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БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
КАФЕДРА СТОМАТОЛОГИЧЕСКОЙ ПРОПЕДЕВТИКИ И МАТЕРИАЛОВЕДЕНИЯ

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АСЕПТИКА И АНТИСЕПТИКА В СТОМАТОЛОГИИ

ASEPSIS AND ANTISEPSIS IN DENTISTRY

Учебно-методическое пособие

Минск БГМУ 2025

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Представлены этиология, классификация, эпидемиология, профилактика ятрогенных инфекций, приведены инфекционные заболевания, которые могут передаваться при лечении стоматологических заболеваний, описаны методы асептики и антисептики, гигиенические мероприятия в стоматологических учреждениях.

Предназначено для студентов 2-го курса медицинского факультета иностранных учащихся.

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MOTIVATIONAL CHARACTERISTICS OF THE TOPIC

Topic of lesson: "Organization and equipment of a dental room. Aseptics and antiseptics. Iatrogenic infections in dentistry. Basic principles of ergonomics in dentistry".

Total class time: 5 academic hours.

Knowledge and observance of the rules of asepsis and antisepsis help prevent nosocomial infections and maintain the health of the doctor and the patient.

Objective of the lesson: to acquire the concepts of asepsis and antisepsis, epidemic regime in a dental institution.

Requirements for the initial level of knowledge. Repeat:

– *from the microbiology:* classification of microorganisms;

– *from the pharmacology:* asepsis and antisepsis.

Test questions from related disciplines:

1. Groups and types of microorganisms.
2. Routes of transmission of infectious diseases.
3. Factors of transmission of infectious diseases.
4. Antiseptics used in dentistry.

Test questions on the topic of the lesson:

1. The concept of nosocomial and iatrogenic infections.
2. Frequency and reasons for the increase in iatrogenic infections.
3. Etiology of iatrogenic infections.
4. Consequences of iatrogenic infections.
5. Diseases, transmitted at treatment dental patients.
6. Pathways, factors and reservoirs of iatrogenic infections in dental institutions. Risk groups.
7. Asepsis and antiseptics.
8. Methodology for pre-sterilization processing of medical instruments.
9. Types of sterilization of medical instruments.
10. Sterilization of dental instruments.
11. Duties of a nurse and orderly.
12. Prevention of HIV infection in dentistry.

MICROBIOLOGICAL ASPECTS OF IATROGENIC AND NOSOCOMIAL INFECTIONS. THE CONCEPT OF NOSOCOMIAL AND IATROGENIC INFECTIONS

Iatrogenic infections (II) (from the Greek "γιατρός" — the doctor) are the most urgent problem of modern medicine all over the world, including our country. **II** manifests itself in the development of infectious diseases and complications in patients seeking medical care, which leads to an increase in morbidity rates, length of stay in hospital and on sick leave, an increase in the number of people seeking outpatient clinics, as well as a deterioration of health of health care workers. **II** complicates the course of the underlying disease, causes long-term loss or reduction in working capacity, high economic losses in families and in the entire national economy, and undermines public confidence in the activities of health care authorities and health workers. **II** is a medical, social, legal and ethical problem of health care.

These infections can occur when providing medical care at all clinical departments of hospitals and outpatient clinics without exception, as well as during preventive examinations and vaccinations. It are the main cause of death in newborns and mothers, and patients who have undergone surgery. Most often, II are found in patients in maternity, gynecological, pediatric, intensive care units, surgical hospitals, patients with oncological, hematological, dental diseases, etc.

Hospital-acquired (nosocomial — from the Greek "nosokomio" — hospital) infections are infections that occur when providing medical care in hospitals, are an extremely serious health problem even in economically developed countries. Numerous literature data indicateg that hospital-acquired infections (HAI) develop in 3–18 % of patients during their hospital stay. In the United States, 2 million patients out of 37 million hospitalized patients develop HAI annually. According to American authors, HAI were the cause of death in 1 % of patients in hospital and in 3 % of those who died they complicated the course of the underlying disease. This is due to the fact that the proportion of generalized forms is quite high: hospital-acquired bacteremia develops annually in approximately two hundred thousand patients in US hospitals (5 per 1000 hospitalized), and the mortality rate is 37 %.

In recent years, as a result of prospective studies conducted using a uniform methodology in 14 economically developed countries, it was found that, on average, 8.7 % of hospitalized patients were diagnosed with nosocomial infections at the time of examination; significant fluctuations in morbidity rates (from 3 to 20.7 %) were also observed in hospitals of various profiles.

The situation with nosocomial infections is so serious that researchers in a number of countries have come to the conclusion that it is necessary to create special centers and institutes of nosocomial infection pathology. The cost of the

prevention program is approximately 72 million dollars. A reduction in hospital infection by only 0.4 % already fully covers all expenses for the prevention program.

Doctors of all specialties among the first were to understand the danger of their professional activity for the life and health of people. Already in the 4th century BC, the Hippocratic Oath contained a promise of a doctor: "... I will protect patients from everything harmful and unsuitable for them". About 2 thousand years ago, this became a principle of treatment: "*Primum non nocere*" (first of all, do no harm), which was perceived as the first commandment of a doctor. Subsequently, diseases associated with the provision of medical care began to be called **iatrogenic diseases, which have a medical origin.**

According to the definition of A. P. Krasilnikov, 1996, **iatrogenies** are diseases and injuries that occur in patients and health care workers as a result of the provision of any type of medical care.

According to the classification of A. P. Krasilnikov, 1997, all iatrogenies should be divided into 5 groups according to the causal factor:

– psychogenic;
– medicinal;
– trauma;
– infection;
– mixed.

Iatrogenies include all cases of infectious diseases that were acquired during the process of providing any kind of medical care. They are more often (sparing the doctor's conscience) called hospital-acquired (hospital, nosocomial) infections, which does not fully reflect the essence of the phenomenon, since these diseases also arise when providing medical care in outpatient and polyclinic institutions and at home. Thus, the term "iatrogenesis" directly indicates the connection of diseases or complications with the provision of medical care, and the term "hospital-acquired" can be retained for iatrogenic infections that develop in hospitals.

According to the WHO definition, **hospital-acquired infections (HAIs)** include any clinically recognizable diseases of microbial etiology that affect a patient as a result of staying in a hospital or seeking help there, or a health care workers as a result of his work in this institution.

In foreign terminology, the following terms are used to describe nosocomial infections:

– **self-infection** — infections caused by the microflora of the person, the patient, in Russian-language literature this term is more consistent with "endogenous infection";

– **cross-infection** — infections caused by another person, either a patient or the staff of a medical institution;

– **environ-infection** — infections caused by the environment of a healthcare facility.

Along with HAI, the term **healthcare-associated infections (HAI)** is also common. HAI are infections that not only join the underlying disease in hospitalized patients, but are also associated with the provision of any type of healthcare (in outpatient, educational, health and recreational institutions, social welfare institutions, emergency care, home care, etc.), as well as cases of infection of healthcare workers as a result of their professional activities.

HAI is any clinically evident disease of microbial origin that affects a patient as a result of his admission to a hospital or seeking medical care, regardless of the onset of symptoms of the disease in the patient — during his stay in the hospital or after his discharge, as well as an infectious disease of an employee of a medical organization as a result of his infection while working in this organization (WHO Regional Office for Europe).

The World Health Organization identifies 3 groups of HAI:

1. Diseases associated with infection of patients in hospitals.

2. HAIs arising from infection of patients in outpatient clinics and when providing health care at home.

3. HAI when medical personnel are infected.

Healthcare-associated infection (HAI) is currently used in WHO publications and regulatory documents of a number of countries.

Frequency of iatrogenic infections

Healthcare workers should be responsibile for infecting patients during the providing of health care, which is one of the unfavorable consequences of nosocomial infections for medicine and undermines public trust in doctors and medical institutions in general.

According to WHO statistics, more people die every year from medical errors than die in road accidents.

The incidence of nosocomial infections varies across countries. In Russia, 1–1.5 % (2–2.5 million cases) are registered annually, in the USA — 2.5–5 % (2 million per year), in Germany — 2.0–3.5 %, in the UK — 5–6 %, in China — 6–8 %, in Thailand — 12–14 %. According to WHO, 44,000–98,000 patients die from hospital-acquired infections every year in the USA, more than 5,000 in the UK. Every year, 24 % of patients with healthcare-associated sepsis die. In 2022, WHO published the first ever report on infection prevention and control, which states that 70 % of nosocomial infections can be avoided if pay attention to infection prevention and control. According to the WHO study, only 15.2 % of healthcare facilities meet all infection prevention and control requirements.

In the International Classification of Diseases and Causes of Death, 10th revision (ICD-10), iatrogenies include all adverse consequences of medical activity. Consequently, this term can be used to describe any new secondary disease

of a patient associated with the action (diagnosis, treatment, behavior) or inaction of a physician or other medical personnel.

Reasons for the increase in iatrogenic infections

The reasons for the increase in the incidence of II include:

– the formation and wide distribution of hospital-acquired strains of opportunistic microorganisms, characterized by high adaptation to hospital conditions, higher virulence, competitiveness and polyresistance to antibiotics, increased resistance to antiseptics and disinfectants;

– a significant increase among elderly and senile patients, as well as among the population of people with congenital and acquired immunodeficiency;

– overload of medical institution;

– widespread introduction into healthcare practice of a wide range of instrumental and endoscopic methods of diagnosis and treatment;

– expansion of the spectrum and complications of surgical interventions;

– the introduction into medical practice of agents that suppress natural immunity and reduce the effectiveness of the immune response to microorganism antigens (immunosuppressants, cytostatics, antibiotics, etc.);

– the enormous and ever-increasing scale of the population's requests for medical care;

– a sharp increase in the number of contacts between patients and medical workers and with each other during treatment and examination;

– the gap between the rate of evolution of pathogens and the rate of improvement and material base of anti-epidemiological measures;

– architectural and construction deficiencies in the construction and operation of healthcare institutions;

– violations of sanitary and hygienic and anti-epidemiological regimes and increased possibilities of contact-household and airborne transmission of infection;

– the spread of resistant strains of microorganisms due to the unjustifiably widespread use of antibiotics and disinfectants in medicine and other sectors of the national economy;

– slow implementation of new generation sterilization equipment methods and techniques with a lack of alertness among medical personnel regarding nosocomial infections.

Etiology of iatrogenic infections

The causes of infection can be a microorganisms, which include bacteria, viruses, mold and yeast-like fungi, protozoa, and multicellular parasites. The multiplicity of pathogen species is one of the main patterns of the etiology of II.

According to a number of authors, there are at least 100 nosological forms, which are caused by more than 200 types of microbes.

