air, ground, water by carcinogen and others pollutants, the sharp changes of the atmospheric phenomena increased heliocosmic, magnetic and other radiations. And only in 8–10 % health depends on public health services, i.e. directly from medicine activity.

To number of this group of risk factors it is necessary to relate inefficiencies of preventive actions, poor quality and inopportuneness of medical aid.

So, health of the population depends on a complex various on the character, an orientation and force of factors. Its studying is complicated that these factors cooperate with each other, vary in time, their influence on levels of parameters of health is not identical in various regions of Republic.

Connection of risk factors with human health will be considered in all sections of the general hygiene. With reference to each section of hygiene factors can be the common (microbiological in hygiene of nutrition, water supply, etc.) or specific (the radiation factor).

The algorithm of hygienic prenozological diagnostics

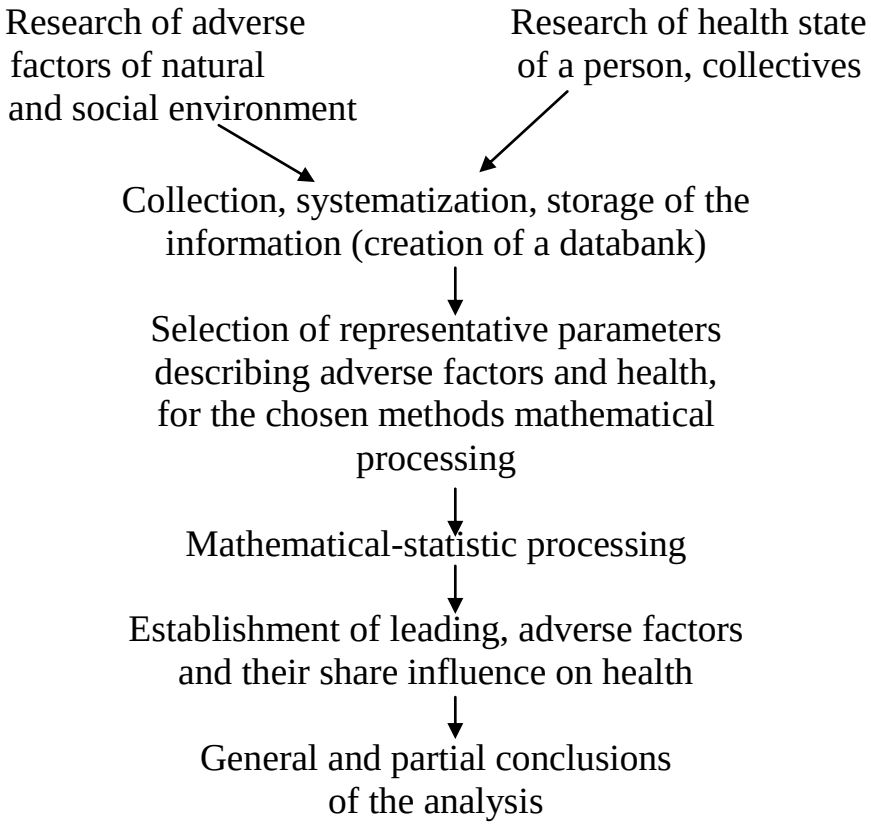


Figure 3 — The algorithm of hygienic prenozological diagnostics

The primary goal of hygienic diagnostics is the establishment of the reasons of health change of the person (population) on the basis of definition of various factors and detection of their sources. Professional work of people in concrete social and medical-and-geographical conditions is taken into account. For preservation and strengthening of health population the doctor carries out hygienic diagnostics with the aid of determined algorithm (see below).

Thus, hygienic diagnostics is multistage process. It includes first of all research of potentially harmful factors and a state of people health. Qualitative gathering of the information demands from the doctor of deep hygienic, physiological, clinical knowledge and skills of work with the medical documentation.

Hygienic standardization of influence on the human organism the environmental factors

The hygiene establishes character of action of factors on the human organism, defines borders of their negative and positive influence, in other words hygienic norms, and also develops offers on elimination or decrease of action harmful and using of valuable factors.

Hygienic standardization is the big and difficult social-biological problem providing health, workability and even the future existence of people. It is carried out in various branches of hygiene (in municipal, military, radiation, hygiene of a nutrition, etc.) differently, however the basic methodological approaches and theoretical principles of standardization, are the general.

Hygienic standardization as process it is based on carrying out of hygienic diagnostics. Its results are the initial material for a substantiation safe for health of fluctuations limits of values of an environment factors. The establishment of hygienic norms is carried out on a basis scientifically-proved relationships of cause and effect between the standardized factors and health parameters.

Hence, the health is the basic criterion of correctness of a choice of the specification. Thus the concept of threshold of the normalized factor actions, calculation of assurance factor and a clinical-statistical method of check guarantee the specification (a principle of a feedback) is used.

Hygienic standardization is carried out in the research establishments, capable to carry out pre-nozological hygienic diagnostics with use of the modern mathematical device.

Principles of hygienic standardization

Now bases of hygienic standardization are developed and formulated by N. F. Koshelev, P. V. Ramzaev and V. P. Mihajlov as universal, the theory of the hygienic standardization basing five interconnected principles.

To number of main principles of hygienic standardization (Koshelev N. F., 1979) concern: guarantee, complexity, differentiation, social-biological balance, dynamism.

Guarantee assumes that hygienic standardization and any norm should guarantee first of all preservation of health, including genetic and reproductive

function of the person, and in some cases — lives of people. Not smaller interest for hygiene is represented with positive factors, presence and which action is necessary for existence of the man, and their fluctuations and variability are the basic condition of training adaptive mechanisms, strengthening of health and even perfection of the man as representative of a biological kind. These factors also are subject to hygienic standardization in connection with that their efficiency duty has quite often enough strictly outlined borders.

The second general principle of hygienic standardization is complexity. The initial stage of development of this principle was studying the combined action of factors of one nature, for example, several chemical substances. Now complexity of standardization assumes the account of action on an organism whenever possible all major environment factors including social.

The third principle — differentiation. Hygienic norms should have certain social applicability. Depending on a social situation, for the same factor quantitative values can be established some, namely: optimal, allowable, maximum permissible, extremely tolerable.

1. Level — optimal, guaranteeing at influence of negative factors preservation of health and work ability at unlimited time of action.

2. Allowable, describing preservation of health and work ability on condition of unitary, repeated or continuous action of negative factors during the certain interval of time, for example, the working day.

3. It is maximal or maximal permissible at which some reduction of work ability and temporary deterioration of a health state is supposed.

4. Maximal or extremely tolerable. It is a level admitting decrease of work ability, failure and deterioration of health.

5. The level of a survival, is provided for application in unusual cases a wartime.

Certainly, it would be desirable that hygienic norms in all cases guaranteed a maximum of health. However social practice shows that quite often the society is not capable to execute this requirement. For this reason in all areas of hygiene the differentiated norms operate: these are various norms of water supply, accommodation, etc.

It is rather remarkable that infringement of a principle differentiation can result to return results as economic expenses of a society for such maintenance can weaken protection against action of other harmful factors or to decrease economic well-being so, that harm for health will be more then advantage for which expected at an establishment of such norms.

Here fourth principle of hygienic norms — a principle of social — biological equation starts to operate. It can be presented in the following: hygienic norms should be such that benefit for health from observance of the specification (A) and benefit of a product of manufacture to which the specification concerns (B), in the sum as much as possible exceeded the sum of damage to the health rendered by manufacture by a residual denaturalization of environment (C) and

damage to health, connected with expenses for observance of the specification, reducing an opportunity of satisfaction of other needs of a society (D).

$$\mathbf{(A+B) - (C+D) = max}$$

In other words, this principle demands reasonable weighing of benefit and harm and acceptance of the specification only in the event that the first will be more than the second. The established norms not always steady. In connection with changes of environmental factors and parameters of health population they can change. Besides, modern scientific researches quite often deny the previous conclusions about safe levels of this or that factor. As an example it is possible to result a history of change of the specification of a irradiation doze of the population from 50 up to 0,5 Zv per year on a measure of knowledge accumulation in the field of radiobiology.

At revision of the specification the parameters indicating on remote, earlier not established, consequences of influence of the factor are conducting. Here it is possible to relate life expectancy, death rate, physical inability, premature biological ageing and others.

Thus, a principle of guarantee, complexity and differentiation, social - biological equation, dynamism of specification are the general for various branches of hygiene and the majority of environment factors. They allow to formulate definition of hygienic norm of positive and negative factors of an environment.

The concept of primary prophylaxis of population diseases

PROPHYLAXIS is a general method in activity of people, the public, the states, directed on the prevention of the undesirable phenomena, offences, illnesses, failures, fires, etc.

Prophylaxis of illnesses is a component of health protection and is reached by means of the prevention and an establishment of risk factors of diseases, traumas, poisonings and other infringements of a health state, and also by increase of its stability to adverse influence of an environment.

It is obvious, that only medical measures it is impossible to warn illnesses.

The concept represents uniform system of views at the prevention of diseases and other infringements of a health state.

In the concept of initial prophylaxis of diseases allocate three its kinds: primary, secondary, and tertiary.

Primary prophylaxis has the purpose the prevention of any diseases, a trauma, poisonings and other pathological conditions.

Secondary prophylaxis is directed on the prevention of complications of available illness, transition to the chronic form, tertiary — on the prevention of disablement and death rates. Last two kinds of prophylaxis concern to a field of activity of a treatment-and-prophylactic direction of medicine.

Preventive measures are undertaken at various levels: individual (personal), public (family, work collective, department, etc.), state (republican), interstate

(in region of the states or on a global level). In the prevention of appearance of diseases — to primary prophylaxis — the leaging role belongs to social and economic measures: working conditions, a life, rest, to maintenance of the population with foodstuffs and water, a condition of an environment and others. Medical measures assume carrying out of hygienic education, sanitary-and-epidemiologic supervision, immunization and others antiepidemic actions. The big value in preventive maintenance of diseases individual measures of prophylaxis — have a healthy way of life of the person: a correct mode of work and rest, physical activity, a balanced diet, refusal from harmful habits.

For functioning system of prophylaxis the following tasks are solved.

1. Studying and estimation:

a) level of health and physical development of the population;

b) level and structure of diseases, a traumatism and accidents, disablement, physical inabilities, death rates;

c) influence on health of working conditions, life, environmental factors.

2. Development of principles, criteria, norms and rules of a healthy way of life, safe working conditions, a life, rest, municipal and personal hygiene.

3. Sanitary-and-epidemiologic supervision of the environmental natural, industrial, medical-social environment, conditions of a life and rest.

4. Training and education of the medical staff in a direction of a hygienic mentality.

5. Hygienic education and teaching of the population.

The structure of primary — preventive activity assumes a high level of vocational training of medical structure in questions of a preventive direction of medicine. Thus the concept acts as the integrating factor during training.

5. AIR IS THE MAIN COMPONENT OF ATMOSPHERE. THE CLIMATE, WEATHER

Atmosphere *it's external* gas covering. This one consists of nitrogen, oxygen, dioxide of carbon, ozone. The state of the atmosphere influences on physical, chemical and biological processes on Earth surfaces, in hydrosphere, lithosphere. The greatest value have: oxygen for breath and mineralization's of dead organic substance; dioxide of carbon — for photosynthesis; ozone — for screening of earth surface from hard gamma rays of UV radiations, nitrogen, water vapour were formed due to volcanic activity and evaporations.

Definition of the concept of air, the air environment — it's a complex combination of meteorological factors with physical and chemical components, and also biological, chemical, physical anthropogenous pollution. The layer of air in height 50–100 m is named surface.

The air environment has a property of self-purification. If the opportunity for self-purification are less than anthropogenous pollution, then the air structure

changes to the worse for the human health. Natural forces become etiologically damaging factors. Air environment self-purification is enabled by sunlight, green plants, water reservoirs, movement of air mass.

Priority movement of air mass in relation to the sides of the world during a year cycle is called «wind rose». There are also intermediate directions of the wind. The wind rose is used when designing houses and public buildings, industrial enterprises, medical establishments, preschool and educational establishments. Air should leave the industrial enterprises zone from the leeward side off buildings, and living houses and public buildings should locate at the windward side. For Gomel and all territory of Belarus a primary wind direction in a year cycle from the west, less often — from a southwest and northwest, even less often from the east. Air mass from northern oceans, the seas bring to us a cold, dryness and pure ringing air. From the west there comes warm, damp, foggy polluted air with atmospheric precipitations; from the east — cold, polluted from the industrial enterprises); from the south — hot, dry, dusty.

Atmospheric air absorbs all emissions from the man, transport, industrial enterprises. There is intensive saturation of air by vapor, aerosols, ultraviolet, phytoncides, microorganisms, oxygen, chemical substances, albuminous components, physical factors. All this mass gets to respiratory ways, settles on a skin, clothes, soil, green plantings, on subjects, food. With food it gets in a gastrointestinal tract. Force of response (reactance) of the organism depends on contact time and quantity of this substance, summation their actions.

Climate *is* a long-term weather tendencies within the geographical latitude and the longitude of the given district, relief, character of spreading surface of soil.

Weather *is* a condition of the physical phenomena in the atmosphere for the given moment. Weather varies with seasons, months. Weather induces fluctuations in morbidity of people with these or those illnesses.

The autumn-spring period is characterized catarrhal, virus diseases, tonsillitis, flues, bronchitis, aggravations of ulcer processes, cardiovascular dystopias, crisises. The summer period promotes growth of gastrointestinal infections, dysfunctions, alimentary and non-alimentary poisonings, overheating, solar and heatstroke's, solar burns. Winter is characterized by overcoolings, freezing, chilblain.

Our health depends on weather, but at a healthy life way, the account of all these factors it is possible to be the whole year healthy, efficient. For catarrhal diseases prevention use a method of hardening through cold and thermal receptors, physical and chemical thermoregulation, a corresponding diet and using of protective properties of clothes, footwear. For gastrointestinal illnesses prevention necessary personal and public hygiene, observance of food preparation technology, terms of realization and food storage; a reasonable rational drinking regimen.

Water of open spaces, deserts, mountains, steppes, large forests, mines promote formation of original air which are used with the medical purpose in

bioclimatology. For goal of treatment by a climate it is necessary to take into account physiological processes of adaptation and acclimatization, the testimony and contra-testimony. At illnesses of respiratory ways steppe open spaces, coniferous files, mountain air, hydrochloric mines are good. The diseases of cardiovascular system need hardwood, water open spaces.

At a homogeneous climate adaptation occurs without serious consequences, at a contrast climate (north – south) occurs acclimatization in three phases. Acute climate change at purpose bioclimatology is not recommended as far as can come to aggravation of illness, more rapid of attacks with a lethal outcome.

Acclimatization is a complex social and biological process of active adaptation to new climatic conditions, a special case of adaptation.

Acclimatization has three phases: 1) initial phase of the physiological strain which lasts for 7–10 days and is characterized by the strain of thermal regulation of the basic and working energy metabolism; 2) phase of reorganization of the dynamic stereotype, it can proceed on two ways. In the first one, favorably proceeding (this may be promoted by social — hygienic actions), the second phase smoothly passes into the third one. Adverse current of the second phase generates marked dysadaptation meteoroneurosis, meteorological arthralgia, acute attacks of chronichal diseases. However, with relevant treatment-and-prophylactic and hygienic actions in both cases it is possible to enter the third phase; 3) the phase of stable acclimatization. It is characterized by stability of metabolic processes, absence of nutrition disorders, normal working ability, usual morbidity level, etc.

The fastest change of the weather situation with sharp change of meteorological factors parameters within a day is observed during passage of front, i.e. a boundary layer between the two different by structure air masses. There are warm, cold, and occlusion fronts. At occlusion the cold front overlaps the warm making weather changes less rapid. Passage of front and change of air masses more frequently combine with formation of one of the basic types of the synoptic condition of the atmosphere - cyclone or anticyclone.

Cyclone is the zone of the lowered pressure with its decrease from periphery to the center. Weather within cyclone is changeable, with big shifts in pressure and temperature, increased air humidity, precipitations and reduction of the electricity gradient. Anticyclone — zone of increased pressure with its increase from periphery to the center. Weather condition in the established anticyclone is mainly stable, dry, without essential precipitations and with big pressure and temperatures shifts.

In summer the anticyclone brings warm and even hot weather, short-term, sometimes strong rains with thunder-storms, brings clear, frosty weather or cold, cloudy, with snowfalls in winter. Therefore connection of a high pressure with good weather (that is specified in traditional barometers) is not obligatory. Anticyclones provide steady, but not necessary pleasant and clear weather. Cyclones and anticyclones replace each other.

The climate and weather have many-sided hygienic value. Healthy people with good advanced adaptive mechanisms as a rule are «meteorological stable», even at acute changes of weather. Together with it a part of people, in particular patients, elderly, «meteorolability», so among patients with hypertonic illness meteorological sensible are 50–80 %. At meteorological sensible people abrupt weather changes cause meteorological reactions of various expressiveness, down to dangerous for life. Therefore the important value has a medical estimation and weather forecast.

Hygienic value of gas structure of pure air. Pollution sources, hygienic standardization

Clean air is used as nature forces for health strengthening. For the specification take a chemical compound of an atmosphere on a sea level at barometric pressure one atmosphere or 760 mm mercury. This air contains 20,94 % — O_2; 78,06 % — N_2; 0,03–0,04 % — CO_2, inert gases — argon — 0,76 %; variable quantity of water vapor, in small amounts-hydrogen, helium, neon.

In oxidizing processes in human organism in a rest condition it is spent about 350 ml O_2/mines, and at work can reach 4500–5000 ml O^2/mines. Carbonic gas does not collect in open space, and with water, rain, snow, by vapor water is washed off in soil, rivers, lakes, the seas, oceans, forming carbonic salts, and CO_2 is absorbed by plants also.

Through contents CO_2 in the closed premises it is possible to judge air pollution by products of human vital activity and efficiency of ventilation of premises. At concentration CO_2 more than 0,07 % in the closed premises arise unpleasant sensations, bad health state (air heavy, stuffy). CO_2 is supposed up to 0,1 %. At concentration CO_2 1 % comes a short wind, heavy breath, cough, heat in breasts, headaches, a tachycardia, increase the blood pressure. Pathogenic microorganisms in the open atmosphere practically cannot exist. Under influence of ultra-violet and infra-red beams they perish.

CO_2 it is necessary for regulation of the respiratory center. Deficiency in CO_2 or its surplus are injuring factors for the organism. CO_2 holds PH blood on neutral position, at deficiency CO_2 there is shift PH in the acid side, surplus CO_2 — shift PH in the alkaline side. Flying products of the metabolism excrete by glandulaesudoriferous, have an unpleasant smell is a sweat smell, products of its decomposition, and also sebaceous glands — skin bacon, products of its decomposition. Through glandulae sudoriferous gases of blood (connections of the ammonia, flying salts of fat acids, connections skatole, indole) are allocated also. All these connections change physical and chemical properties of air. The adult in one hour exhales 22,6 CO_2 liters. Children and adolescents breathe out liter CO_2/hour approximately so much, how many years old to him, 10-year — 10 l, 18-years — 18 l, etc.

At change blood PH the homeostasis is broken, there are painful symptoms. In the closed premises the number of motes, droplets increases (conversation,

cough, sneezing), grows number of heavy ions. If air are clean, fresh the number of heavy ions does not exceed 1–2 incm^3 of air. In polluted (stuffy) air their number grows up to 300 incm^3. Simultaneously with it the number of easy ions is reduced. Motes appear from books, papers, folders, magazines, from the person of a particle epithelium, hair, clothes. In a paper-book dust the book tick who promotes occurrence of bronchitis, asthmatic bronchitis, cough settles.

The toxic dust renders to poisoning influence. Microorganisms, as a rule, settle on motes. In the closed household premises air becomes soiled from use of household chemical goods, electric and gas cookers. Through motes with microorganisms air — drop infections are distributed quinsy, a flu, respiratory virus infections, etc. If the premise is well aired in it mainly there are easy ions are an electric condition of air (pure air after a thunder-storm). At presence even invisible motes, easy ions of them as though will neutralize, settle on them and turn to heavy ions. For maintenance of cleanliness of air is used aeroionization (Chizhevsky lamp).

The sanitary-and-hygienic norms of ventilation volume are easy, frequency rates of air exchange in a premise through natural or compulsory system of ventilation is developed.

Environmental pollution is any entering into the ecological system of not typical alive or lifeless components resulting in structural and physical-and-chemical changes, changes in energy direction or destruction of the ecosystem.

Anthropogenous pollutants share on material (dust, gases, slags, ashes), physical or power (electromagnetic fields, noise, vibration). Material pollutants are subdivided on mechanical, chemical, biological. To mechanical the dust, aerosols, firm particles in water, ground concern. Chemical are gaseous, liquid, firm chemical compounds and elements. They enter chemical reactions with elements of the environment and form acids, alkalis, dioxides, etc. Biological pollutants are all kinds of microorganisms: mushrooms, bacteria, blue-green seaweed, etc.

Influence on the man both direct, and indirect is expressed in deterioration of his physical and moral state, deterioration of demographic parameters at disease and death rate, birth rate of children with pathologies.

The greatest contribution to pollution bring thermal power station: SO_2, NO, CO, firm particles, fluoric compositions. By kinds of fuel strong pollutants share on material (dust, gases, slags, ashes), physical or power (electromagnetic fields, noise, vibration). To mechanical the dust, aerosols, firm particles in water, soil concern. Coal, brown coal, black oil; the purest kind of fuel - natural gas. The following pollutants share on material (dust, gases, slags, ashes), physical or power (electromagnetic fields, noise, vibration). This are the iron and steel industry, black and color; mechanical engineering, manufacture of building materials.

Bacterial pollution include bacteria, spores, fungi, viruses, helminth eggs, etc. are on a surface of motes. Bacteria basically saprophyte, pathogenic in atmospheric air meet seldom, and at the closed premises there are as saprophyte,

and pathogenic microbes. Air - drop infections — at sneezing, cough of a droplet of a saliva, slime can scatter in air up to 5–6 m, at strong sneezing up to 11 meters. The more finely motes and droplets, the further they are distributed and can there are in a suspension some hours. Droplets dry up, the weight of a mote decreases, and it is in air even longer. At sneezing about 40000 drops are formed and even completely healthy person excretes thus 10–20 thousand microbes. Pathogenic microbes become the reason of infectious diseases — measles, whooping cough, flu, diphtheria, scarlet fever, meningitis, chicken pox, natural smallpox, tuberculosis, pyogenic infections, the Siberian ulcer.

Primary prophylaxis of intrahospital infections are the ventilation, the damp cleaning, natural illumination, UV irradiation. During 10–15 minutes the beams of UV-lamp clears air from microbes on 70–80 %. It is possible to turn in during 30–40 mines every 2–3 hours. Disinfection reduces pollution by microflora on 90 %, there is a disinfecting.

The hygienic science allows entering of various chemical substances in the natural, household and industrial environment; not excepting their entering to the human organism. However, quantitatively this entering is limited to a limit at which harmful chemical substances are indifferent for the human organism and for environment. In this connection there were concepts of maximum concentration limit, MCL.

For a hygienic estimation of structure and air pollution in premises, hostels, children's, treatment-and-prophylactic establishments are used hygienic standards (maximum concentration limit, MLL) the harmful substances in air, and at the estimation of air environment of industrial premises — is the specialhygienic standards (maximum concentration limit, MLL) harmful substances in air of working zone. The given hygienic standards have a number of the basic distinctions incorporated in a basis of their definitions.

MCL, MLL can be recognized such concentration of substances in air which at daily continuous influence for a long time on human organism do not render direct or harmful indirect or adverse influence, do not reduce his workability and mood.

For air of a working zone, according to Sanitary Rules & Norms № 11-6-2002 RB «Hygienic classification of working conditions» the following definition of MCL, MLL is given.

Maximum concentration/level limit (MCL, MLL) are levels and concentrations of harmful production factors, which at daily (except for weekends) work but no more than 40 hrs a week, during all working experience, should not cause diseases or disorders of health state, detected with modern research methods, during work or in the remote life periods of the present and future generations. Observance of hygienic specifications does not exclude affection of the health state in highly-sensitive people. Hygienic specifications are based upon 8-hours working day.

MCL, MLL of the atmospheric pollution in CIS and Belarus are established in two parameters: maximum single (for 30 minutes) and daily average (for 24 hrs.). The latter are the basic; their purpose — not to allow suppose adverse influence as a result of continuous resorbtiveaction. Maximum single dozes are set in addition to daily average for substances possessing smell or irritating action and able to cause acute poisoning.

The state sanitary specifications are widely used in precautionary sanitary supervision at designing, choice of technological process; at the planning and building of the occupied places; at sanitary examination of toxicity of polymeric products; at a choice of means of man-to-man defence, etc. They are used during realization of sanitary inspection and form the legal basis of estimation of impurity of objects of the environmental natural environment (air, drinking water sources, soil, food stuffs) and the social environment, and also estimating of improving actions efficiency. Qualitative and quantitative definition of substances in objects of environment is carried out with the help of the wide spectrum of modern chemical and physical research methods with application photoelectrocalorimeter, fluorometer, spectrograph, chromatograph and other devices.

At human organism simultaneously influence numerous various factors of the air environment in places of dwelling. To one factors the organism has a wide range of the adaptation and endurance, and to others has the adaptation in a narrow range, with disruption of adaptation.

Atmospheric pressure and human

Air surrounding globe has the certain weight. Thus 1 litre of air at near 0º on a sea level weighs 1,294.

All life on the ground surface developed in conditions of this pressure, therefore we feel it only at significant fluctuations, for example during ducking or climb to mountain. With conditions of the raised atmospheric pressure the man faces at diving and pneumatic work, at a bookmark of the bases of various constructions, at tunneling, mines (shafts), construction of the underground, bridges, dams.

Atmospheric pressure is more in areas below than a sea level and lower in high mountains. On the man body surface air presses with force about 16 Tas the body surface is equal about 1,6 m^2. It is one counterbalanced by pressure in cells and organism tissues.

At increase of pressure pulse and breath become slower, the bradipnoe, there are signs of narcotic action of nitrogen, excitation, ambiguity of ideas, deterioration of orientation, coordination. Dissolution of gases in the organism is increased. At 1 Atm blood contains 1,2 % of nitrogen, at 2 Atm — 3,9 %. From blood nitrogen passes in the tissue and is dissolved in lipid, lipoid. The sharp change of pressure lead to nitrogen boiling (air-bladders which have not time to exude through lungs — gas embolic, blood-vessel occlusion by air-bladders of nitrogen — consequences — a paralysis, death). At immersing pressure grows by 10 m on 1 Atm. On depth 20 m pressure approximately 2 atmospheres. There

are symptoms underwater, deep because of shortage O_2, hypoxemia and hypoxia tissues, cells. The man loses orientation of space and time, there can come destruction because of other direction of rise or emersion. Superfluous air pressure (over usual atmospheric) in the working chamber of caisson can make up to 4 atmospheres. At pressure of 10 atmospheres is possible loss of consciousness.

At professional work at divers arises or decompression illness. If gas embolism there is in vessels of the central nervous system how consequence of the ischemia — local infringement of blood circulation, can come to ischemic paralysis — infringement of impellent function, speech. At gas embolism coronary vessels or in vessels of the vital centers of a brain, lungs arteries there can come to death. Preventive maintenance of caisson illnesses consists in protection by time — standardization of stay duration in conditions of the raised pressure. At first signs of disease the man is located in a special box (recompression chamber) in which raise pressure up to primary level. Approximately through 30 min — 1 hour the painful phenomena disappear, then slowly and little by little pressure is reduced.

In caissons there should be a temperature of air in limits 17–22° C. At reception on caisson works should be medical survey, and then during a week — the medical control. At employment of divers rules also are observed: the current medical control, observance of norms and rules on depth of subsea. The diver has telecommunication with service of ground for informs the coordinates about health state. At vessels occlusion of the lower extremities lead to a chronic professional disease of caisson workers and divers. It is shown by symptoms of infringement of local blood circulation: snap of lower extremities, chilliness, cyanosis, puffiness, painful sensations, infringements of movement.

High-altitude illness begins about 2000 m (flights by plane, campaigns in mountains) — the flying on 10000 m lead to insufficient receipt of oxygen in blood — hypoxemia — weariness, apathy, drowsiness, muscular weakness, dizziness, a nausea, vomiting, increase of breath, a bleeding from a nose, ears, intestines. At pressure 1 Atm oxygen is active, has certain partial pressure which provides saturation of blood by oxygen — oxygenation. The above there is a district above sea level, it is less partial oxygen pressure, the less its saturation in air and in blood. It is reduced oxygenation and as indemnification of the given damaging factor — is developed more Erand hemoglobin (170–160 g/l) is higher. On a sea level at 1 Atm — 120–140 g/l. With decrease of oxygen partial pressure appear symptoms of pathological reaction and a pathological condition — mountain or high-altitude illness. The critical zone of a threshold for life and death is located above 6000 m. Without special equipment to be at such height it is impossible. Up to height the zone of full indemnification for the account erythropoiesis is considered of 3000 m, the number of erythrocytes considerably grows and compensates respiratory function. At height more than 3000 m up to 6000 m in the beginning go decrease of compensation, and then comes decompensation and significant infringements in organism functions.

Preventive maintenance of high-altitude illness consists in training in pressures chamber, high-altitude flights, mountain ascentions, application of oxygen devices and in maintenance with special clothes. In modern conditions use isolating, compensative survival suits. In survival suits pressure in under closing space is automatically supported. Cabins of flying devices are pressurized, in them the temperature, humidity, pressure of air and maintenance O_2 is automatically supported also. At increase of atmospheric pressure till 750 mm hg saturation $O_2$are higher grows, meteodependent people feel discomfort. At decrease of atmospheric pressure (sometimes up to 725 mm hg) parcial pressure O2 is reduced, health state becomes worse almost at everybody.

At significant and fast pressure difference in the organism can arises high-altitude decompression frustration (DF) and high-altitude decompression disease (HDD). In a basis of pathogenesis DF and HDD three kinds of processes lay:

— difficulty of pressure smoothing in natural body cavities which results to high-altitude meteorism, to aerosinusitis, aerootitises, HDD;

— formation of free gas fraction in organism wicking lead to high-altitude decompression illness;

— transformation with occurrence high-altitude tissues emphysema.

High-altitude meteorism is caused by expansion of gases in gastrointestinal tract, and also an output of gases dissolved in intestinal contents at rise of man on height. Thus substantial growth of volume of gases causes mechanical and reflex influence on an organism on type visceral-and-visceral reflexes, causing changes breath, pulse, blood pressure, etc.

Aerootitises, aerosinusites, aerodentites are consequence of differences of barometric pressure in cavities of middle ear, additional sinuses of nose, carious teeth. Cause occurrence of feeling stuffiness in nose, pains of various intensity.

Explosive decompression is characterized by fast and significant pressure difference, it occurs at sudden depress surizationcabins of the plane. Than there will be a size of pressure difference more and its duration is shorter, consequences explosive decompression, acute (explosive decompression disease) will be especially expressed.

Medical-and-climatic division into districts of Belarus Medical weather forecast and meteoprophylaxis

In medical practice division of a climate on «sparing» and «irritating» is applied. Sparing it is accepted to name a warm climate with small amplitudes of temperature, with rather small yearly, monthly, daily fluctuations of other meteorological elements, with minimal requirements to adaptable physiological mechanisms. The wood climate of the middle latitudes as in RB, Southern coast of Crimea is «Sparing». The «Irritating» climate is characterized by the expressed daily and seasonal amplitude of meteorological elements; it requires increased adaptive mechanisms. The cold climate of the North is such; high-mountainous; a hot climate of steppe areas and deserts. In Belarus are selected northern, central and southern medical-climatic zones.

Northern zone occupies of Belarus lake area, and northern part of the Minsk height, is characterized by a cold and damp climate. Duration of solar light in one year consist 1735–1800 H. The annual sum of solar radiation 86,5–92,8 kcal/cm^2, and the sum of active temperatures 1900–2150 degree. Opportunities for solar isolation for the population are limited here, biologically active solar radiation (BASR) — 234–240 days; in Verhnedvinsk — 200 days, in Vitebsk — 190 days. In this zone the most long period of cooling of the people organism (with negative air temperatures) — 76–82 days and ultra-violet starvation — 96–103 days (November - February). In east part of this zone are established: area of the raised storm activity (Ushachi, lake Lukomorie, Vitebsk) with loss of deposits. At carrying out of salvage operations participation of the medical personnel is required here.

The central medical-climatic zone of Belarus includes Orsha-and-Mogilyov and Central-Berezinskaya plains, lowland Nemanskaja. In comparison with northern zone, it differs more moderate parameters of the cold period and high warm. Duration of solar light 1800–1900 hour, the sum of solar radiation of 90,5–96,1 kcal/cm^2 and the sum of active temperatures 2150–2400 hailstones. The period of possible biological active solar radiation — 240–252 days; actual in Mogilyov — 210 days, Minsk — 202, Grodno — 209 days. The period of cooling of a people organism 56–73 days, and ultra-violet starvation — 81–95 days. In east part of this zone areas with often blizzards and ice are allocated. Here at high density of highways the greatest probability of road and transport incidents during winter time.

The southern medical-climatic zone occupies Polesskaya and lowlands Pridneprovskaja, is characterized by a warm climate, higher temperatures of the years (summer) and winter periods. Duration of solar light 1800–1950 hrs, the annual sum of solar radiation 90,0–97,4 kcal/cm^2, the sum of active temperatures 2400–2530 hailstones. The period of possible biological active solar radiation from 253 till 270 days; actual in Gomel — 212 days, Lelchici — 220, Brest — 224 days. The period of cooling and overcooling of people (50–74 days) and ultra-violet starvation (67–80 days) are the least in comparison with other zones of Belarus. The zone differs the raised storm activity, the extensive areas of years (summer) and autumn high waters, spring floods of the rivers (Pripyat, Bug, their inflows).

Medical weather forecast is the special form of the scientifically-valid assumption of character of a forthcoming condition heliogeographical and meteorological factors. It is made on the basis of the analysis of development of large-scale atmospheric forecasts, with the purpose of preventive maintenance of aggravations meteodependentdiseases. Such forecast is necessary not only to treatment-and-prophylactic establishments, but also for all agriculture, industrial and for transport agencies. If in the first case the forecast can warn pathological syndromes, an aggravation of illnesses and to increase efficiency of treatment, patients rehabilitation in the second — to warn and lower quantity of accidents

on manufacture, accidents on transport. Medical weather forecasts make for 24 hours and longer terms (48–72 hrs). On the basis of the analysis of the space aerosynoptic, meteorological processes, current dynamics of the basic meteoelements. Medical weather forecast should be informed in due time to attending physicians and nurses for corresponding preventive maintenance.

Meteoprophilaxic it's a complex of the medical actions directed on the prevention of development or mitigation of meteopathic reactions:

— acquaintance of doctors with principles of medical weather forecast and allocation of adverse classes (types) of weathers;

— definition and an estimation of patients with allocation of meteolabil-groups: with psycho-and-emotionalchanges; the increased irritability; amplification of attacks of a stenocardia; asthmatic attacks; hypertension strokes;

— scheduled meteoprophylaxis;

— urgent meteoprophylaxis.

All variety of measures of medical preventive maintenance can be reduced to three groups:

— Increase of nonspecific organism stability, especial hardening during adverse seasons of year; preventive by UVR; rationalization of nutrition and vitaminization; the rational organization of work, life and rest.

— Sparing actions include: confinement to bed or other sparing mode; carry of scheduled operations or tiresome medical-and-diagnostic procedures; a direction of outpatients in dispensaries; to change of a climate during an adverse season of year (use of holiday); transfer of risk patients in special chambers with an artificial microclimate (biothrones), etc.

— Scheduled 10–15 day time preventive courses of treatment at adverse monthly weather forecast and urgent, on the basis of the operative information on weather the nearest days. Thus nonspecific means, medicines, physiotherapeutic procedures are used.

6. HYGIENIC CHARACTERISTIC OF PHYSICAL FACTORS OF AIR

Classification of physical factors

In the hygiene of air physical factors are traditionally divided into three basic groups: microclimatic, mechanical-and-acoustic and electromagnetic.

Microclimate, i.e. condition of meteorological elements indoors, is determined by its temperature, humidity, speed of air movement and pressure; besides, for formation of a microclimate the temperature of surrounding surfaces and intensity of thermal emission from these surfaces is essential. To microclimatic parameters they also refer estimated functions of its basic elements (for example, average radiating temperature, effective temperature, resulting temperature, etc.).

The group of mechanical-and-acoustic factors includes the basic kinds of acoustic noise (constant, interrupted and pulse), fluctuations of air pressure and generated acoustic pulses, vibrations and shock acceleration.

Electromagnetic factors include illumination, ultra-violet radiation, non-ionizing radiation (super-high-frequency, ultra-high-frequency, high-frequency, and also very low-frequency, super-low-frequency and laser radiation), electrostatic and magnetic-and-static fields, air-ionization and ionizing radiation.

Physical factors as components of environment, providing vital activity of man

Similar to medications which, depending on the dosage, may cause therapeutic or toxic action, majority of environmental physical factors have adverse effect on the human when achieved definite levels. However, a certain intensity of these or those factors as of environmental components is necessary for normal vital activity of a man.

The graphic evidence of it is microclimatic factors. Sizes of each of microclimate components by their action on the organism are interconnected and mutually conditioned.

Physical properties of air meteorological factors

Physical state of air is characterized by the temperature, humidity and speed of air movement, barometric (air) pressure and also by air ionization and atmospheric electricity. The human organism is influenced by a complex of meteorological factors a set of which forms climate and weather.

The hygienic assescment of meteorological factors consist both of their complex influence on the human organism and their separate influence.

For example, reduction of atmospheric pressure in 10–12 mm Hg results in increase of oxygen consumption due to respiratory function and blood circulation. he increased volume of negative aeroions causes increase of oxygen of inhaled air and the basic metabolism. The most important meteorological factors are solar radiation, as the main climate-forming element, and the air temperature first of all determining thermal state of the human organism.

Solar radiation

The sun is an energy source, heat and light on globe.

The solar energy heats up a surface of the Earth, causes evaporation of a moisture, formation of air currents and the changes of weather connected to these phenomena and a climate in the given region.

Solar energy, which surface has temperature 6000° C, represents electromagnetic fluctuations, spreading with a speed of 3.10580 km/s.

The sunlight has three sub-ranges: ultra-violet beams (10–400 nanometers), visible light (400–760 nanometers) and infra-red beams (760–3400 nanometers), ratio of which in the general solar radiation by total energy makes 7,46 and 47 % respectively.

The sunlight, being a source of life in the Earth, renders direct influence on a thermal condition of human organism, function of the visual analyzer, on a vitamin exchange and nonspecific resistance of an organism.

The biological importance of ultra-violet, infra-red radiation and visible light various.

Ultra-violet radiation. Intensity of the ultra-violet radiation reaching earth surface, depends on height of Sun standing.

If height of a solstice above horizon less than 25° the most active biological ultra-violet radiation does not reach an earth surface.

For the man ultra-violet beams with wave-length from 200 up to 400 nanometers have the greatest hygienic value. By character of biological action they are divided into 3 zones: A — with wave-length from 400 to 320 nanometers, B — 320–280 nanometers, and C — 280–200 nanometers.

Zone A — sunburn or fluorescent zone. Ultra-violet beams of this zone cause melanin formation in the skin — the specific pigment causing darkening of the skin.

Zone B, or erythematous zone of ultra-violet radiation. Beams of this zone cause skin erythema and also promote formation of vitamin D. Biological role of vitamin D, as known, is in absorption of calcium and phosphorus in the gastrointestinal tract and calcium phosphate deposition in a bone tissue.

Zone C, or bactericidal. Ultra-violet beams of this zone cause death of microorganisms, due to which are used for disinfecting of water, air and surface of subjects. The greatest bactericidal effect is marked at ultra-violet beams wavelength about 265 nm (used in medicine).

UVR of zone C causes effect at a level of protein of cells nuclei and differs in high bactericidal activity. Radiation of this range practically is absent in the solar beams reaching earth as it is absorbed by atmosphere. Therefore to its reception in conditions of the Earth apply artificial sources — bactericidal lamps.

Beams of this range are desirable «impurity» to UVR sources intended for an irradiation of the man. Presence of them should not exceed 5 % from all stream.

Middle wave radiation (area) cooperates mainly with molecules of protoplasm fibers of cells. It is considered thus, that protein of protoplasm carry out function of additional filters, protecting nucleus protein of cells from damage. The superficial layer of a skin is characterized by low factor of permeability for UV-beams. Nevertheless UV-beams of a zone B are capable to penetrate into a skin deep into 1 mm.

Long-wave beams have ability most deeply to penetrate into proteins of coverlet. Despite of this, long time was considered, that beams of area A are biologically inactive and consequently their biological effect is less investigated. Now it is established, that beams of this part of a solar spectrum in the big dozes differ high ability to stimulate formation of melanin at participation melanostimulative hormone, renders tonic action on condition CNS, adrenal glands, cardiovascular system, etc.

Character of reaction of an organism on UVR is defined also by intensity of influence and regimen of irradiation. Changing frequency rate, duration and intensity of beam influence it is possible to receive opposite effects. To features of biological influence UVR it is necessary to attribute long (up to 3 weeks) the period of aftereffect. For the characteristic of skin sensitivity to UVR the threshold of erythematous sensitivity, or minimal erythematous doze (MED) is used. MED is the minimal quantity of UVR causing erythema. MED is expressed in joules per $1m^2$. Its value, depending on individual features of the surveyed people, varies from 60 to 600 J/m^2 at influence of UVR with wave-length of 297,6 nanometers. But since the opportunity of precise measurement of specific capacity of separate monochromatic beams of a source is not always available, in medical practice MED is frequently expressed in minutes. It is taken into account that at constant spectral structure, capacity and distance of a source from the irradiated surface the quantity of coming energy is proportional to the duration of irradiation.

As erythema from UVR it is considered as the undesirable phenomenon connected to overdose and destruction of structural skin formations at use UVR with the preventive purpose it is recommended to apply in suberythemadozes.

Prophylaxis ultra-violet over irradiation is provided with use of rational clothes and light-defensive glasses. For protection of a skin from solar burns it is possible to use various ointments, elementary of them consist from following components: Vaseline — 10,0; oxide zinc — 3,0; salol — 1,0. The important role in maintenance of organism stability to ultra-violet beams over irradiation play the organization of a balanced diet consisting in increase of reception of protein, vitamins, mineral substances and polynonsaturated fat acids since they are strenuously spent by organism at synthesis of melanin.

Overirradiation by the ultra-violet beams can promote an aggravation of some chronic diseases, in particular, tuberculosis, rheumatism, nephrite, a stomach ulcer and a duodenal gut, it is especial at people of average and senior age groups. It is known also, that the excessive irradiation beams can provoke a skin cancer.

Infra-red radiation. Infra-red radiation represents the electromagnetic fluctuations rendering basically thermal action. Their sources are all bodies with temperature of the man in natural and industrial conditions.

The thermal effect of infra-red radiation depends on power and a spectrum (lengths of waves) of radiations. If local action of the radiant heat having power of irradiation 0,3–0,6 kw/m^2, man stands indefinably long time, power 1,6–2,1 kw/m^2, it is possible to stand an irradiation only during 20–30 sec, and it is more than 3,5 kw/m^2 within several seconds.

The short-wave part of infra-red radiation (up to 1400 nanometers) will penetrate on depth of proteins up to 3 cm and causes their uniform warming up.

The long-wave part of infra-red radiation (1400–1300 nanometers) is late basically in the top of epidermis and causes fast rise in temperature of skin and

to erythema. Specific reaction of an organism in reply to an infra-red component of solar radiation is thermal (solar) impact. Victims register the headache, excitation, in heavy cases — convulsions, and loss of consciousness are marked rise of body temperature up to 40–42° C. The reason of it is accumulation of heat in an organism owing to what there is a frustration of its functions. Heatstrokes frequently come to lethal end.

Temperature of air

The temperature of air is the basic meteorological parameter describing a thermal condition of the air environment. The air temperature is expressed in degrees of scale Celsius (°C). The temperature of air depends on a degree of heating by solar beams of under layer of ground or water which transfer heat to air.

The minimal temperature of air within day is marked before sunrise, and maximal — at 13–15 h.

The difference between the greatest and least air temperatures for a day refers to as daily amplitude. This parameter has also the certain hygienic value for characteristic of climate-and-geography areas. So, the greatest daily amplitude of air temperature is marked in depth of continents (for example, in desert — up to 60° C), the minimal — as approaching to the seas and oceans.

The difference between air temperatures of the warmest and coldest months of year refers to as annual range.

For the man living in moderate latitude, comfortable air temperature from 20 till 25° C is considered.

Humidity of air

Source of formation of water vapour, determining humidity of atmospheric air, are the rivers, lakes, the seas and oceans, and also soil and a vegetative cover.

Distinguish humidity absolute (more precisely — aqueous tension), maximal and relative.

Aqueous tension in of air (e) is the moisture content expressed in terms of atmospheric pressure (kPa, millibar, mm of mercury), absolute humidity (a) — concentration water vapour in air (g/m^3).

The maximal humidity (E) is an aqueous tension in a condition of saturation by them of air (kPa, Mb, mm mercury or g/m^3).

Temperature at which water pairs in air reach saturation, i.e. humidity becomes maximal and starts to be condensed, refers to as a dew-point.

Relative humidity (r) represents the relation of actual elasticity water vapor in air (or absolute humidity) to the greatest possible humidity of air at the given temperature and is expressed in percentage:

$$r = \frac{e}{E} 100\ (\%)$$

Deficiency of saturation of air by moisture (d) is a difference between the maximal humidity (E) and actual elasticity of pair (e):

$$d = E - e$$

It is established, that at temperatures 18–20° C and speeds of air movement 0,1–0,3 km/s the optimal for an organism is relative humidity from 40 up to 60 %. At high temperature and relative humidity feedback of heat is at a loss due to evaporation, thus there can come to organism overheating accompanying with deterioration of health state and decrease of workability. The combination of high air temperature and low relative humidity causes dryness of mucous membranes and occurrence of skin microcracks. The combination of low temperature and high humidity of air causes strengthening of heat irradiation and promotes development of overcooling of an organism. Hence, high humidity of air at high and low temperatures it is necessary to regard as adverse factor of an environment since it promotes development, both supercooling, and superheating.

Movement of air

Atmospheric air is in a condition of constant movement.

The reason of this phenomenon — different air pressure in various areas of a land and the sea, caused by in turn distinction of thermal balance in these regions. The air movement is characterized by speed (km/s) and a wind direction determined by the sides of horizon, where from it blows: northern, southern, east, western. Any geographical area is characterized the certain repeatability of winds — a wind rose.

Hygienic value of air movement is defined first of all strengthens heat irradiation effect by convection. If temperatures of air is high then its movement increases heat irradiation from a body surface and warns thus superheating of an organism, if one low — promotes super cooling of an organism.

Atmospheric pressure

The mass of air press down on the land equal on a sea level at temperature 0° C 1,033 kg/cm^2. This pressure corresponds to pressure of mercury column in height of 760 mm and is named normal.

Atmospheric pressure is measured in hectopascal (hPa). It is necessary to tell, that 760 mm mercury are equal 1000 hPa (1 mm mercury is equal 1,33 hPa).

Daily fluctuations of atmospheric pressure are usually within limit 5–8 hPa, seasonal — no more than 40 hPa and does not render to essential influence on an organism of the healthy man. However elderly and sick people whose functionalities of the organism in particular suffering hypertonic illnesses are reduced are very sensitive to differences of atmospheric pressure that connected respective alterations partial pressure of oxygen.

With rise on height atmospheric pressure is reduced on the average on 110–120 hPa. The fast rise on height more than 2500 m appeal the phenomena high-

altitude, or the mountain illness, connected with sharp atmospheric pressure decline. It is typical of it weakness, drowse, dizziness, a short breath, cyanosis of mucous membranes. Increase of stay duration at height give rise adaptation to depressed partial pressure of oxygen in inhaled air, the specific symptoms fade away.

Air ionization and an atmospheric electricity

The air always contains the certain quantity of the ionized atoms and molecules of gas (aeroions) or particulate pollutant in the form of a fog, a cmoke or a dust (aerodispersion), charged by a positive or negative electricity. To ion-generative factors concern: space beams, radioactive substances, the ultra-violet radiation, an open flame and the heated up surfaces (thermal ionization), an atmospheric electricity. Dispersion of water at sea surf, falls and the mountain rivers is accompanied by the expressed atmospheric air ionization also. Under the action of all these factors occurs detaching electrons from molecules, thus the molecule residues get a positive charge. The ions existing in air as the independent residues of gas molecules or attached to group of neutral molecules of oxygen, nitrogen, carbonic gas, ozone, refers to easy, and connected with particles of a fog, a smoke or a dust — heavy. From hygienic exponents of air ionization it is usually analyzed the following: the contents of different ions, weight of particles, unipolarity coefficient (ratio of number positive to number of negative ions) and pollution factor (ratio of total quantities of heavy metals and easy ions of the same sign).

In ground atmospheric air the quantity of the easy, positively charged ions, as a rule, always is more, than negative. In this connection the factor of unipolarity reaches 1,3 thousand pairs easy ions in 1 cm^3. Air of sea coast at surf contains up to 5–40 thousand easy ions in 1 cm^3.

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 climate formation 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 acclimatize. Acclimatization 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° 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 cli-

mates 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 300° 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 carbondioxide, 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, helminthes 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.

The microclimate of premises and its hygienic estimation

Health and workability of the man in many respects depends on conditions of a microclimate of internal premises.

The microclimate of premises is the physical air condition composed of four elements — temperature, humidity, speed of air movement, the radiant heat, determining human heat sensation.

Elements of a microclimate can be among themselves in various combinations and essentially define three condition kinds of the person such as superheating, thermal comfort and supercooling.

The hygienic microclimate estimation taken separately meteorological parameters (t, humidity, mobility of air and radiant heat) not always gives full idea about possible thermal influence of an environment on human organism as they, as a rule, influence not separately, and together. It is known also that the identical subjective perception of the environment can be observed at various combinations of separate meteorological parameters. Therefore, for hygienic estimation of microclimate, estimation of physical conditions of thermal exchange and thermal loading on the man complex parameters were proposed. The theoretical grounding of them lie in different degree specifications of the basic equation of thermal balance.

In the basic equation of thermal balance the primary factors influencing thermal exchange of the man are taken into account:

$$Q = M \pm C \pm R \pm E,$$

where:

Q — thermal loading on the organism;

M — metabolic heat, composing 67–75 % of energy expenses level;

C — convecting thermal exchange between the organism and the environment;

E — organism heat emission with evaporated sweat.

Hence, thermal loading is defined by a level of a metabolism, intensity evaporated perspiration and meteorological conditions from which in turn depend on character and a degree of functional shifts, prepathological and pathological changes in an organism.

The thermal comfort of an organism in usual conditions corresponds to zero value Q. Positive thermal loading **(+Q)** results in development of thermal tension, physiological limit of heat accumulation in an organism is 600 kJ; negative — **(-Q)** results in overcooling of the organism – heat emission more than 5000 kJ results in freezing of the organism.

In complex parameters of microclimate estimation factors of the basic equation of thermal balance **(M, C, R, E)**, and also factors directly or indirectly their reflecting (temperature of air, temperature of the damp thermometer, average radiating temperature, character of clothes and work, skin temperature, etc.) are taken into account.

Now it is known more than 50 parameters of a total estimation of thermal loading on an organism. It testifies to proceeding searches of universal criterion.

Complex parameters of microclimate estimation are based on development various nomogramm, tables and the formulas reflecting connection between a complex of meteorological factors (sometimes in view of a degree of adaptation, clothes, heaviness of work) and physiological organism reactions. So have arise methods of effective temperatures.

Effective temperature **(ET)** takes into account temperature and humidity of air. Further speed of air has been included in this parameter. The effective temperature is the conditional parameter based on comparison heat sensations of people stripped up to the waist or usually dressed in people, carrying out work of the certain degree of heaviness at the certain microclimate with their heat sensationsin conditions of the immobile air fully saturated with water vapour at the determined temperature. For conditions of rest or easy physical work are established the **line of comfort** (18,1–18,9° ET) and the **zone of comfort** (17,2–21,7° ET), for average and heavy work a zone of comfort is reduced accordingly on 1 and 2,5° ET.

Method ETmost of all approaches for an estimation of such meteorological conditions when radiating heat does not play a role, for example, in premises with the raised humidity of air. The basic lacks of scale ET are it does not take into ac-

count radiating heat and physiological reactions. Besides it's used in conditions of very high temperatures and relative humidity can result in wrong results.

For the account of a radiating component of a microclimate it was offered to replace in scale ET temperature on the dry thermometer with temperature on the black spherical thermometer. This parameter has been received the name corrected effective temperature (CET).

Principles of hygienic standardization of microclimate of premises

At an establishment of hygienic specifications of premises microclimate are issued that it should provide thermal comfort for the man. In case of normal microclimatic conditions about 10 % of people (on average) feel thermal discomfort. It is explained by individual distinctions in intensity of exchange processes, thickness of a hypodermic fatty layer, national and social features, etc. The microclimate is considered favorable if the number of subjective values «comfort» or «normally» makes more than 75 %, and discomfortable — less than 25 %. For hygienic standartization of a microclimate of premises it is necessary to take into account the following:

— conditions of people activity (destination of premises);

—seasonal distinction of microclimate parameters (the separate for warm and cold periods of year);

—necessity of creation of a narrow diapason of normalized microclimate parameters.

It is necessary besides to prove the separate components of a microclimate creating in complex sensation of thermal comfort at the person. The thermal comfort is the meteorological conditions of environment promoting an optimum level of physiological functions, including thermal regulator, at subjective sensation of comfort. Apparently the leading role is played with the subjective factor.

It is impossible to establish uniform hygienic specifications of microclimate parameters of various premises as it is impossible to require identical hygienic requirements, for example, to a microclimate of premises.

The majority of researchers considers, that border of intellectual workability deterioration is the temperature in premises 28–30° C, is above which the number of erroneous reactions of operators grows. So at temperature of air 27–31° C the number of mistakes at work with the Morse alphabet increases till 50 %, at 36° C it becomes more then in six times. At temperature 40° C and relative humidity 70–80 % pace of brainwork is reduced twice, concentration of attention with increase of quantity of mistakes in 5–6 times sharply reduced, further rise of air temperature lead to disturbance of movements coordination. Physical workability in conditions of high air temperatures is reduced later.

7. HYGIENE 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 hemoglobin;

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 35^0 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.

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 carpopedal 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 tachycardia. 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 exertion. 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. Exertion 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.

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 exertion heatstroke, sweating is relatively common. In both, temperature is 40° C and may be 46° 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 equipments (overalls, helmets, points, masks);
— carrying out of preliminary and periodic medical inspections;
— preventive food;
— tempering.

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.

1. 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 fog (smog). 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.

2. Malnutrition in countries of a hot climate.

The recently completed Demographic and Health Survey 2006/7 showed that 22 % of Sri Lankan children below five years of age are underweight, 18 % being too short (stunted), and 15 % too thin (wasted) as measured by weight for height. There is an improvement, when you compare these figures with figures in 1987, when 38 % of children under five were underweight, and 28 % 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.

3. 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 realization. High humidity creates more favorable environment for reproduction of activators of intoxications. Local customs of life, food character with use of many products (vegetables, fruits) 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.

Prevention of food poisonings:

— 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 food borne illness. The action of monitoring food to ensure that it will not cause food borne 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.

4. Sanitary-hygienic examination of foodstuff.

Hygienic examination stages:

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 organoleptic 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 Service.

Certification is a research of products on conformity their STst.

5. 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 hospitalized 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:

1) 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;

2) working out of national criteria of quality of potable water;

3) building of waterpipes, systems of water drain and treatment facilities, i.e. increase of sanitary-engineering accomplishment of settlements;

4) 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:

Location/circumstances	Volume *per person per day*
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 meters of a water source.

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, bore-holes, 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.

6. 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 vasodilatation 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 acclimatization. Acclimatization is a gradual physiological adaptation that improves an individual’s ability to tolerate heat stress.

Acclimatization to heat is fully developed within two weeks, with maximal effects in the first week. In a heat-stressful situation, a person acclimatized 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 acclimatized at the start of exposure to excessive heat.

Once acclimatized, personnel will retain most of their adaptation for about one week after leaving the hot environment. The acclimatization 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 characterized 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, pustular 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.

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 acclimatize, 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.

8. HYGIENIC VALUE OF ENVIRONMENT

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.

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.

Development of some ecological diseases is connected with influence of environment factors, in particular, acrodynia (poisoning by mercury), Minamata disease (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.

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 organization 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, helminthes 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 in polyclinics, improvement of water quality.

Water indicators:

a) organoleptic (smell, smack, muddiness, color, 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^{o};

— muddiness — no more than 1.5 mg/dm^3;

— iron — no more than 0.3 mg/dm^3;

— manganese — no more than 0.1 mg/dm^3;

— fluorine — no more than 1.5 mg/dm^3;

— number of bacteria of intestinal bacillus group — no more than 3 in 1 dm^3;

— dry residue should not exceed 1000 mg/dm^3;

— chlorides — 350 mg/dm^3;

— sulphates — 500 mg/dm^3.

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;

— delivary network.

Water is considered suitable for drink if the general microbic number no more than 50/sm^3, thermotolerant and the general coliform bacteria are absent in 300 sm^3, coliphage — in 100 sm^3.

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 microbic inseminating. 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 an 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 microbic 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.

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 climate formation 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 endemic at a person.

Biogeochemical endemic diseases are characterized by metabolism infringements. Endemicgoitre developing owing to insufficient receipt of iodine in a human body. Molibdenosis 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.

9. HYGIENIC VALUE OF DRINKING WATER AND RATIONAL WATER SUPPLY

The problem of water supply infringes interests of the big number of people. This feature follows from that role which water play in human physiology. As is known, the human body consists of 65 % of water. The organism even in conditions of the starvation, not satisfied thirst at absence of physical loading loses some of water which is formed in result of continual oxidizing processes.

Rather small water deficiency in the organism results in considerable health infringements. In experiment with animals it is shown, that water loss of 20–22 % results in their death. All this speaks that processes of digestion, synthesis of living substance in organism and all metabolic reactions take place only in the water environment.

Despite of extremely big physiological role of water, water expenses for the drinking purposes is insignificant. In conditions of a temperate climate at absence of physical loading, the man loses (hence, and uses) 1,5 litres of water per day. On a consumption level of drinking water influences natural (temperature and humidity of air, isolation, wind) and social (working conditions) factors. So, during physical average work in the temperate climate it is necessary 4 litres, at the same work in a hot climate — 5 litres of water per day. In unusual cases (at work in conditions of desert or in hot shops) the water need for man can raise up 11 litres per day.

However hygienic value of water it's not only physiological role of one. A great deal it necessary for the sanitary and economically-and-domestic purposes. Water commercially promotes to development of hygienic skills (body care, keeping in cleanliness of household goods, etc.).

The sanitary condition of treatment-and-prophylactic establishments depend on quantity of consumed water. The rational centralized water supply is the important condition for prevention of hospital (nosocomial) infections.

Water of drinking quality is necessary for creation of a due sanitary-engineering conditions at the enterprises of the food industry and catering with the purpose of the prevention food toxicoinfections and intoxications. Commercially water is used for carrying out of improving and sports actions (swimming pools), and hydrotherapeutics also.

It is necessary to emphasize, that for water consumption with the purpose of prophylaxis of infectious diseases and improvements of sanitary conditions of population's life is necessary the drinking water of corresponding quality.

In the basis of norms of water consumption are put:

a) physiological need;

b) body hygiene;

c) preparation of food;

d) cleanliness of dwelling;

e) water discharge in public institutions;

f) for sprinkling.

In the countryside at use of water from water-folding columns norm of water consumption are 30–50 liters per day, and in city — up 400–500 liters per day.

For example, in Minsk for 1 person is spent more 700 liters, in Rome — 1000 liters (it is a lot of fountains, reservoirs) — is emphasized aesthetic value of water as hail growthinfactor.

The water quantity which necessary for one inhabitant in day depends on a climate of place, a cultural level of the population, a degree of the accomplishment of city and the housing stock. On average in Republic Belarus water consumption makes more than 200 liters per day. In some cities development of a waterpipe allows to provide enough high norms of water consumption (till 400 liters per day).

Epidemiological value of water

The centralized water supply allows to lift a level of sanitary culture of the population, promotes reduction of disease only at uninterrupted submission of enough of water of the certain quality. Infringement of those or other sanitary rules as at the organization of water supply, and during ofuse a waterpipe lead to sanitary trouble down to accidents.

The most mass and with heavy consequences of infringement of public health are connected to the opportunity of carry with water of pathogenes of intestinal infectious diseases. The opportunity of transfer through water of cholera, typhoid fever, salmonellosis, dysentery, brucellosis, a virus hepatites and others is proved.

In water of water supply sources frequently find out viruses of a poliomyelitis, various adenovirusand enterovirus.

Accordinly to the data the WHO annually in the world because of poor quality of drinking water dies about 5 million people. The infectious disease of the population connected to water supply reaches 500 million cases per year.

It has given the basis to name a problem of water supply hygieneby a problem N 1, i. e. supply by good-quality water in adequately.

In order that distribution of infectious diseases through water would became real, simultaneous presence of three conditions is necessary.

The first condition — a etiological agent of disease should get in water of a source of water supply. At modern development of canalization of the occupied places, presence infectious patients and healthy bacteria carrier this condition constantly is present.

The second condition — pathogenic microorganisms should keep viability in the water during enough long time. The reality of this condition is determined by ability of preservation of a microbe as biological kind. Practical supervision

and experimental data testify about opportunity of their long existence outside of human organism, for example, in the water.

The third condition — a etiological agents of infectious diseases should get with drinking water in human organism. This condition can be realized at breakdown in process of water-preparation technology at station of water treating or the first operation of a water supply system.

Protozoan invasions, i.e. the diseases caused by elementary, which meet basically in a hot climate of the Asia and Africa countries. Among the *protozoan invasions* are *amebiasis* or *amoebic dysentery*, *balantidiasis, lambliosis*, accompanying by diarrhea at receipt of the elementary with drinking water and their penetration into mucous membrane of large intestine. Children are lamblia carriersin collectives can be found up to 30–40 %.

Many helminthiasis — *opisthorchosis, diphyllobothriasis, ascariasis*, etc. can be transferred through water. The factor of transfer ofopisthorchosisand diphyllobothriasisis the fish, molluscs, fresh-water shellfish Cyclops. Ascariasis is possible at drink of the water containing eggs of it's heminth.

Schistosomiasis dermatitis (itch of bather) meets everywhere, especial among children. The basic owner, where schistosomiasis reach a sexual maturity, are domestic and wild ducks, the intermediate owner is the fresh-water mollusc. Larvas ofschistosomiasistake root into human epidermis in process of bathing, cause a strong itch, puffiness and appearance of skin rash. Duration of disease are from several hours till 2 weeks.