Depending on the degree of pathogenicity for humans and the conditions of the disease occurrence, the causative agents of II are divided into two groups: *obligate* and *opportunistic pathogenic*. The role of obligate pathogenic microbes is less important. This is due to the fact that most infectious patients are hospitalized in infectious hospitals with an effective system of anti-epidemiological measures. In non-infectious hospitals, many nosological forms of hospital infection caused by these microbes are registered. This group of diseases includes bacterial (diphtheria, whooping cough, tuberculosis, legionellosis, typhoid fever, paratyphoid A and B, salmonellosis, colienteritis, shigellosis, cholera, clostridiosis, listeriosis, chlamydia, yersiniosis, mycoplasmosis), viral (hepatitis B, C and D, HIV infection, influenza, parainfluenza, adenovirus and other respiratory viral infections, measles, rubella, mumps, chickenpox, herpes and cytomegalovirus infection, rotavirus infection, acute intestinal infections caused by enteroviruses), parasitic (toxoplasmosis, trichomoniasis, malaria, cryptosporidiosis, pneumocystosis, enterobiasis, lice, scabies).

At the present stage the majority of II are caused by opportunistic microorganisms (opportunistic microbes). In the 70–90s, the main group of II pathogens were opportunistic microorganisms, the main group of those affected were hospitalized patients, and the main place of distribution was non-infectious hospitals of all profiles. The total number of II pathogens increases every year, mainly due to opportunistic bacteria, as well as microorganisms that were previously considered saprophytic. The main pathogens of ulcerative colitis at present are enterobacteria (Escherichia, Klebsiella, Proteus, Citrobacter, Serratia, Enterobacter, etc.), staphylococci, especially Staphylococcus aureus and Staphylococcus epidermidis, group A, D, K streptococci, pseudomonads, especially Pseudomonas aeruginosa, Haemophilus influenzae, Acinetobacter, Bacteroides, Campylobacter, Fusobacterium, Peptococci, Peptostreptococci, Candida fungi, Aspergillus, etc.

Many of the opportunistic microbes circulating in hospitals are divided into two ecological variants: hospital-acquired and community-acquired. The main role in the development of nosocomial infections is played by hospital ecovars of microbes. These include microorganisms (staphylococcus, streptococcus, pseudomonas aeruginosa, enterobacteria and other microorganisms) selected in the hospital environment as a result of the action of antimicrobial regime factors (antibiotics, chemotherapeutic agents, antiseptics, disinfectants). These ecovars differ from community-acquired ones by increased intra- and rullence, heterogeneity of microorganism populations, greater resistance to antimicrobial regime factors and the human immune environment. A characteristic feature of hospital ecovars is their high colonization and invasiveness.

The pathogenesis and clinical picture of diseases occurring in hospitals differ significantly from similar diseases occurring in out-of-hospital conditions.

Hospital-acquired infections tend to be protracted, chronic and recurrent, have a pronounced tendency to generalization, secondary and reinfection. Hospital-acquired infections are characterized by slow development and low intensity of acquired anti-infective immunity, associativity of pathogens (mixed infections), heterogeneity of the pathogen population.

The analysis of literature data and our own research allow to identify the following specific patterns of the etiology of hospital infections:

– continuous evolution of the composition of pathogens and their proportion in the development of hospital infections;

– a large number and diversity of the species composition of pathogens;

– the predominant role of opportunistic microbes over obligate pathogens, the leading role of hospital strains and ecovars in the occurrence of hospital infections, polyorgan tropism of pathogens, which determines the diversity of clinical forms and cases of hospital infections;

– pronounced polymorphism of populations of pathogens of hospital infections by many characteristics, including resistance to antibiotics, antiseptics, disinfectants, physical factors, bacteriophages, virulence for humans, etc.;

– variability of the species, variant and strain composition of pathogens during the disease process;

– dependence of the etiological structure on the method of infection, the state of the immune system function, the location of the patient, the localization of the pathological process, the nature of medical intervention, the age of the patient, the nosological form of the underlying disease, the nature of violations of the anti-epidemiological regime, etc.

Classification of iatrogenic infections (A. P. Krasilnikov, A. I. Kondrusov, 1987)

Classification sign:

1. Group of pathogens:
– bacterial;
– fungal;
– viral;
– protozoans;
– metazoans.
2. Place of infection:
– hospital;
– outpatient clinics;
– home;
– production.

3. Method of infection:
– endogenous;
– exogenous;
– metastatic;
– autoinfections.
4. Categories of affected people:
– sick;
– health workers;
– healthy patients.
5. Severity of the current:
– microbial carriage;
– asymptomatic infection;
– clinical (manifest) mild, moderate, severe.
6. Process localization:
– local (local);
– systemic;
– generalized.
7. Duration of the course:
– acute;
– primary chronic;
– acute-chronic.

Consequences of iatrogenic infections

Numerous data from the literature indicate that the medical, economic and social consequences of II are varied and are heavy.

The medical consequences are expressed in increased morbidity, mortality and fatality rates.

The economic consequences are expressed in the increase in cost treatment and care, lost labor, social security costs, decreased ability to work, economic losses for the patient's family.

The legal and ethical aspects of the consequences of II are less developed. The problem of the relationship between the doctor and the patient comes to the fore. When providing medical care, the doctor often harms the health of a person, and the patient, turning to the doctor to get rid of one disease, risks getting a new one, sometimes more severe than the one with which he turned.

The legal aspect of the II is based on the concept of health and life as the main human needs and on the human right to health protection enshrined in the WHO Constitution.

A classification of accidents in the provision of medical care can be used to differentiate the II according to the legal and ethical criterion, according to 4 groups of iatrogenies (A. P. Karalnikov, 1997).

The first includes medical complications that do not depend on the health worker (imperfection of diagnostic and treatment methods and means).

The second group is iatrogenies associated with erroneous but unintentional behavior of the doctor (violation of the technique of performing manipulations, incorrect prescription of the drug and procedure).

The third group of II includes rare cases of intentional murder (medical crime).

The fourth group does not specify whether the health worker's actions were accidental or intentional.

EPIDEMIOLOGY OF IATROGENIC EFFECTS

In hospitals, two levels of disease intensity are recorded: sporadic and epidemic (group, outbreak). Morbidity is predominantly sporadic with endo- and autoinfection predominating under conditions of a strict and effective sanitary and epidemiological regime. Epidemic outbreaks (group diseases) occur, which can cover from several to hundreds of cases of diseases, in cases of gross violation or prolonged non-compliance with the antimicrobial regime, as well as its inconsistency with the epidemiological situation, Some outbreaks are the result of the acceleration of the pace of evolution of the epidemic process caused by certain pathogens, others are a consequence of the simultaneous infection of large groups of patients, for example, with contaminated food products, drugs, blood transfusion systems, etc.

There is no generally accepted criterion for dividing sporadic and outbreak diseases. Three or more diseases caused by one pathogen depending on the infectiousness and severity as well as those related by a common source or factor of infection transmission.

The basis for developing antimicrobial measures to combat and prevent nosocomial infections is knowledge of the basics of their epidemiology. The epidemiology of "opportunistic" nosocomial infections, like classical infectious diseases, consists of 3 links: **source of infection, factors and routes of transmission, susceptible population with immune system characteristics** (Fig. 1). In classical infectious diseases, such a triad has been well studied, and on this basis, complexes of measures have been developed to prevent this or that infection. The situation is more complicated with "opportunistic" infections caused by opportunistic bacteria, since here the sources of infection are numerous, the routes and factors of transmission are diverse and complex, and the susceptible group is characterized by a high proportion of people with insufficient immune function.

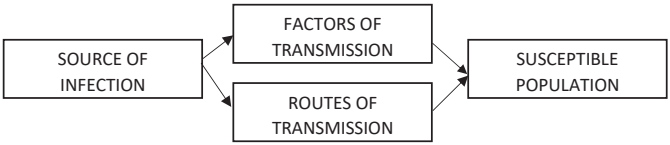

Fig. 1. Epidemiology of infectious diseases

Sources of iatrogenic infections

The main sources of "opportunistic" infections in medical and preventive institutions and in dental institutions are patients who are carriers of bacteria, medical personnel who have been in the institution for a long time, and patients with purulent-inflammatory diseases.

In light of new data, the source of infection of some groups of bacteria (Legionella, Klebsiella, Proten, Pseudomonas, Clostridia, bacilli causing deep mycoses, etc.) may be abiotic factors of the surrounding hospital environment, for which they are a natural habitat, where microorganisms can intensively multiply and accumulate. Infections caused by such microbes are called sapronoses. It occupies a significant place in the structure of the II.

Patients are the main source of II. Moreover, the constant change in the species composition of pathogens occurs due to the introduction from outside by a large number of patients at a dental appointment, especially a surgical one.

Healthcare workers are carriers of hospital strains and play a role in the spread of respiratory pathogens. According to some data, the carrier rate can reach up to 50 %. The greatest danger is posed by medical personnel from among chronic carriers and patients with latent forms of infectious diseases.

Persons accompanying patients may be carriers of streptococci, staphylococci, enterobacteria, rotaviruses, and respiratory viruses.

The role of clinic visitors is limited, but they can be carriers of acute respiratory viral infections, as well as staphylococci and enterobacteria.

The reservoirs of the infectious agent are medical equipment, contaminated instruments, furniture, liquid objects — distilled water, hand creams, water in flower vases, drinking water, including solutions of disinfectants with reduced concentration or the surfaces of "wet" objects — taps, sinks, etc. As well as opened contaminated drugs, special clothing, hair, hands of personnel.

Factors and routes of transmission of iatrogenic infections

The second link in the epidemic process is the routes and factors of transmission of nosocomial infections, among which the most important are contact-household, airborne and airborne dust routes of infection transmission.

The factors of transmission of nosocomial infections are the most diverse objects of the hospital environment (living and nonliving): hands of medical personnel and patients, medical linen and instruments, devices and instruments for diagnosis and treatment, solutions of drugs, especially antibiotics, antiseptics and disinfectants, which are often contaminated with microorganisms.

The third link in the epidemic process in a healthcare facility is the susceptible group (patients and medical personnel), which is characterized by a high proportion of individuals with insufficient immune system function.

In recent years, more attention has been paid to the **artificial** transmission mechanism, which includes variants of infection associated with invasive diagnostic and therapeutic manipulations that violate the integrity of the skin and mucous membrane. The hands of health workers contribute to the spread and increase in the role of the artificial transmission mechanism. Insufficiently treated hands in the absence of protective clean gloves contribute to the transmission of II both during invasive diagnostic and therapeutic manipulations and during examination and palpation. Considering that the peculiarity of II is the fact that the pathogen is not so much the person himself, but the environment around him, it is necessary to minimize the number and duration of invasive procedures. WHO states that 30 % of invasive manipulations are unjustified. The combination of these data with potential violations by health personnel can be considered the leading mechanisms in the development of II.

PREVENTION OF IATROGENIC INFECTIONS

Prevention of infectious diseases is a system of architectural and planning, sanitary and hygienic, anti-epidemic, medical and preventive and organizational measures aimed at timely detection and neutralization of infection sources, combating pathogenic and opportunistic microorganisms in the external hospital environment and in the internal environment of people in medical and preventive institutions, as well as increasing the general and local anti-infective resistance of inpatients and medical workers. Prevention of infectious diseases, along with other measures, should ensure the creation of the most favorable and safe conditions for examination, treatment and stay of people in medical and preventive institutions.

The multifactorial nature of the epidemic process of II requires the provision of a permanent comprehensive system of monitoring them, taking into account the main reasons leading to the development of the epidemic process. This is achieved by introducing epidemiological surveillance of II, which forms the basis for the development of preventive events.