Dracunculosis (guinea worm) occurs in the countries of Africa, in India (at drink or bathing). The intermediate owner is a fresh-water shellfish-Cyclops. Larva through a skin take root and migrate into lymphatic system in subcutaneous fat. The length of individuals can grow till 120 sm, the parasite is in the human organism till 14 months.

Filariasis isinoculablehelminthiasis, transmitted through stings of malarial and not malarial mosquitoes. They are distributed in Africa, Asia, Australia and S. America. The number of patients in the world reaches 100 million people. Filariasparasitize in lymphatic system, blood vessels and internal organs. Cause a fever, puffiness, stagnation of lymph, legs elephantiasis, a sepsis.

In some cases at bathing in unsanitary conditions it is possible to catch mycosis diseases.

In water there can be Oligochaetaworms, flat Ciliatedmollusc, Crustacea. They are found out to the unaided eye, get from ground, subsoil waters, with a dust, are transferred by germs. Their appearance is connected to thinness in water-supply network.

Value all this conditions very important for correct tactics of the doctor at development of preventive actions and the control over their realization.

The chemical composition of water and its influence on population health

All chemical compounds incoming gintohuman organism from environment divided on essential and non-essential (toxic) substances.

The chemical compound of organisms is connected to a chemical compound of an earth's crust. On the basis of Vernadskii's doctrine cad. A. P. Vinogradov has created the doctrine about biogeochemical provinces. As result of deficiency or surplus of one or another element is developed end emicdiseases. In the organism macroelements appreciably comes with water, for microelements it is not the basic way of receiving. In total in human organism was determined more than 80 chemical elements which can be subdivided on macro-, micro- and ultramicroelements. Macroelements — they are C, O, H, N, Ca, Mg. Micro- Fe, J, F, Cu, Mn, etc. Ultramicroelements — indium, gold, tellurium, niobium.

In the nature water never meets chemically pure composition. Having properties of universal solvent, it constantly has a plenty of various elements and compositions, the structure and which ratio is determined by conditions of water formation, structure of water-bearing horizons. The big influence on structure of natural waters, both superficial, and underground, renders their man-caused pollution. When we speak about water as about the reason of diseases not infectious nature, we have in view influence on human of chemical impurityman-caused or anthropogenous factors.

The limit of a mineralization of drinking water (the dry rest) 1000 mg/l has been established on the basis of organolepticsign. The basic part of the dry rest of fresh water consist of chlorides and sulfates. These salts have the expressed salt or bitter taste that is limited one in water up to level of a threshold of sensation: 350 mg/l for chlorides and 500 mg/l for sulfates.

It is established, that by the lower limit of a mineralization at which the homeostasis of the organism is supported by adaptive reactions, the dry rest is 100 mg/l, the optimal level of a mineralization of drinking water is 200–400 mg/l. Thus the minimal contents of calcium should be not less than 25 mg/l, magnesium — 10 mg /l.

The water rigidity caused by the total contents of calcium and magnesium, was considered usually in economic-and-domestic aspect (scaleformation, the raised expenses of washing-up liquids, bad cooking meat and vegetables, etc.). There is a direct high correlation of water rigidity with the contentsin it, except for calcium and magnesium, more then 12 elements fromanions lines. However already for a long time there were assumptions about etiologicrole of the salts causing of water rigidity in development of urolithic illness (*urolithiasis*). In last years was come out with a suggestion, that water with the low contents of salts of rigidity promotes development of cardiovascular diseases.

Until recently presence, concentration and a ratio of nitrates and nitrites in water of sources were regarded only as parameters of a sanitary condition of the

reservoir, testifying about a degree and prescription of its pollution by organic substances. In 19452 cases of cyanosis at younger children, which ended fatally have been described. Cyanosis was accompanied by presence in blood of the raised quantities of methemoglobin. It was connected with the high maintenance of nitrates in the well water used for dilution of children's nutritious mixes. Further this disease received the name water-nitratemethemoglobinemia. Easy forms of toxic methemoglobinemia are shown by weakness, pallor, easily fatigue ability, and at insufficient awareness can be estimated as other reasons. As is known nitrates do not promote methemoglobin formation. Their harmful action is shown when in result dyspepsia, a dysbacteriosis in intestines they are restored in nitrites. Nitrites absorption results in increase of the methemoglobin content in blood. Younger children have the insufficiency of the specific enzymes working in return transformation methemoglobin into hemoglobin. Diseases occur at pregnant, at patients with a stomach ulcer and malignant cancer, i.e. at the weakened persons with metabolism disoder. Nitrates can turn to nitrites which incorporate with amines and amides, entering with food. In result are formed nitrosamines with the marked cancerogenic properties. Nitrosaminesrender also to toxic action in a liver, and some from them have mutagen and teratogenic properties. For example, in Chinese province Fuynthe highest death rate from a cancer of a stomach has revealed. Was established that in this area the content of nitrates and nitrites in drinking water and vegetables was higher than in areas of low risk. The hygienic norm for nitrates is 45 mg/l.

In water are revealed about 65 microelements contained in tissues of animals and plants in concentration corresponding to thousand shares of percent and less. Hygienic value of microelements is determined by their biological role as they not only participate in a mineral metabolism, but also essentially influence on the general metabolism as catalysts of biochemical processes. Now biological value for animals and plants near 20 microelements is proved. It is necessary to take into account and aesthetic influence adverse organoleptic properties of water, importance for secretion of gastric juice.

Dental fluorosis develops at the superfluous contents of fluorine in water. Fluorine is postponed in teeth as calcium fluoride («black spots»). Dental fluorosis form at children's age during 2–3,5 years. At the contents of fluorine more than 6 mg /l are amazed dentine also. Consequences are next: osteoporosis, fragility of bones.

Daily need of iodine — 100–200 mkg, 2/3 of one comes with food, 20 mkg — with water (indirect parameter of provision in the given district). At deficiency synthesis of enzyme thyroxinis broken, which lead to diffusive increase of thyroid gland, it’s hyperfunction, in heavy cases — to cretinism.

Urovskayaillness or Kashina-Bekaillness isendemicdeforming osteoarthritis (widely-spread in Transbaikal, in permafrost regions), is described by Kashinin 1856 and doctor Bek. It is connected to use of local sources with soft water of a marsh origin characterized by calcium sufficiency.

Hygienic requirements to potable water quality

Standardization of water quality has the big history. Criteria of water safety for health varied with expansion of medical and biological knowledge. Also hygienic requirements to water accordingly varied. There are four stages in histories of hygienic standardization of potable water quality.

The first stage of standardization of water quality concerns to the antiquity when quality determined by sense organs.

Organoleptic method of the water estimation as single accessible at that time dominated within many centuries. However the general, only qualitative definition organoleptic properties of water did not give to its estimation a necessary degree of objectivity.

Making the second stage is connected to opening M. Lomonosov and Lavoisier quantitative and qualitative analysis in chemistry. The results of chemical analyses expressed by a measure and weight, attracted with the concreteness since could be used as scale for comparison of water from different sources. The big attention was given definition of the general water mineralization, contents of chlorides and sulfates, water rigidity. The choice of methods is determined by their availability. In due course are begun to determine the contents of organic composition and products of their decomposition (ammonia, nitrites, nitrates).

The third stage was characterized by primary studying of bacterial structure of water and hygienic standartization of water quality. Special value had discovery of Robert Koh. Participating in 1891 in liquidation of big cholera epidemic in Hamburg — Alton, Kokh has established not only the fact of absence of diseases in Alton, but also has connected it with clearing river's water. Water researches have shown that water Alton's waterpipe contained no more than 100 saprophytesin one ml. And in water of the Hamburg's waterpipe was much more microbes. On this basis Koh made conclusion, that water in which is no more than 100 saprophytesin 1 ml, does not contain pathogenic microbes (in this case — cholera vibrion). It is the first example when the hygienic specification has been offeredas a consequence of study of influence on human organism. Further the method of definition of Escherichia coli-titre has been introduced into practice of an estimation of clearing efficiency.

The Escherichia colibeing the obligatory and constant inhabitant of human intestines is in close connection with group of pathogenic microorganisms - activators of intestinal infections. So its detection in water in the greater measure testifies to presence of epidemic danger. This method of definition of Escherichia coli in water easily and safelyfor laboratory diagnostics. In 1914 in the USA have been published the first quality standard of drinking water — general number of colonies and Esherihia Coli titre.

The third stage of development of hygienic standartization can be named critical. Since this time the problem of water hygienehas got a physiology-hygienic direction.

At the fourth stage of new knowledge accumulation necessity of standard revision has appeared with the purpose of its development.

Quality of drinking water

In present are guided by normative standard SanR&N10-124 RB99 «Drinking water».

Water should be safe in the epidemic and radiating relation, harmlessly in a chemical compound, and should have favorable organic properties.

If it were detected bacteriophagesor coliformed bacteria in water their test repeatedly. If in repeated test their more than 2 general coliformed bacteria and coli phages in 100 ml, tests of water are investigated with pathogenic group and intestinal viruses.

It is standardized 6 organolepthic attributes of disutility, 20 sanitary-and-toxicological, maintenance of the harmful chemical substances entering and formed in water during its processing in system of water supply (chlorine, ozone, etc.), at maintenance of the harmful non-organic and organic chemical substances entering as a result of economic human activities. To last group refer more than 1200 chemical compounds.

Quality of drinking water should correspond to hygienic norms before its entering in a distributive network, and in points of water pumping of an external and internal water supply system also.

Safety of drinking water in the epidemic relation is defined by absence in it of pathogenic bacteria, viruses and the elementary microorganisms, in accordance with norms in microbiological and parasitologic parameters.

The hygienic characteristic of sources of water supply

One of the main principle questions of drinking water hygiene is the choice of a water source. This choice is carried out by technical and economic comparison of variants of water supply sources which can be atmospheric, underground and superficial.

Atmospheric waters rather weak mineralized, very soft, contain few organic substances and are free from pathogenic bacteria. Further method of water gathering and storage influence on water quality.

Underground water suitable for the purposes of drinking water supply are deposited on depth no more than 250–300 m. Next conditions of water bedding are differed: upgrade water, underground waters and middle waters considerably distinguished from each other by hygienic characteristics.

The underground waters deposited most close to earth surface are named upgrade waters. Upgrade water easily becomes dirty owing to superficial bedding, absence of a waterproof roof and small volume, as a rule, in the sanitary relation it is unreliable and cannot be considered as a good source of water supply.

Subsoil waters are the waters of the first from a surface of the ground constantly existing water-bearing horizon. They have not waterproof layers as protection; the feed area of subsoil waters coincides with area of their distribution.

Subsoil waters are characterized by rather changeable regimen which entirely depends on hydro meteorological factors, frequencies of loss and an abundance of precipitations. Thereof there are significant seasonal fluctuations of a standing level, chemical and bacterial structure of subsoil waters.

Middle waters are deposited between waterproof layers and depending on bedding conditionscan be pressure or non-pressure. Middle waters differ from underground by low temperature (5–12°), structures ability. Usually they are transparent, colorless, devoid a smell and any smack.

Due to a long filtration and waterproof roof protecting middle waters from pollution, in it is almost absent microorganisms, and this one can be used for drink. Middle waters are extracted with the help of deep tube well and less often mineshaft. Constant and big discharge of water supply source (from 1 up to 200m) and high qualities of water allow to consider middle horizons as the best source of water supply for small and average waterpipes, majority of which give water to the population without any clearing.

Springs. Underground waters can independently rise on a ground surface. In that case they carry the name of springs. From them are formed *keys or streamlets*.

Superficial waters flow down on natural slope to more lowered places, forming flowing and landlocked reservoirs: *streamlets, rivers, flowing and landlocked lakes*. Open reservoirs are provided for not only atmospheric but partially underground waters.

Open reservoirs are subject to pollution from the outside, therefore with the epidemiological point of view all open reservoirs are potentially dangerous. Water reservoirs near settlements are especially dirty due to discharge of sewage. If necessary to use an open reservoir for water supply it is necessary to prefer, first, large and flowing reservoirs, second, protecting reservoir from pollution by household and industrial sewage and, thirdly, it is necessary to disinfect water safely.

All-Union State Standard provides at a choice of water supply sources first of all pressure head, middle-artesian waters. At impossibility of their use should find others in the following order: a) middle pressure waters, including spring; b) subsoil waters; c) open reservoirs.

Sources of reservoirs pollution

1. Household economic-and-fecal sewage. Sewage of infectious hospitals is most dangerous in the epidemic relation. In them also contains SAM (surface-active material).

2. Industrial drains. Exist more than 140 kinds of technological processes, each of which defines specific structure of sewage. Toxic substances, radionuclids, pesticides, salts of heavy metals (water — mollusca — fish — man, water — plant — animal — man) get to water.

3. The air environment in large cities (acid rains, etc.).

4. Navigation (problem of the Baltic, Black and Mediterranean seas). In a reservoir the crude sewage, combustive-lubricating materials get.

5. In an emergency at the enterprises.

6. Sewage of an agricultural production:

- fertilizer, pesticides;
- liquid waste products of animal husbandry industries and food production.

7. Dumps.

Aral sea — with 1970 up to 1980 there were big changes of catastrophic drying and loss of fish value. The man has created man-caused ecosystem, huge region of an artificial irrigation. The area of the sea decreased almost half and more than twice in water volume. Concentration of salts has grown from10 $^{0}/_{00}$ till 14 $^{0}/_{00}$. The forage reserve for fishes was lost.

Sarezskoe lake, Aral (Central Asia) are sourses fresh, cleanest water. This one has arisen as a result of accident. The piece of mountain has failed to a valley and has partitioned off channel of river Murghab (1911). It's lake of goaf-type. Now it's deepest and young lake in Central Asia.

Sanitary protection of sources of water supply

All sources share on 3 classes. The higher the class, the more especially effective water purificationis required.

With the purpose of protection of water supply sources from pollution are organized zones of sanitary protection (ZSP) in which are have three subzones.

First zone of underground and superficial sources of water supply and water constructions is established with a view of exception of an opportunity of casual or deliberate pollution of water source and allocate in places of water-intake and water supply constructions. Water intake of underground waters should settle down, as a rule, outside of territory of the industrial enterprises and living zone. First zone is established on distance not less than 30 m from a water intake at use of the protected underground waters; if used not enough protected underground waters — on distance not less than 50 m. At use of group of underground water intake the border of the first zone should be on distance not less than 30 m and 50 m, accordingly, from end holes (or mineshafts).

The border of second zone is defined by hydrodynamical calculations from conditions that if outside in water-pump horizon will arrive microbic/ not stable/pollution they it is not achieved water-intake. For effective protection of underground source of water supply against microbic pollution it is necessary the estimated time of promotion of pollution with underground waters from borders of the second zone up to water-intake was sufficient for loss of viability and virulence of pathogenic microorganisms, i. e. for effective self-purification.

The border of third zone is defined by hydro dynamical calculations at condition that if from outside in water-pump horizon chemical (stable) pollution will arrive, they or don't achieve a water-intake, moving with underground waters outside of area of a feed, or reach a water-intake, but not earlier then estimated time.

The scheme of water supply defines by the mutual, technologically coordinated arrangement of constructions of water supply system and the order of water

delivery from a source to consumption. The choice of the scheme depends on a source of water supply, requirements to quantity and water quality, reliability and survivability of water supply system, from reliefand other features.

Drinking water in all cases should be safe in the epidemic relation, harmlessly from a chemical compounds and has favorable organoleptic properties, i.e. should satisfy to hygienic requirements of normative documents.

Methods of improvement of quality of drinking water

The basic methods of improvement of drinking water quality are clarification, decolouration and disinfecting. Clarification and decolouration of water are reached with the help of coagulation, sedimentation and a filtration.

For disinfecting water apply chemical (chlorination, ozonization) and physical (boiling, UV irradiation) methods.

For **sedimentation** are applied horizontal and vertical precipitation tank. Clarification depends on speed of water movement and densities of particles. The more slowly water flow, and the more hardly the particles, the more easy they fall on a bottom (about 1m up to 1mm in sek.). Speed in horizontal sediment bowls — 2–4 mm/s, in vertical — 1mm/s, time of passage — 4–8 hours.

Lack is a slowness and increase in volume of precipitation tank for time lengthening of sedimentation.

Coagulation of water — the weighed substances form flakes and drop out in a deposit. Coagulan thas a charge opposite to a charge of colloid particles. Sulfate of aluminium is used for this. After coagulation are used precipitation.

Water goes in the down part, is distributed and rises with small speed upwards, passing through coagulant layer in a zone of clarification — the filter.

The filtration is passage of water through fine-pored material (filters of slow speed, contact clarifiers). Efficiency — 95 % in detention of suspensions. Consist of sand, lower — gravel. In filters of new type water passes through coarse-grained layers, and then — through sand. Speeds of a filtration 4–5 m/hour.

Disinfection

One of the most widespread disinfection method is chlorination. To chlorination of water apply gaseous chlorine, chloride lime, dioxide of chlorine, hydrochloride of calcium, chloramines. Chlorine-containing tablets are applied to disinfecting individual stocks of water: aquasept, etc.

There are some ways of water chlorination:

1) chlorination by normal dozes (the doze of chlorine is established on size chlorineabsorptivity and sanitary norm of residual chlorine);

2) chlorination with ammoniation (in water simultaneously are entered chlorine and ammonia for chloramines formation);

3) hyperchlorination (the doze of chlorine considerably exceeds water chlorineabsorptivity (quantity of active chlorine which is spent during chlorination 1 liter waters during 30 min. for oxidation of the organic substances, easily oxidized inorganic substances and connection with protoplasm of bacteria).

For maintenance of reliability of disinfecting it is necessary that after end of process of chlorination in water residual chlorine in the following quantities contained: 0,3–0,5 mg/l of free residual chlorine (in the form ofhypochlorous acids) at normal chlorination and 0,6-1,0 mg/l of the connected chlorine (in the form of chloramines) at chlorination with ammonization. The necessary doze of chlorine at chlorination by normal dozes is determined in each case by carrying out of test chlorination, with the account chlorineabsorptivity of water. Minimal time of chlorine contact with water at chlorination by normal dozes makes in the summer not less than 30 min.; time of contact increases up to 1 hour in the winter at low temperature.

This one consists of stages:

a) managements of the equipment for liquid chlorine and plant for dissolution;

b) dosages of chlorine;

c) mixture with water;

d) contact to water.

Plant consists of 3 tanks (1 — ready solution chloride lime, 2 — for receiving a working solution; 3 — dozer).

Double chlorination (before sedimentation and after the filter).

Ammoniation — at once ammonia is entered in water, and then — chlorine in the ratio 1:4. Advantages are longer disinfecting action, prevention of smells and test of chlorine.

Super chlorination is chlorination by superfluous dozes of chlorine.

Ozonization applies in France, Switzerland, England, the USA, Kiev, Moscow. Advantages of this method:

- speed;
- ozone has not taste and smell;
- small dependence from t°, pH and other properties of water;
- ozone is made on a place.

Special devices — ozonizers, consist of 2 electrodes with an air layer between them (2–3 mm), used for as discharge space. Ozone is a received from air.

Disinfecting by UV-beams:

- speed;
- absence of a smell and test.

Lacks: the test controlover maintenance is excluded, complexity of technical service. UV-lamps are allocated above a water stream or into the water. It is applied on small waterpipes.

10. HYGIENE OF POPULATED AREAS AND DWELLING

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 are lively 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 organizations, 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;
— sleep 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:

— modernization 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 neurosises, 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 cattle graves, 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 m^2 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 pollu-

tion 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 build-up:

1) continuous (territory of quarter is built up almost entirely as in area of streets, and inside);

2) closed (or peripheral, on perimetre there is continuous building and in quarter yard settle down);

3) ordinary (buildings are under construction entirely on two opposite side of quarter);

4) group (buildings are under construction groups between which there are breakings);

5) 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 m^2 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 m^2 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 m^2 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.

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 m^2 on one person.

Planning of inhabited apartment should provide good insolation of living rooms. An 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 m^2. 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 electro supply 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 dm^3 a day on a person. In settlements with a waterpipe, water drain, baths, centralized hot water supply water consumption is 250–350 dm^3 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-houres 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.

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 insolated 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*:* anthropotoxins, 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 hemolitic streptococcuses — 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 m^3/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 beds;

— 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 m^2; 100 persons — 35 m^2; 200 persons — 30 m^2; 400 persons — 25 m^2; 600 persons — 20 m^2; 1000 persons — 17 m^2). 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 m^2. 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 m^2 on 1 person, for workers — 0,15 m^2 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^o 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 ^{o}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 m^3/h on 1 m^2 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.

11. HYGIENE OF HOSPITAL-BUILDING. PROPHYLAXIS OF INTRAHOSPITAL INFECTIONS

Hospital hygiene develops hygienic norms and requirements to accommodation, allocation and sanitary-and-engineering maintenance of patient care institution (PCI) with the purpose of creation of optimal stay conditions for patients, effective carrying out of medical process and favorable working conditions for medical personnel.

It is known, that the hospitalization success of patients depends on many factors. We shall consider a role of hygienic optimization of the hospital environment.

1. Optimal hygienic conditions first of all are necessary for the medical process and for recovery of patients. The patient, placed in a hospital, except for medical aid, requires a careful and skilful care, light, warm, enough spacious, it is good insolated and the ventilated ward, convenient (sometimes functional) bed; silence, quiet conditions, etc.

2. Hygienic conditions are the important precondition of the prevention of a hospital infection. Struggle against a hospital infection is actual not only for infectious, children's, surgical, maternity, but also for all other branches. Last years in hospitals is marked growth of hospital diseases, in particular due to a staphylococcal infection which even have named «a plague of 20-th century». So, in the USA a hospital infection is sick 6,3 per cent of all patients in hospitals. At the same time it is established, that a basis of the prevention of a hospital infection is the rational device, the equipment and the maintenance of hospitals.

3. Hygienic conditions are the integral element of a treatment-and- guarding regimen in which basis lays actions, supplying with the patient full somatic and mental comfort.

4. Hygiene of hospitals should provide healthy working conditions of all personnel. The medical personnel can be exposed to influence of some professional harmful conditions. The neuropsychic (psychological) pressure, muscle tension, night work, chemical agents concern to them.

Taking into account the increased value of hospital hygiene, in hospitals of some the countries was introduced the new post «the hospital hygienist». The primary goals of its activity: 1) improvement of hygienic conditions in hospital; 2) the regular control over a sanitary condition of a hospital; 3) creation of minimal risk of a hospital infection. Creation of hygienic conditions depends on system of hospital construction, properties of the ground area and the location of hospital in settlement, internal emplacement of hospital buildings, a sanitary-engineering accomplishment, the equipment and the sanitary maintenance.

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, after treatment, 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.

The hygienic characteristic of systems of hospital construction

Hygiene of hospital is stated by the example of the basic medical institution - hospitals of the general type. Hospital of the general type includes:

1) reception;

2) hospital with a therapeutic and surgical structure, and also obstetric-gynecologic, children's, infectious, anesthesiology-and-reanimations, radiological and others;

3) polyclinic;

4) medical-and-diagnostic divisions: subdivision of functional diagnostics, radiologic investigation, physiotherapy, physiotherapy exercises;

5) pathologoanatomic subdivision with a morgue;

6) auxiliary services: food establishment, a laundry with sterilizer room, the central sterilizing subdivision, workshops for repair of medical technics, garages, a vegetable storehouse, etc.;

7) administrative part: office, medical archive, library, etc.

Reciprocal accommodation all listed divisions in hospital buildings depends on architectural — composite structure of hospital (system of hospital construction).

There are the following types of hospital building:

— decentralized system of construction;

— centralized;
— mixed;
— centralized-and-block.

At decentralized system of construction the hospital establishment consists of separate rather small buildings in which are placed various on a structure medical subdivisions. The majority of pre-revolutionary hospitals are constructed on this system.

At the centralized system the hospital is placed in one many-storeyed building. Each of the named systems of hospital construction has merits and demerits. For example, merits of decentralized hospitals are good isolation of subdivisions among themselves and from policlinic that facilitates an opportunity of rest creation and warns a hospital infection. In view of small number of stores buildings is facilitated the opportunity of patients stay on air.

At the centralized system construction is reduced the price, duplication of premises and expensive equipment in each building is excluded, ways of movement of patients and the personnel both to diagnostic and physiotherapeutic studies are shorten, becomes simpler the delivery of ready food from kitchen in wards. At this system is facilitated the device and operation of regimen sanitary technical equipment (central heating, artificial ventilation, air conditioning), the mechanization of auxiliary operations, the centralized submission of medical gases (oxygen, nitric oxide).

However isolation of some groups of patients, the organization and realization of a medical — guarding and sanitary regimen, using a hospital garden in this building is difficulty. The mixed system of hospital construction allows to use the positive sides decentralized and the centralized hospitals and to reduce to a minimum their defects.

At the mixed type of building in the main housing are placed the specialized not infectious subdivisions, laboratory, medical-and-diagnostic subdivisions. Except for the main corpus, is built some smaller buildings in which locate polyclinic, infectious, maternity, children's and radiological subdivision. In separate buildings are placed also the pathoanatomical subdivision and auxiliary services. This system of hospital construction was widely applied earlier. Now apply on-line-block system more often, at which the hospital consist of several corpusis (therapeutic, surgical, etc.), blocked in a single whole. In this building the positive sides of the centralized system of construction are better used.

The on-line-block system of construction allows to unit functionally similar divisions. For example, creation of a uniform operational complex with 6-8 and more operational rooms, central sterilizing, uniform X-ray subdivisions with 6–8 X-ray [radiological] apparatus.

Hygienic requirements to accommodation and lay-out of PCI

The opportunity of creation of hygienic comfort depends on place and other features of a hospital site. Therefore for PCI are allocated the ground areas, op-

timal in the natural conditions, located on raised dry district, whenever possible with the southern slope, well aired and rich by vegetation.

The territory of hospital should be distant from sources of noise (railways, air stations, the main city highways) and air pollution, ground and water (dumps, fields of sewage disposal, massacre, burial ground of cattle.

Between the industrial enterprises and hospital sanitary — protective zones are established width from 50 up to 1000 m depending on a degree of occupational hazard. The site should settle down from windward (side) (in view of a wind rose) concerning the industrial enterprises and other sources of air pollution. Not casually the specialized hospitals (for example, tubercular, psychiatric hospitals or the rehabilitation centers), are under construction on surburb or even outside of settlement, for which a favorable environment are the additional treatment factor.

The most convenient for accommodation of a hospital complex is the site of the rectangular form with a ratio of the sides 1:2 or 2:3. The long axis of a hospital building should be located in a direction from the east to the west that allows to provide optimum southern orientation of wards for patients.

The site should be connected to served area or settlement by convenient local ways.

At contemporary construction systems of hospitals it is required not less than 100–150 m^2 territory counting upon one bed.

Before construction make the general plan of a site of hospital. For creation of optimum sanitary and medical guarding regimens and psychological comfort by development of the general plan a site divide to a functional attribute into the following zones: 1) medical buildings — not infectious, infectious; 2) landscape gardening; 3) polyclinics; 4) pathoanatomical subdivision; 5) economic, etc.

Hospital buildings should be simple, but beautiful architecture, the light, surrounded green plantings. They should be removed from borders of a site not less than on 30 m. Break between facades of the next medical building should be not less than 2,5 heights of an opposite building; between end faces there is enough distance — 15 m. Infectious subdivision is located in depth of a site.

Building of a polyclinic must be separately from medical building — in distance 30–50 m. The entrance in a polyclinic zone should be separate. In an isolated place, not outstanding from windows of hospital buildings, is located pathoanatomical subdivision with a mortuary. At periphery of a site is organized 15-meter green planting protective zones from noise, dust and strong wind.

The correct lay-out provides presence a minimum of two entrances on territory of hospital: in medical and economic zones. Last ones can be used as an entrance to the pathoanatomical building.

The density of building on hospital site should be within the limits of 12–15 %.The area of green zone and lawns occupies not less than 60 % of territory, and the others 20–25 % — an economic court yard, driveways, tracks.

Hygienic requirements to architectural decisions of the basic divisions of a hospital

Rational positional allocation the basic hospital divisions should promote realization of medical process, simplification of work of the medical personnel, the prevention of intrahospital infection, creation of optimal hygienic conditions.

The central reception is intended for patients reception, their survey, specification of the diagnosis and subdivision in which treatment will be carried out. It is placed in the largest medical housing, near to the transport lift. Convenient connection with reanimation, radiological and surgical subdivisions is desirable. From antiepidemic reasons infectious patients, parturient woman and children are accepted directly in the subdivisions having for it casualty wards.

At reception are placed wards for patients with the indeterminate diagnosis. The bed quantity in them should be 10 % from number of the patients incoming within day.

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 м^2 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.

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 m^2 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 two corridors ward units. *One corridors* 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 many cots hospital are formation *two corridors* 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 two corridors building of department when wards are focused wherever one wishes light, and various variants of this building: T-shaped, polygonal, square, round.

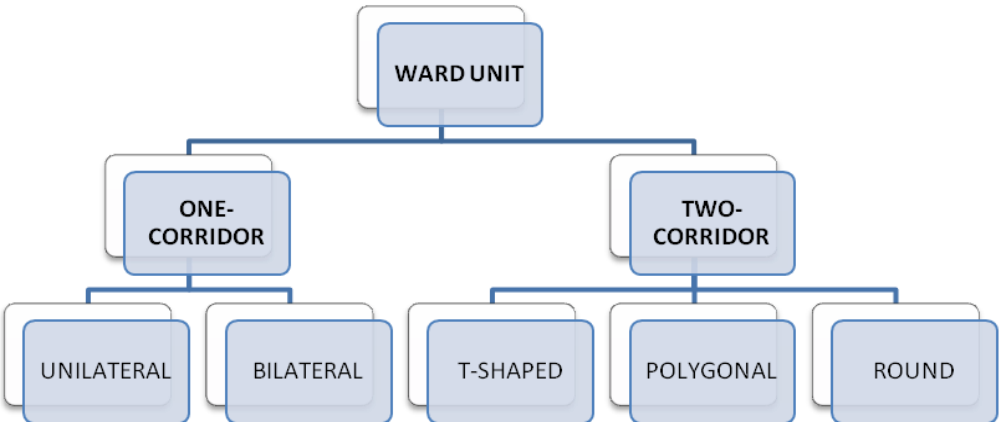


Figure 4 — Ward unit

At such planning of department have good visibility and economic.

Lacks of compact two corridors building:

— unsatisfactory in solation in wards;

— absence of natural illumination in premises;

— difficulties of maintenance of favorable air regimen;

— additional noise from lifts.

Ward unit calculated on 60 beds and consist of two ward sections.

Usually ward units have blind character. Ward units 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.

The specialized subdivisions and sections.

The hospital consists of the specialized subdivisions, each of which intends for patients with homogeneous diseases.

The specialized subdivision is the major functional element of hospital. At capacity more than 30 beds it arranges from sections and the rooms located between them, the common for all subdivision.

The structure section includes the following rooms:

a) for stay of patients: wards, rooms of the day time stay, a glazed verandah;

b) medical-and-auxiliary: doctor's consulting room, procedural, a post of the nurse, dressing room - in subdivisions of a surgical structure;

c) economic: buffet, dining room, linen, rooms of the nurse — mistress and the senior nurse;

d) a lavatory: bathing, a washstand, toilets for patients and personnel, a sanitary room;

e) ward corridor connecting listed rooms.

All hospital *rooms* should have natural illumination. Artificial illumination is supposed in wards lavatories, hygienic bathing, preoperative room, warehouse.

The *basic room* of section is the ward. Now the common wards for adult patients are projected no more than 4 beds; thus in each section there should be two wards per 1 bed and not less than 2 wards per 2 beds. Beds should be located in parallel a wall with windows, but no more than in three lines. Thus the distance from a bed up to external walls should be not less than 0,9 m, the long sides line worth — not less than 0,8 m. Depth of wards at natural illumination on the one part should be no more than 6 m.

The *post of the on duty nurse* is projected as the glazed cabin by the area 4 м^2 available from northern side of a corridor a little bit outstanding to corridor to provide good supervision over entrance in wards. The arrangement of a post in the center of section (around of a post are grouped one and 2 beds wards for seriously ill patients) reduces the relocation time of the medical nurse (15–18 m up to distant ward) and to improves her work.

In hospital construction expediently partial bilateral building of corridors with the device of light break in the extent not less than 40 % of its length now is recognized. The corridor width necessary for free movement and turn of a stretcher, wheelchairs and beds should be not less than 2,4 m.

Procedural room serves in section for carrying out of some physiotherapeutic procedures, massage, injections.

Food intake by patients in a *dining room* renders the big psychological influence on them. Translocation of patients in a dining room is perceived by them as a critical stage from illness to recovery. A dining room it is possible to arrange one for subdivision (two sections), having it nearby buffet. The quantity of places in dining rooms is accepted with equal 80 % of bed quantity in subdivisions: postnatal, physiotherapeutic, dermatovenereologic, tubercular, psychiatric and recovery treatment and not less than 60 % — in other subdivisiones. In buffet is warmed up and distributed food on portions, and also washed dishware.

The lavatory consists from wash-room, a bath, toilets, a sanitary room. The sanitary room serves as a room where are made washing, sterilization bedpan, storage of a material for the analysis, disassembly and time storage of dirty linen, washing of oilcloths, storage of subjects of cleaning.

Therapeutic subdivision is the basic structural division of multiple-discipline hospital. For carrying out of medical actions in the majority of therapeutic subdivisions it is provided only procedural rooms. Therefore section of these subdivisions consists of a set of identical rooms.

Now in structure of subdivision of a therapeutic structure highly specialized subdivisions are allocated: cardiologic, gastroenterologic, nephrologic, heamatologic, pulmonologic, etc. where new methods of diagnostics and treatment of patients with use of the difficult medical equipment are widely applied. Therefore in the specialized subdivisions of a therapeutic structure additional rooms for carrying out of special researches and medical procedures are provided.

Surgical subdivision

The requirements to designing of surgical subdivision (general type or specialized) are common:

1) presence of convenient connection with the operational block and diagnostic subdivisions;

2) presence of corresponding number dressing and procedural rooms;

3) the organization of conditions for postoperative stay of patients in the specially equipped wards, including for carrying out of a long narcosis with reanimation or the medical purpose;

4) exception of an opportunity of contact of postoperative («pure») patients and so-called «purulent» patients at which have appeared postoperative complications.

Section of subdivision of the common surgery in few differs from section of therapeutic subdivision. In addition in all surgical subdivisions it is projected dressing rooms.

For patients with suppuration processes (phlegmons, abscesses, extensive purulent wounds) are allocated purulent subdivisions or sections and special operational. All other patients are placed in pure subdivisions or sections.

The main feature of subdivision of the common surgery is presence of the operational block, and in large hospitals - operational subdivisions.

The *operational block* represents important structural unit of surgical subdivision. The operational block is never through-passage. The operational block, as a rule, should have two not through-passage subdivisions: septic and aseptic.

Into structure of the operational block included: operational, preoperative, sterilizing, narcotic and other rooms.

Operational it is necessary to project at the rate of 1 operational table per 30 beds of surgical structure. The height operational, as against all other rooms

of a hospital, should be not less than 3,5 m. Width of operational room is not less than 5 m and corridors in the operational block is not less than 2,8 m.

Preoperative it is intended for carrying out of last preparation of the surgeon and other medical personnel before operation. From preoperative the surgeon should have an opportunity to observe narcotic and operational where prepare for operation of the patient.

Narcotic is the room for last preparation of the patient for operation. It is also a workplace of the anaesthesiologist which conducts a narcosis during operation.

Sterilizing in the operational block settles down between two operational and serves for sterilization of the surgical tool.

In immediate proximity to the operational block wards for postoperative stay of patients are placed. The bed quantity in postoperative wards is established at the rate of 2 beds per 1 operational. The area in postoperative wards increases up to 13 m per bed, that allows to place the special equipment for a care of patients.

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 subdivision

Patients come in infectious subdivision not only for treatment, but also for isolation. Therefore the opportunity of distribution of intrahospital infections should be excluded in correctly organized infectious subdivision.

The infectious subdivision is more rational to allocate in detached building. The internal lay-out and a sanitary regimen of this subdivision have a number of the features directed on the prevention of intrahospital infections. For reception of patients it is provided viewing boxes by the area 16 m^2. In subdivision by capacity from 30 up to 60 beds should be 2 boxes, from 60 up to 100 beds — 3 boxes, more than 100 beds — 3 % from total beds.

For the personnel in a reception of the infectious building of division it is provided sanitary inspection room.

The lay-out even small infectious subdivision should allow to divide it on a little bit independent sections, the patients intended for hospitalization with different infections. Each section should have the important role of «bactericidal locks». The sluice has two densely closed doors and if one is open — another is closed, that protect carry out of a drop infection. For greater reliability the sluice can be equipped with a bactericidal lamp. The section should have the lavatory.

The following distinctive feature of infectious subdivisions is that for improvement of isolation of patients in ward are arranged mainly one - and 2-beds (a maximum 4-beds). All wards are equipped with wash-stands. In children's hospitals for prevention of drop infection distribution are obtained blimped wards. In similar wards it is possible to place only sick with one certain infection, for example, a scarlet fever or diphtheria. The entrance in ward has a sluice.

For individual hospitalization of patients are applied 1-bed wards with a sluice, semiboxes and boxes. Semibox consists of ward, a sluice and a lavatory. Essential defect of semibox is that patients come in it through corridor. Thus it is possible semination of corridor air by pathogenic microflora which from here can spread into wards.

Completely guarantees against the intrahospital infection, transmitted by the drop way, only individual box. It consists of street tambour, a lavatory, actually wards and a sluice. The patient come to box through tambour directly from street (if subdivision on 2-nd floor- from gallery). The personnel enter from corridor through a sluice. In a wall which separates box from a corridor, maked the glazed windows for supervision over patients. Washing and disinfection of utensils is spended in box. The area of box is 22 m^2. In box are placed first of all patients with the obscure diagnosis or with the mixed infection. The similar lay-out and strict observance of a sanitary regimen allow to reduce till a minimum and even completely to liquidate intrahospital infections in children's infectious subdivisions.

Boxes can be projected also on 2 beds by the area 27 m^2.

Semibox consists of the same rooms as box, but has no external entrance (exit) with tambour. Patients and the medical personnel enter to semibox through a sluice from a hospital corridor. In the section consisting from semiboxes, there can be patients only with identical infectious diseases.

Construction of infectious subdivisions with boxes cost much more expensively, but there are facilitates maneuvering by infectious beds and promotes full liquidation of intrahospital infections.

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 mothers milk;
— 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 half boxes. 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 application therapy. 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.

Medical-diagnostic unit of hospital:

a. surgery block;
b. department of regenerative treatment;
c. department of functional diagnostics;
d. anesthesiology;
e. X-raydepartment;
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;

— 1operational table on 30 beds of surgical profile is projected;

— height of operational should be not less than 3,5 m, area – 36–48 m^2.

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

Polyclinics should be placed in detached building, adjoining to a hospital in common places of accommodation for a hospital and a polyclinic of medical - diagnostic subdivisions.

About 40 % of all rooms are therapeutic and 20 % are surgical subdivisions of a polyclinic. Quantity of visits to polyclinic in the greatest shift it is necessary to accept equal 60 % of the total quantity of visits to a polyclinic in day.

The approach of patients to the building should be independent of entrance to a hospital.

The basic rooms of a polyclinic are medical, medical-and-diagnostic studies, waiting room for patients, registry, vestibule with checkroom.

Doctor's rooms should be oriented on the north. The area of a room of the therapist, the neuropathologist, the psychiatrist, the adolescentsdoctor is 12 m^2. The area of specialized rooms (the surgeon, specialist in skin and venereologic diseases, urologist, traumatologist) should have not less 18 m^2. The ophthalmologist room should have length not less 5 m for definition of visual acuity.

The polyclinic subdivision for children is completely isolated from subdivision for adults. Intake of children is carried out through the filter in which nurse asks parents about a child condition, examines a skin and mucous membranes, takes temperature. Children with the raised temperature, with attributes of acute infectious disease direct from the filter to box which has a separate exit at street.

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 its 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, roentgen angiography, 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.

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^{o}, aperture angle — not less 5^{o} is provided. Expediently is glassing of light apertures by uviol 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^{o} 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^{o} 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.

• E*xhaust ventilation* air from a premise is sucked away by means of fan and fresh air arrives in a premise naturaly.

• *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 ant epidemic 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/m^3 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 m^3/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/dm^3 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 dm^3, on 1 outpatient reception hours — 15 dm^3. In rural hospitals at absence of centralized hot water supply expense of water on 1 bed a day makes 100–150 dm^3.

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.

Neutralizationof 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.

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.

<u>It is spent by:</u>

— wiping;
— 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 antimicrobic 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 hipochlorite which receive by electrolysis method on electrochemical installations from 4 % solution of sodium chloride.

In the republic of Belarus electrochemical installation «Akvamed» 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/dm^3. 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 not screened 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 not screened 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 m^3 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 m^3 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, midwifes should wash hands necessarily at survey of each patient.

Preventive maintenance of intrahospital infections

The term «intrahospital infection» designates various infectious diseases with which patients fall ill in connection with treatment in hospitals or the persons who were fallen ill in connection with activity of physician.

Are allocated three groups of intrahospital infections:

a) ambulatory infection;

b) infection arising owing to preventive actions;

c) hospital infection.

Properly hospital infection is infectious diseases which arise in time or after hospitalization. So-called accompanying infections concern to this group (a mastitis at parturient woman, a sepsis at newborns, a pneumonia at measles), superinfections (for example, a sick by scarlet fever falls ill with a salmonellosis, the patient with a hepatites — a dysentery, etc.), cross infections, when there contagion of patients from each other. Frequently is met an infection arising at activization of own flora (for example, at the patient with virus disease of the upper airways the pneumonia can develops, after operative intervention - a tetanus, a gas gangrene, etc.).

The hospital is closely connected to an environment — from here their mutual influence. Are possible the latent cases, when the person, suffering disease come in a hospital, being in the incubatory period concerning other disease, or, on the contrary, leaves in the incubatory period of the disease, got in a hospital. The infection can be carry out by the personnel, in that way are observed flashes in families.

Sources of intrahospital infections are various. It is the infectious patients, who have arrived in a hospital with the mixed infection, the somatic patients, who have not sustained terms of quarantine; pathogenic staphylococcus carriers, carriers of intestinal infections.

The reasons of distribution of intrahospital infections also are various, that complicates struggle against them. On the one hand, this change of an inhabitancy and properties of microorganisms, presence in the hospital environment more virulent stamps, occurrence of stamps, resistant to antibiotics and action various disinfecting means, with another introduction in surgical practice of more and more difficult operative interventions, wide, frequently irrational and unsystematic application of antibiotics; infringement of a sanitary-and-hygienic regimen in hospitals and other medical institutions, an overload of wards, faults in work of ventilation, etc.

Special value has thus infringement of aseptic rules. Training of «feeling of prophylaxis» at doctors and paramedical personnel is very important. Absence of a preventive orientation in the organization of work of a hospital results in oblivion of necessity of careful and pedantic performance of aseptic instructions.

Activators of intrahospital infections are various. It's first of all air drop infections — flu, scarlet fever, measles, chicken pox, etc. Respiratory viruses play a role in occurrence of pneumonias. Then follow by value staphylococcal infections.

Last years serum hepatites have raised in worldwide. More often it is registered in hospitals and subdivisions for chronic patients with big incubatory period since the hepatites has time to be shown as intrahospital infection only under condition of long (months, years) stay of patients in a hospital.

Most beaten contingent are the newborns, prematurely born children, puerpera, patients with leucosis, a diabetes and the persons receiving corticosteroid, is especial immunosuppressive, therapy.

Struggle with hospital infections is difficult, since activators, as a rule, widely circulate in the intrahospital environment, have high stability to external influence, and mechanisms of transfer are rather various. As reliable methods of specific preventive maintenance of intrahospital infections are absent, carrying out of nonspecific actions is required.

To nonspecific actions for preventive maintenance of intrahospital infections concern: architectural-and-planning, sanitary-engineering, sanitary-and antiepydemic, disinfecting-and-sterilizing. Architectural-and-planning actions are directed on the prevention of distribution of the activator by section isolation from

operational blocks. Efficiency of sanitary-and-hygienic actions is provided with performance of all requirements, sanitary culture of patients and the personnel, correct statement of the bacteriological control, revealing among the personnel and patients of the pathogenic bacteria carriers and sanitation of these persons.

The second necessary part of preventive maintenance of intrahospital infections are the specific actions directed on increase of organism stability of patients to intrahospital infections. Effective specific preventive maintenance provides the actions directed on prevention of development of disease at people in case of their contamination. It purpose is creation of immunity in limits of incubation period. For example, with a view of sanitary preventive maintenance of pyoinflammatory diseases at parturient woman and newborns should be carried out active immunization of pregnant by cleared staphylococcal anatoxin.

Depending on character of used means emergency preventive maintenance can be subdivided on specific and the general: for specific are apply chemicals of the directed action (staphylococcal adsorbed anatoxin, antistaphylococcal hyperimmune plasma, antistaphylococcal gamma- globulin, bacteriophage), for general — antibiotics of wide spectrum action, strengthening means and others.

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 *Legionella*, *Mycobacterium tuberculosis* 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

Route	Description
	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

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 bloodtransfusions 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/m^3.

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 blood borne pathogens is mandated by the OSHA Blood borne 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 dezinfection-sterilising actions is carried out:

— underwear and bed-clothes are disinfected in laundry;

— blankets, pillows and mattresses are processed in dezinfection 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 acqui-

sition. Hydrogen peroxide is effective against endospore-forming bacteria, such as *Clostridiumdifficile*, 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.

Specificprevention 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.

12. ACTUAL PROBLEMS OF OCCUPATIONAL MEDICINE BASES OF PHYSIOLOGY AND WORK HYGIENE

In a modern society are improved safe conditions of work, but concurrently becomes complicated and increase psychophysiological load. Hard physical work is changed by intense work, with the raised degree of the responsibility for the analysis of the received information and for the maked decisions. Involving of sensor acoustical and visual systems occur on a background of the long forced work poses with changes in musculoskeletal system.

Index of development of human potential is the basic criterion of work conditions and life quality. In developed countries labourer's health is considered as an indispensable condition of production, quantity and quality of made production. Health of the work and services producer is economic potential of the country. Expenses for indemnification and insurance payments are huge and not effective, in a morbid society there cannot be a healthy economy and business. Primary prophylaxis of a professional pathology is not only humane, but also the most economical way of society development.

In Belarus is developed and act the state concept «Population health». Modern classification of working conditions has defined criteria of assessment of harm and danger of work process. The Ministry of Work and Social Protection has defined a technique of workplaces certification on working conditions. Complex assessment of working conditions includes hygienic and psychophysiological factors, criteria of emotional and physical efforts, aesthetic and physical discomfort.

The subject of studying, the purposes, tasks, methods

The physiology and hygiene of work are integrated into one concept — **medicine of work.** Occupational medicine is a science about population health preservation, methods and ways of its improvement, prolongation of the active period of live ability and life quality. It concerns to preventive medicine. Realization of these positions is carried out through system of nation-wide, public, individual actions on the basis of legislative support of the State. A subject of

studying in occupational medicine — conditions of work process, and object of supervision — human organism in interrelation with working conditions, character of work. Worker's health, changes in functional systems, workability is studied. Questions of somatic and mental health in different modes of work, processes of tiredness and their prophylaxis are considered.

The purpose of studying — to promote an efficient use of physical and mental opportunities of the person, modern means and technologies of work for growth of work productivity, quality of production at the least economic expenses and social loss.

Tasks of occupational medicine: a qualitative and quantitative assessment of influence of concrete conditions and work kinds on physiological, mental functions of human organism; development of improving and preventive actions.

The medicine of work is conditionally subdivided into the general and particular. The general medicine of work studies the general laws of influence of negative industrial environment and work process factors, their combinations on an organism. Large, independent sections of the general occupational medicine are physiology of work, psychology of work, hygiene of work, industrial sanitary, a work safety. The particular medicine of work in a complex studies influence of conditions and character of work process on worker's health, their work capacity and workability in separate sector of the national economy.

Methods of research in occupational medicine are subdivided on subjective, objective and complex. To subjective methods concern visual supervision, descriptions of objects, questionings, materials and reports of public organizations. To objective one concern: tool measurements of industrial environment parameters; timing of day and operations; work productivity; changes of physiological reactions; physical and mental tiredness; studying of common and professional sickness rate; traumatism; temporary and long-term effects; mathematical methods of medical statistic; results of experimental researches; clinical supervision; the data of medical periodic surveys; mathematical modelling and forecasting on the basis of computer programs; a databank of monitoring.

Terms and definitions, the basic concepts of physiology and hygiene of work

To the basic terms, definitions and concepts concern:

Working conditions — set of factors of the industrial environment, influencing on health and workability of the person during work.

Health is a condition of full physical, mental and social well-being, and not just absence of illness and physical defects.

Workability — the condition of the person determined by an opportunity of physical and mental organism functions, which characterizes its ability to perform concrete quantity of work of the set quality during required time interval.

Workplace — a place of constant or temporary stay of worker during work activity.

Working zone — the space limited in height of 2 meters above floor level or a platform on which is worker.

The working day (shift) — the duration of work, established by the legislation (in hours) during the day.

A leading production factor — the factor, which specific action on an organism are shown in the greatest measure at combined or complex action of some factors.

Character of work — set of forms of the work organization, workplaces, shift system, regimen of work and rest, ergonomic, aesthetic and psychology of work.

Hygiene of work is the preventive medicine studying conditions and character of work, their influence on health and a functional condition of the person, developing scientific bases and practical measures of the common and professional morbidity prophylaxis.

Physiology of work — the preventive medicine studying changes of a functional organism conditions in work process, developing scientific bases and practical measures of tiredness prophylaxis and support of workability.

Hygienic criteria are the parameters, allowing to evaluate a deviation degree of the industrial environmental and work process parameters from hygienic norms.

Physiological criteria are the parameters, allowing to evaluate a deviation degree of physiological functions parameters from regulatory value.

Static work — process of traction for body maintenance and its parts in space during work, instruments and subjects of work.

Dynamic work — process of traction for materials handling, body parts or whole organism during work.

Brainwork — reception and information processing with a tension of the sensory systems, attention, memory, thinking, decision-making.

Fatigue — subjective sensation of tiredness and objective decrease of workability, quantity and quality of parameters of work, accuracy of movements, delay of reaction, the mistakes.

Principles of conditions and kinds of work classification

Forms of work activity are conditionally subdivided into kinds of work with preferred loading either on the musculoskeletal system or on sensory and emotional - cogitative sphere. **Main principle of classification** of work kinds is physiological criteria. Physiological classification of work activity with significant muscular activity is based on energy expenses. Easy physical work — 1 category A and B, would be carried out sitting or standing, or with insignificant moving in space across or vertical. Factor of physical activity (FPA) — no more than 1,6. Average work 2-nd category also are subdivided on A and B, they connected to constant moving of body parts or whole body in space, subjects and instruments of work. These are partly mechanized kinds of work. The factor of physical activity 2,0.3-d category of work — heavy physical work is con-

nected to constant moving a body and a cargo across and vertical, FPA 2,2 but can be and more.

The factor of physical activity defines the relation of the general energy expenses to expenses of the basic metabolizm. Leading physiological criterion of physical work is oxygen consumption at work and restoration time, and also pulse, functions of nervous system, respiratory, exchange processes. **Static work** is more exhausting, blood circulation in intense muscles is complicated, anaerobic energy provision goes with accumulation of lactic acid. **Dynamic work** is subdivided into the general, regional and local, represents the most widespread kind of activity. General muscular work is carried out with involving significant value of skeletal muscles. Regional muscular work is carried out mainly by muscles of a shoulder girdle and the upper extremities. Local muscular work is carried out with participation of insignificant muscular groups.

Easy physical work is frequently accompanied by monotony, which is the negative factor, results in tiredness, reduction of attention. Monotonous repeated movements result in braking process, dispersion of attention, decrease of reactions speed. Such kinds of work are registered at conveyor manufacture, work on one operation, at operators, dispatchers. Such concept is connected to braking processes as tiredness — transient reduction of the workability, restored after rest. Mental work are defined by a tension of sensory, emotional-and-cogitative sphere. At these kinds of work there is a reception of the information, they processing, decision-making. This is work of operators, administrative work, creative, pedagogical, students, doctors. The principle of classification take into account number of perceptible marks and the responsibility for the making decisions. Mental work is connected with neurophysiologic changes of a brain — its blood supply amplifies, the energy exchange raises, parameters of bioelectric activity change. The energy exchange makes up to 20 % from the general metabolism, consumption of oxygen — in 5 times more, than is spent by a skeletal muscle of the same volume. At the moment of making of a critical decision and at time deficiency are marked significant changes in cardiohemodynamics, breath. Intellectual kinds of work are accompanied hypodynamia, the forced working poses. The physiological picture physical and mental work is similar. At mental work the muscular tiredness is constantly observed also. Renewal of work on a background of tiredness results in over fatigue which is characterized by headache, feeling of weight in muscles, slackness, absent-mindedness, decrease of attention, memory, sleep disturbance.

Physical, intellectual, monotonous work can takes place in different working conditions. Classification of working conditions is built on a principle of the account of harm and work danger, on hygienic criteria and functional changes in organism systems. They are subdivided into four classes: optimal, permissible, harmful, dangerous.

Optimal working conditions — 1 class, such conditions at which worker's health hold out and are created preconditions for maintenance of a high level of

workability. Optimal conditions are established for the closed premises on microclimatic parameters. For other factors, optimal conditions are considered such conditions, at which these other factors at all are absent, or are within the limits of safe levels.

Permissible working conditions — 2-ndclass, are characterized by presence of different environmental factors and work process, at which in an organism there are functional changes in systems and they are restored after regulated rest or to the following shift. These functional changes should not render adverse action in the nearest and long-term period on workers and on their posterity.

Harmful working conditions — 3-d class, is characterized by presence of the harmful production factors, exceeding hygienic norms, render harmful action on an worker's organism. The third class on a degree of harm is subdivided into 4 subclasses — 3.1; 3.2; 3.3; 3.4.

Class 3.1 is the least harmful, functional changes in an organism are restored, but for longer term, instead of to the beginning of shift and increases risk of health damage. The class 3.2 causes more stable functional changes, increases industrial-caused morbidity, easy forms of occupational diseases at the experience of work more than 15 years. The class 3.3 is characterized by such conditions, at which occupational diseases develop of an easy and average degree with loss of professional workcapacity. Growth chronic caused by industrial pathology is simultaneously marked with temporal disability (on 100 workers — 110–119 cases and 1100–1119 days of invalidity).

At conditions of a class 3.4 there are heavy forms of occupational diseases with loss of the total workcapacity, significant growth of number of chronic diseases and a high level of disease with temporal loss of workability (120–149 cases and 1200–1499 days of invalidity per 100 workers is marked).

Working conditions of 4-th class are accepted dangerous, extreme. During shift or its part threat for life, high risk of development of acute professional defeats, including heavy forms is created.

Hygienic estimation criteria of working conditions, depending on weight and intensity of work process

Weight of work is the characteristic of work process reflecting primary loading on the locomotor apparatus and functional organism systems (cardiovascular, respiratory, metabolic, secretory), which provide process of work. Weight of work is characterized as **static load**, a working pose, a degree of body inclination, and **dynamic load** — by weight of a lifted both moved cargo across and vertical, moving in space of the body, the total quantity of stereotyped working movements. All these kinds of dynamic and static load can take place in different working conditions — in optimal, permissible, harmful and dangerous.

Intensity of work is the characteristic of work process reflecting loading mainly on the central nervous system, sense organs, emotional sphere of the

worker. To the factors describing intensity of work concern: intellectual, sensory, emotional loading, a degree of monotony of loading, an operating regime.

The estimation of physical work weight is made on the basis of all parameters account:

1) physical dynamic loading in kg (external mechanical work per shift); 1.1 — at regional and 1.2 — total load, separately for men and women;

2) depend on weight of a lifted and moved cargo manually, kg; 2.1 once-only; 2.2 within one hour; 2.3 alternate; 2.4 from a floor; 2.5 from a working surface;

3) depend on stereotyped working movements, quantity per shift at 3.1 — local load; 3.2 — regional;

4) depend on static load — size of static load per shift at keeping of a cargo, with effort, kg (forces) • sec = kg sec: 4.1 by one hand; 4.2 — two hands; 4.3 — with participation of body muscles; 4.4 — feet; separately for men and women.

The assessment on a working pose: it can be free, fixed, inconvenient, sitting, standing. At body inclination take into account it's the forced inclination or quantity of inclinations during shift. Technological process sometimes demands moving the worker or across or in a vertical. Is calculated quantity meters or kilometers per shift.

In the beginning is established a class of working condition on every parameter. The assessment is made on a parameter of the highest degree of weight. The maximal level of weight is 3.3 class. Class 1-st it's easy physical work, 2-nd — permissible ones, average physical load. Weight of work is expressed in ergonomic units and does not depend on specific features of individual participating in work. All measured parameters are entered in test report. At presence of two and more parameters, concerning class 3.1 and 3.2, total assessment is established above on one degree of work weight. In the test report is underlined surname, profession, production type, the brief description of active job under the certain scheme. The total assessment is established and subscribed by the doctor — hygienist.

The estimation of work intensity is made on classes also.

Class 1 — optimal conditions, intensity of work of easy degree.

Class 2 — permissible intensity of work of average degree.

Class 3.1 — harmful, intense work. The most high-level of intensity is 3.3.

Intellectual load are taken into account depending on decision-making necessity; task solution according to description; according to algorithm; heuristic — creative activity. The next parameter of work intensity is signals (information) perception and their correction, comparison to other signals, complex estimation. On character of active job — under the individual plan, under the established schedule: job at time deficiency; with the raised responsibility for the final result. From sensory loads are defined duration of a supervision concentration; density of signals and messages in unit time; on the sizes of objects of recognition; job with optical devices; supervision over screens of videoterminals. Take into account separately load on the vocal apparatus — quantity talking hours; load on auditory analyzer with distinction and the analysis of signals. On

a degree of emotional load — the personal responsibility for performance of tasks, responsibility for collective; for production quality; for safety of other persons. The degree of monotony of job is defined depending on number of elements in unit time; duration of performance of repeating operations, monotony of industrial condition. The operating mode, actual duration of the working day is especially taken into account. Optimal variant — 6–7 hours per shift, allowable variant — 8–9 hours, a harmful working mode — 10–12 hours. For restoration of organism functions plays a role interchangeability of work. The optimal class of work conditions is a job without night shift. Allowable condition is two-shift job without night shifts. If job is three-replaceable with a night shift it is harmful working condition (class 3.3). According to scientific organization of work and dynamics of workability are established regulated breaks, their duration. If break duration of 7 % from duration of a work shift it's an optimal variant; from 7 % till 3 % — allowable break duration and less of 3 % — insufficient break duration for functions restoration, are possible overfatigue.

The assessment of work intensity is carried out irrespective of profession (trade) with 22 parameters. The selective account is not admitted. On every parameter is defined the class of work. If any parameter is not presented, the first class intensity of working conditions is put (easy degree). If 17 parameters of a 22 are estimated as the first class and there are no parameters 3.1, the total assessment is given as optimal working conditions, easy degree intension. If 6 parameters of a 22 belong to second class, a total assessment — an average degree of work intension. The most intension class of work is 3.3 All data are entered in the minutes, the total estimation is given by the doctor — hygienist, privileges and indemnifications, protection means are defined.

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 3 — 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.

Fatigueprevention:

— 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.

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, infra-sound, 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).

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.

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 solutions and disinfectants. Personnel of

medical-sanitary unit 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-terapeut and all necessary experts and also realization of instrumental and laboratory researches should be supplied.

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 $м^3$, area — not less than 4.5 $м^2$ 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 m^3/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.

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.

Pneumoconiosis is a chronic lung disease caused due to the inhalation of various forms of dust particles, particularly in industrial workplaces, for an extended period of time. Symptoms are:

- shortness of breath, particularly on exertion;
- wheezing;
- chronic coughing, which may or may not be accompanied by mucus;
- fibrosis of the lungs;
- swelling in the legs due to excessive strain on the heart.

Depending upon the type of dust, the disease is given different names:

- coal worker’s pneumoconiosis (also known as «black lung» or anthracosis) — coal, carbon;
- asbestosis — asbestos;
- silicosis (also known as «grinder's disease» or Potter's rot) — silica;
- berylliosis — beryllium;
- siderosis — iron;
- byssinosis — cotton;
- silicosiderosis — mixed dust containing silica and iron.

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. sleep 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 sleep;

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:

f. skin temperature raises;

g. water-salt exchange is broken;

h. there is organism dehydration;

i. loss of mineral salts and water-soluble vitamins;

j. 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.

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, 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 min through everyone 2 h;

— for teachers — 4 h with break 15–20 min through everyone 2 h.

Hygienic characteristic of weight and intensity of work

Heaviness of the labour — 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 the labour — 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.

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.

Routes of exposure of toxins:

• inhalation;

• ingestion;

• absorption through the skin;

• less common:

• injection;

• absorption through eyes and ear canals.

Inhalation — most common route of entry into body, therefore our area of highest concern. Lungs are designed for efficient gas exchange between the air and bloodstream, therefore great potential for toxins to enter bloodstream.

Skin absorption (2nd most important route) — materials can be absorbed into blood stream just below the skin surface or toxins can be stored in fat deposits. Obviously workers can easily expose their hands into solvents, oils, chemicals, etc., plus these materials can be sprayed or rubbed on other parts of the body. Many chemicals are either soluble in water or in oil (fat, lipid). The skin easily absorbs lipid-soluble materials, water-soluble materials are not easily absorbed.

Ingestion (3rd most important route) is not usually intentional. The digestive tract is moist and designed for efficient absorption. Surface area of intestines is greatly increased by small projections (villi). Thin surfaces, highly vascularized. Materials easily transferred to bloodstream.

Distribution of toxins — once toxins are in the body, there are several mechanism of movement and action. Arrived in an organism industrial poisons intensively collect in bodies and tissue having good blood supply. After inhalation toxics may enter bloodstream, irritate or scar lung tissues directly. After skin absorption toxics may enter bloodstream, irritate, corrode or burn skin directly. The exit of poisons in a bloodstream occurs at diseases, nervous stress, cooling, overheating, alcohol reception.

Once absorbed into the body, toxins can move to other tissues and organs through various ways:

• filtration — toxins move through membrane pores;

• diffusion — movement from higher concentration to lower concentration;

• active transport — movement across a membrane otherwise impermeable by a transport mechanism; chemical reaction or carrier molecule, requires energy;

• phagocytosis — toxins «eat» or engulf other cells or by use of white blood cells.

In an organism industrial poisons interact with structural components, chemical substances of cells and an intertissue liquid and are exposed to metabolism. Poisonsmetabolism 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 characterized 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, benzine, 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 merculialism, 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. 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.

Hygienic characteristic of biological factors

Pathogenic microorganisms can cause allergic diseases, candidiasis, chronic bronchitis, bronchial asthma, etc.

Can be infectious diseases:

a) bacterial (tuberculosis, brucellosis);

b) virus (ornithosis, rabies);

c) fungicide (actinomycosis);

d) protozoologic (toxoplasmosis);

f) gelmintosis nature (trichinosis).