Epidemiological surveillance

Epidemiological surveillance — is a system of continuous comprehensive observations of the dynamics of the epidemic process (morbidity, carriage, mortality), factors influencing the spread of nosocomial infections, as well as analysis of the obtained data in order to obtain objective information on the state and trends in the development of the epidemic process to substantiate rational measures to combat and prevent nosocomial infections (NI).

The system of epidemiological surveillance of NI includes the following components:

– accounting and registration of NI;

– decoding the etiological structure of NI;

– sanitary and bacteriological studies of environmental objects and medical and preventive institutions;

– study of the circulation of pathogenic and opportunistic microorganisms;

– determination of the breadth of distribution and spectrum of resistance of microorganisms to antibiotics, antiseptics, and disinfectants;

– monitoring the health status of medical personnel (morbidity, carriage of epidemiologically significant microorganisms);

– monitoring compliance with sanitary and hygienic standards and anti-epidemic regime in medical and preventive institutions;

– epidemiological analysis of the incidence of nosocomial infections (current and retrospective), allowing conclusions to be drawn about the sources, routes and factors of transmission, as well as the conditions that contribute to infection.

Microbiological diagnostics and control

Establishing the etiology of the disease caused by UI is important for choosing rational methods of treatment and organizing targeted anti-epidemic and preventive measures. Microbiological methods are of decisive importance in establishing the etiological diagnosis of UI, developing a rational treatment regimen and preventing the development of secondary cases of the disease. Currently, the main diagnostic method is bacteriological, consisting of isolating a pure culture of the pathogen and determining the properties necessary for therapeutic and preventive purposes. The diagnostic capabilities of other methods (microscopic, serological) are limited. In the 1980s, molecular genetic methods of microbiological diagnostics were developed using DNA probes and amplification reactions (polymerase chain reaction), which make it possible to identify the pathogen without isolating a pure culture. However, for various reasons, including economic ones, they have not yet found application in practical microbiology. Bacteriological diagnostics of II infections should be carried out using the following principles:

– *biocenotic* (isolation and study of all microorganisms present in the biotope);

– *population* (isolation and study of a certain number of cultures from each population due to its heterogeneity);

– *quantitative* (determination of the number of microbes present in the material and establishment of their etiological significance);

– *dynamic* (repeated examination of pathological material from the patient every 4–5 days of hospitalization, which is due to the high frequency of secondary, re- and superinfection);

– *chemotherapeutic* (mandatory study of etiologically significant types of microorganisms for sensitivity to chemotherapeutic drugs and antiseptics);

– *epidemiological* (typing of microorganisms during epidemiological monitoring).

To decipher the etiology of a hospital-acquired disease, **it is necessary to:**

– mandatory microbiological examination of pathological material (blood, cerebrospinal fluid, pus, sputum, feces or other pathological material determined by the clinical form of the disease) from a patient with suspected nosocomial disease;

– the use of an effective set of differential diagnostic tools that allow the detection of a wide range of opportunistic pathogens in the material being studied and their simultaneous differentiation;

– use of a sample sufficient to identify the full composition of species in the association and variants in the population (at least 2 colonies of one type of microorganism in closed processes and 4–5 in open processes);

– the use of methods for quantitative recording of microorganisms in pathological material with the determination of populations dominant in associations;

– identification of isolated microorganisms with determination of their species and genus;

– conducting repeated examinations every 4–5 days of hospital stay bacteriological studies to establish superinfection, reinfection, or secondary infection, and to correct treatment and preventive measures;

– study of the biological properties of isolated microorganisms with differentiation and typing (serological, biochemical, phage, resistance and pyocynotyping), as well as molecular genetic typing methods;

– determination of the frequency, level and spectrum of sensitivity of isolated bacterial strains and populations to various antibiotics and other chemical preparations, as well as periodically to used antiseptics and disinfectants;

– making a joint decision between the attending physician and the microbiologist about the significance of the opportunistic pathogen isolated from the material under study microorganism in the etiology of the disease.

The etiological role of an opportunistic pathogen in a hospital-acquired disease can be is based on a combination of several features: isolation of a given pathogen from pathological material in a monoculture or dominance in microbial associations, the repeatability of its detection, the massiveness of isolation,

isolation of hospital ecovars of bacteria, the presence of dynamics of specific immunological shifts in the patient's body, isolation of identical cultures from different patients in the hospital, the nature of clinical manifestations of the disease and the results of etiotropic therapy; conducting regular analysis of the etiological structure of nosocomial diseases, taking into account nosological forms according to definitions and in the hospital as a whole.

Microbiological monitoring of hospital-acquired infections is part of epidemiological surveillance of hospitals. It is based on microbiological monitoring of hospitals, which includes the collection and analysis of information on the level of distribution and properties of microorganism strains that cause hospital-acquired infections and colonize patients in hospital departments. First of all, this applies to departments where patients with a high risk of developing hospital-acquired infections are located. Here, the importance of microbiological monitoring is also determined by the fact that the microbiological assessment of the patient's condition and the situation in the department should be ahead of the appearance of clinical symptoms of the disease and, especially, its spread in the hospital.

Microbiological control (monitoring) of hospitals includes:

– analysis of data from microbiological studies of material from patients or pathological material from the deceased, carried out for the purpose of establishing an etiological diagnosis;

– bacteriological studies of microflora colonizing patients in hospital; bacteriological studies of hospital environment objects and air, carried out specifically to detect microorganisms with the properties of hospital strains;

– study of carriage of pathogenic and opportunistic strains of microorganisms by hospital medical personnel;

– bacteriological studies in epidemiological investigations of group diseases and outbreaks of hospital infections, monitoring of microbial contamination of medicinal solutions, working solutions of antiseptics and disinfectants.

IATROGENIC INFECTIONS IN DENTAL INSTITUTIONS

Some infectious diseases that can be transmitted during dental treatment (Table 1).

Table 1

Some infectious diseases that can be transmitted during dental treatment

Diseases	Pathogens	Incubation period
AIDS	Virus	up to 8 years and older
Hepatitis A, B, C	Virus	2 weeks — 5 months
Herpes	Virus	up to 2 weeks
ARI	Virus	2–3 days

End of the Table 1

Diseases	Pathogens	Incubation period
Flu	Virus	1–3 days
Measles	Virus	9–11 days
Infectious mononucleosis	Virus	4–7 days
Chicken pox	Virus	10–21 days
Mumps	Virus	14–25 days
Streptococcal, staphylococcal infections	Bacteria	1–30 days
Gonorrhea	Bacteria	4–7 days
Legionellosis	Bacteria	2–10 days
Pneumonia	Bacteria	different
Tetanus	Bacteria	7–10 days
Tuberculosis	Bacteria	up to 6 months
Syphilis	Treponema	2–12 weeks
Candidiasis	Mushrooms	2–3 days

Pathways, factors and reservoirs of infectious diseases in dental institutions

Risk groups. Dentists suffer from occupational infectious diseases among people of various professions. They account for 50 % of all infectious diseases caused by the profession.

It is known that dentists have primary syphilitic effect after treating patients.

Routes of transmission of II:

– contact;
– instrumental;
– aerosol;
– parenteral;
– implantation.

Transmission factors:

– household (air, water, floor, wall, ceiling surfaces, furniture, dishes, linen, shoes, plumbing equipment, hand skin, hair, etc.);
– medical (instruments, devices, apparatus, blood, medicines and disinfectants, linen).

Susceptibility of different categories of people, medical and technical staff and patients depends on many factors by which risk groups for susceptibility to II are identified:

– newborns;
– elderly people;
– patients with immunodeficiency;
– diabetes;

– blood diseases;
– oncological diseases;
– postoperative;
– other serious diseases.

Insufficiently decontaminated objects, equipment and medical supplies become **reservoirs of infectious diseases**. "Classic" reservoirs of infection are shared towels, spittoons, washbasins, armrests, seats, backs of chairs (especially seams in upholstery). Reservoirs of infectious diseases are medical and auxiliary equipment and, last but not least, the telephone.

The most contaminated items are the X-ray film clamps. Dental laboratory tanks II — boxes for storing dentures, spoons for taking impressions, polishing brushes, powder puffs, circles for polishing.

The possibility of cross-infection at a polyclinic appointment is a great danger. The work of a dentist is constantly associated with the use of sharp and piercing medical instruments. The ever-increasing spread of viral diseases (hepatitis A, B, C; herpes, flu) and especially AIDS requires special attention to this issue.

Hygiene levels depending on the treatment area of the dental patient

Surface treatment in a dental treatment room should be aimed at reducing bacterial contamination of all surfaces (walls, equipment, door handles, taps, etc.). Dental rooms are divided into 3 zones with different levels of hygiene:

Zone 1 is the treatment zone where the highest level of hygiene must be maintained. This zone usually includes a table on brackets or a table-trolley cloth, as well as part of the surrounding space. All surfaces in the treatment zone must be disinfected before the start of the working day and after each patient. The work in Zone 1 must be based on the following principles:

– sterility (almost all dental instruments);
– disposable (disposable instruments);
– individuality (gloves).

Zone 2 — the boundaries of the treatment area, including the surface of the treatment table, armrests, dental unit, halogen lamp, pulp testers, apex locators, individual glasses (drinking cups), spatulas and cups for mixing impression material. This includes handpieces, air pistols, suction hoses, lamps, spittoon, sink taps. The surfaces of these items are processed and disinfected after each patient, at the end of the shift and as they become dirty.

Zone 3 — the rest of the office: furniture, equipment, door handles, taps, sinks, bactericidal lamps, lights, floor. The objects and surfaces in it (walls, floors, doors, storage and portable cabinets) do not come into contact with the patient's mucous membrane. In this zone, routine cleaning is carried out daily, at least twice a day, using disinfectants.

ASEPSIS AND ANTISEPTICS

Asepsis — a method of preventing the penetration of microbes into a wound or organism during diagnostic and therapeutic manipulations. It is achieved by sterilizing linen, dressings, suture material, instruments, preparing the hands of medical personnel, and the surgical field.

Antiseptics — a set of methods for suppressing the growth and reproduction of potentially dangerous microorganisms on intact and/or damaged skin and mucous membranes of the body of humans and other animals.

The Medical Encyclopedic Dictionary (MED) defines antisepsis as a set of therapeutic and preventive measures aimed at destroying microbes in a wound or other pathological formation in the body as a whole.

The place of antiseptics in the system of antimicrobial measures. Antimicrobial measures can be divided into three groups: direct, indirect and combined action on microorganisms that cause infectious processes.

Direct action: disinfection, sterilization, chemotherapy, antisepsis.

Indirect action: isolation, separation, disunity.

Complex: asepsis.

Antiseptics (AS) are chemical agents with microbiostatic or microbicidal action, used on damaged and intact skin, mucous membranes (MM) and cavities in order to prevent the development and treatment of infectious diseases.