Professional infections can arise at short or even unitary contact.

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/m^3, hydrogen sulphide — 10 mg/m^3, nitrogen oxide (IV) — 2 mg/m^3, chlorine — 1 mg/m^3, sulfuric acid — 1 mg/m^3, alkalis — 0.5 mg/m^3, benzene — 5 mg/m^3, acetone — 200 mg/m^3.

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, ear plugs, muffs, safety glasses, respirators, gas masks, overall, aprons, trousers, boots, hard-hats special linen and clothes from the rubber and other materials steady against toxic substances).

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 dangerotraumatism.

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, non limiting 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.

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:

a. heating up microclimate;

b. air pollution of working zone by dust and exhaust gases, pesticides, mineral fertilizers, etc.;

c. noise and vibration presence;

d. contact with fuels and lubricants oils;

e. intense working pose.

Adverse factors at work in animal industries:

a. compelled working pose;

b. pollution of air environment;

c. special microclimate of working premises;

d. physical and nervously-emotional stress in an operating time;

e. contact with toxic irritating substances;

f. 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

P — it's total name of chemical protectors of plants against harmful microorganisms, plants and animals.

In the world market now total about 10000 marks of pesticides (P) incorporated into 450 chemical compounds. It is annually published about 2500 patents for application of new pesticides, more than 20000 chemical compounds are annually tested for pesticide's activity. In RB it is applied more than 3000 P and the volume of their use grows. Now the situation when the mankind applies P in

increasing quantity was generated, becoming thus directly or indirectly by a target of their influence on organism.

On chemical P structure are divided into the following groups:

1) chloroorganic P;
2) organofluoric P;
3) organomercuric P;
4) preparations As;
5) derivatives of phenols;
6) cyanic compounds and some other.

Depending on orientation of action are distinguished:

1) insecticides (for struggle against insects);
2) fungicides (for struggle against viruses, bacteria and mushrooms);
3) herbicides (for struggle against weeds);
4) regulators of plant's growth.

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.

Fertilizer — are materials, either natural or manufactured, containing nutrients essential for the normal growth and development of plants. There are:

— organic fertilizers;

— inorganic fertilizers (composed of synthetic chemicals and/or minerals).

Fertilizers typically provide, in varying proportions:

• six macronutrients: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg) and sulfur (S);

• six micronutrients: boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn).

Effects of fertilizers. Nitrate levels above 10 mg/L (10 ppm) in groundwater can cause 'blue baby syndrome' (acquired methemoglobinemia), leading to hypoxia (which can lead to coma and death if not treated). Nitrite may react with compounds in the stomach to produce N-nitroso-compounds, particularly nitrosamines, which have carcinogenicity.

Mercury, lead, cadmium and uranium are some of the toxic heavy metals that have been found in fertilisers and can cause distrubances of the kidneys, lungs and liver and cause cancer.

Usage of fertilizers can cause dermatitis, rhinitises, conjunctivitis, resorptive action leading to dystrophic changes of a liver, kidneys, a spleen and heart.

Prevention of professional pathology at workers of agriculture is spent by the same principles, as in industries and includes legislative, technological, sanitary-technicals, 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.

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 super high 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 ofphysiatrists:

— 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 ofroentgenologists 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 m^2, equipped with refrigerators, electrowater-heating devices and washstands. Med-

ical 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.

Dynamics of workability and prophylaxis of tiredness

Tiredness is not only physiological process, but also social-and-biological ones, interrelated with factors of the industrial environment, work motivation. Biochemical changes at heavy physical work are similar to those in animals experiment, on an isolated nervous — muscular preparation. The received data in experiment cannot be extrapolated completely on activity of the skilled worker in different kinds and working conditions.

The physiological nature and the mechanism of workability dynamics at work in optimal tempo reveals typical law. According to it exist prologue, stable workability stage, tiredness. Therefore tiredness is considered as a stage in dynamics of workability and use it in practical activities at the decision of work organization questions. In a basis of tiredness mechanisms lays the parabiosis phenomenon according to N. E. Vvedensky doctrine. According to A. A. Uhtomsky — a principal cause of tiredness is coordination frustration in functioning systems. This theory of tiredness is most recognized. The somatic nervous system submits to human consciousness, the vegetative nervous system — only indirectly depends on conscious activity and submits to the central nervous system. The cortex of cerebrum preserves muscles and other systems against tiredness and destructions.

The basic mechanism of workability is physiological lability of nervous system that underlies the central regulation of process. Through lability are established the coordination, stability of nervous processes which characterize a dynamic stereotype, a dominant, musculoarticulate sensation, accuracy of movements, coordination, automatism. Any external or internal infringement breaks this coordination, one of manifestation which is the tiredness. External sanitary-and-hygienic factors, their levels of harm and danger and time of an exposition are capable to break any circuit in this harmonious part. Therefore studying of workability and tiredness should be complex and use results of supervision in physiology and work hygiene, in questions of the work organization.

At beginners the tiredness by virtue of unusual activity for them faster develops (fast tiredness). It is observed and at workers with the experience at development of new operations or the elements, new machines and the equipment. From the economic and social — biological point of view the experience of work in one

speciality, a trade when high qualification of the worker is got is encouraged. At qualified employees tiredness develops slowly, with the phenomena of overfatigue is marked at harmful working conditions of the third class. In this case the experience of work untill 15 years is limited with the purpose of occupational diseases prophylaxis of easy degree and increase is industrial the caused total morbidity with loss of temporary work capacity (quantity of cases 110–119 per 100 workers). If works are carried out on the same manufacture and in the same speciality more than 15 years, probably persistent reduction of professional workability, growth of morbidity. All this is regulated and taken into account in work hygiene on the basis of the data of work physiology. All rehabilitation actions, physiotherapeutic procedures, sanatorium treatment are used.

At *intellectual work* the statical poses with primary use of the second signaling system, a brain prevail. Blood circulation increases in brain vessels, changes in visual — motor and acoustical reactions, electric brain activity are fixed. Processes of tiredness and workability dynamics depends on work intensity, conditions and personal quality of the worker also. The thinking and consciousness, a concentration of attention is connected to sensual, material processes in nervous system. Socially significant activity as well as physical work, is accompanied by the certain changes in organism system, formation of a dynamic stereotype. Formation of a dominant at intellectual work is accompanied by the big nervous tension of cortical processes, there is a danger of a functional tiredness and development of protective inhibition. Dominant formation is a long process, a level of perception and memorization at beginners is lower, their workability is low. Intellectual potential collects since the birth, significant role belongs reading, logic, personal disposition of the individual. Qualification is evaluated also by the work experience, but accumulation of overfatigue also is connected to duration of work in the given profession, with temporary, working and long-term memory. At intellectual work organization the significant role belongs to aesthetics, regulated breaks, psychological unloading, functional music.

At all kinds and working conditions workability during a work shift has the certain laws. The work productivity in parallel changes also. Similar law is revealed and in days of week, seasons of year. If the work organization is optimal on all work and conditions parameters the workability dynamics is expressed in stages: gradual increase of workability, steady workability, tiredness. During the first period traces of excitation are summarized that determines then workability increase. On reaching of an optimal level of excitability and mobility of reflex arch systems (a steady phase of workability) gradually there is a delay of pulses — functional properties of nervous system are reduced. There comes tiredness — the third stage in workability dynamics, which is characterized by the temporal functional changes, capable to be restored for the certain period of time, optimal variant — of 7 % time from a work shift. At the moment of a break is not recommended to be engaged in industrial activity with the purpose of prophylaxis of tiredness accumulation

in functional systems. Such laws are marked both on somatic and on sensory level. Speed of visual-motor and acoustical reactions (change of latent period duration) are subordinated to one organic law. During the first work hour the latent period is shortened, occurs gradual increase in workability. In the middle of the working day, in 4 hours, stabilization, steady workability is observed. Before a break, after 3–4 hours workability is reduced. After a break the workability level is higher, but tiredness effects are summarized and in 3–4 hours mobility of nervous processes is considerably reduced. In case of conveyor manufacture are entered additional breaks — the conveyor is stopped or its speed is slowed down. If the operator at a control panel there should be a second worker or autotrack of technological process. At physical work additional interreplaceable breaks (smoke breaks) are given.

Change of latent period time reflects mobility and lability of the nervous centers and depends on sanitary-and-hygienic working conditions, action of harmful and dangerous factors of technological process. Therefore workability and productivity are directly connected and to working conditions, and not just with psychophysiological processes.

Engineers, physiologists, psychologists, hygienists develop new kinds of machines, technological processes, improve workplaces, furniture with the purpose of production optimization, increase of its efficiency, tiredness, overfatigue and occupational diseases prophylaxis. All these changes are based on the scientifically-grounded measurements, parameters and concern to the scientific work organization (SWO). The design of the industrial equipment and the workplace organization should take into account such social factors as height and development, the nutrition status, anthropometrical and psychological features worker and youth.

Modern kinds of work are accompanied by the small mobility, the compelled body inclinations and the fixed working poses at conveyor work, at control panels, at students, doctors, teachers, at economic and bank workers. Biomechanical features of muscular skeleton system, vision and hearing are studied. The optimal pose of the person provides long, unfatiguing work, change of a pose during work is recommended for static tension removal, positive effect give sitting - standing position changes. Long standing work with inclination of the case also is tiresome, for tension removal are entered 5–7 minute breaks within shift. The ratio sizes of workplaces for men and women are not identical, zones of reach at them are different, according to data of anthropometrical measurements. In a modern social and economic society the deviation from these laws is observed.

Work activity in modern kinds of work makes great demands of several human functional systems, however one of them will be leading. Similar level increase of a leading system refers to functional tension. The tension of excitable systems (a muscle, nerves, a centers), is connected to increase of energy expenses (ligaments, tendons, a bone tissue) with local functional changes in them. If tension levels are not high, working conditions are optimal, restoration occurs during work. In allowable conditions

restoration occurs to the following shift. At irrationally organized work there can be traces underrecreation, tiredness accumulation, a condition of tiredness for excitable systems — temporal visual acuity, hearing, taction reduction, etc.

Rational of work and rest modes are such ratio and the content of work and rest periods, at which long, steady workability is kept and combined with high steady work of functional systems without tiredness. There are some forms and kinds of rational work and rest construction. First of all, lunch break under the legislation and paid kinds of intrashift breaks, different on duration depending on kinds of work, its weight and intensity. At especially hard works, the ratio of an operating time and rest is in a proportion 1:1.There are special, scientifically-grounded formulas of rest time calculation depending on weight and work intensity. At these calculation are guided by the limiting parameter demanding significant indemnification by rest. The lunch break does not enter into this total time. Except for regulated breaks during work there are micropauses — spontaneous time intervals between operations, which are formed due to rate change of operations performance.

The correct organization of work process is a construction of working movements on physiologically favourable use of force, speed, harmony of the movements, the most favourable and not very exhausting working pose. Skilled qualified workers in the beginning take faster rate, then it slow down, distribute force and rate according to muscular-articulate sensation. The beginner tries to support the same rhythm, force, makes many superfluous movements with the greater amplitude, get tired faster. Change of body position at work with the help of specially designed chair is not only overstrain prophylaxis, but prophylaxis of musculoskeletal and vascular diseases also. It is offered in SWO system not only microbreaks, and two or three breaks for 20–30 minutes with use of additional means and methods for functions restoration. For example, at work with vibroacoustic subjects, machines in these breaks are used warm trays for hands for angiospasm elimination. Application of functional music not always gives a positive effect at all workers by virtue of different types of nervous system.

Besides shift breaks under the legislation daily, week, monthly, annual regimes of work and rest are established also. At a daily mode the worker should suit rationally to himself the periods of rest, high-grade sleep, with the purpose of functions restoration to the beginning of shift. During a week are allocated days with the greatest workability. It’s basically Wednesday-Thursday at six-day working week. It is necessary to include purposeful physical exercises, industrial gymnastics in elements of rational work and rest.

The basic systems feel a tension — a boundary condition between norm and pathology. The overstrain is regarded as risk factors of development of various organism systems diseases. At that immunity activity is reduced (risk factors of development of industrial caused disease with temporal disability). Finally these are reasons of a professional pathology of the basic four systems: muscu-

loskeletal (MSS), peripheral nervous system (PNS), visual system (VS) and vocal apparatus (VA).

Rather effective means of tiresomeness work reduction are industrial aesthetics, a combination of color, light, architectural and sound appearance of shops, sites, places of rest. All colors depend on influence character on human nervous system shared on three groups: stimulating, calming, neutral. The colors are used as alarm.

The essential factor is the moral and psychological climate of work collective. It is defined as satisfaction of collective members by interpersonal relations, mood, emotions. The social essence of a healthy microclimate is shown by collective stability, its solidarity, reduction of working hours loss.

Modern classification of working conditions on a danger and harm degree, a degree of weight and intensity of work process at the state level guarantees the maximal protection of workers from these factors, preservation of their health at the simultaneous personal responsibility of the individual for the health.

13. ACTUAL HYGIENIC ASPECTS OF PROTECTION AND STRENGTHENING OF CHILDREN AND ADOLESCENTS HEALTH

Dynamics of a children's health state in Belarus is characterized by increase in functional disorders and chronic diseases. The technology of complex social-and-hygienic monitoring of children's population health in Belarus is developed. Analysis of health state is used in view of quantitative integral estimations in marks of day regimen parameters of the schoolchildren in concrete conditions of training.

In structure of diseases the first place is occupied with illnesses of respiratory system, nervous system, sense organs and the third place – digestive system. The life style and the family status have an important role and the importance social component of the pupils.

Educational conditions of training should correspond to functional capabilities of the pupil.

Morphofunctional deviations registered at 60 % children are connected with the musculoskeletal system, and as consequence — bearing disorder, foot flattening. They are caused by low motion activity, disorder of rest regimen. Only 1/3 population are engaged in their health and family health.

There are certification of educational establishments, are planned to enter into schools staffs doctors, physical training to make by more health-improving form. Transition to subject training (4–5 classes) is accompanied fragile of stereotypes, differentiations in training, formation of the new collectives, falling on

critical pubertal period. These years are connected to intensive growth and development of pupil organism, their socialization.

Are distinguished the following components of health: somatic, mental, spiritual, intellectual, moral, social, emotional, personal. Criteria of estimation are acts and behaviour, a self-estimation, self-education, life-style.

For teachers it is a level of an academic load, a condition of physical-improving work, a condition of extracurricular educational work, the psychological help to pupil, preventive work in health life-style. For estimation of the quantitative health characteristic is entered the health index. The health index is a number of the revealed body system deviations to the common number of children.

Allocation of children and adolescents hygiene in independent discipline is caused by original conditions of education and the training, not conterminous with professional and public life of adults. The significant contribution to children and adolescents hygiene has brought F.F. Erisman: in law of growth and their development; in estimated parameters of physical development; about the reasons of occurrence of short-sightedness; has developed hygienic specifications on light exposure, on the sizes of school desks and their design (Erisman's school desk); on preventive maintenance of exhaustion - requirements to the timetable of lessons.

Profession of a physician in the field of children and adolescents hygiene is based on sanitary rules and norms, governmental decrees, certificates, laws and has the state character. However, the role of family and the person also is great and conclusive.

The subject, goals and objectives of children and adolescents medicine

Medicine of children and adolescents is a science about laws of growth and development of human organism into phylogenesis and ontogenesis; definition of a share of its basic components in this process; about methods and ways of hygienic regulation of generation health at a simultaneous combination of all complex of actions to teaching and educational process in preschool, general educational establishments, average special educational institutions.

School hygiene studies influence of the educational loading also, the forced pose at reading and writing, school furniture and conditions on growth, development, health state of pupils in different age groups and a health level.

The medicine of children and adolescents covers wide aspect of questions: sanitary-and-hygienic accomodation conditions of children and adolescents, quality of nutrition, protective clothes and footwear, intensity of training and education process, improvement and treatment. The system of state actions should be combined with public and not less important individual actions.

Subject of studying is teaching and educational process. Object of studying is children's and adolescent's organism.

The goal of studying is perfection of teaching and educational system, assistance to harmonious development of children and adolescents.

There are three basic medical, sanitary-and-hygienic problems at modern school: bearing, vision, organization of nutrition.

Hygiene of children and adolescents is closely connected to psychology-and-pedagogical sciences, pediatrics, social hygiene, epidemiology, physical training and sports.

The primary goal of children and adolescent hygiene, school hygiene is development of the hygienic actions directed on the illnesses prevention, creation of comfortable conditions for growth and development of all functional systems of a growing organism, strengthening of mental and physical health, preventive maintenance of deformation of the musculoskeletal system, visual impairment, increase of the general workability and progress.

The growing organism in the anatomophysiological features and functionalities considerably differs from the adult. Children are more sensitive to adverse environment influences, including industrial conditions. Their health in many respects is defined by correctness of a work and rest combination, color and light, air movement, ventilation, illumination, the forced pose at school desk, a working table.

Obligatory criteria of educational establishments include ten blocks:

1) a sanitary condition of establishment territory;

2) a sanitary-engineering condition of a building and its engineering accomplishment;

3) a set of the area and the equipment of rooms;

4) a light and thermal regimen;

5) conditions and the organization of teaching and educational process;

6) conditions and the organization of physical training;

7) a sanitary condition of eating establishment;

8) food organization;

9) sanitary-antiepidemic regimen;

10) the organization of medical help.

The Medical personal card which is filled for persons from 3 till 17 years is authorized also. This card contains data of medical survey, questioning of parents and certification of establishment and is a source of the information on a health state of children and adolescents, social and biological risk factors in family and educational establishment.

Complex estimation of a health stage of children and adolescents health is groups

The health state is determined by growth and functional development. Growth and development is a change of anatomic and morphological parameters, i.e. length and body weight, proportions of body parts, the cross sizes and volumetric, changes in physiological systems, tissues and organs — i.e. a func-

tional direction in age aspect. Growth and development are interconnected, depend from each other; from environmental conditions; hygiene social; school; hygiene of nutrition; work and rest; physical training and sport. The periods of amplification of growth are replaced by the periods of amplification of development, differentiation of tissues and systems and on the contrary. It is so-called heterochronia is diversity two phases of unitary process, harmonicity of this one depends on external and internal factors.

Hygienic aspects of children and adolescents health begin with preventive medicine at a stage of planning of pregnancy and delivery, the whole complex of protection actions of motherhood and the childhood. These are female consultations, maternity hospitals, social protection — antenatal and maternity leave, transference in safe and easy work, encouragements and compensations for the early registration in antenatal clinic. Are carred out genetic consultation, supervision, the control over intra-uterine development, recommendations of the health life style of the woman, her nutrition, movements, the rest. In an organism of mother is formed the third circle of blood circulation of an embryo and a fetus, first of all the best and worse acts it, a priority of new life.

All illnesses by children's legs are entered into adult life. The level and quality of health depends on many well controlled factors both genetically determined, and external nature forces, life-style and the help of preventive medicine. All interconnected complex of physical, mental and moral health is formed not only by the environmental biological-and-social factors, but also by the person.

Health is the best blessing. Scientific and technical process reduces a share of physical work and increases its intensity, intellectual and mental loading, reduces moving activity. There are three «whales» of physical, mental and moral health - a nutrition, movement, protection. The nutrition is becoming more refined, high-calorific, poor or deprived by biologically active substances more and more. Deficiency of sleep increase neurotic and asthenoneurotic conditions. Motoric «starvation» increases deformations of the locomotor system.

Health is integrated parameter which is formed from the following components: somatic, physical, emotional, personal, moral, intellectual, spiritual, mental, social.

For an estimation of children and adolescents health necessary to use four criteria as a minimum, namely:

1) presence or absence of chronic diseases at the moment of examination;

2) level of the achieved physical both psychological development and a degree of its harmonicity;

3) level of functioning of the organism basic systems;

4) degree of resistibility of an organism to adverse influences.

From the hygienic point of view of the greatest attention deserves the estimation the health state based on set of all four attributes.

According to the suggested scheme children and adolescents, depending on set of health parameters, are subdivided into five groups.

The first group are persons who do not have the chronic diseases, sick seldom for the supervision period, having normal, according to age physical and psychological development (health without deviations (rejections).

The second group is children and adolescents not suffering chronic diseases make, but the having functional and morphological deviations (rejections) frequently sick — 4 times per year and more, or have long one disease — more than 25 days (healthy, with functional deviations (rejections) and the reduced resistance).

The third group is the persons having chronic diseases or with a congenital pathology in a condition of compensation, with rare and not hardly current aggravations of chronic disease, without the expressed infringement of the general health state (condition of compensation).

The fourth group is persons with chronic diseases, congenital anomalies of development in a compensation condition, with infringements of the general condition and health state after an aggravation, with the long period convalescence after acute intercurrent diseases (condition of subcompensation).

The fifth group includes persons with heavy diseases in a condition decompensation, with considerably reduced functionalities (patients in decompensation condition). As a rule, such patients do not attend children's and adolescence establishments of the common structure and by mass surveys cannot be involve.

Children and the adolescents are referred to different health groups, require the differentiated approach by development of a complex of treatment-and-prophylactic actions. For the persons who are included in the first health group is organized educational, work and sport activity without any limits according to existing programs of teaching and educational process. The pediatrist or the adolescence therapist study in usual terms carries out their routine inspection. Children and the adolescents entering into the second health group (group of risk), demand more steadfast attention of doctors. The matter is that the given contingent requires a complex of improving actions which duly carrying out has the greatest efficiency in the prevention of chronic pathology development at children's and adolescence age. Hygienic recommendations for increase of organism resistance by nonspecific means have special value: optimal impellent activity, hardening by factors of the nature, a rational day regimen, additional vitaminization of food stuffs.

Children and the adolescents referred to the third, fourth and fifth health groups are subject to dispensary supervision at doctors of different specialists according to existing methodical recommendations on prophylactic medical examination of the children's population.

Patients receive the necessary medical and preventive help caused by presence of this or that pathology form and reduction of compensation. In children's and hardening establishments for them is created the sparing day regimen, is prolonged duration of rest and night sleep, is limited the volume and intensity of physical loadings, etc. If necessary, patients with chronic diseases or with congenital developmental aperiodicities are directed to special children's and adolescents establishments, where treatment and education is carried out purposefully in view of features of pathology.

In Belarus the purposeful program for preservation of pupils health is carried out.

Hygienic aspects of age per iodization

Biological factors of growth and child development are defined by the nature in the organism, and social conditions correct them. Irregularity of growth and development are known in hygiene as the periods «stretching», «rounding». «Stretching» takes place during puberty, it is replaced by «rounding» within youth and the growth ending till 18–20 years. «Disgusting duckling» turn in «fine swans», stately, relief young people with more coordinated and sedate movements. All stages of embryo maturing, a fetus, the person is divided for some age chronological, passport periods. Processes of growth, development and functionalities of an organism during these age periods are identical. Each age period finishes the certain qualitative and quantitative stage of accumulation and achievement of readiness for the certain activity, realization. Age periodization integrates children and adolescents under the biological and social status: to education, study, intellectual and physical loading, nutrition, formation of all kinds of health.

The first prenatal period is so important, that it is subdivided on days, weeks, months. Only 40 weeks (10 lunar months):

— embryonic — till 8 weeks;

— transitive — till 16 weeks;

— fetal — till 40 weeks.

The second period, postnatal includes:

1. the neonatal period — till 10 days;
2. breast — till 1 year;
3. early children's, prepreschool — till 3 years;
4. the first childhood, preschool — 3–5 years.

School age is subdivided on:

1) the second childhood, younger school age — 6–11 years;
2) adolescent age, average school — 12–15 years;
3) youthful, senior school age — 16–18 years.

Age periodization is necessary for a substantiation of health protection system and development of physical, mental and moral opportunities of children and ado-

lescents, their training and education. The calendar, chronological, passport age not always corresponds to their biological maturity, the difference can make limit 5 years. The reasons of developmental lag of an individual retardation can be factors of nutrition, movements, social and ecological one. The accelerated development can be both in ontogenesis, and in relation to the last generations. If acceleration of biological development goes in relation to the last centuries are used the term — acceleration. If acceleration goes in relation to homogeneous group its designate «secular trend». In XX century parameters of acceleration in all age groups were fixed. So, the newborns weight has increased on 100–300 gr., body length — on 1,5 sm. Doubling of weight occurs not to 6 months, and to 4–5 month. Change of a dairy teeth comes to the end on one year earlier and etc.

There are some hypotheses of the given phenomenon:

1. Physical and chemical hypotheses according to which it is considered, that children regimen are exposed to more intensive influence of solar, radioactive and electromagnetic radiation.

2. Alimentary-nutritive hypothesis — improvement of nutrition, increase in consumption of fats, proteins, vitamins, especially B_6 and B_{12} which stimulate growth and development.

3. Successes of medicine, development of a preventive direction in pediatrics.

4. Change of social and religious factors, deleting of borders between the nations and the states, the interethnic marriages. All this, undoubtedly, affects change of a heredity and acceleration of growth and development.

5. A hypothesis of urbanization — increase in irritating influence of an environment, rate of city life at nervous system, and also cinema, radio, TV, video, computer, the Internet, etc.

Process of acceleration has both positive, and the negative sides. Mental functions and physical qualities not always go in harmony, began more dispersion in the data in the same age groups of children, adolescents. This dispersion rather big — on some exponents — sigmas. According to this one diseases of respiratory, blood circulation, digestion system among children, adolescents grow, became more deformation of the musculoskeleton system, grow up death rate and a birth rate of defective intellectually and physically children. Begin more allergic, autoimmune diseases, rheumatism, etc. All this form new goals — about terms of the beginning of school education, about lessons duration, studies at school, about growth of children and the sizes of the educational equipment, clothes, footwear, etc.

At children of younger school age the bone system differ by insufficient hardness because of prevalence in its structure of organic substances in relation to mineral — calcium, phosphorus, magnesium. Changing of the skeleton form can be connected to it at static loadings, at wrong positions of a body standing, sitting, at the long forced poses. Process of ossification of hands comes to end

by 10–13 years that it is necessary to take into account at loadings on hand — the writing, physical loadings (expression, emphasises, hang, etc.).

The growth of bone system passes ahead of development of muscular mass. The muscular mass starts to develop strenuously approximately from 10–11 years (rounding off). But the increase in muscular weight and its force goes not simultaneously. Muscles of a trunk (backs, a shoulder, a hip) grow faster, than development of fine muscular groups, for example hands and feet. It is complicated with performance of the certain physical exercises, is registered bad coordination and stability. By virtue of it for children more approaches dynamic work and not so long (for 10–15 minutes).

Development of motility is closely connected to development CNS. In this age group coordination mechanisms in a bark of a brain are insufficiently advanced. During this period is marked instability of nervous processes, prevalence of processes of excitation over braking processes. Therefore it is necessary to dose out emotionality of classes. Instability of attention, fast approach of exhaustion which the child does not notice by virtue of the emotionality speaks also. All this is necessary for taking into account at the organization both intellectual, and physical work, strictly to normalize duration, character and size of loadings, it is necessary to provide switchings and micropauses.

In average school age the bone system has already same structure, as well as at adult people, but process of its growth, development, differentiation proceeds. Ossification of a backbone and an attachment of costal arches is not completed yet, danger by deformation of a chest and a back therefore is kept at the big statical loadings, wrong planting and a raising, carrying of weights — bags. As a result of often pressure at a chest at a support about a school desk is possible the curvature and chest forms with the subsequent infringement of normal activity of lungs function, heart, a gullet, large vessels. Incomplete ossification and basin bones adhesioncan result in their displacement at jumps from height, at rigid landing (broad jumps, high jump, for example). And further these displacement are fixed adhesion and the form of a basin varies, that can affect genital function at girls. Taking into account these features it is necessary for incompleteness of ossification to build the plan of a lesson of physical training, to give attention for bearing, correct statement feet, to correct planting, etc. to promote strengthening of a bone tissue and formation of correct bearing.

The muscular mass is characterized both strengthening of growth, and a gain of muscular force, especial at boys. Children's ability to performance of exercises with effort, resistance raises; time of continuation of the work increases, there is perfect a coordination of movements also, stability increases. But to overload with such exercises does not follow yet, it is better to apply high-speed, dynamic with switching on statics. At this age the period of sexual development, maturing begins also. In an initial stage excitability of nervous system, instability of mental sphere prevails, therefore badly there is an adaptation to physical

loadings and the regenerative period is delayed or it pass undulation. In this connection in this age group the individual approach is necessary, is especial at the beginning of sports lessons. Correctly picked up dosage of physical exercises on structure, force, time will promote normalization of the aggravated reactions, instability of the pshyho-and-emotional environment, the best adaptation and functional systems of an organism, in particular blood circulations, breath, digestion.

At the senior school age formation of bone and muscular systems comes to the end, marked strengthened growth of a body length, weight addition significant, the greatest gain of hand force, attachment. Accuracy and coordination of movements in general and fine movements in particular is improved. Parameters of physical development come nearer to those of adult people. At this age any specialization in sports is accessible.

Growth and functional development of a brain, differentiation of its functions comes to the end. There are possible more thin and difficult movements, acceptance of fast decisions at the moment of game, are balanced processes of excitation and braking, and consequently, inclusion in work and restoration.

Except for especial bone-muscular and nervous systems it is necessary to take into account features and all other functional systems, including, tactile sensitivity, cardio-respiratory system, metabolism, etc.

Anthropometry-Is the measurement of the human body. Measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition (Jelliffe, 1966).

General uses:

— to evaluate progress of growth: identify people whose growth is outside normal values suggesting under or over nutrition;

— screening tool to identify individuals at high risk of malnutrition;

— tomeasure changes over time: monitor effects of nutrition intervention for treatment of disease, surgery or malnutrition. Also, can track weight changes that may indicate disease.

Anthropometric data uses:

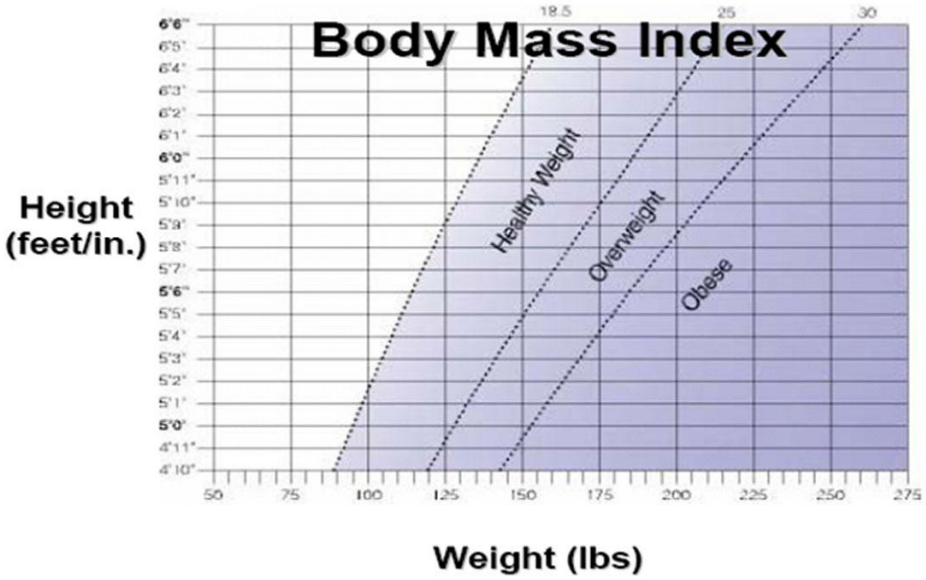


Figure 5 — Anthropometric of BMI

Identify risk factors for chronic disease i.e. elevated BMI.

Anthropometric data uses

- Good to track growth in kids (growth chart).
- Typically measure weight, length, head circumference (brain growth).

Body Mass Index (BMI) or Quetelet's Index

$$\textbf{BMI} = \frac{\textbf{weight (kg)}}{\textbf{height (m}^2\textbf{)}}$$

This ratio was first suggested as a measure of fatness by Quetelet in 1869

Example: if x weighs 58 kg and he is 165 cm (1.65 m) tall, what is his BMI?

$$BMI = \frac{58}{1.65^2} = \frac{58}{2.7225} = 21.3 \text{ kg/m}^2$$

Classification of weight in adults according to BMI

BMI (kg/m^2):

— Underweight < 18.5.

— Normal range 18.5–24.9.

— Overweight > 25.

■ Obese class I: 30.0–34.9.

■ Obese class II: 35.0–39.9.

■ Obese class III: > 40.0.

Example:

➢ Subject: Male.

➢ Age: 48 y.

➢ Height: 1.96 m.

➢ Weight: 125 kg.

- BMI: 33 kg/m^2.
- Classification: Obesity level I.

Head circumference for age

Index of **chronic protein energy** nutritional status during first 2 yrs of life.

Weight for age

Index of **acute malnutrition** widely used to assess protein energy malnutrition **&** over-nutrition in children from 6 months to 7 yrs.

Limitations include

1. Age often unknown.
2. Composition of the weight unknown (lean, fat, oedema, tumour etc.).

Weight for height

Sensitive index of **current nutritional status** which is relatively independent of age between one and 10 yrs.

Can be used in conjunction with weight for age.

Height for age

Within populations, heights of children at a given age **reflect their nutritional status.**

Waist circumference / hip circumference

An indicator of body fat distribution.

High health risk at 0.82 for women & 0.94 for men indicating a tendency for central fat deposition & possible ↑ health risk.

Hip circumference with clothing introduces error.

Figure 6 — Hip circumference

Skin fold thickness:

Most of the fat stored in the body lies immediately under the skin;

The thickness of a fold of skin picked at strategic sites indicates the amount of subcutaneous fat;

Based on the idea that a measure of the largest deposit of body fat may provide a reasonable estimate of **totalbody fat**.

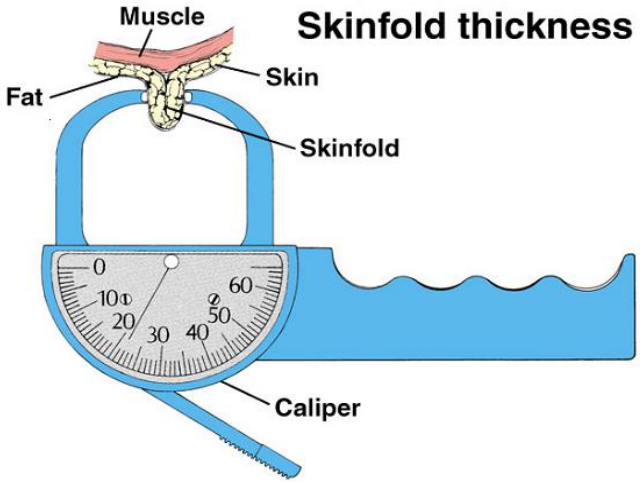


Figure 7 — Skin fold thickness

Total body fat: fat within subcutaneous adipose, bone marrow, visceral and intermuscular fat.

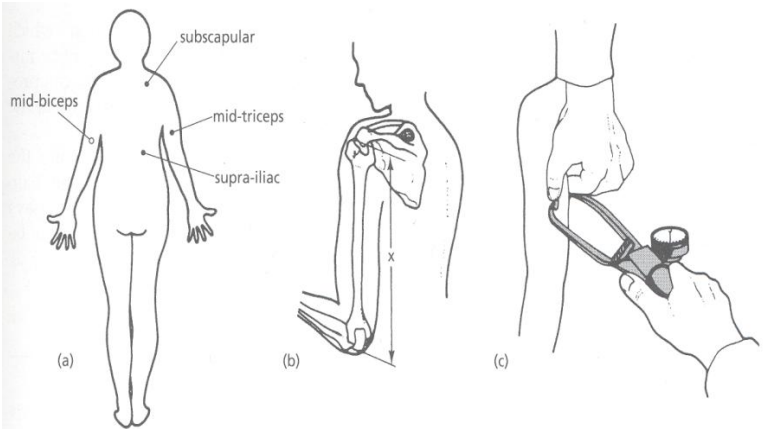


Figure 8 — Skin fold thickness at 4 sites

The organization of medical examinations of children and adolescents. Definition of a degree of readiness for school education

The children and adolescents health state depends on the organization of their medical maintenance. Form of medical help basically is concentrated in hands of the local pediatrist (in conditions of a polyclinic, in-home), chargeable the preventive help (in conditions kindergarten, schools) doctors working in children's establishments.

Medical examinations of 5 age children has special value for preparation of the child for school, allow not only to reveal in due transient deviations in their health condition, but also to carry out maximal full improvement.

The program of an elementary education, application of an active method as a whole corresponds to age opportunities of the six-year child. At the same time some first-graders badly adapt for school conditions. It occurs at completely normal

intelligence many children, have no sufficient functional readiness for school. As have shown special researches, «not ready» to school there are children with lag of biological age, with some diseases or functional deviations, with developmental lag psychophysiologic functions most connected to educational activity.

The majority children who are not having sufficient functional readiness for school education, do not cope with requirements of the school program and the school schedule. Unavailability of children to school is adversely reflected in their workability, progress and health state.

So, according to data of Institute of hygiene and preventive health care among children more than 50 % this one, which went to school, hadn't «school» maturity and during training in the first class have worsened a health condition both due to functional deviations, and due to deterioration of current or occurrence of new chronic diseases.

Therefore there is a necessity of careful duly diagnostics of a readiness degree of each child for entry to school. Such diagnostics is based on results of versatile medical research and the special researches determining a level of development of «school-necessary» functions.

All children who goes to school is necessary in September – October of the year previous to entry, are subject to the first in-depth examination. The in-depth medical examination (prophylactic medical examination) is carried out in kindergarten or a children's polyclinic by pediatrist, otolaryngologist, ophthalmologist, neuropsychiatrist, surgeon — orthopedist, stomatologist. In the same terms by the doctor of children's preschool establishment or a children's polyclinic it is carried out psychophysiologic examination of all children. Results of the first in-depth medical and psychophysiologic children examination fix in a medical card of child development.

To children having deviations in health state is appointed the complex of medical and improving measures. To preschool children, at whom are revealed lag in development of school-necessary functions (a motility, speech), is appointed a complex of exercises on their correction. Medical and improving actions are carried out by doctors of a children's polyclinic. Elimination of articulation defects are carried out by the doctor — logopedist.

Exercises for motility development (drawing, modelling, games with fine designers, etc.) can be made by kindergarten tutors or parents. The local pediatrist or the doctor of preschool establishment controls performance of the appointed measures.

The repeated children examination including psychophysical inspection, is carried out in April – May by the same experts, as at the first examination.

The final decision of child readiness for school education fix in medical card. Children having deviations in a health state, lagging in biological development and not reached a school maturity are considered not ready to training. The conclusion about readiness for school education is fixed in a medical card

of child development. There are medical contraindications for entry in school of six-year children.

As a school maturity understand such level of development of some physiological systems or even separate functions which provides performance by pupils of all school requirements without health damage and normal development.

Research of parameters of some functions at children in comparison to progress, workability, fatigue, educational activity and dynamics of a health state in the first class has allowed to select psychophysiological criteria on which it is indirectly possible to judge a functional readiness of children to study at school.

Medical criteria

- Level of biological development.
- Health state at the moment of examination.
- Acute diseases during previous year.

Psychophysiological criteria (the estimation of the physical maturity)

— Results of the Kern – Irasek's test (synthetic and analytical brain function).
— Quality of pronunciation.
— The motor-metric test.

Hygienic bases of a healthy life way. Modern problems of personal hygiene

Hygiene of teaching and educational process in infant school (IS).

In the IS educational process, training and preventive medicine is connected. The medical care in preschool establishments carries out the nurse. Her obligations are children examination, to appoint medical-and-preventive actions; to supervise carrying out of preventive vaccinations; regular medical check-up of sick children group: to reveal and isolate children with infectious diseases, to supervise the organization and carrying out of physical training, physical development, hardening, nutrition, the daily routine; sanitary-and-hygienic conditions of light exposure, ventilation, heating, clothes, footwear, easting establishments, disinfection measures. The medical staff control in the IS for all antiepidemic actions, carries out employment with tutors, parents, trains in their skills of individual and general hygiene of children, formation healthy life way. Passports of certification of accommodation condition for children in the IS are made.

Hygiene of environment in the IS

Designing and construction of the IS are made according to construction regulations and rules. Optimal variant of IS accommodation — intraquarter. from 1996 in Belarus the following types the IS are under construction:

General development — duration of children stay — 6–24 h.

Supervision and care — 1–4 h.

• Improvement — with special physical training, swimming, gymnastics, therapeutic exercises, massage; nutrition — 12–24 h.

• The profound direction in work — aesthetic, language, choreographic, physical — 6–12 h.

IS capacity — up to 200 person in cities and 100 — in countryside. In «sleeping region» — up to 300 children. The main principle of building is isolation of groups and rooms. 50 % of the ground area is occupied with green plantings. Group areas is the IS territory under open-air with a sunshade, sandboxes, swing, benches, kitchen, garden — berry-field, sport zones with a running-track, jumping hole, an obstacle course, various apparatus, a ring path. For development of impellent activity — bridges, hills, figured walls, etc.

Sleeping and game room, the specification of the area — 4 m^2 per child, volume of air — 12 $м^3$, t° — 19–22° C. In a game room children eat also. Hygienic requirements to furniture — conformity to child growth — prophylaxis of bearing infringements, vision, deformations. For gymnastic and musical exercises are planed a hall of 75 m^2 for 100 children, a covered swimming pool 37 $м^2$ and depth 0,6–0,8 m with use flowing and recirculating water-filling, replacement of 20 % of water per one hour, water drinking with t° 28–30°. Water is disinfected by chlorination, ozonization. For a change teaching and educational work — game stores, auditoria, a study of manual skills, the fine arts, a choreography, linguistic, etc. Light coefficient LC 1: 4, coefficient of natural illumination — 2,5–2,7 %, illumination by incandescent lamps 150 lux, luminescent — 300 lux.

The medical block: room for medical staff, a procedural room, isolator with a separate toilet.

Food establishment — 1-st floor with separate entrance. Structure of food establishment include: a room of kitchen, distributing, handling of food shop, washery, a pantry.

For successful education and training of children in the IS they are necessary be prepared for this starting the birth. Children adapt for new conditions not all equally: 1 group — physiological adaptation, they are not sick, diseases are easily transmitted; 2 group — intense adaptation — children have viral respiratory infection, neurotic reactions; 3 group — pathological adaptation, children hardly get used to the IS — neurotic reactions, neurosises, depressions. The daily routine standard with food intake, play activity, studies, walks, sleeping.

Preparation of children for school training is possible in the IS in preparatory groups or in the same groups of comprehensive schools.

The nutrition in the IS should be multicomponental, balanced, adequate to physiological opportunities.

These hygienic bases are caused by intensive growth and development of children during this age period. There is a formation of organs and systems, their differentiation, their functions are improved. Children the IS are extraordinary active, they have big high-speed impellent activity. During this period nutrition renders essential influence on brain development, intelligence — especially protein food. Proteins in a diet should compose 70–75 %. Lack of proteins results in delay of growth and development, psychomotor and intellectual, to memory impairment. Surplus of proteins raises predisposition to allergic diseases. Carbohydrates and fats should be balanced also for prophylaxis of adiposity, latent protein insufficiency. It is necessary to use unedible carbohydrates (cellulose, pectin) for putrefactive microflora suppression, radionuclids and toxic substances removing, for development in intestines Bifidobacteriums.

The impellent need of children is provided with sport and games, morning gymnastics. Exercises on different muscular groups in dynamics promote preservation of correct trunk position, points of a support and the gravity centers. Exercises in a static stress, with breath-holding are excluded. General duration of lessons — from 15–20 mines for 3-year-old untill 30–35 min — for 6-year-old. Studies on the open space at t° not lower — 12–15 °C without a wind and precipitation are allowed. Into system of physical training are included hardening at the obligatory medical-and-pedagogical control. Are defined health state, physical development, functional readiness, adequacy of load, a degree of exhaustion, etc.

Load is normalized on pulse rate to external, visual exhaustion attributes: children under 3 years — 140–160 bit/mines; under 6 years — 160–180 bit/mines; on motor density of lesson — 60–85 %. Air t° in a hall + 16–18° C, humidity 40–55 %; light exposure 200 lux, air mobility — no more than 0,5 m/s.

In the preschool age period there is an intensive formation of locomotor system, as the IS, and visual muscles, speech muscles, respiratory muscles.

By 6 years old is formed bearing which depends on conformity of furniture to growth of the child, light exposure of working surfaces, size of subjects, figures, a font, distance till considered objects, quality of illumination and a corner of protection against artificial sources — incandescent lamps, aesthetic appearance of a premises, colour of working surfaces. There is all-Union State Standard «Furniture nursery preschool. The functional sizes of tables, chairs»

The distance of chair-bottom should be negative — the table edge goes for chair edge on 4 cm. Chair are completed with a table. There are special gymnastics for preventive maintenance of sight infringements, development of visual system, perception, a visual memory. Special games are carried out by tutors.

Table 4 — Group of furniture and children growth

Group of furniture	Growth of children	Height, mm	
Color of marks		Table	Chair
00 black	Up to 85 cm	340	180
0 white	85–100 cm	400	220
1 orange	100–115 cm	460	260
A 2 violet	115–130 cm	520	300
B 3 yellow	130–145 cm	580	340
C 4 red	145–159 cm	640	380
D5 green	160–175 cm	700	420
E6 blue	Over 175 cm	760	460

The important criterion of child development is way of life, nutrition, movements, body weight, thickness of skin-fatty fold.

2. Hygiene of teaching and educational process in SS (secondary school).

In a basis of hygiene of teaching and educational process in SS lays the continuity with the IS, dispensary method of supervision over children. The somatic maturity is defined on parameters of physical development in sigma relation, rank correlation, nomogram method. Harmoniously developed children — M ± 0,5σ; maximal-permissible harmonious — M ±1,0σ; disharmonious development due to overweight or body overlengths — M ±2,0 σ and more.

Admission in school for not ready child is stress, shock.

The medical care at school is carried out by the nurse, the school doctor and the doctor the pediatrist domiciliary. Duties of them as nurse the IS — all antiepidemic actions in an educational institution. Scheduled to annual plan of health activities, including dispensary supervision over frequently sick children and adolescents, over adequacy of physical loadings at physical training.

The profound medical surveys of younger and average age pupils, annual scheduled surveys are carried out by pediatrist. Results will be worn out in diagnostic cards of children's polyclinics for drawing up of treatment-and-prophylactic actions. Results of the profound surveys of adolescents are directed to adolescent's studies. Screening tests are carried out, the databank is made. At school age disease of respiratory tracts considerably raises, it are connected to absence of controllable hardening actions; infringement of hygienic rules of training and education: the overload, insufficient ventilation. The number of functional changes of cardiovascular system, musculoskeletal system increases, visual acuity is reduced. Since average school age and especially in senior one the number of functional infringements increases from the part of nervous system, surplus of body weight, illness of urinogenital, digestion system.

Designing and construction of educational institutions is carried out according to sanitary rules and norms, but deviations from norms by virtue of depreciation of plant, the current repair work, replacement of school furniture, fillability of rooms, auditoriums, dining-halls etc.

All educational institutions are under construction on standard projects, they should not exceed 3 floors. By analogy to the IS at schools are provided isolation of uneven-age school groups due to a block, section lay-out. Special requirements are presented to windows of educational studies, to room height, width, length for maintenance of the maximal effect of natural light exposure. The maximal length of a room should be 8–8,4 m, width of a room — no more than 6 m, height — not less than 3 m. Optimal thermal air conditions are the important factors of preservation of health and pupils workability. Sanitary-and-hygienic infringements of air — thermal mode promote overheating, overcooling, hypoxia, to growth of respiratory infection including tonsillitis, a flu, respiratory infections, reduce workability, to occurrence of discomfort sensation, headache. T° should be 19–20°C, in a hall — 16–17° C, relative humidity — 30–70 %, mobility of air — 0,2–0,4 m/s, in a gymnasium up to 0,8 m/s. At absence of ventilation t° raises on 2–3°C during one lesson. Flying metabolism products of the men simultaneously collect (sweat smell and products of its decomposition, ammonia compound, flying salts of fat acids, skatole, indole compositions). These substances have named «anthropotoxins». The best criterion of air chemical assessment is definition of CO_2concentration, its maximal concentration limit in classroom — no more than 0,1 %. For first-years-old volume lung ventilation — 10–12 m^3 with frequency rate of air exchange 1 time/hour, for senior pupils — frequency rate of air exchange — till 5 time/hour.

The light mode should be sufficient, depending on size of the glazed windows surface, their orientation (the better are south-east, a south-west).

Uniformity depends on color appearance. Absence of shadows depends on the side of light falling. Absence of glare – brightness – factor of reflection – the glass, the polished furniture.

LC(LF) — ¼–1/5; in a gymnasium — 1/6

— *corner of light falling — not less than 27°;*

— *corner of an aperture — not less than 5°*.

Luminescent lamps give high depth of a pulsation — 35–65 %, noise effect, at incandescent lamps 5–15 %. These effects reduce visual acuity and cause discomfort. For elimination of these negative influences luminescent lamps include in different phases — shift of phases and for noise reduction — noiseless starting regulator.

In lux 150–200, in a gymnasium — 100, specific capacity for incandescent lamps — 40–48 Wt/m^2; luminescent lamps — 20–24 Wt/m^2; a gymnasium — 16–18 Wt/m^2. It is desirable to have and UV radiation — with the purpose of diseases prophylaxis. It is desirable to include in system of the general illumination erythematous luminescent lamps — air prophylaxis of respiratory infections — bactericidal effect. The most perfect is halogen light — it has a spectrum of visual part of a sunlight, eliminates light starvation, reduces visual exhaustion, keeps workability, there is no pulsation, efficient more in 3 times. There should

be passports of certification on sanitary-and-hygienic conditions of teaching and educational process.

Parents control day regimen of schoolchildren at home: study load, sleeping, work, rest. The norm of weight — 1 textbook should be no more 300 gr.

State Standard «Student's tables», «Student's chairs», «School desks».

The number (size) of a school desk can be defined under Kartashihina's formula:

Number = height — 100:15; 153–100:15 = 3 number.

If there is no marks, group of a table — its height: 5–10; 68:5–10 = 3 number.

Distance — of 3–6 cm across.

Differentiation ↕ — the distance on a vertical can be defined from edge of a table up to an elbow of the down hand — 3–4 cm.

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 adolescents**:** 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 — trebles. 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.

The state sanitary inspection on hygiene of children and adolescents

The State Sanitary Inspection on section of children and adolescents **hygiene** is carried out according to the Law of Belarus «About sanitary epidemic well-being of the population».

— Law RB «About health protection».

— Law RB «About education in Republic Belarus».

— Law RB «About protection of the rights of consumers».

— Law RB «About the child's rights».

Problems:

1) the control over performance sanitary rules and norms at the organization of teaching and educational process, work, rest, nutrition, physical training and improvement of children and adolescents;

2) assessment of a sanitary-and-hygienic condition of children and adolescents stay in establishments;

3) assessment of a condition of their health, including on the statistical data;

4) development of actions on improvement of an environment in places of children and adolescents stay;

5) preparation and entering into corresponding governmental organs the offers on health strengthening of the children's population.

The state sanitary inspection is realized in the form of precautionary and current supervision. It conducts organizational-and-methodical work, propagation of hygienic knowledge among children and parents; put into practice scientific recommendations.

Methods: descriptions of establishment; conditions and regimen; training and education; tool methods; statistical data processing of disease; health states and physical development; results of surveys. The basic parameters — dynamics (changes) of health state and morbidity; dynamics of physical development and physical readiness, a functional condition.

General educational SS

Sanitary norms and rules are coordinated with the Ministry of Education, the Ministry of Architecture and Construction RB, are authorized by the Main State Health Officer of Belarus.

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.

I. General provisions

Are distributed to all projected, reconstructed establishments: primary, secondary, evening schools, schools with the raised and profound level of studying of separate subjects, lyceums, grammar schools, medical improving centers, aesthetic education, sanatorium, boarding schools.

Capacity of general educational establishments:

1 gr.— 20 pupils

2–4 gr.— 25 pupils

5–11 (12) — 30, in a countryside 12,18,24.

Grammar schools — 20–25 pupils

Lyceum grade — 20 pupils

Teaching and educational process in general educational establishments of all types should provide health preservation, maintenance of the workability, necessary impellent activity, development of individual abilities, occupation according to interests, nutrition, rest.

II. Requirements to a site

Schools must be accommodated in residential zone with screening by apartment houses, well aerated and illuminated, isolated.

Landing of bushes is not closer than 5 m and for trees not closer than 10 m from facades of buildings. Presence the wind and dustproof trees strips along a wind rose — not less than 10 m.

Zone for sport is allocated on territory.

Sports places need to focus longitudinal axes in direction N-S on the part of a sports hall, instead of windows of educational rooms. For pupils of primary grades rest zones for use of outdoor games are allocated.

Economic zone on the part of entrance in the eating establishment, should have separate entrance from street, utility building, garbage collector.

Bildings

Number of storeys are projected no more than 4.

Accommodation 1–2 grades is not higher than 3 floors. Height of rooms — not less than 3 m. Orientation of windows — E–S–W.

At an entrance in a building - tambours (it is desirable with thermal screen). On the glazed doors there should be protective lattices on 1,2 m from a floor.

Classroom — laboratory system of training, grouping of rooms to destination:

— educational section of 1 grade;

— educational section 2–4 of grades separately from others sections;

— educational section 5–12 of grades;

— labour training and children's creativity;

— study-sports and cultural — mass assignment;

— common school assignment — a dining room, library, economic, medical care.

It is desirable to have rooms for individual occupations, rooms of psychological unloading, improving assignment.

The entrance in a toilet should not settle down opposite to an entrance in an educational room.

It is recommended to enter into structure of the sport-improving block: sports halls, a training hall, pool, ski storehouses, a medical restored study; in cloakroom: washstands, toilets, shower.

Rooms of medical destination: medical study, procedural room, in boarding schools — isolator, halls for therapeutic exercises, massage, physiotherapeutic procedures, etc.

Quality of water must correspond to all-Union State Standard «Water drinking».Drinking fountains should present on every storey.

Natural and artificial illumination

Is supposed the ceiling natural illumination and illumination by second light of through passage corridors. A direction of a light stream in educational rooms — left-side. At room depth more than 6 m should be additional right-side illumination or an angular arrangement of windows. NIF — not less than 1,5 %, at more precision job — 2 %. Working surfaces should have a matte coating or with insignificant shine of light, tones are green, blue or a natural structure of wood with factor of reflection 0,11–0,45, blackboard are green, dark brown, dark-blue color with factor of reflection 0,10–0,20, with the upper illumination — soffits.

Walls, ceilings, floors — matte surfaces of warm tones with reflection factor 0,45, straw-coloured, pale-green, pale blue have factor 0,45; ceiling — white — 0,60; floor — light factor of 0,2–0,3. Stands, posters, tables need to place on a wall to an opposite board.

Height of flowers on window — not more 15 cm.

Artificial illumination — optimal — luminescent lamps or halogen.

Class rooms: incandescent lamps (IL), luminescent lamps (LL) — 200/400 Lux 25/64 Wt/m^2.

Table 5 — Hygienic norms of light exposure

Place	IL/LLWt/m^2
Workshops, studies of work	300/500 32/80
Sports halls	100/200 13/32
Medical pedagogical study Room for teachers	150/300 20/48
Sleeping rooms	75/150 10/24
Dinning hall	100/200 13/32

The distance between rows of lighting fixtures and from walls should be 1,5 m, from a blackboard — 1,2 m; from a back wall — 1,6 m.

Clarification of fixtures — 1 time/quarter.

Air — thermal regimen

Educational, sleeping rooms — 18–20° C.

Sports hall — 15–18° C.

Assembly hall — 17° C.

Relative humidity — 30–60 %.

Easting establishment — 60–70 %.

Frequency rate of air exchange

Class rooms 16 m^3 / hour per 1 person.

Sports halls 80 m^3/ hour per 1 person.

Assembly halls 20 m^3 / hour 1 person.

Sleeping rooms 1,5 time / hour.

The opening transoms area — 1/50 from the floor area. In sleeping rooms of a transom are closed 30 minutes prior to sleep. During sleep — are open only on the one side.

The equipment of rooms

Should correspond to sanitary-and-hygienic norms and room destination.

Correction of children seating — 2 times/year, 1–3 line. Frequently sick children should sit farther from windows.

School desk and tables, chairs in classroom — 2–3 sizes.

Distance — not less 4 cm across.

Furniture marking — a circle in diameter of 25 mm or a horizontal strip.

Distance from walls — 0,5 m; from a back wall — 0,65 m; between tables 0,5–0,6 m; from 1-st desks till board 1,6–2,0 m.

Height boards from a floor — 85 cm for younger age and 95 — for elder age.

Physics, chemistry, biology laboratores, computer techniques should be according to sanitary rules and norms with the functional equipment.

Sleeping rooms for 6–7-years-old — distance between beds not less than 45 cm, at one's bed-side — 20 cm, from walls — 60 cm.

The optimal organization of studies — in one shift from 9^{00}.

Duration of a lesson in 1-st grade — 35 mines;
2-nd grade — 45 mines (11–12 grades).
Sanatorium schools 1–4 grades — 30 mines;
5–12 — 40 mines.

Break between obligatory and additional studies of a school component there should be not less than 30 minutes.

Uniform distribution on days of week with the account rank scales of subjects difficulty. On Monday and on Saturday is not necessary to put mathematics, physics, chemistry. At drawing up of the schedule need to alternate studies on weight and intensity, impellent and dynamic components. Mathematics, physics, chemistry must not put 1-st and last lesson. Union of 2 lessons in the senior grades is supposed at carrying out laboratory and examinations, alternation of a theoretical and practical part. Examination to carry out strictly according to schedule, no more than in one subject in day, but not on Monday, on Saturday and not first and last lessons.

Break — not less than 10 minutes, sometimes give one main break of 20 minutes. At sanatorium schools — 20–30 min — walks on fresh air.

In the middle of a lesson — sports pauses, minutes — preventive maintenance of vision exhaustion, bearing infringement.

Physical training — according to complex programs, on open air at t° is not lower 15° and wind speed — not more than 1–3 m/s. Distribution of pupils on health groups — on the basis of a health state till 15. September annually.

The basic and preparatory groups can be engaged together with reduction of physical loading according to doctor recommendation.

Special medical group — separately, 8–12 pupils.

Exercise therapy group conducts nurse in medical establishments or at school in special studies. Training in sports section, competitions is possible with the doctor's permission.

The medical staff together with administration the one time per month must check the organization and carrying out of physical culture study, pulse rate and its increase: after a preparatory part — on 50–60 %, basically — on 70–90 %, after final — 10–15 %, restoration — within 3–5 minutes.

Working education — with the doctor's permission.

Volume of home work — 2 grade — 1,5 hours;
3–4 grade — 2 hours;
5–6 grade — 2,5 hours;
7 grade — 3 hours;
8–11 grade — 3,5 hours.

To 1-st grades of the home work are not set, for the pupil of initial grades — on the holidays, for all pupils — in vacation.

Long-day groups, stay on fresh air — not less than 2,5 hours.

Within one academic year — a vacation in volume of 30 days, years (summer) — not less than 8 weeks.

Hygienic education of pupils is carried out at lessons as obligatory study according the program and in out-of-grade activity.

In 1–4-grades — rational regimen of day and nutrition, personal and public hygiene, vision, hearing protection, physical training, the organization of a workplace, preventive maintenance of the infectious diseases, harmful habits, traumas, etc.

5–11 (12) grades: healthy life style — nutrition, movement, health, sexual education.

It is carried out by teachers and medical staff with attraction of the health centers, hygiene, polyclinics. The pedagogical personnel are obliged to demand from pupils of observance of public hygiene, airing of rooms, personal hygiene.

Features of feed of children and adolescents.

Features of a feed of children and adolescents:

— should correspond to all principles of a balanced diet;

— the parity between proteins, fats and carbohydrates in a diet of children and adolescents makes 1:1:4.

A food of children and adolescents should correspond to all principles of balanced diet. Food change should be carried out gradually, especially at the first year of a life.

Table 6 — 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 600 ml) 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.

Adolescents 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 adolescents begin to develop real independence from their parents, including making decisions about the food they eat. adolescents 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 adolescents 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 adolescents 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.

Role of personal hygiene and way of life in health strengthening. Hygienic properties of textile. Hygiene of a body, linen

The clothes, footwear, head-dress should protect a body of the person from adverse environmental factors, keep thermal balance.

For manufacturing clothes, footwear are used various materials of an animal, vegetable and it is artificial received, synthetic of chemical fibers. The fabric and clothes should accord to certain hygienic requirements and to keep temperature under clothes 28–32° at relative humidity of 20–40 %.

The clothes should be easy, not tire and not constrain movements, not interfere with movements, not interfere with breath, blood circulation, to not cause skin irritations, blood and a lymph stagnation. The clothes skintight to a body break ventilation, prevent sweat evaporation. The fabric from which sewed clothes should be heat-conducting, is air-penetrable, hygroscopic, elastic, be poorly electrified. Manufacturing of warm clothes from a material having small heat conductivity — this property rare, thick, fluffy fabrics have. Porosity of fur — 95–97 %, wool — 88–89 %. Vegetable fabrics have smallcapacity and small air permeability, their porosity is not more 37–40 %. From synthetic materials high heat-shielding properties lavsan has. Kapron and viscose have low heat-shielding properties. Therefore in a cold season it is recommended to carry clothes from fabrics of an animal origin, synthetic or mixed, and in a warm season from kapron, artificial silk, cotton clothes.

Under clothes space various gases, pairs accumulate. If the clothes are poorly air-penetrable, secretory function of a skin can be broken. At increased heat-conducting fabrics during cold time there can be overcooling, fever.

At a strong wind on winter time it is necessary to use special wind-shelter clothes from a leather or the rubberized fabric.

Air permeability depends on porosity, the above air permeability, the below heat conductivity. Air permeability is necessary for ventilation under clothes. The greatest air permeability have woolen fabrics, the least — cotton fabrics and linen have. Small air permeability accompanies the big heat conductivity.

Water-retaining capacity and hygroscopicity of a fabric, i.e. ability at becoming wet to detain water or to be impregnated with it. Water-retaining capacity — i.e. detention of water the factor negative since water supersedes air from пор and the fabric, clothes become heat-conducting. Heat conductivity of the wetted woolen fabrics grows in 1,5–2 times, and cotton in 3–4 times. Therefore after a rain the cotton fabric cools an organism fastly and more strongly. Most hygienically in this respect the knitted linen, is independent from what it of a material.

Hygroscopicity — ability to adsorb on the surface water vapoirs to absorb sweat, moisture. Good hygroscopicity have knitted products from natural fibres.

Elasticity — the more irritates skin, the greatest elasticity — at easy woolen and cotton, knitted fabrics — less. Electrization characterizes only fabrics from artificial and synthetic fibres. At friction there is a static electricity, which results in unpleasant tactile sensations. The chlorine linen carrying negative charges is applied with the medical purpose, at disease of joints and peripheral nerves.