Requirements for the AS:

1) must have a broad spectrum of antimicrobial action and microbicidal effect;

2) drugs used for therapeutic antisepsis must have a selective antimicrobial effect;

3) must be of both short-term and long-term action (as necessary);

4) should not have mutagenic, carcinogenic, teratogenic properties action (mild irritating, sensitizing and toxic effects are permissible);

5) must dissolve well in lipids and poorly or moderately in water, which ensures their sorption in the skin, mucous and wound surfaces and, at the same time, prevents their absorption into the blood and lymph;

6) antiseptic drugs should have the least effect on human functions;

7) additives to AS preparations (base, preservatives, solvents, etc.) should enhance the antimicrobial activity, depth of penetration and stability of the AC and reduce its side effects;

8) AS should be inexpensive to manufacture and stable at storage (at least 5 years).

Mechanism of action of AS:

According to the mechanism of action, AS are divided into groups:

I. Increasing the permeability of microbial membranes.

II. Denaturing proteins that are part of microbes.

III. Blocking metabolic reactions due to the formation of reversible and irreversible compounds with enzymes or metabolites of microbes.

IV. Oxidizing metabolites or enzymes of microbes.

V. Dissolving lipoprotein structures and causing lysis microbes.

According to the spectrum of action, AS are divided into the following drugs (Table 2).

Table 2

Antiseptics according to the spectrum of action

Antiseptics	Representatives
I. Narrow spectrum of action (acting only on Gr^+ and Gr^- bacteria)	Dyes Local purpose AB
II. Limited spectrum (acting on some Gr^+ and Gr^- bacteria)	Nitrofuran drugs Quaternary ammonium compounds, which are part of the surfactant group Preparations CI-, J-
III. Broad spectrum (effective against all types of bacteria)	Phenols Oxidizers Formaldehyde Acids

Disinfection. Sterilization and control

All medical products used in medical and diagnostic procedures in healthcare facilities must be sterile. The stages of disinfection and sterilization are regulated by government orders and regulations:

1. Law of the Republic of Belarus of 07.01.2012 No. 340-3 “On the sanitary and epidemiological well-being of the population”.

2. Sanitary rules 1.1.8–24–2003 “Organization and implementation of industrial control over compliance with sanitary rules and the implementation of sanitary-epidemic and preventive measures”, approved by the Resolution of the Chief State Sanitary Doctor of the Republic of Belarus dated December 22, 2003 No. 183. Resolution of the Ministry of Health of the Republic of Belarus dated September 1, 2010 No. 117 (8/24394 dated February 16, 2012).

3. Resolution of the Ministry of Health of the Republic of Belarus dated March 21, 2013 No. 24 “On approval of the Sanitary norms and rules “Requirements for the procedure for carrying out disinfection, disinfestation and deratization measures” and recognizing as invalid the resolution of the Chief State Sanitary Doctor of the Republic of Belarus dated December 26, 2002 No. 143”.

4. Resolution of the Council of Ministers of the Republic of Belarus of March 3, 2020 No. 130 “On approval of specific sanitary and epidemiological requirements”.

5. Order of the Ministry of Health of the Republic of Belarus dated 25.11. 2002 No. 165 “On the implementation of disinfection and sterilization by healthcare institutions”.

6. Resolution of the Ministry of Health of the Republic of Belarus dated 06.02.2013 No. 11 “On approval of sanitary norms and rules “Requirements for the organization and implementation of sanitary and anti-epidemic measures aimed at preventing the emergence and spread of viral hepatitis” and the resolution of the Ministry of Health of the Republic of Belarus dated November 14, 2011 No. 112, which has lost its force”.

7. Order of the Ministry of Health of the Republic of Belarus dated December 16, 1998 No. 351 “On the revision of departmental regulations governing issues related to the HIV/AIDS problem”.

Sterility of medical instruments is achieved **through processing stages**, which include:

– disinfection;
– pre-sterilization cleaning (PSC);
– drying;
– package;
– sterilization;
– storage.

Disinfection is a set of measures carried out to destroy pathogenic and opportunistic microorganisms: viruses (including pathogens of parenteral viral hepatitis, HIV infection), vegetative bacteria (including mycobacteria tuberculosis), fungi (including *Candida fungi*) on surfaces, as well as in the channels and cavities of medical devices.

According to the order of the Ministry of Health of the Republic of Belarus No. 165 of 25.11.2002 “On the implementation of disinfection and sterilization by healthcare institutions”, disinfection of products is carried out by physical (boiling, saturated water steam under excess pressure, dry hot air) and chemical (use of chemical solutions) methods. The choice of disinfection method depends on the characteristics of the product and its purpose.

The choice of the disinfection method depends on the properties of the pathogen, the object of disinfection and its properties, as well as on the organizational capabilities of the healthcare facility. Depending on the purpose and goal, disinfection is divided into preventive and focal, current and final (Fig. 2). Current — is a set of disinfection measures that allow for constant monitoring of the sanitary condition of the premises of the healthcare facility and the objects located in it. This is achieved through daily wet and general cleaning of premises and surfaces using disinfectants

Focal disinfection — a set of measures, carried out directly in the focus of the current infectious disease, or in case of suspicion of it.

Final disinfection is a set of measures that are carried out in complete isolation of the patient after the end of his stay in the focus.

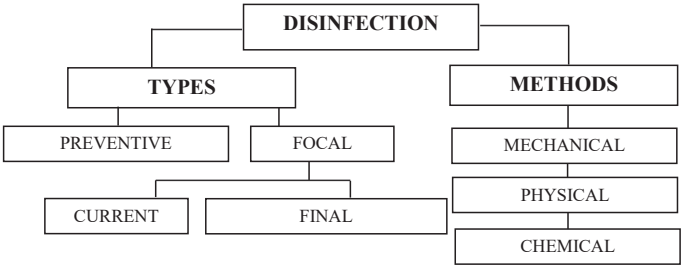

Fig. 2. Types and methods of disinfection

Methods of disinfection. Disinfection includes mechanical, physical and chemical methods of action.

Mechanical methods of disinfection are designed to reduce the concentration of microorganisms on objects. Mechanical methods include shaking, beating, vacuuming, washing and scrubbing, and airing. and ventilation of premises, water filtration, sweeping.

Physical methods of disinfection are based on the destruction of microorganisms under the influence of physical factors: mechanical, temperature agents, radioactive radiation. Physical methods include burning, calcination, scalding, boiling, ironing with a hot iron, using sunlight or radioactive radiation, quartzization, exposure to saturated water vapor under excess pressure in a steam sterilizer or dry hot air in an air sterilizer. The physical method of disinfection is reliable, environmentally friendly and safe for personnel.

Disinfection using the physical method is performed:

– by boiling in distilled water or in water with the addition of sodium bicarbonate (baking soda);

– by steam method in a steam sterilizer (autoclave);

– by air method in an air sterilizer (dry heat oven).

Glass, metal, durable polymeric materials and rubber items are subjected to disinfection by boiling. Before boiling, items are cleaned of organic contaminants (blood, mucus, etc.) by rinsing with tap water and observing safety precautions when working with biological fluids. The disinfection holding time is counted from the moment the water boils. Boiling as a disinfection method in practical Healthcare in the Republic of Belarus is not currently widely used.

The steam method is used to disinfect glass, metal, rubber, latex, and heat-resistant polymer products. No preliminary cleaning of the products is required. They are placed in sterilization boxes and placed in a steam sterilizer. Disinfection

is carried out by exposure to saturated water vapor under excess pressure. Air disinfection is used for glass, metal, and silicone rubber products and is carried out in the open on the shelves of an air sterilizer. This method can only disinfect products that are not contaminated with organic substances (due to their burning to the surface of the product).

The chemical method of disinfection occurs with complete immersion. instruments in a solution of a disinfectant or wiping the surface with a solution. The choice of disinfectant, its form, concentration, exposure depends on the type and object of disinfection.

Disinfectants are classified according to the active substance:

– oxygen-containing compounds;
– surface-active substances (surfactants);
– acids;
– aldehyde-containing substances;
– guanidines;
– phenols;
– alcohols;
– halogen-containing compounds.

Oxygen-containing agents are preparations whose active substance is oxygen. Hydrogen peroxide is used, as well as combined preparations, which include peroxide compounds with additives. Preparations of 6 % hydrogen peroxide solution have a wide spectrum of antimicrobial action and sporicidal properties, but their use is limited due to a pronounced corrosive effect.

Surfactants are a chain of carbon atoms with a polar group at the end. Due to this group, they are divided into cationic, anionic, ampholytic and nonionic. The main purpose is to use for one-stage cleaning and disinfection. This is possible due to their cleaning properties. Surfactants are most often added to antiseptics, only cationic and ampholytic can be used independently due to their groups.

Acid-based disinfectants are considered toxicologically safe and biologically active. They are used in rinsing and disinfecting compositions. The action of acid-containing disinfectants is based on the interaction and destruction of the cell membrane. Most often, organic acids are used, such as *acetic, peracetic, lactic, propionic* and *formic*. The presence of acids in rinsing compositions allows neutralizing and removing residues of alkaline detergents and disinfectants. The emergence of automatic washing technologies, in which the last stage of rinsing is preferably combined with disinfection, has led to the emergence of a large number of acid-based disinfectants. These products are usually used in the final stage of equipment processing — rinsing and disinfection, after which the equipment is left overnight with a minimal risk of microbial contamination. Requirements for such products — lack of corrosion in relation to metals.

Aldehyde-containing agents are preparations whose active ingredient is glutaric or succinic aldehyde. Preparations of this group have a broad spectrum of action — bactericidal, fungicidal and virucidal. In concentrations above 2 %, they have a pronounced sporicidal effect. The advantage of these preparations is low corrosion activity of metal products, absence of strong odors, and a wide spectrum of antimicrobial action. The disadvantages include the ability to fix organic compounds on the surface and in the channels of products.

Guanidins are complex organic compounds that have pronounced bactericidal activity against gram-positive and gram-negative microorganisms (except tuberculosis mycobacteria), but do not exhibit activity against fungi, viruses, and spore forms. Antimicrobial activity increases when guanides are combined with surface-active substances (SAS).

Phenol-containing disinfectants are not active against viruses and spore forms of bacteria, and therefore have not found their application in dental practice.

Alcohol-based preparations have virucidal and antimicrobial effects (except for mycobacterium tuberculosis). Of the negative properties — it is capable of fixing organic compounds on the surface of products. In 70 % concentration, alcohols are used to disinfect the skin, medical equipment, including endoscopic equipment.

Halogenated preparations — the active ingredients are chlorine, iodine, bromine, they have a wide spectrum of antibacterial action. The composition of the preparations includes chloramine, sodium and potassium chlorite. Preparations based on bromine are used for the treatment of premises and linen.

Disinfectants with the active substance in the form of an iodine-alcohol solution, a complex compound with surfactants are used to disinfect hands, injection and surgical fields. But they all have a number of negative properties — they have an irritating effect on the mucous membranes of the eyes and respiratory organs, corrode instruments, and discolor some materials.

Multi-component equipment that has come into contact with blood, saliva and other biological fluids must be disinfected and sterilized in a disassembled form.

When disinfecting reusable dental instruments CA, *the following points must be taken into account:*

– it is not allowed to wash products under running water before disinfection, since the aerosol generated during the washing process can infect the persons involved in the processing, as well as the surfaces of the premises;

– immediately after use, the instrument is immersed in a container with a disinfectant solution so that it is completely immersed in the disinfectant solution;

– products with complex configurations are disinfected in disassembled form;

– the anus and cavities of the products are filled with a disinfectant solution so that they do not contain air bubbles;

– before using new dental instruments, after removing the lubricant, it is necessary to carry out disinfection, pre-sterilization cleaning and sterilization;

– all dental prosthetics must be disinfected in the doctor's office before being sent to the dental laboratory and after returning from the laboratory before being placed into the oral cavity;

– small disposable dental instruments, disposable cups, disposable saliva ejectors, chest napkins for the patient, gloves, masks are disposed of after disinfection and are not reused;

– for medical devices that are not subject to immersion in disinfectants and for devices and their parts that do not come into direct contact with the patient, irrigation or wiping methods may be used with a cloth soaked in a solution of a disinfectant in the concentration, time interval and frequency according to the manufacturer's recommendations.

Requirements for disinfectants:

– have a broad spectrum of antimicrobial activity, suppress the growth and reproduction of viruses, bacteria, fungi, and protozoa;

– low toxicity, safety for personnel during preparation and use of the disinfectant;

– have properties that prevent the development of resistance;

– short exposure of the solution, multifunctionality and multiple methods of application, long shelf life of the finished solution without loss of its disinfectant properties;

– good solubility and ease of preparation of the working solution;

– compatibility with several types of materials used in healthcare facilities;

– no aggressive impact on instruments and containers for solution preparation.

Disinfection solutions should be prepared strictly daily. It is strictly forbidden to leave instruments in the solution overnight or on weekends. The solution should be replaced during the day, since in case of prolonged use, corrosion of instruments and a decrease in the effectiveness of disinfection due to contamination of the solution may occur.

According to the Order of the Ministry of Health of the Republic of Belarus dated 25.11.2002 No. 165 "On the implementation of disinfection and sterilization by healthcare institutions" disinfection requirements are mandatory for all organizations providing dental care.

Reusable products must undergo **pre-sterilization cleaning (PSC) before sterilization**. Pre-sterilization cleaning (PSC) medical instruments (MI) is carried out only after disinfection and before sterilization in accordance with the order of the Ministry of Health of the Republic of Belarus No. 165 dated November 25, 2002 "On the implementation of disinfection and sterilization by healthcare institutions". PSO allows eliminating organic (fat and protein), medicinal and mechanical contaminants that interfere with and worsen the quality of sterilization.

Physical and chemical agents are used for PSO that are permitted for use in the Republic of Belarus, according to the instructions for use agreed upon by the Ministry of Health.

PSO of detachable products is subjected to disassembled form. To clean the products, use brushes, cotton-gauze swabs, fabric napkins, brushes, the channels of the products are washed with a syringe. It is forbidden to use ruff when PSO of rubber products.

Cleaning of instruments is carried out automatically (ultrasonic and washing-disinfection methods) and mechanically.

Mechanical cleaning is performed manually. Before performing the manipulation, the medical worker should be equipped with personal protective equipment — gloves, protective glasses (screen) and a mask. It is necessary to prevent splashing of liquid during cleaning. Mechanical cleaning is performed with a soft brush using a solution to remove material residues.

Automatic ultrasonic cleaning eliminates aerosol formation and reduces manual manipulation (Fig. 3). Ultrasonic cleaners use high-frequency, high-energy sound waves to more effectively remove contaminants from medical objects. High-frequency sound alternately creates high and low pressure waves as it passes through disinfectants. Formed microscopic bubbles that explode with the release of energy that exceeds the energy created by medical personnel during mechanical cleaning with a brush. In this case, contaminants are torn off the surface of the products.

Processing of instruments in washing and disinfecting machines compared to ultrasonic washers is carried out in a fully automatic mode. The instruments are placed in the basket (frame), the mode is selected on the display and upon completion the instrument ready for sterilization is taken out of the machine (Fig. 4). The principle of operation is that powerful jets of water under pressure are used to clean, then the cleaning solution is automatically dosed, after which the washing cycle begins, followed by rinsing, thermal disinfection and hot air drying.

Fig. 3. Ultrasonic cleaning

Fig. 4. Automatic ultrasonic cleaning machine

Visual quality control is required after cleaning. After PSO, the products are washed in running water for at least 5 minutes until traces of the antiseptic disappear and dried until all moisture disappears in drying cabinets with hot air (+85 °C) for 30 minutes until moisture disappears or naturally. Drying of products with optical parts is carried out by wiping with a clean cloth napkin and drying at room temperature. Then the instruments are subject to packaging and storage until the sterilization stage.

Storage of instruments is carried out in accordance with the Methodological Guidelines of the Chief State Sanitary Doctor of the Republic of Belarus dated November 30, 1999 No. 90-9908.

Packaging materials for any sterilization method should have the following characteristics:

– do not affect the quality of sterilized objects;

– be permeable to sterilizing agents;

– ensure tightness until the packaging is opened;

– easy to open without compromising the asepsis of the contents.

The sterilizer load must ensure free air circulation around each package and not exceed 70 % of the chamber volume. When loading the steam sterilizer chamber with different types of packages (metal containers, paper bags), metal containers must always be placed under textile or paper packages to allow free condensation to sinter and prevent them from getting wet. Packaging materials can be classified into single-use materials (paper, paper-plastic materials) and reusable materials (containers). There are 2 types of packaging paper — plain and creped. Creped paper has increased strength, therefore it is resistant to damage and better retains its shape, which allows packaging materials of different geometric and spatial shapes. It is necessary to use 2 layers of packaging material to maintain sterility. The shelf life of products depends on the type of packaging:

– metal containers without filters — 3 days;

– metal containers with a filter — 21 days;

– paper and fabric, based on cellulose, — 3 days;

– paper, fabric based on synthetic fibers (2 layers) — 2 months;

– combined paper-plastic materials with heat sealing on machines — 6 months;

– combined paper-plastic materials when sealed with indicator packaging tape — 3 months;

– with synthetic materials in the form of bags or rolls when heat-sealed on machines — 1–5 years.

The frequency of use of moisture-resistant sack paper, crepe paper — up to 2 times, high-strength packaging paper — up to 3 times (taking into account its integrity). Products sterilized without packaging are placed on a “sterile” table and used during one work shift.

Requirements for PSO:

– pre-sterilization cleaning is carried out only after preliminary disinfection of the instruments;

– daily assessment of the quality of cleaning by performing an azopyram test for the presence of residual blood.

According to the Order of the Ministry of Health of the Republic of Belarus dated November 25, 20002 No. 165 "On the implementation of disinfection and sterilization by healthcare institutions", the quality of pre-sterilization cleaning of products is assessed by setting up an azopyram samples (for the presence of residual amounts of blood).

To prepare 1 l (cubic dm) of the initial solution azopyram weigh out 100 g of amidopyrine and 1.0–1.5 g of aniline hydrochloride, mix them in a dry measuring cup and bring to a volume of 1 liter (cubic dm) with 95 percent ethyl alcohol. The mixture is thoroughly stir until the ingredients are completely dissolved.

The stock solution of azopyram should be stored in a tightly closed bottle in the dark. The shelf life of the original solution of azopyram is: at a temperature of 4 °C (in the refrigerator) — 2 months; at room temperature (20 +/– 2 °C) — no more than 1 month.

Before taking the sample, prepare the azopyram reagent by mixing equal volume quantities of the initial solution of azopyram and a 3 % solution of peroxide hydrogen. The azopyram reagent can be stored for no more than 2 hours. At temperatures above +25 °C the solution turns pink faster, therefore, it should be used within 30–40 minutes. Hot items should not be tested. If necessary, the suitability of the azopyram reagent is checked as follows: 2–3 drops the reagent is applied to the blood stain. If a purple color appears within 1 minute, which then turns into a lilac color, the reagent is suitable for use, if coloration does not appear within 1 minute, the reagent should not be used.

Methodology for setting up the sample. The controlled product is wiped with a gauze napkin soaked in the reagent, or 2–3 drops of reagent onto the product using a pipette. 3–4 drops of the working solution of the reagent are added to the syringes and the plunger is moved forward several times to in order to wet the inner surface of the syringe with the reagent, especially the places where the glass meets metal, where blood most often remains, the reagent is left in the syringe for 1 minute, and then displaced gauze napkin. When checking the quality of cleaning of needles, the reagent is drawn into a clean, trace-free syringe corrosion. By successively changing the needles, the reagent is passed through them, displacing 3–4 drops per gauze napkin. The quality of cleaning of catheters and other hollow products is assessed by introducing a reagent inside product using a clean syringe or pipette. The reagent is left inside the product for 1 minute, after which pour onto a gauze napkin. The amount of reagent introduced into the product depends on its size. Taking into account the results of the test — in case of

a positive azopyram test in the presence of traces of blood, immediately or no later than after 1 minute, purple appears first, then quickly, within a few seconds, turns into pinkish-lilac or brownish coloration of the reagent.

Azopiram, in addition to hemoglobin, detects the presence of static amounts of the following on products:

– peroxidases of plant origin (plant residues);

– oxidizers (chloramine, bleach, washing powder with bleach, chromium mixture;

– rust (iron oxides and salts).

Azopiram, in addition to hemoglobin, detects the presence of residual amounts of plant-based peroxidases (plant residues), oxidizers (chloramine, bleach, washing powder with bleach, chromium mixture for treating dishes, etc.), as well as rust (iron oxides and salts) and acids on products. If rust and the specified oxidizers are present on the products under study, a brown coloration of the reagent is observed; in other cases, a pink-lilac coloration occurs. In the case of a positive test for blood or for residual amounts of alkaline components of detergents, the entire group of controlled products from which the control was taken is subjected to repeated cleaning until negative results are obtained.

When performing the azopyram test, the reagent becomes colored later than 1 minute after the test is taken, it is not taken into account. The results of the control are reflected in the journal in form No. 366/u.

Sterilization — disinfection, sterilization — the process of complete destruction or removal of vegetative and dormant forms of microorganisms from environmental objects. **Sterilization sets the following goals:** prevention of the introduction of microorganisms into the human (animal) body during medical interventions; exclusion of contamination of nutrient media, cultures, cells, etc. during microbiological research and biotechnological production; prevention of microbial biodegradation (spoilage) of various materials, including food, medicine, diagnostic.

In medical practice, **the following are subject to sterilization:** medicinal and diagnostic preparations introduced into the human body; dressing and suture material; syringes, injection needles, instruments, endoscopic devices; patient care items; medical linen; nutrient media, laboratory glassware; when creating a germ-free zone, air and equipment, and all other objects of the zone (boxes, wards, etc.).

The sterilization process consists of the following stages:

1) disinfection (in the case of objects contaminated with pathological material);

2) cleaning the material from dirt, grease, dust, etc.;

3) drying (in a sterilization chamber);

4) assembly, grouping and placement of materials in the container and in the sterilizer chamber;

5) sterilization itself;
6) control over sterilization;
7) storage of sterilized materials.