Pollution of clothes in result socks occurs both from within, and outside. Mechanical, chemical, etc. pollution worsen hygienic properties of clothes — air permeability, a thermal capacity. There are bacterial pollution of clothes, organic dirties of clothes under influence of microorganisms decay, allocating evil-smelling substances, the skin irritation, skin disease can appear. Pathogenic microbes keep the viability in fabrics long time. For example, pneumococcus, diphtheritic, typhoid do not lose the virulence till 2–4 months.

The survival rate of microbes is promoted by humidity and absence of light. The clothes, adjoining to a body especially become soiled. Synthetic products quickly become soiled skin bacon. Therefore the clothes should be erased, ironed more often to air.

Hygienic requirements to footwear — it should be easy, convenient, spacious and not break blood circulations of the bottom finitenesses, skin evaporation, not cause deformations of phalanxes of fingers and feet, attritions, hyperhidrosis development. The material for tailoring footwear should be soft, protect from dampness, cooling, for winter time — to have small heat conductivity, good air permeability. Heel at working footwear should be 3–4 cm on width of all foot. The footwear without heel promotes to slide down the gravity centre on calx and

feet deformation develops. Too high heel (7 cm and more) promotes moving of the gravity centre forward and also results in deformation of metatarsal bones. Thus are shortened sural muscles, forward muscles of a shin relax, stretching and breaks ligaments, dislocations are possible also.

The best material for manufacturing footwear is the leather, it has durability, is capable to keep the form and the sizes after humidifying and drying, sufficient softer and elastic, well protects from dampness and mechanical influences, provides evaporations of sweat. The rubber footwear is less hygienic, since it not infiltrate for air, promotes foots hyperhidrosis. Footwear from synthetic fabrics is softer. Protect to stop from overcooling an insole which should be hygroscopic, are air-penetrable with small heat conductivity (felt, cloth), but in such footwear it is not recommended to be in a room since it results in delicacy of legs and such images sensitivity a cold raises. Synthetic materials are poorly suitable for summer footwear as it is insufficiently air-penetrable. Socks, stockings should not be too warm, for example, woolen socks cannot be carried in a room — the legs skin becomes coddled.

It is necessary to clean, dry, air, grease footwear regularly with fat or ointment that gives to it elasticity, smaller became wet. Footsteps of the person allocates at one hour 1,5 g sweat, and at physical work — up to 10 g. Socks, stockings are necessary for erasing daily from two sides since pollution reduces air permeability, creates conditions for duplication of microbes and can promote development of foot diseases.

Personal hygiene includes: the hygienic maintenance of a skin, body, linen, bedding, clothes, footwear, oral cavities, teeth, diet, rest, sleeping, physical training.

The human skin carries out the physiological functions incorporated in it the nervous terminations are initial analyzers of external irritations and carry out connections with an external world. The skin carries out a role of body allocation and body absorption. In maintenance, regulation of heat exchange the role carries out sweat evaporation. Sebaceous glands, allocating skin bacon soften skin, protect it from drying, raises elasticity and ability to resist to mechanical influences.

At an insufficient care of cleanliness of skin, skin allocation, sweat, a dirty skin pore bridging of glands excretory ducts, that lead to infringement of their functions. Complex organic substances of sweat under influence of bacteria of rotting break up to simple connections which can irritate a skin, cause an itch, allocate unpleasant gases, smells. The bed-clothes became soiled also, in such linen long time pathogenic microorganisms are kept. Dirty hands it is possible to bring in an organism helminth’s eggs. It is regularly necessary to clear skin - washing by warm water with soap, a bast and it is necessary to change linen. At increased footsteps hyperhidrosis is recommended to be washed daily their cool water and to change stockings, socks.

A care of an oral cavity — rinsing after food reception, in the morning with the hygienic purpose to clean teeth, and before dream - a tooth-past and soap. In an oral cavity of a bacterium find the favorable environment, presence of a nu-

trient medium, moisture and temperature. Places of duplication of bacteria — various folds, interdental spaces. Rotting of the rests of food causes unpleasant smell from a mouth, change of saliva reaction in the sour party, and conditions for teeth caries creates.

Hygiene of sleeping — provides high-grade rest of an organism. In a basis of sleeping — reduction of excitability of the central nervous system, braking of its activity — for this time are acquired food substances, cells restore the structure, accumulate energy. During sleeping physiological functions are reduced. Duration of sleeping must be not less than 7–8 hours, and at illnesses, exhaustions, overfatigue, emotional-mental, physical — more than 8 hours. Not getting enough sleep conduct to a nervous breakdown, there is an irritability, activity of internal organs is broken. To go to bed time is necessary in one and too, thus sleep comes faster and it more high-grade.

The effective form of rest during day is switching, micropauses, gymnastics, psychological unloading.

The urgency of a problem of children and adolescents health protection grows every year as from 1986 in Belarus is observed decrease of birth rate, and from 1989 — increase in death rate of the population owing to what from 1993. There is a reduction of a population. From 1992 the increase in children's death rate increase of cases of transition of acute forms in recurrent and chronic is marked by feature of a pathology of children's age.

Already at preschool age of 15–20 % children have chronic diseases, and more than 50 % of preschool children — those or other functional deviations in a health state. The reasons of children health state deterioration have multifactorial character: infringement of day regimen and an academic load insufficient or superfluous impellent activity, an inadequate nutrition, etc. Therefore the knowledge of medical control principles over child development, hygienic bases of a day regimen and teaching-and-educational process, physiologic-and-hygienic aspects of improvement of children and adolescents in conditions of ecological trouble is necessary for us in the decision of health protection questions in the social relation of the most significant, and in biological — to the most vulnerable part of the population.

14. HYGIENIC BASES OF OPTIMAL NUTRITION. CLASSIFICATION OF THE NUTRITION STATUS. THE BASIC LAWS OF NUTRITION

At composition of a high-grade diet it is necessary to take into account, that approximately 40 % of ration should be animal origin products, food volume should give feeling of satiation. This feeling is connected to stay of food in a stomach. In this respect the best advantage the meat food has. Fried food are more nourishing, than one cooked. At culinary processing it is necessary to keep a maximum of values of foodstuff, especial vitamins and microelements. There is digestion adaptation to food, therefore sharp changes are inexpedient. Spices, bitterness in food have the certain value. A diet is necessary to distribute in regular intervals both in volume, and in caloric value. Great one-stage food volume is badly acquired, it is better to divide a day time diet into 4–5 times. Time of food consumption depends on a habits, and distribution daily ration from a profession, operating time, etc. Protein's food are recommend to eat till 14–15 o'clock since this one accelerates a metabolism, stimulate nervous system, raises a vitality. The first dishes contain extractive substances of meat and vegetables, they serve as chemical activators of secretion.

Milk and vegetative food fast passes through a stomach and gives short-term satuation (200 g milk stay in a stomach 1–2 hours, 200 g bread — 2.5 hours; cooked rice, cabbage, potato — 3–4 hours; 200 g meat — 4–5 hours; fat, cmoked meat — 6–7 hours. Cream, sour cream, fat cottage cheese — till 7–8 hours; 2 hard-boiled eggs — 2.5 hours. The usual dinner stays in a stomach 4–5 hours. The animal food is assimilated on 95 %, vegetative — on 80 %, sour cream — on 80–90 %. Assimilation of vegetative food — is less due to cellulose. Fat pork, mutton, duck, goose are digested difficultly. The fresh fish is assimilated good, the egg is assimilated easily too and good. Gastric secretion is decreased at milk, bread intake, and is braked by fat food. From string beans and peas mashed potatoes is better to preparate, porridges are assimilated better if they are cooked on milk. On digestion and assimilation of food influences conditions of consumption, the important role belongs conditioned-reflex to secretion of juice and salivation, temperature of food. The temperature must not be higher than 60–65° C. After of nutrition should be impossible to start at once work, is necessary the interval 1–1,5 hours. The dinner should begin with the soup, the second dish: in the beginning to eat meat to reduce acidity of gastric juice.

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 sam-

pling, know an order of food poisonings investigation and be able to carry out food poisonings prevention.

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.

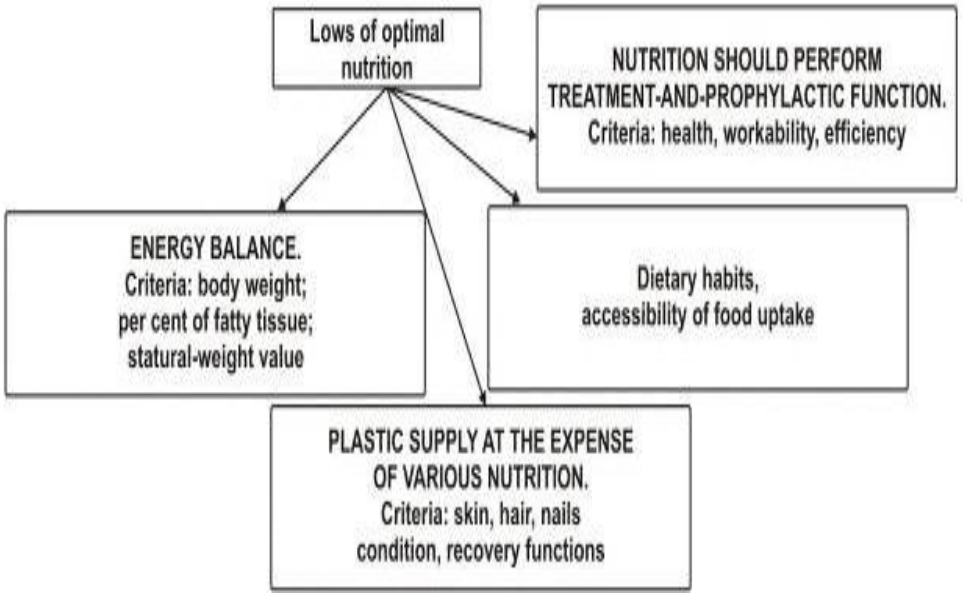
The balanced diet is based on the theory of the balanced and adequate nutrition and consist of five laws of a nutrition.

The first law — observance of balance between energy entering with food (caloric content of food) and energy expenses of an organism.

For measurement of food caloricity are used a unit of measurements — a calorie, the international — joule (Jl), 1 cal = 4,184 Jl.

The second law — is necessary to follow the rule of equation between proteins, fats, carbohydrates, vitamins, mineral and ballast substances.

Norms of physiological needs for food substances and energy for different groups of the population are developed.



Figere 9 — Lows of optimal nutrition

For definition of an optimal nutrition is necessary to calculate **factor of physical activity*(FPA):***

Total energy expenses

Basic metabolism

At easy work average FPA is equal 1,4; at average — 1,6, at hard work — 2,5.

The third law dictates a rule — the variety.

The fourth law — observance of eating [dietary] pattern — regularity and optimal food distribution within day.

The fifth law — to keep to age needs and motion activity, the nutrition will carry out a preventive orientation in this case.

In recommendations the ratio is offered: for preschool children 1 : 1 : 3, for school children 1 : 1 : 4; 1 : 1,2 : 4,6 (1 : 1,1 : 4,7).

Eating [dietary] pattern is multiplicity of food consumption, quantitative distribution during day, intervals between food consumption. At 4 multiple nutrition: a breakfast — 25 %; a lunch — 35 %; a dinner — 15 %, a supper — 25 %.

There are physiological norms for 9 groups of the children's population, 6 groups of preschool and school age. For adult population — 5 groups for men and 4 groups for women.

Classification of the nutrition status (NS)

The analysis of the literary data shows, that the basic parameters of a nutrition reflecting a body structure condition, functional and adaptable opportunities of an organism, inherently characterize a health level of the person and a population as a whole. Existing classification of the NS requires correction in connection with that it is practically impossible to differentiate the usual and optimal status. Moreover, on available classification the superfluous status is considered as a condition of adiposity of a various degree, the intermediate condition between the superfluous and usual NS is not allocated.

It is established, that on a level of physical readiness, a condition of functional and adaptable opportunities of an organism exert essential influence the body structure, in particular fat content. The optimal results of relative physical workability, the maximal oxygen consumption, performance of physical exercises is registered among young men with the contents of a fatty component in organism from 9 up to 18 %.

Results of research of immuneresistance of organism show, that at persons with the fat contents in a body less than 12 % are considerably reduced bactericidal activity of blood serum and increased lysozyme level. At the men having the superfluous nutrition status (fat contents more than 18 %) are reduced the content betta-lysine and increased the lysozyme level in blood. At higher fat quantity in organism (over 21 %) bactericidal activity of blood whey, a compliment level and betta-lysine in blood is authentically reduced in comparison with persons with the fatty component from 12 up to 18 %.

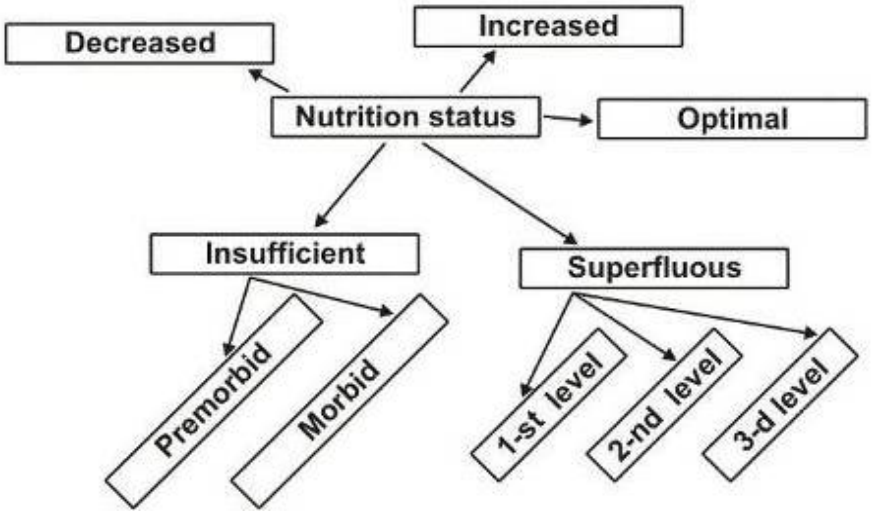


Figure 10 — Classification of the nutrition status

In the offered classification the following basic levels of the NS are allocated: optimal, lowered, raised, insufficient and superfluous. *To **the usual nutrition status** is necessary to concern persons with the fat contents in a body 12–18 % or having IBM within the limits of 20,0–25,0 kg/m^2*. At that functional and adaptable opportunities of an organism provide usual conditions of vital activity. Such nutrition status takes place among the most young people accepting an adequate diet.

***The decreased status** is characterized by fat quantity in a body 9–12 % or IBM from 18,5 up to 20,0 kg/m^2*.It can be caused by the constitutional and adaptable features of the organism, an inadequate nutrition, physical and nervous-and-emotional loadings. At that takes place preservation of functional adaptable organism opportunities or their insignificant reduction at inadequate nutrition.

People concern to the increased nutrition status with a fatty component of body from 18 up to 21 % (IBM — 25,0–27,5 kg/m^2). Such status is formed as a result of consumption of diets, at which energy expenses of organism less then consumption. At persons with such nutrition status is not marked essential changes of functional and adaptable opportunities though their some reduction takes place.

The insufficient nutrition status** arises at quantitative or qualitative inadequacy of nutrition, and also at reduction or full impossibility of nutrients assimilation. Therefore the body structure, functional both adaptable reserves and opportunities of organism can be broken. Persons with such nutrition status (fat content in organism less than 9 %, IBM — not less than 18,5 kg/m^2) are subject for medical inspection and treatment. **The insufficient nutrition status is subdivided on pre-morbid (latent) and morbid.

***Pre-morbid status** is characterized by occurrence of microsymptoms of nutrient's insufficiency, deterioration of functions of the basic physical systems, decrease of the general resistency and adaptable processes even in usual conditions of vital activity. **Morbid or the painful status** is characterized not only functional and structural infringements, but development distinct syndrome of nutrient insufficiency.*

For the healthy person starvation heavily as reserves of the basic substances are insignificant. So, free amino acids are spent during several hours, carbohydrates till 13 hours, fats — till 27 days. At starvation the organism is reconstructed on an expenditure of own reserves; functions of a liver, hemopoietic systems, CNS are broken. Avitaminosis is dangerous at this time also.

The raised need for vitamins and microelements arises at pregnancy, lactation, in extreme situations, at presence of parasites in intestines, some bacteria. The unbalanced ratio of vitamins in food promotes hypervitaminosis. Presence in food of so-called «antivitamins» reduces or completely liquidates corresponding vitamins. For example, ascorbinaza destroys an ascorbic acid, thiaminaza — thiamine, avidin — biotin, etc.

The illnesses connected to nutrition insufficiency

Alimentary insufficiency essentially reduces organism ability to synthesize antibodies, phagocytic activity micro-and-macrophages, nonspecific resistency to bacterial toxins, one is the reason of abatement of inflammatory reaction, slows down of wound repair, changes intestinal microflora. Sensitivity to deficiency of food substances is more than younger organism and than more intensive growth. Long term nutrition limitation results in radical changes in cells down to the dystrophy phenomena.

Protein-calorie deficiency (PCD) occur as **Quashiorcor** and alimentary marasm. Quashiorcor happens at 2–3 years children. The main reason of ones is unb alanced nutrition, especial in animal proteins. Insufficient of protein entry results in occurrence of hypostases, water- diarrheal syndrome — as consequence of disorder of enzymes synthesis by pancreas, the muscular hypotonia, psychomotor disoders (apathy, inertness, etc.), changeable symptoms — skin depigmentation («snake leather», anemia, crescens-shaped face form, dermatosis, splenomegaly and hepatomegaly, etc.).

Alimentary marazm (cachexy) is deficiency as proteins and energy of food.May be observed a lag in physical developmental. At marasm the form and color of hair does not change, skin depigmentation does not happen, there are no hypostases, mental disoder are less expressed than at Quashiorcor.

This condition can develop in all age groups, but occur at children of the first year more often. The reasons are social-and-economic factors, the early termination of breast feeding (ablactation) without adequate artificial feeding.

Quality monitoring over proteins in organism

The widespread means of the proteins control by calculation of their maintenance in dishes and periodic weighing products. The protein maintenance expects using the table of a chemical compounds of products.

Quantitative protein detection in diets objectively characterizes completeness of food issue. However is not taken into account thus actual protein assimilated by the man. It can be determined by a method of nitrogen definition excreted with urine.

Except for the general nitrogen is defined protein nutrition factor (PNF).

PNF = N urea/N general 100 %

At protein deficiency the share of urea nitrogen is decreased. The essence of reaction consists in use of metabolits nitrogen including urea for synthesis of amino-acids and the basic nitrogens and, finally, protein.

The least protein quantity at which PNF reaches 90 %, corresponds to an adequate level of its consumption, the compensated consumption level of protein — 70–89 %, low or insufficient — PNF < 70 %.

Advantage of this method its exsanguinity, availability for mass inspections. PNF can be used for an estimation of a diet and the control over it, in clinic — for the characteristic of disease severity, efficiency of treatment.

For an estimation of supply organism by protein can be other biochemical parameters are used also: the maintenance of the general protein, free amino-acids in whey of blood, excretion with urine of ammonia, creatinine, etc.

Hypo-and avitaminouse states
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 groups 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.

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

2-nd 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., lauricacid, 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 bodylike 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 glactose. 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 gm.

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 from. 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 (B_1), riboflavin (B_2), pyridoxine (B_6), vitamin B_{12}, vitamin B_7, niacin, folic acid, and pantothenic acid.

Vitamin B_1 (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 B_2 (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 B_5 (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 B_6 (Pyridoxine, Pyridoxal and Pyridoxamine) is required for protein metabolism. It 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 B_7 or Vitamin H) is required in carbohydrate and fat metabolism. Source: liver, egg yolk, yeast, pulses, nuts.

Vitamin B_{12} (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, Vitamin B_3) 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* (content in organism > 0.01 %)*:* e.g., Calcium, iron, phosphorous, sodium, potassium, magnesium, chlorine.

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 electolyte balance in the body. Source: Widely distributed in all foods. Daily requirement: 5–7 gm.

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 dai-

ly. 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 (buildsbone, 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 B_{12} family of coenzymes.

Copper required component of many redox enzymes, including cytochromeoxidase.

Chromium required for sugar metabolism.

Molybdenum required for xanthineoxidase 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 foot 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., cardiopulmonary or renal disease).

<u>The reasons:</u>

1. Alimentary insufficiency of vitamins:

— the low maintenance of vitamins in a diet;

— destruction of vitamins owing to technological products processing, their wrong storage and irrational cooking processing;

— action of the antivitamin factors contained in products;

— presence at products of vitamins in little-digestible form;

— diet disbalance and optimal ratio between vitamins and other substances;

— food distortions, religious interdictions;

— anorexia.

3. Deppression of the normal intestinal microflora, producing vitamins:

— illnesses of intestinal tract;

— irrational chemotherapy.

4. Infringement of vitamins assimilation:
— infringement of vitamins absorption in a gastrointestinal tract;
— presence of pathogenic intestinal microflora, parasites;
— hereditary anomalies;
— anti-vitamin action of medicines.
5. The raised needs for vitamins:
1 — special physiological states of organism;
2 — climatic conditions;
3 — intensive physical activity;
4 — stress;
5 — infectious status;
6 — harmful production factors;
7 — internal diseases.

Hypovitaminosis A — frequently arise as specific eyes defeats at preschool age children. This is progressing conjunctiva and corneas of eyes (xerophthalmia), defeat infringement of twilight vision («night-blindness») and colour perception; may be observed hyperkeratosis, the raised susceptibility to infectious diseases, etc.

Insufficiency of vitamins D (rachitis) is more often at children, at adults seldom and is shown as an osteoporosis and osteomalacia.

Hypovitaminosis E occures seldom, are considered a risk factor of an atherosclerosis and its complications — IDH and stenocardias. Insufficiency of tocopherol plays the important role in occurrence of various diseases of a liver and bilious ways.

Thiamine (B_1) deficiency occurs at consumption food with the big densities of refined carbohydrates. The hot climate, heavy physical work, endocrine diseases, poisonings with heavy metals, alcoholism promote its development. Clinical symptoms are a headache, undue fatiguability, sleep disturbance, depression, muscular astenia, pains and syndromes in musculus gastrocnemius (illness Beri-beri), at an avitaminosis — peripheral polyneuritis.

Riboflavin (B_2) hypovitaminosis lead to changes of a mouth mucous membrane, a skin, eyes, characteristic angular stomatitis with cracks in mouth corners, vertical cracks of mucous lips (cheilosis), seborrheic eczema.

At ariboflavinosis «geographical language», conjunctivitis, disturbance of light and color sensitivity. This can arise at absence of milk and dairy products in a diet.

Pyridoxine (B_6) insufficiency occurs seldom, at the chronic diseases IT, hereditary defects of pyridoxine-dependent enzymes, at persons inclined to alkogolizm. Disturbance of the central nervous system, defeats of skin and mucous may be observed.

Avitaminosis B_{12}arises at the vegetarians, pregnant: irritability, loss of appetite, disturbance of intestine motility.

Deficiency of folic acid (B_9) is the most widespread form. Is connected with bad intestinal food assimilate. The high maintenance of a folic acid: in liv-

er, vegetables, beans, yeast. This one present at the older persons, pregnant and nursing mothers more often. Pregnant are special group of risk **B_9 hypovitaminosis** — promotes occurrence teratogenic effects and can result in disturbance of mental development of newborns.

The illnesses caused by deficiency or disbalance of microelements are named microelementosis. Hypomicroelementosis can have exo- and endogenous origin. Exo- is met at 20 % of the population of biogeochemical provinces. To endogenous — concern to hypomicroelementosis, caused by hereditary or congenital diseases. Secondary endogenous this one arises at infectious diseases, diseases of a gastrointestinal tract, CNS. It's divided into mono-and polyhypomicroelementosis.

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 (table 5).

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 7 — 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

Table 8 — 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	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

The control over vitamin provision includes:

— the analysis of apportion of foodstuff;
— the control of rules storage of products, technology of food preparation;
— the analysis of foodstuff and ready dishes;

— clinical and biochemical methods of researches;
— methods of functional diagnostics;
— revealing of microsymptoms of vitamin insufficiency.

Vitamin C is least steady, in an organism of the human is not synthesized, in an open atmosphere — quickly collapses. A method of functional diagnostics is definition of durability of skin capillaries, definition of time dark adaptations.

The calculation method consists in studying a consumable complex by the person according to official documents (in menus, cumulative list) with the subsequent calculation under tables of a chemical compound of maintenance foodstuff in them vit. A and C.

The biographical — polling method is simple, accessible, does not demand the special equipment, can be used at the analysis both groups, and an individual nutrition.

The weight method consists in weighing of all products and dishes consumed in day. This method is laborious but let to realize a full quantitative estimation of an actual nutrition.

Complex studying of a health state includes generally clinical inspection of disease estimation, studying of immunological status and anthropometrical parameters, is the important approach to an estimation of organism provision by vitamins.

Generally clinical and somatoscopy inspection is directed on revealing of possible micro symptoms. Studying of disease includes the account of the general number of cases with temporal disability, structures disease, calculation of collective health index. The deviation of anthropometrical parameters of physical development also can indicate vitamins deficiency in nutrition.

Physiological methods include investigation of vascular permeability, an estimation of time dark adaptation (for an estimation vit. A adequacy). **Biochemical methods** are based on definition of the maintenance of vitamins and metabolism products in blood, urine, leukocytes, etc. About adequacy of vit. C in organism judge by quantity of the ascorbic acid egest with urine (mg/hour or daily), under the relation of quantity of urine ascorbic acid to egests general nitrogen quantity (in norm — 0,21–0,33), under the maintenance in blood serum and leukocytes (norm 0,7–1,2 in 100 ml).

The illnesses connected to overnutriton

The superfluous status (fat in an organism — more than 21 %, IBM — more than 27,5 kg/m^2) is characterized by corresponding infringements of body structure, decrease of functional and adaptable opportunities an organism depending on a degree of adiposity. This status is formed as a result of consumption of diets which energy value considerably exceeds energy expenses of an organism. The family of superfluous nutrition illnesses consists of an atherosclerosis, cholelithiasis, fatness, podagra, metabolism polyarthritis, renal insufficiency, diabetes, etc.

Cardinal symptoms of a superfluous nutrition:

— hypercholesterolemia;
— hyperglycemia;
— azotemia;
— hyperuresis.

A superfluous nutrition in the first months and years of life promotes formation of fatty cells depot and is a risk factor of accumulation of a significant amount of fat. Appear especially resistant to treatment hypercellular form of adiposity. All cases of adiposity are considered as manifestation of energy disbalancein view of nutrition character and growing hypokinesia. The first degree of adiposity is characterized by superfluous body weight up to 30 % from normative level. The second degree of adiposity — more than 50 % of surplus of body weight from normative level.

It is considered that a principal cause of adiposity is overeating. However it more likely consequence than the reason. An original cause is frustration of regulating function of homeostasis mechanism supervising entry and a energy expense and their reserves in an organism. Under action of the external or internal reasons this regulating function can be broken. To external one concerns are hypodynamia, family and national habits, alcohol consumption.

To internal factors it is necessary to relate age changes of metabolism, diseases of CNS, endocrine diseases.

Now it is conventional, that adiposity is dangerous for health. Any separately taken illness cannot attribute all additional death rate among people, suffering by adiposity, however adiposity raises risk of a diabetes at the adults, the raised blood pressure and aggravates the tendency to the increased lipid level in blood. The heavy form of adiposity (BMI > 35) is connected to hypertonic illness, chronic intimate insufficiency, sudden death from a heart attack of a myocardium and insult. Recently carried out researches have shown importance of distribution of body fat. The risk of diseases occurrence is higher at distribution of fat in the field of a stomach than total than at its distribution on hips and in the field of a pelvis.

The overwhelming majority of epidemiological researches show positive connection between fats consumption and a degree of adiposity among the population. A diet rich the fats usually stimulate overeating. Consuming food, containing more fat, the person receives more energy, than at the use of food with the high maintenance of carbohydrates and the low fat maintenance. The fat food causes smaller satiation feeling than food rich carbohydrates from equal caloric content. 1g of fat contains 9 kcal of energy, whereas 1g of carbohydrates — 4 kcal. Products rich carbohydrates more volumetric, therefore with them it is more difficult to use as much than energy, how many with fat products.

Ischemic cardiomyopathy is one of the important problems in the majority of the advanced countries. At ischemic cardiomyopathy the arteries supplying

with blood heart are narrowed owing to an atherosclerosis — illnesses at which during many decades under inferior envelope of artery is formed atherosclerotic «plaque». Later this plaque can break. It causes to number of the processes directed on restoration of integrity of a vessel therefore the blood clot or a thrombus is formed. The quantity and type of the fat contained in a diet can influence both process of an atherosclerosis and on process of a blood clot. The fat included into food everywhere admits as one of fundamental external risk factors which action is shown through blood cholesterol and other physiological and biochemical functions. For reduction of risk ischemic cardiomyopathy is important not reduce of total fat but type of consumed fat, i.e. replacement of the saturated fatty acids by nonsaturated. For example, oils (soya, corn, sunflower), rich polynonsaturated linoleic acid, provide lipoprotein structure, optimum for reduction of risk ischemic cardiomyopathy. Recommendations concerning to nutrition cannot be the most effective way of ischemic cardiomyopathy reduction-risk among the population. Alternative variant of strategy is change of fat structure of acids in fatty products of mass consumption.

Depending on the mechanism of occurrence all kinds of adiposity divide on metabolic and regulation. Metabolic are genetically caused or got, regulation - due to disorders of the central mechanism. To illnesses of a superfluous nutrition concern hypervitaminosis. Overdose of vitamin A is characterized by dizziness, a headache, vomitting, disorder of sight, muscular spasmes. Overdose of vitamin D amazes nervous system, organs of blood circulation, kidney. Develops premature skeleton and skull ossification, hypercalcemia, arterial calcinosis, parenchymatous organs calcinosis.

Biogeochemical provinces determine mineral structure of soil, water and plants and undirectly illnesses of microelements insufficiency — fluorosis — enamel spottiness — superfluous fluorine intake, at insufficient intake of fluorine teeth caries develops.

What we consume, that what we are sick; illnesses are a mirror of the nutrition status.

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 crude 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 (predatory fish, seaweed) — muscles pain, affection of kidneys.

In spite of the common term food poisoning, most cases are caused by a variety of pathogenicbacteria, viruses, prions or parasites that contaminate food, rather than chemical or natural toxins. Foodborne illness usually arises from improper handling, preparation, or foodstorage. 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, abdominalpain, 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 immunesystems.

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

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

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

This ranges from hours to days (and rarely months or even years, such as in the case of Listeriosis or Creutzfeldt-Jacobdisease), 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 — fecal-oral, transfer way — alimentary. Flashes of diseases occur at use of ready feed (salads, fish products, mashed potatoes and boiled potato). It is arise against infringements of sanitary-hygienic requirements at storage and cooking. Poison-

ing 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 clostridialenteritis 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 enterostrain 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, usage 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 of *Aspergillus flavis* (aflatoxins), leads to **aflatoxicosis.** For this poisoning defeats of liver, nervous and immune systems are characteristic.

Toxins of *Claviceps purpurea* contain in the cereals can cause **ergotism**(spastic muscles contraction, necrosis, gangrene).

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 he-

patic 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 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 poisoningis 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 com.

Prevention of food poisonings:

• 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.

• Goodhygiene 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 **foodsafety**.

The important role in prevention of feed 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.

Questions of nutrition in the treatment-and-prophylactic institutions. A dietary nutrition

Provision by foodstuff does not solve a problem of their correct consumption and achievement of the basic purpose of nutrition — preventive and medical effect.

The basic directions of practical activities of the Republican center of hygiene in the field of nutrition are following:

1. Study of fundamental bases of nutrition influencing on formation, development and functioning of physiological and biochemical functions and processes: adaptogenic, antioxidant, protective, genomic, xenobiotics neutralization.