Disinfection, cleaning, grouping and placement are aimed at reducing the number of microbes on the object and facilitating access to them by the sterilizing agent, the sterilization stage is the complete release of the object from microbes; the control stage — checking the effectiveness of sterilization; storage stage — prevention of re-contamination in the period from the end of sterilization to use. Errors at the sterilization stages are sharply reduced when a centralized sterilization department (CSD) is in operation in a medical institution.

The main methods of sterilization:

1. Physical (high temperature)
– steam;
– air;
– infrared;
– glass bead;
– ionizing radiation;
– plasma.
2. Chemical (low temperature)
– gas;
– liquid.

Boiling and single heating do not destroy bacterial spores and some viruses, and therefore cannot be classified as sterilization methods. Irradiation of air and objects does not have a sterilizing effect. The filtration method is applicable for sterilizing air and liquid materials, such as nutrient media. In fractional sterilization, the liquid is heated in a water bath (80°) or flowing steam (100°) is passed through it for three days in a row for an hour. In between heating sessions, the liquid for spore germination is kept in a thermostat. This sterilization method is effective if the liquid is suitable for spore germination. A less reliable option for fractional sterilization is tyndallization, in which the liquid is kept for 5–6 days in a row at 56–60° with incubation in a thermostat between sessions.

Steam sterilization. Saturated water vapor under pressure has high biocidal properties, does not damage most sterilized materials, does not require release from the sterilizing agent (Fig. 5). Steam sterilization is characterized by reliability, availability, safety for personnel, cost-effectiveness, and a high degree of automation. In the steam sterilization method, the sterilizing agent is saturated water vapor under excess pressure of 0.05 MPa (0.5 kgf/cm²) — 0.21 MPa (2.1 kgf/cm²), temperature 110–135 °C. The sterilizing effect of steam is associated with heating the object during the condensation of steam into water on the surface and inside the object. The condensation effect is optimal for saturated steam when it contains only three percent of liquid water. Overheated steam containing less than two percent of the liquid phase

can burn the object, wet steam (more than three percent of the liquid phase) strongly moistens the objects. To achieve a sterilizing effect, it is also necessary that the air be completely removed from the working chamber, otherwise it can prevent the steam from contacting the surface of the object and leave it unsterile.

Fig. 5. Steam sterilizer (autoclave)

1st type — **gravity sterilizers:** in them, the steam flow penetrates the upper part of the chamber and displaces air from it through a drainage tube. The pressure and temperature of the steam increase and reach the set value. A timer is turned on, which maintains a constant temperature until the end of the exposure. After this, the steam is removed through the drainage from the chamber; the chamber jacket remains hot and the dry heat emanating from it dries the sterilized objects. The lid (door) opens when the chamber temperature drops to 90° and below. Otherwise, the containers with liquid may explode.

2nd type — **pre-vacuum (fore-vacuum) steam sterilizer**. In it, the vacuum system, using multiple cyclic air pumping (3–9 times), draws most of the air from the chamber and sterilized objects through the drain, after which the chamber and its jacket are filled with steam under pressure. The pressure and constant temperature are maintained automatically. After the end of the sterilization period, the chamber is freed from steam and the objects are dried using the vacuum system; in the chamber filtered air is let in. The sterilizer is unloaded. Depending on the objects being sterilized, the temperature of the steam in the steam. The sterilizers are set from 110° to 138°, steam pressure 2.5 atm., exposure — from 0.4 to 15 to 60 min. Steam sterilizes almost all products made of metal, glass, heat-resistant plastic, rubber, linen, dressings and suture materials, nutrient media, including liquids, and medicinal products.

Steam sterilization is the preferred method of sterilization. Exceptions include heat-sensitive materials, large items, and complex multi-component devices.

Sterilization by heat. In the air method of sterilization with a sterilizing agent is hot air with a temperature of 160° and 180°, sterilization is carried out in air sterilizers (Fig. 6).

Fig. 6. Dry heat oven

High-temperature dry air is highly effective as a sterilizing agent, but has a pronounced destructive effect on objects. Therefore, a limited range of objects is sterilized by this way: glassware and other heat-resistant materials, anhydrous hydrophobic powders, Vaseline, Vaseline gauze, objects that do not allow the required level of moisture to pass through. Heat sterilization, unlike other methods, burns microbes without leaving pyrogenic substances. But when sterilizing with heat, bacterial spores tolerate higher temperatures for a long time (in comparison with wet steam sterilization). It should be borne in mind that temperatures above 160° lead to the sublimation of fatty acids and resinous substances from wood, cotton wool, and some types of paper, which can cause inhibition of microbial growth upon contact with such products.

The quality of sterilization depends on the uniformity of hot air distribution in the sterilization chamber, which is achieved by properly loading the sterilizer. The items are loaded in such quantities that allow free air supply to the sterilized items. The sterilized items are evenly distributed and laid horizontally across the cassette (shelf) grooves, preventing overlapping of the purge windows and ventilation grate. Bulky items should be placed on the upper metal grate so that they do not obstruct the flow of hot air. Loading and unloading of items is carried out at a temperature of 40–50 °C in the sterilization chamber.

Heat sterilization is carried out:

1) in gravity convection sterilizers with passive circulating air as a result of temperature differences in different parts of the chamber;

2) sterilizers with mechanical (forced) convection of the formed flow of hot air.

A prerequisite for the effectiveness of heat sterilization is the correct relationship between temperature and exposure, which is expressed as follows:

– at 180° — 1/2 hour;

– 170° — 1 hour;

– 160° — 2 hours;

– 150° — 2.5 hours;

– 140° — 3 hours;

– at 121° — 6 hours.

The time indicated does not include the heating and cooling phases.

The temperature level must be constantly monitored to prevent overheating (damage to materials) or underheating (non-sterility).

Stages of heat sterilization:

1) loading the sterilizer chamber;

2) setting the sterilization mode and checking the thermometer for serviceability;

3) switching on air heaters;

4) exposure time of the specified exposure;

5) turn off the heating;

6) cooling;

7) unloading.

In modern sterilizers, stages 3–6 are automated. The chamber doors cannot be opened during sterilization.

The infrared method (IM) is based on the use of short- term pulsed infrared radiation, creating a temperature of 200–203 °C in the working chamber of the sterilizer (Fig. 7). High efficiency of IM sterilizing action ensures complete destruction of all studied microorganisms, including such as *S. Epidermidis, S. Aureus, S. Sarinaflava, Citrobacterdiversus, Str. Pneumonia, Bacillis cereus*. Depending on the type of instrument, the duration of the full sterilization cycle is from 10 to 25 minutes, after which the instruments can be used for their intended purpose.

Fig. 7. Infrared sterilizer

An infrared sterilizer can be made in the form of a small-sized device, in which instruments are sterilized without packaging and indicators for control are not required (Fig. 8). Unlike steam, air or glass bead sterilization, IM sterilization does not have an aggressive effect of the sterilizing agent (infrared radiation) on the cutting instrument.

Fig. 8. Portable infrared sterilizer

Glass bead sterilization method. The method is intended for rapid sterilization of small all-metal instruments that do not have cavities, channels and locking parts in a medium of heated glass beads at a temperature of 190–250 °C. The method is used for express sterilization of small items: burs, endodontic instruments, metal matrices, pins, diamond heads, as well as working parts of larger ones — probes, trowels, excavators, spatulas, etc.

The instruments to be sterilized are immersed in a medium of heated glass beads to a depth of more than 10 mm from the surface in a vertical position (Fig. 9). The duration of sterilization at a temperature of 190–250 °C is 20–180 seconds, depending on the size and weight of the instrument. After sterilization, instruments are removed from the sterilizer using sterile tweezers and placed in a sterile tray for use.

Fig. 9. Glass bead sterilizer

The glass bead method has a number of advantages that simplify the sterilization process, including short sterilization time, no need to use consumables (kraft bags, etc.), preservation of the performance properties of piercing and cutting

instruments, and the ability to keep the sterilizer in working condition throughout the entire working day.

But there are also a number of negative aspects of sterilization by the glass bead method. This method is not suitable for instruments that have massive locks (bayanets, dental pliers). Instruments are sterilized without packaging, which does not allow them to be stored after sterilization, as a result of which the instruments cannot be stored, they must be used immediately after sterilization. Larger instruments, due to the small size of the sterilization chamber, do not fit completely in the environment of heated glass beads, so only the working part of the instrument can be immersed in it. During the holding time, during which sterility of the working part of these fairly massive instruments is achieved, their handles heat up to such an extent that it is impossible to grab them and remove the instrument from the device. This method is more suitable for small instruments that can be completely placed in the environment of heated beads.

Sterilization with ionizing radiation. Antimicrobial treatment can be carried out using ionizing radiation (γ-rays) and ultrasound. Gamma-ray sterilization is most widely used today. The isotopes used are Co^{60} and Cs^{137}. The dose of penetrating radiation must be quite significant — up to 20–25 μGy, which requires strict safety measures. In this regard, radiation sterilization is carried out in special rooms, this is a factory method (it is not carried out directly in hospitals). Sterilization of instruments and other materials is carried out in sealed packages; if the latter are intact, sterility is maintained for up to 5 years. Thanks to the sealed packaging, it is convenient to store and use the instruments (you just need to open the package). The method is used to sterilize various disposable instruments and medical products (syringes, suture material, catheters, probes, blood transfusion systems, gloves, etc.). In this case, the properties of the sterilized objects do not change.

Plasma sterilization is the most modern method today, which is being introduced into dental practice. It allows sterilization of absolutely any type of instruments and is suitable for any structural materials: cables, hollow instruments, electrical appliances. For this type of sterilization, argon gas is used, passed through an alternating current source, or vapors of 60 % hydrogen peroxide in combination with their low-temperature plasma (Fig. 10).

Plasma substance atoms attack the sterilization object and the microorganisms' protein bonds are broken, resulting in their death. Sterilization occurs at a temperature of 36–60 °C. The advantages include short exposure, absence of toxic waste, versatility, and ease of installation (Fig. 11).

Fig. 10. Plasma sterilizer

Fig. 11. Portable plasma sterilizer

Chemical sterilization (low temperature, liquid). The development of modern medical technologies requires the development of new effective sterilization methods. Micron-sharpened instruments, endoscopic devices, anesthetic equipment, fiber optics, dental mirrors, gutta-percha do not withstand high-temperature processing. Therefore, low-temperature, or chemical, methods are intended for complex instruments.

Gas sterilization. Ethylene oxide (EO) is currently used for gas sterilization — a colorless gas, odorless at low concentrations, easily penetrates through conventional packaging materials, contacts the entire surface of dense objects, and also penetrates porous and liquid ones, and is eliminated by conventional ventilation (Fig. 12). EO sterilization depends on the gas concentration, humidity and temperature in the chamber, and exposure. The usual gas concentration is 450 mg/l. It must be maintained at a constant level throughout the entire period of gas treatment. Humidity must be 50–75 %. Lower humidity reduces the effect, while high humidity leads to the formation of ethylene glycol, which is not removed by ventilation.

A mixture of OB (a mixture of ethylene oxide and methyl bromide in a weight ratio of 1 : 2.5, respectively), and vapors of a solution of formaldehyde in ethyl alcohol are also used. Sterilization with a mixture of OB and ethylene oxide is carried out at room temperature (not less than 18 °C), at a temperature of 35 °C and 55 °C; and with vapors of a solution of formaldehyde in ethyl alcohol at a temperature of 80 °C. Sterilization by the gas method is carried out in stationary gas sterilizers approved for use in accordance with the established procedure, as well as in portable devices. To maintain the sterilization temperature (35 °C and 55 °C) in portable devices, they are placed in a thermostat or in a water bath.

Destroys all forms of microbes, including spores. The mechanism of biocidal action is alkylation.

Fig. 12. Gas sterilizer

In large-sized sterilizers, it is used in a mixture with freon in two temperature modes: “warm” 63° and “cold” — from 29 to 38°. The sterilization process takes many hours due to the need for long-term contact of objects with gas and a long period of ventilation.

Gas sterilization is used for fragile surgical instruments, electrical equipment, anesthesia and respiratory therapy equipment, endoscopes, cardiac catheters, cameras, etc. Due to its high toxicity and the length of the process, gas sterilization is used only for processing items that are damaged by steam sterilization.

Liquid sterilization is carried out using chemicals with biocidal action (sterilants). Currently, 2 % alkaline aqueous solution of glutaraldehyde and 20 % solution of formaldehyde in 70 % ethanol are used as sterilizants. Glutaraldehyde and formaldehyde destroy vegetative and spore forms of all microbes.

Chemical sterilization is performed by completely immersing the object in the solution for a relatively long period (about 10 hours) at room temperature (Fig. 13). When the temperature of the solution increases (up to 40–50°), the efficiency increases sharply; at temperatures below 20°, as well as in an acidic environment, the sterilizing effect may be lost.

Before being immersed in the sterilizing solution, the items are subjected to pre-sterilization cleaning, and items that have been in contact with pathological materials, disinfection and cleaning. The solution is poured into a sterile container. The immersed items must be dry to avoid a decrease in the concentration of the sterilizer.

At the end of the sterilization period, the items are removed from the solution and rinsed several times with sterile water under aseptic conditions to avoid chemical burns when such an item comes into contact with the skin and mucous membranes.

Endoscopes and their components, tubes and masks for anesthesia, etc. are subject to chemical sterilization.

Fig. 13. Chemical sterilizer

The use of chemical sterilization is limited by: the need to release sterilized items from the sterilizing agent, during which repeated contamination with microbes is possible; toxicity of liquids and vapors to humans; duration of exposure; difficulty in monitoring concentration, especially when reusing the solution; corrosion of metal items in an acidic environment.

Sterilization control. The effectiveness of sterilization is controlled by mechanical, chemical and biological methods.

Mechanical control consists of visual and instrumental control of all sterilization items. Measuring equipment, in turn, must be periodically controlled by a state metrological institution. According to the guidelines of the Chief Sanitary Doctor of the Republic of Belarus dated 30.11.1999 No. 90-9908, physical, chemical and biological control methods are used to control the sterilization process.

Physics (involves monitoring the operating parameters of sterilization equipment — timers, temperature, pressure and relative humidity sensors, etc.) is carried out by the operator servicing the sterilization equipment, is carried out daily during the sterilization cycle. Allows you to quickly identify and eliminate deviations in the operation of the sterilization equipment. Disadvantage: evaluates the effect of parameters inside the chamber of the device, and not inside the sterilization packages and therefore should be used in combination with other control methods. Confirms the effectiveness of the selected sterilization mode.

Chemical control is carried out using chemical indicators that change color or melt when a certain level of temperature, humidity, or concentration of the sterilizing agent is reached.

External and *internal control* are used because correlations between them there is none. External indicators, usually in the form of a sterilization tape (colored or not), are applied to the packaging of the sterilized item and indicate that the item

has been sterilized. Internal chemical indicators are placed in a specific way in the sterilization chamber. They indicate whether the sterilized items have been exposed to one or more conditions sterilization, but not on the sterility of the object. The readings of internal chemical indicators are taken after sterilization is complete.

The international classification distinguishes 6 classes of chemical indicators.

Class 1 — process indicators — demonstrate only the difference between sterilized and non-sterilized packaging. They are intended to prevent non-sterilized products from getting into sterile ones in the CSO. Most often they have the form of a heat-indicating tape, which is attached to the packaging or tray before sterilization.

Class 2 — indicators of the special Bowie-Dick test — are used to assess the degree of air removal from the steam sterilizer chamber, since the remaining air in the sterilizer prevents the penetration of steam.

Class 3 — Single variable indicator — designed to measure only one indicator of the sterilization process, usually the maximum temperature, but does not provide an idea of the duration of sterilization.

Class 4 — multiparametric indicators — are designed to simultaneously monitor two or more cycle parameters, such as: for the steam sterilization method — temperature, exposure time of a given temperature, saturated water vapor; for the air sterilization method — temperature and exposure time of a given temperature; for gas sterilization methods — concentration of the gas used, temperature, exposure time, relative humidity level; for radiation sterilization — total absorbed dose.

Class 5 — integrating indicators (integrators) — react to all active factors of the process and imitate the biological type of indicator. Gives an idea of the quality of sterilization immediately after the completion of the cycle.

Class 6 — emulating indicators (emulators) — the most modern. They respond to all control values of critical parameters in sterilization and if one of the parameters is not met, the indicator does not work.

Biological control as opposed to mechanical and chemical directly indicates whether the destruction of microbes occurred during the sterilization cycle or not, i.e. whether the object is sterile or non-sterile. Biological control is the gold standard for sterility control. For steam sterilization, spores of *Bacillus stearothermophilus* — 100 thousand 1 million are used as a biological indicator (BI), for sterilization ethylene oxide (EO) — *You. Sabtilis* in the same quantity. Less standard results are given by "spore soil". The quantity and stability of BI exceed similar indicators of microorganisms present in sterilized objects. Packages for placing BI should be designed in such a way that their processing is more difficult compared to other items for sterilization. They should be placed in difficult to sterilize places of the chamber. All this taken together increases the sterilization safety factor. Upon completion of the sterilization cycle, BI is removed from the package and

the spores are tested for viability using conventional microbiological equipment or by changing the color of the special package.

Control of chemical sterilization, as well as sterility of various materials is carried out by sowing pieces of sterilized materials or washings from objects in Hottinger's sugar broth, thioglycollate medium and Sabouraud broth; small objects are selectively immersed in the media; test tubes, mattresses are filled with media. The absence of growth during 14-day incubation at 37° sugar broth and thioglycollate medium and at 20–22° Sabouraud broth indicate the sterility of the material, the appearance of growth on at least one of the media indicates non-sterility of the entire batch. Materials subjected to chemical sterilization are washed several times with sterile water before sowing to remove the sterilizer and are inoculated onto media with its neutralizer.

Self-monitoring of the sterilizers is carried out by the personnel of the healthcare facility: by physical and chemical methods — at each loading of the sterilizers, by bacteriological methods — monthly. Specialists of sanitary and epidemiological institutions carry out scheduled monitoring in accordance with the current regulatory documents.

ASEPSIS OF THE SKIN OF THE HANDS

In the Republic of Belarus, the method of hand treatment is regulated by the Instructions for Use "Hygienic and Surgical Antisepsis of the Skin of the Hands of Medical Personnel", registration No. 113-0801 dated 05.09.2001.

The microflora that inhabits it are dangerous in epidemiological terms. The microbiological background of the hands is represented by the flora:

– resident 10–20 %;
– transient 80–90 %;
– infectious up to 100 %.

Resident flora is represented by microorganisms that constantly live and reproduce on the skin. The highest contamination is observed under the nails, around the nails and between the fingers. Up to 20 % of this flora are in the deep layers of the skin, in the sebaceous and sweat glands, hair follicles. S. aureus is found in the nose of about 20 % of healthy people, and colonizes the skin of the hands extremely rarely. But if the skin epithelium is damaged, in medical treatment facilities it will be found in the treating personnel. It is impossible to completely remove resident microflora by hand washing and antiseptics, but it is possible to reduce contamination.

Transient microflora is the flora acquired by medical personnel during their work as a result of contact with infected patients or contaminated objects in the environment. It may be represented by *E. coli, Klebsiella spp., S. aureus,*

C. albicans, etc. In some cases, these pathogens, which are the source of HAI in a patient, are not detected anywhere except on the hands of the staff. Transient flora remains on the skin of the hands for a short time and can be removed by regular hand washing or using an antiseptic.

Infectious flora is flora represented by microorganisms that cause infectious and inflammatory diseases, including diseases caused by nosocomial infections.

Therefore, hand hygiene is one of the most effective ways to prevent the development of HAI. The **"5 steps of hand hygiene" rule** developed by WHO will allow personnel to control hand treatment situations:

– before contact with the patient;
– before the procedure;
– after a medical procedure or contact with body fluids;
– after contact with the patient;
– after contact with surrounding objects.

When receiving dental patients in a clinic or in a hospital setting, resistant flora predominates, i.e. flora that is resistant to antiseptics. Resistant microflora cannot be completely eliminated by regular hand washing or antiseptic treatment. This flora is usually represented by gram-negative opportunistic microorganisms.

However, only gloves are not are able to protect both the doctor and the patient from contamination of the infection and working with gloves does not exclude hygienic and antiseptic treatment of hands. Gloves are necessary as a means of protecting personnel from infections and are an additional means of preventing cross-infections. It is known that even when working with gloves, up to 15 % of cases of personnel's hand skin is contaminated gram-negative microorganisms and enterococci from the mucous membranes of the patient's oral cavity. The contamination of the gloves themselves is several times higher, which leads to the inadmissibility of processing gloves between patient appointments and dictates a mandatory condition for working in antiseptic conditions — a mandatory change of gloves before each patient appointment.

Hand treatment is divided into three levels:

1. Mechanical hand treatment (social level).
2. Hygienic hand treatment (hand treatment using antiseptics).
3. Surgical hand treatment (a special sequence of manipulations when (hand treatment followed by putting on sterile gloves).

Mechanical hand treatment

The purpose of mechanical hand treatment is to remove most of the dirt from the skin, parts of the transient microflora (antiseptics are not used). Preservation of the stratum corneum and relative stability of the resident population of microflora prevents colonization of the skin of the hands by dangerous microorganisms. When

washing hands with aggressive brushes and highly alkaline soap, a destructive effect on the stratum corneum of the skin occurs, the species balance of the resident microflora is disturbed, which leads to the development of skin dysbacteriosis with subsequent colonization by gram-negative bacteria.

Similar hand treatment is carried out:

– after visiting the toilet;

– before eating or before working with food;

– before and after physical contact with the patient;

– in case of any contamination of hands.

Necessary equipment:

1. Liquid neutral soap in doses or individual disposable soap in pieces. It is desirable that the soap does not have a strong smell. Open liquid or bar reusable non-individual soap quickly becomes infected with microbes.

2. Disposable napkins measuring 15 × 15 cm, clean for blotting hands. Using a towel (even a personal one) is not advisable, because it does not have time to dry out and, in addition, is easily contaminated with microbes.