2. Monitoring of actual nutrition on adequacy to physiological needs in view of a health state of different groups of the population, equation of a diet.

3. A hygienic substantiation of diets of separate groups of the population: for children — «the Collection of compoundings of dishes»; «the Card file of dishes» in view of deviations in their health; a preventive nutrition of workers in view of their working conditions, weight and intensity of work; the treatment-and-prophylactic nutrition of a sick directed on recovery with clinical researches.

4. Control of food stuffs safety according to quality specifications at enterprises and the trade, accompanying components (container, packing, the equipment, technology) contacting to foodstuff: heavy metals, chlorine-containing pesticides, mycotoxines, nitroseamines, polyaromatic hydrocarbons, hormones, antibiotics, monomers of polymeric materials, etc. Must be obligatory sanitary-and-hygienic examination of foodstuff.

Food — the major substratum of an environment rendering constant and very essential influence on vital activity as healthy both sick organism. Cellulose and pectin sorbs salts of heavy metals and radionuclids, strengthening of intestines peristalsis, accelerate their mechanical removing from the organism.

Fresh crude vegetable products (for example: cabbage, beet, pumpkin, carrots) — the most valuable food for the human. They are ideally balanced in acids and alkalis, contain vitamins and biologically active substances, the recommended consumption — up to 400 g per day. Their thermal processing reduces product's value.

Macro- and micronutrients should not be a subject of «food body building». In gastrointestinal tract are shown their synergetic and antagonistic interactions, so, zinc increases cadmium intestinal absorption. Antagonistic effects are established for: iron — manganese; zinc — copper; calcium — iron; calcium — manganese, etc. Enrichment of products by calciferol, consumption of vitamin medicines and enthusiasm for sunburn promotes deficiency of vitamins A, E, B_1, C and bioflavonoids.

For Belarus is actual search of effective treatment-and-prophylactic medicines and foodstuff for normalization of the functional-and-metabolic organism status in conditions of complex man-caused, ionizing and non-ionizingradiations, noisy and vibrating influence. The way of creation of similar treatment-and-prophylactic diets on a basis of vegetable derivatives bioflavonoids is perspective. They can become a basis of preventive medicine. Bioflavonoids (about 4000) have multiform biological activity: P-vitamin activity strengthens capillaries; they render detoxic action, anti-oxidant, cardioprotective, spasmolytic, anti-inflammatory, choleretic, radioprotective, antiallergic, hepatoprotective,diuretic, anticancerogenic and other influences.

A dietary (medical) nutrition is directed on increase of treatment efficiency and prophylaxis of repeated hospitalization. The dietetics, diet-therapy is treatment by nutrition (who well nourish — well treats).

Questions of nutrition should be considered in a complex: health, profilaxis, treatment in view of a sex, age, organism status, stressful situations, working, social, ecological and industrial conditions.

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, activization fermentation and rotting in intestines, to phenol, indol and other toxic substances occurrence.

Nutraceuticals is a broad umbrella term used to describe any product derived from food sources that provides extra health benefits in addition to the basic nutritional value found in foods. Products typically claim to prevent chronic diseases, improve health, delay the aging process, and increase life expectancy.

Classification of nutraceuticals:

1) dietary supplements;
2) functional foods;
3) medical foods;
4) farmaceuticals.

Actions of nutraceuticals:

— increase physical and intellectual working capacity;
— protect against stresses and harmful factors of environment;
— slow down ageing;
— prolong active longevity;
— change metabolism;
— fill shortage of food substances;
— raise nonspecific resistance of an organism;
— render immunomodulating action;
— remove xenobiotics.

The basic principles of a dietary nutrition

A dietary nutrition is organized according to the general principles of the balanced (rational) nutrition in view of disorder of metabolic processes. Modern tactics of dietetic therapy issue from the following main principles.

1. Equation of nutrition and its full value taking into account of needs of the sick organism. Live ability of an organism is possible, if it receives with food the certain amount of proteins, fats, carbohydrates and others vitally important substances. Decrease of proteins in a diet is especially inadmissible, as at acute diseases (pneumonia, stomach ulcer, enterocolitis, traumas, operations) is observed infringement of albuminous metabolism, decrease of albuminous supply of the organism.

The quantity of fats in a dietary nutrition is a little limited at patients by chronic colitis, a chronic gastritis with lowered secretory stomach function, cardiovascular diseases. Dietary dishes are prepared on the cow oil. The vegetable oil containing valuable for organism unsaturated fat acids and phosphatides also should be included into a diet.

The maintenance of carbohydrates at patients with functional diarrhea, a chronic gastritis and a stomach ulcer should be within the limits of usual norm, and at patients with malnutrition — increases. At the chronic intestine diseases with amplification of fermentative processes the quantity of carbohydrates are decreased.

Assimilation of vitamins at stomach diseases and especially intestines is broken, and patients require their raised quantity. The control over the maintenance of vitamins at culinary processing of products and for food vitaminization is necessary.

Table salt in a diet are decreased at a chronic gastritis with the raises secretion, a stomach and duodenum ulcer, at diseases of cardiovascular system and organs of urogenital system.

Quite often in a diet of the sick person it is required to change usual balance of food and biologically active substances to result in a necessary optimal ratio a chemical compounds of a diet with fermental systems. For example, at kidneys disease in a diet the quantity of proteins decreases, at adiposity are increased proteins and reduced carbohydrates, at diabetes are reduced quantity of carbohydrates, especial fast-absorb.

2. Taking into account of features of biochemical and physiological processes of transformation and assimilation of food substances by the sick person. For example at atherosclerosis is prescribed to limit easily digestible carbohydrates, total animal fat can depending on features of metabolizm infringements.

Enrichment of a diet by essential nutritional factors is stimulated synthesis of enzymes in regenerative processes. At hepatitis, for example, a diet is enriched with lipotropic substances: the proteins containing amino acid methionine, choline, lecithin, vitamins B_6 and B_{12}.

For normalization of biochemical processes in an organism change a diet (frequency rate, quantity of food intake). Most frequently this method will be applied after operations on organs of gastroentestinal tract, etc.

3. Mechanical and chemical sparing diet of diseased organ. At mechanical sparing is limited in diet products rich cellulose and difficult assimilable: black bread, cabbage, radish, kidney beans, beans. Are appled methods of processing of the products improving food digestion and assimilation: products are crushed, wipe, knead, shaked up. Vegetative products are soften, reduced the contents in them rough cellulose. Vegetables are boiled or baked, wipe and use as puree, roll, baked puddings. Meat is used of average fatness, low-fat, carefully crushed. For preparation of soups are used wellsodden soft groats: pearl-barley, semolina, oatmeal. The second dishes are necessary to prepare by porous, air, light.

The principle of chemical sparing is achieved by exception of products rich extractive substances, restriction of the dishes stimulating secretory and motor functions of gastrointestinal tract. Are excluded strong broths, rich soups, fried dishes with formation of the crust, the concentrated sauces, pickles, pancakes, fresh bread and spices (mustard, pepper, vinegar). Taste of dietary dishes improves due to use of some seasonings and spices (vanillin, vanilla — citric acid,

cinnamon, greens). It is widely applied boiling at which extractive substances pass in bouillon and broth. The food should not be hot or cold as can render irritating temperature influence on mucous membranes of a mouth, an oesophagus and a stomach. The temperature of the first dishes should be no more than 60°, the second — no more than 55°, cold — is not lower 15°.

4. Limitation in nutrition (quantitative and qualitative), down to partial or complete starvation. Regime of partial starvation (are limited intake of some food (dairy, cottage cheese, apple etc.), are used at treatment of cardiovascular diseases, alimentary adiposity. Complete starvation for the limited term is shown at some acute diseases: uraemia, intoxications, acute inflammatory processes in gastrointestinal tract.

Dietetic therapy in all cases should promote the best action of medicines. So, at therapy by anabolic steroids it is necessary to increase the maintenance of proteins in a diet (anabolic effect raises).

It is necessary to consider the food not only as an energy and plastic substances source, but also as a pharmacological complex. Therefore dietetic therapy is an obligatory element of modern complex therapy which in one cases renders conducting therapeutic action, in others — promotes achievement of effective influence of other medicinal methods. Correctly organized nutrition provides an organism by food substances necessary for life and recovery of the patient.

Indications for increase of proteins in a diet are the extreme emaciation, condition after operation or acute diseases: colitis, enterocolitis, stomach ulcer, and also other illnesses accompanying hypoproteinemia. At all this pathology the maintenance of proteins in a diet should increase up to 150–160 g in day. Half of them should consist of proteins of animal origin.

Restriction of proteins is shown at function sparing of kidneys at nephritis, hypertonic illness, and also at urolithic diathesis. However, it is necessary to remember, that limitation of protein of below physiological norm is allowable only at short date.

At dietetic therapy is recommended to take into account also the general action of various products and dishes on the organism, on a metabolism and local their influence on organs of digestion.

Properties of products and the dishes taken into account in dietetic therapy — «Dietary pharmacology»:

1. Quickly evacuated from a stomach: milk, lactic products, an egg lightly-boiled, fruit, berries, mashed potatoes, dishes from ground meat and a fish (a cutlet steam, quenelles, rolls, quenelles), porridges from ground groats, macaroni products, white yesterday's bread.

2. Slowly assimilating: a salty fish, fresh (warm) bread, refractory fats (beef, mutton, pork), fat meat and a fish, geese, duck, fried meat, legumes.

3. Render expressed secretagogue action: extractive substances of meat, a fish, mushrooms (broth from them), cheese, spices (mustard, horse-radish, pepper), vegetable gains and juices, cabbage, cucumbers, smoking, pickles, friedmeat.

Have weak secretagogue action: dairy products, cooked vegetables and fruit, boiled meat, carrots, green peas, fats.

4. Render eccoprotic action: prunes, honey, vegetable oil, cold vegetable juices, sweet drinks (water with honey), compotes, kefir, cold aerated mineral waters, vegetables and fruit (except for having astringent taste), bread from coarse grinding, legumes.

Slow down intestinal peristalsis: hot dishes, rice and a cream of wheat, flour dishes (pies, pancakes, noodles), lightly-boiled egg, strong tea, cocoa, chocolate, bilberry and broth from it (have the expressed fixing action), fresh bread (it is especial from a flour of a thin grinding), cottage cheese.

5. Have choleretic action: vegetable oil (especially olive, sunflower), vegetables rich vegetative cellulose, the tomatoes, a grated radish with vegetable oil, beet.

6. Contain much sellulose: foliferous green, legumes, bread from a flour of a rough grinding, bran wheaten, groats — buckwheat, pearl-barley, peeled barley, millet, white cabbage, dried fruits, green peas, horse-radish.

Contain a little sellulose: macaroni products, bakery, products from flour of the maximum (supreme) and first grade, rice, semolina, pumpkin porridges, potato, cauliflower, berries.

7. Cause meteorism: legumes, fresh bread (rye), white cabbage, whole milk.

8. Promote shift in acid-alkaline balance to the sour side: meat, fish, bird, bread, flour products, groats, legumes, cowberry, nuts, almonds.

Promote shift in acid-alkaline balance to the alkaline side: vegetables, fruit, berries (except for a cowberry), dairy products, not sour cottage cheese, mushrooms.

9. Stimulate nervous system: meat and fish gains, cheese (especially at night), cocoa, coffee, chocolate, strong tea, spices.

10. Products rich oxalic acids: sorrel, spinach, cauliflower, rhubarb, cocoa, tea, chocolate.

11. Products rich of purines: sardines in oil, sprats, herring, fish, meat, internal organs, lentil, beans, spinach, cauliflower, rich broths.

12. Products rich of holins: eggs, liver, legumes, cabbage.

Physiological-and-hygienic characteristic of basic diets

In 1922 M. I. Pevzner developed the basic diets for the different groups of illnesses. Dietary nutrition at M. I. Pevznera's system includes 15 basic diets. The chemical compound and caloric content of diets are submitted in the table. Diets № 0, 0b, 0c, 1a, 1b, 4, 5a, 5, 8 concern to strict diets (without right of choice). Being unbalanced in structure and food value they are appointed at short date.

The first diets (1a, 1b, 1) provide mainly, mechanical sparing of sick organs, therefore are appointed at diseases of a stomach and a duodenal gut. They provide sparing baro-, chemo-and termoreceptors of stomach, fast food evacuation. The food stuffs unduly stimulating stomach secretion are excluded from a diet.

During an exacerbation are limitedthe food stuffs slowly evacuated from a stomach and containing a lot of cellulose. The diet includes products poorly stimulating secretory stomach activity.

The diet № 1a includes 4–5 glasses of milk, soups dairy or mucous (from groats or wheaten bran) with oil, soft-boiled egg or steam omelette, kissels and jelly berry, fruit (not sour), and dairy. Once a day liquid dairy porridges, a souffle from cooked meat or a fish are resolved.

Period of this diet is considered as the first stage of treatment. At favorable current of disease in 7–10 days the patient is transferred on more loading regimen — a diet № 1b for the same term. At that are added white crackers (75–100 g), the meat and fish dishes increases up to 2–3 times in the day, prograted porridges are given 2 times in day. Nutrition on diets № 1a and 1b is better to organize six times the amount.

The primary goal of dietetic therapy at diseases of the broken intestine functions is maximal recovery organs involved in pathological process.

The diet № 4 is appointed at enterocolitis promoting normalization motor and secretory functions of intestine, to weakening of fermentative processes.

Diets № 5 and 5a are appointed at acute hepatitis of any aetiology. This diet high-grade, but with some fat limitation (up to 70 g). The basic kidney diet in Pevzner is a diet № 7. In this diet half the quantity of proteins and not less than 1/3 is consist of proteins of animal origin. Fats in relation to quantity of proteins are in a physiological ratio, the quantity of carbohydrates is a little bit increased. Table salt is not given neither for preparation of food, nor for a table, the vegetables are selected with the least maintenance of chloride sodium.

The diet № 10 is the basic medical diet at cardiovascular diseases (myocardial ischemia, essential hypertension, cardiac infarction). It promotes normalization of metabolism processes in an organism, improves a functional condition of heart, kidneys, has good diuretic action. With the help of a diet may actively influence on the basic atherosclerosis mechanisms.

It is necessary to know that animal fats, especially emulsified, raise coagulating blood properties, vegetative one operate in opposite direction. Cellular environments contained in vegetative products (dietary fibres), raise motor function of intestine and strengthen cholesterol removing from the organism, positively influence on lipid metabolism.

Dietotherapy renders essential influence on a condition of blood circulation and myocardium function. This action is caused by limitation in a diet of table salt (ions of sodium) and inclusions in it of products rich salts potassum, vitamins (especially groups B). Essential value has a diet regim. Rare food intake increase hyperlipidemia, break tolerance to carbohydrates and promote increase of body weight. Distribution of regim within day should be uniform, amount of food intakes — 5–6 times in day.

The diet № 9 is applied at allergic conditions when any kinds of a metabolism suffer and infringements of a carbohydrate-and-fatty metabolism are most expressed. The given diet is recommended also at diabetes.

From the menu is excluded sugar and sweets, limit the maintenance of table salt and the general caloric content, mainly due to protein and fat.

The diet № 8 is appointed at superfluous body weight, for reduction of hypererethism of the food center.

It's typical for a diet:

— Sharp limitation of caloric content (50–60 % of need for persons with normal body weight) due to restriction of carbohydrates.

— The physiological maintenance in a diet of proteins and restriction of fats. Significant reduction in a diet of fats expediently since fats have expressed lipolytic action, reduce lipogenesis (fats formation) from carbohydrates, create feeling of satiety.

— Restriction of table salt up to 5–7 g.

— Exception of products and the dishes stimulating appetite (meat, mushroom, fish broths, alcohol, sharp, salty and fried dishes; spices, smoked products).

— Inclusion volumetric products, vegetables and fruit poor by carbohydrates (cabbage, cucumbers, tomatoes, apples), with the purpose of creation of satiety feeling.

— Presence in a diet of sea products containing a plenty of essential aminoacids and iodine.

All products are given not crushed, mainly in the cooked, baked or crude kind. Quantity of food intakes consist of 4–5 times.

The chemical compound and caloric content are determined by «due» body weight of the patient. In view of it are allocated three variants of a diet № 8.

Table 9 — Diet № 8(variants)

Variants	Maximal normal body weight, kg	Protein, gr	Fats, gr	Carbohydrates, gr	Calories, kkal
A	till 60	95	75	120	1400
B	61–70	110	80	130	1500
C	more 70	125	85	140	1650

Zero diets are appointed after operations on digestion organs and contain a minimal food quantity.

The diet consist of liquid dishes: juice, tea with sugar, liquid kissel, a weak broth with butter, rice broth with cream, vitamin drinks. Fruit drinks, juices and vitamin drinks are necessary to give guardedly, taking into account an opportunity of peristalsis amplification and diarrhea. Milk, vegetables, meat, fish, bread, crackers, porridges, cocoa, chocolate are forbidden.

The food is accepted 7 times in day, according to the necessity — in each 2–2,5 hours round the clock.

The diet № 11 is appointed at lung tuberculosis to persons with the lowered nutrition status, to convalescents after infectious diseases, operations and traumas, at anemia. They are intended for stimulation of assimilation processes and regeneration in a sick organism and characterized by a variety in assortment. Caloric content of food, animal proteins, lipotropic substances, vitamins and calcium are increased.

The diet № 15 provides a high-grade nutrition. It is characterized by a high-grade set of food stuffs with the raised maintenance of vitamins and exception of difficult transferable fat products. It is appointed at absence of indications for special diets. Culinary processing at diets № 11 and 15 is usual, various.

DIET № 1

Prescription: acute condition of stomach ulcer in partial recovery stage; a chronic gastritis with the conserved and raised secretion during acute condition.

The characteristic: moderate mechanical and thermal sparing of a stomach mucous membrane and a duodenum; food cooked and mainly in prograted kind. Food intake 5–6 times per day, ration weight nearby 3 kg, table salt — till 8–10 gr.

Assortment of products and dishes: yesterday's white and grey bread, crackers white, biscuit. Soups: dairy, prograted, groats and vegetable (except for cabbage). Steam cutlets (meat, fish), the hen and a fish should be cooked or steam. Vegetable puree, porridges and puddings should be prograted, cooked or steam; soft-boiled eggs or a steam omelette. Sweet grades of berries and fruit, juices from them, sugar, honey, jam, baked apples, kissel, mousse, jelly. Whole milk, cream, fresh sour cream, fresh low-fat cottage cheese. Tea and cocoa rather weak, with milk. Butter — unsalted and vegetative.

Are limited: rough vegetative cellulose, bouillons.

Are excluded: spices, coffee, mushrooms.

DIET № 1a

Prescription: stomach and duodenum ulcer, the first 8–10 days of exacerbation; a acute gastritis and chronic gastritis exacerbation, the first 1–2 days.

The characteristic: mechanical and thermal sparing of stomach and duodenum mucous membrane; all food should be in fluid and semi-fluid kind. Food intake — 6–7 times per day, ration weight nearby 2,5 kg, table salt up to 8 gr.

Assortment of products and dishes: soups dairy and mucous from groats and wheat middlings with the butter, prograted vegetables (carrots, beet) and puree from the boiled down lean meat and fish. Porridges are liquid, prograted, dairy, soft-boiled eggs, steam omelette, whole milk. A souffle must be prepared from green cottage cheese. Are recommended dogrose decoction, rather weak tea. Butter and olive oil are added in a dish.

Are excluded: vegetative cellulose, bouillons, mushrooms, bread and bakery products, lactic acid products, spices, snacks, coffee, cocoa.

DIET № 1b

Prescription: exacerbation of a stomach and duodenum ulcer, 10–20 days of disease; acute gastritis 2–3-d days.

The characteristic: more moderate in comparison with a diet № 1a mechanical, chemical and thermal sparing a stomach and a duodenum mucous membrane; all food in semifluid and pureeform kind. Food intake - 6-7 times per day, ration weight up to 2,5–3 kg, table salt — 8–10 gr.

Assortment of products and dishes: dishes and products of a diet № 1a, and also white and thinly cut and not toast crackers — 75–100 gr., 1–2 times day — meat or fish quenelles or meat-balls; prograted vegetable puree; kissels, jelly from sweet grades of berries and fruit, the juices diluted half-and-half with water and sugar, sugar, honey.

DIET № 2

Prescription: a chronic gastritis with secretory insufficiency; acute gastritis, enteritis, colitis during the period reconvalescence as transition to a balanced diet.

The characteristic: mechanically sparing, but promoting increase of gastric secretion. Food are cooked, baked, fried without breading. Table salt — up to 15 gr. in day.

Assortment of products and dishes: yesterday's white bread, not rich crackers, 1–2 times in a week — not rich pies. Soups must be from groats and vegetables with meat and fish broth. A low-fat beef, the hen are cooked, stewed, steam, baked, roasted without breading and galantine. A fish low-fat by a piece or in chopped kind, boiled, steam, jellied. A herring — soaked, chopped. Vegetables: a potato (is limited), beet, carrots in a prograted kind, boiled, stewed, baked; tomatoes are raw. Compotes, kissels, jelly, mousses, from mature fresh and dry fruit and berries (except for melons and apricots), the fruit and vegetable juices, baked apples, fruit candy, sugar. Whole milk is used at good tolerance. Acidophilus milk, kefir, cottage cheese fresh not sour, row and baked; cheese not spike and grated; sour cream is added in dishes. Sauces are meat, fish, sour cream and on vegetable broth. Are used: bay leaf, cinnamon, vanilli; tea, coffee, cocoa on water with milk; butter and oil; lightly-boiled eggs, fried omelette.

Are excluded: legumes and mushrooms.

DIET № 3

Prescription: chronic diseases of intestines with prevalence of constipations, unsharp aggravation period and the period of remission.

The characteristic: increase in a diet of products, rich vegetative cellulose and the products strengthening intestine motor function. Table salt — 12–15 gr. per day.

Assortment of products and dishes: bread wheaten from a meal, black bread — at good tolerance. Soups — with the skim broth or vegetable broth with vegetables. Meat and a fish should be cooked, baked, sometimes — cut. Vegetables (especially deciduous) and fruit — crude, in large quantities (prunes, fig), sweet dishes, compotes, juices. Porridges — crumbly (buckwheat, pearl-barley), cottage cheese and cheesecakes, one-day kefir, hard-boiled eggs. Butter and olive oil add to dishes.

Are excluded: turnip, a radish, garlic, mushrooms.

DIET № 4

Prescription: acute enterocolitis, chronic colitis aggravation, the profuse diarrhea period and strongly pronounced dyspepsia.

The characteristic: chemically, mechanically and thermally sparing intestines. Food intake — 5–6 times in day. All dishes are prepared on a pair, prograted. Table salt — 8–10 gr in day. Duration of a diet — 5–7 days.

Assortment of products and dishes: crackers from white bread. Soups with the skim meat broth, broths from groats with egg flakes, the semolina, frayed rice. Meat is low-fat in the cut kind, cooked or steam. A bird and a fish low-fat in a natural kind or cut, cooked or steam. Porridges and puddings from frayed groats with water or the skim broth. Juices — from fruit and berries, broth of a dogrose, a bilberry. Tea, cocoa on water, jelly, kissels. Eggs - at good tolerance — no more than 2 pieces in day, soft-boiled or steam omelette. Butter — 4 %-s' — 250 gr.

Are limited: sugar up to 40 gr., cream.

Are excluded: milk, vegetative cellulose, spices, snack, a pickles, a smoked product, legumes.

DIET № 7

This table is destined to patients with kidney's diseases. The main requirement here — liquid, table salt, proteins limitation, especially an animal origin. Every possible spicy and «acute» substances are forbidden.

To patients give: vegetarian and fruit soups, kissels, compotes, berries, fruit, sweet dishes, butter, flour dishes, various vegetative proteins, cottage cheese, cooked meat and fish.

However: at different conditions of the patient and various secretory system diseases the diet is altered. For example, at various hypostases is limited drink and completely excluded table salt; proteins excluded at uraemia, including vegetative (legumes products, bread, porridges, etc.), at nephrosis, when in urine the big maintenance of proteins, is destined with so-called «days of limited intake of food» with almost full exception of the basic products (proteins, fats, carbohydrates), basically at first 1–3 days. During starvation is entered in organism necessary liquid quantity — a physiological solution — hypodermically or intravenously; at acute current of illness — usually is limited drink, at chronic — quite often is destined plentiful drink (but only not irritating kidneys and urinary tracts), mainly milk,

mineral water, cranberry and cowberry fruit drink, extract bearberries , cowberry, a bilberry, birch kidneys, etc.). In heavy cases the patient is destined only sugar days, when give only 120–200 gr. sugar in day.

Eco-hygienic problems of population nutrition

From an environment harmful chemical substances migrate to various ecosystems and finally, moving ahead on food chain to get in human organism with products of a vegetative and animal origin. Thus the alimentary way of defeat of people by xenobiotics reaches 80 % and more (in some cases up to 95 %) from all ways of reception to an organism of alien substances. So, for example, stable pesticides from environment get into organism in 95 % of cases with food stuffs, in 4,7 % — with water and about 0,3 % only — with atmospheric air through respiratory ways and is absolutely insignificant — through a skin.

Radionuclids are usually get on chains «soil — vegetation — human» into people organism in 94 % of cases with food, approximately in 5 % of cases — with water and 1 % only — with inhaled air.

The primary quantity of nitrates with food stuffs are received also, and about 70 % from daily their receipt in an organism decreases, mainly, to the share a potato and vegetables, and the others of 30 % — with meat both other products and potable water. In overwhelming majority with food stuffs entry in human organism salts of heavy metals and others dangerous xenobiotics. Thus the basic their migration (as well as pesticides) occurs on food chains in all ecosystems.

The majority of chemical substances concerns to the so-called microelements widely distributed in the nature. They are similar to vital (biomicroelements) and frequently together with them make the certain migratory ways on ecosystems and do not represent value for organisms. The majority such (not biogenic) elements, especially in concentration, usual for many natural ecological systems, as a rule, do not influence on organism, valid historically output organisms adaptations to these substances.

In this connection migration of similar elements, appear, should not disturb scientists, including ecologists and hygienists, but as it was specified above, for last 3–4 decades in an environment began even more often and all in plenties to act from the various enterprises of metallurgical, chemical, energy and other branches, vehicles the by-products containing high concentration of some heavy metals, poisonous organic compounds, radionuclids and other harmful substances. Besides, some from such alien substances due to chemical similarity to any vital biomicroelements concentrate (as well as the last) in the same tissues. For example, the strontium similar with calcium chemical compounds and collects in bones. And if it appears radioactive strontium its pernicious action on an organism does not cause doubts. Therefore circulation practically all substances, both biomicroelements, and minor elements are subject to ecological studying.

It is known, that for many biomicroelements (or so-called essential irreplaceable factors) the physiological daily need is determined, which for the adult on the average (in mg) makes: iron — 15–20, zinc — 10–12, manganese — 5–6, fluorine — 2–3, copper — 2–2,5, cobalt — 0,1–0,2, iodine — 0,2.

Some other microelements can be by biologically active substances. For example, arsenic and nickel stimulate haemopoiesis, but vital necessity of them is not proved yet, and the daily need is not established. But it is necessary to take into account one practically important circumstance, consisting that in the certain dozes all microelements (including essential) can appear toxic and, getting together with foodstuff in human organism to cause heavy ecological consequences. Therefore presence of alien chemical substances in foodstuff, anyone xenobiotics, in quantities, even in 2–3 times exceeding their backsoil (usual in the given district) the contents, is undesirable, and in case of excess established for them maximum concentration limit (MCL) in that or other foodstuff simply inadmissible.

And already the extremely dangerous is the situation when the quantity such xenobiotics in food stuffs appears incredibly big or extreme, i.e. when maximum concentration limit (MCL) are exceeded in 5 and more times.

As it was already marked, some heavy metals differ by special toxicity. Eight of them (mercury, cadmium, lead, arsenic, strontium, copper, zinc and iron) are included in number subject to the control over international foodstuff trade. Except for these are eight, at us six more chemical elements (fluorine, iodine, antimony, nickel, chrom and aluminium) are subject to the control over the concentration in foodstuff, and at presence of corresponding parameters and other chemical elements.

From all listed heavy metals the most toxic and, certainly, dangerous are mercury, cadmium and lead. Mercury makes two types of circulation in the nature. One of them, so-called global, is connected to natural shape of elementary (inorganic) mercury between an atmosphere and Earth's surface, World ocean. Thus in industrially undeveloped regions insignificant backsoil contents of such mercury, as a rule, not causing anxieties are marked only from the point of view of influence on human organism.

Other type of mercury circulation in the nature is so-called local. It is connected to processes of inorganic mercury methylation, acting mainly from anthropogenous sources. Such sources now are, mainly, the enterprises of the electrotechnical and cellulose industry, mercury fungicides production, caustic soda manufacturing and the majority of manufactures and vehicles at fuel burning in them. In result in the world annually entry to an atmosphere (and therefrom in soil with its vegetation, in reservoirs from them water life) as vapor and aerosols on the average about 60-80 thousand tons of mercury. Thus background mercury concentration in an atmosphere can change from 0,001 up to 0,8 m kg/m^3, depending on region industrialization and eco-hygienic safety of manufacture.

But especially big anxiety is caused mercury intake in reservoirs. Here in bottom sediment as a result of methylation processes by microorganisms when inorganic mercury connections turn in organic, are carried out well soluble methyl mercuric compound. These processes are the beginning of trophic way of mercury promotion in water ecosystem. As a result of such food ways mercury gets already in human organism.

For example, in water of Minamata gulf (in Japan) during significant poisoning flash among the population with mercury from the use of the fish caught in this gulf, mercury concentration changed from 80 up to 680 mkg/l, i.e. from 4 up to 30 thousand times is higher, than at open ocean.

The first flash of this mass mercury poisoning (named «illness Minamata») has been diagnosed in 1956 when it has been registered 130 diseased, and the second flash has taken place also in Japan in 1964–1965, when was ill 180 person, from which 52 persons have died. These food flashes have grown out of direct pollution of a gulf by sewage and other dumps of industrial wastes from located near to factory, releasing nitric fertilizers at vinyl chloride synthesis, containing alkyl mercury compound. Significant mercury accumulation was marked in aquatic life of soil reservoirs and especially in fish products, which diseased used in nutrition.

At initial stages disease was expressed mainly by symptoms of CNS defeat (mercury concerns to protoplasmatic poisons). Thus speech disturbance, gait disorder, hearing and vision impairments were marked. In the subsequent weight of these defeats accrued, and many diseased people were died. Autopsy has been establish, that mercury concentration in various organs and tissues was incredibly great and exceeded the usual contents of mercury in tens, hundreds and thousand times. Congenital Minamata illness on a clinical picture was similar to a children's cerebral paralysis.

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Учебное издание

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Лабуда Анна Арнольдовна

ОБЩАЯ ГИГИЕНА
(на английском языке)

Учебно-методическое пособие
для студентов 2, 3 курсов факультета по подготовке специалистов
для зарубежных стран с английским языком обучения
медицинских вузов

Редактор ***Т. М. Кожемякина***
Компьютерная верстка ***А. М. Терехова***

Подписано в печать 03.11.2015.
Формат $60\times84^{1}/_{16}$. Бумага офсетная 65 г/м^2. Гарнитура «Таймс».
Усл. печ. л. 13,02. Уч.-изд. л. 14,24. Тираж 90 экз. Заказ № 342.

Издатель и полиграфическое исполнение:
учреждение образования «Гомельский государственный медицинский университет».
Свидетельство о государственной регистрации издателя,
изготовителя, распространителя печатных изданий № 1/46 от 03.10.2013.
Ул. Ланге, 5, 246000, Гомель