Rules for hand washing:

All jewelry and watches are removed from the hands to ensure that the soap has access to all skin surfaces. Hands are treated twice. It is believed that the first-time soaping and rinsing with warm water will wash away germs from the skin of your hands. Under the influence of warm water and self-massage, the skin pores open, therefore at repeated soaping and rinsing are washed away microbes opened pores. Hands soap themselves up, then rinsed warm running water and everything repeats again. Warm water helps the antiseptic work more effectively or soap, while hot water removes from the surface of the hand's protective fat layer.

Washing hands with unprofessional solid soap increases the possibility of spreading infection, as bacteria on the skin of the hands are dispersed. After washing hands with household soap, the skin is damaged, becomes dry and irritated, in comparison with the use of specially approved alcohol antiseptics, which combine moisturizing components to protect and care for the skin of the hands.

Hygienic hand treatment

The purpose of hygienic treatment is to destroy or remove transient skin microflora using antiseptics (disinfection).

Similar hand treatment is carried out:

– before putting on gloves and after taking them off;

– before any physical contact with the patient;

– before and after performing invasive procedures, minor surgeries manipulation;

– after contact with biological fluids (for example, emergency situations with blood);

– after visiting the toilet;

– before going home.

Necessary equipment:

1. Liquid dosed pH neutral soap or individual disposable soap bars.

2. Disposable clean napkins measuring 15 × 15 cm.

3. Skin antiseptic.

Rules for hand washing:

Hand hygiene consists of two stages: mechanical hand cleaning and disinfection of hands with skin antiseptic. After completing the mechanical cleaning stage (double soaping and rinsing) the antiseptic is applied to the hands in an amount of at least 3 ml and rub thoroughly into the skin until completely dry (do not wipe your hands).

If the hands were not contaminated (for example, there was no contact with the patient), then the first stage is skipped and you can immediately apply the antiseptic. Each the movement is repeated at least 5 times. Hand treatment is carried out for 30 seconds — 1 minute.

Among the variety of methods for treating hand skin, there is only one method received the qualification features of the European standard and was registered as "European Norm 1500" (EN 1500). The specified method is the most optimal for hygienic and surgical antisepsis of personnel hands (Appendix 4).

Sequence of movements when treating hands EN 1500:

1. Rub one palm against the other palm with back and forth movements.

2. Rub the back of your left hand with your right palm, then change hands.

3. Connect the fingers of one hand in the spaces between the fingers of the other, rub the inner surfaces of the fingers with upward and downward movements.

4. Interlock your fingers and rub the palm of your other hand with the back of your bent fingers.

5. Grasp the base of the left thumb between the thumb and index fingers of the right hand, rotating friction. Repeat on the wrist. Change hands.

6. Rub the palm of your left hand with the fingertips of your right hand in a circular motion, then change hands.

Requirements for hand treatment with an antiseptic:

– rub the antiseptic only into dry skin;

– use an amount of antiseptic adequate to the level of treatment (avoid excess), for which it is necessary to use elbow dispensers;

– do not use napkins, sponges, tampons or other foreign objects to apply the preparation;

– alternate the use of antiseptics containing active substances with different mechanisms of antimicrobial action;

– thoroughness of execution of the processing technique;

– observe the sequence of actions, dosage of the drug and exposure of treatment at each stage.

Surgical treatment of hand skin

Surgical treatment of the skin of the hands involves elimination of transient and reduction of the number of permanent population of microflora to subinfectious doses.

Surgical treatment of hands is performed:

– before surgical interventions;

– before serious invasive procedures.

Necessary equipment:

1. Liquid dosed pH neutral soap or individual disposable soap bars.
2. Napkins measuring 15 × 15 cm, disposable, sterile.
3. Skin antiseptic.
4. Disposable sterile surgical gloves.

Surgical treatment of hands consists of three stages:

– mechanical cleaning of hands;

– hand disinfection cutaneous antiseptic;

– closing hands sterile disposable gloves.

Rules for hand treatment according to EN 1500.

1. Mechanical cleaning:

– mandatory conditions are the inclusion of forearms in the treatment, for blotting sterile wipes are used, and hand washing itself lasts at least 2 minutes;

– after drying additionally are being processed nail lodge and periungual ridges with disposable sterile wooden sticks, soaked in an antiseptic solution;

– it is not necessary to use brushes. If brushes are used, then you should use sterile, soft, disposable brushes or those that can withstand autoclaving, while brushes should only be used for treatment of periungual areas and only for the first treatment during work shift.

2. After the mechanical cleaning stage is completed, the hands are treated with antiseptic:

– in portions of 3 ml and, without allowing it to dry, rub into the skin;

– strictly following the sequence of movements;

– procedure for applying skin antiseptics are repeated at least twice, the total consumption of antiseptic is 10 ml, total procedure time is 5 minutes.

3. Sterile gloves are put on only on dry hands. If the duration of work in gloves is more than 3 hours, the treatment is repeated changing gloves.

4. After removing the gloves, wipe your hands again with a napkin soaked in skin antiseptic, then wash with soap and moisturize with a softening agent cream.

Requirements for antiseptics for hand skin treatment:

– must have a broad spectrum and a sufficiently high level of antimicrobial action (bacterio-, tuberculo-, virucidal, fungicidal);

– must have a rapid disinfecting effect (for hygienic antiseptics — 30 sec — 1 min, for surgical — 5 min);

– there should be no skin-irritating, allergenic, or general toxic effects;

– must have residual action;

– should not provoke the development of resistance in microorganisms;

– economic accessibility.

According to the requirements of the Resolution of the Ministry of Health of the Republic of Belarus dated July 5, 2017 No. 73 "On approval of the Sanitary norms and rules "Sanitary and epidemiological requirements for organizations providing medical care, including the organization and implementation of sanitary and anti-epidemic measures to prevent infectious diseases in these organizations", recognition as invalid According to certain regulations of the Ministry of Health of the Republic of Belarus, when performing medical procedures, personnel must wear gloves.

Basic rules for working with gloves:

– gloves must be worn before any manipulation of the patient;

– gloves are changed to new ones after each patient visit;

– gloves are put on thoroughly washed hands;

– fingernails should be cut short and without polish;

– before using gloves, all jewelry and watches must be removed from your hands;

– gloves must be selected according to size;

– when using non-sterile gloves, they should be treated with 70 % ethyl alcohol or another antiseptic;

– after removing gloves, hands must be washed with soap;

– you must not leave your workplace wearing gloves;

– do not touch your mucous membranes or unprotected areas of skin with gloves.

Gloves should not be stored near X-ray machines, air conditioners, radiators, at high temperatures and under direct exposure to sunlight and UV rays, as any exposure to these physical factors may cause damage to the polymer matrix of the material structure.

HYGIENIC MEASURES IN DENTAL INSTITUTIONS

The plan of hygienic measures in the dental office is based on the order of the Ministry of Health of the Republic of Belarus dated 25.11.2002 No. 165. "On the implementation of disinfection and sterilization by healthcare institutions".

When treating patients, a dentist must use only sterile instruments (Appendix 3). The sterilization process consists of several stages. The instruments (probes, tweezers, excavators, spatulas, smoothers, stoppers, periodontal and surgical instruments, trays) should be subjected to preliminary disinfection by soaking. For this purpose, disinfectant solutions approved by the order in the healthcare facility are used by completely immersing the instruments in them. Containers with disinfectant solution must be visually clean, have no sediment or turbidity. Also, each container must have a label indicating the disinfectant, its concentration, purpose, and date of preparation. The thickness of the solution layer above the product must be at least 1 cm.

Next, proceed to pre-sterilization treatment of instruments in the following sequence:

– preliminary rinsing of instruments with running water to remove the disinfectant;

– soaking and hand washing of instruments in a cleaning solution using a brush and gauze, rinsing with warm running water (3–5 min);

– about rinsing in distilled water;

– with hot air from the ear, drying naturally is allowed until traces of moisture disappear.

Rotational instruments have direct contact with biological fluids, so they must be strictly sterile. In addition, each new instrument, after being removed from the factory packaging, is also subject to preliminary sterilization before use. Small dental instruments are subject to pre-sterilization cleaning by soaking in a washing and disinfecting solution with their complete immersion or ultrasonic treatment for 3 minutes in a washing and disinfecting solution. It is important to know that prolonged exposure of rotary instruments to chemical solutions causes the instrument's color coding to disappear. Disinfectants containing hydrochloric acid and hydrogen peroxide can cause corrosion of instruments, so they are not recommended for disinfection of small rotary instruments. It is also not recommended to soak carbide and steel burs in the same container with solutions to avoid corrosion. After pre-sterilization cleaning, rinse the instruments with running water for 3–5 minutes, then with distilled water and dry with hot air for 2–10 minutes or naturally. When choosing a sterilization method, follow the manufacturer's instructions so as not to damage the working properties of the material. Most manufacturers do not recommend sterilizing burs at temperatures above 160 °C, as this reduces their quality characteristics, damages the bond

between the rod and the working part of the instrument, or causes the disintegration of diamond chips and abrasives made of other materials. In this regard, air (180 °C) and glass bead sterilization methods (190–250 °C) cannot be used.

Considering that **dental mirrors** are damaged by high temperatures, it is recommended to treat them using the cold sterilization method. It is recommended to treat the mirrors in the following order:

– pre-sterilization treatment is carried out in the same ways as for other instruments;

– after use, the mirrors are washed in running water;

– preliminary disinfection of mirrors is carried out using a disinfectant solution;

– pre-sterilization cleaning in prepared solutions;

– processing of mirrors by the cold sterilization method is carried out in a 6 % solution of hydrogen peroxide (exposure 6 hours), in a solution of clindesine-3000 (exposure 8 hours), 10 % solution of gigasept (exposure 10 hours) or in a triple solution;

– at the end of the exposure, the mirrors are rinsed with sterile water, wiped with a sterile napkin and stored in a dry sterile tray under a sterile napkin during the work shift.

In addition, mirrors can be sterilized in autoclaves at a temperature of 110–134 °C.

All **dental prosthetic products** (impressions, bite templates, etc., blanks of future prostheses) are disinfected without fail in the office before sending to the dental laboratory and after returning from it before inserting into the oral cavity. After receiving a dental impression, it is immediately washed with water, observing personnel protection measures. During washing, the impression should not be allowed to splash water with biological material. Next, disinfect the materials with one of the list of disinfectants. After disinfection, the impressions are washed with water to remove residual disinfectant.

Disinfection **orthopedic and orthodontic structures** that the patient has already worn, occurs after removal from the oral cavity and before sending to the dental laboratory (preliminary rinsing in a container with a disinfectant — disinfection — rinsing with running water — drying — individual packaging for storage).

At the end of the work shift, brushes for polishing dentures, dental instruments, small instruments (discs, cutters, heads, burs, etc.) are disinfected; if biological fluids come into contact with them during work, disinfection is carried out immediately.

After each use by a patient, **carpule syringes** are disinfected by wiping twice with a 70 % solution of ethyl alcohol or another disinfectant solution at intervals of 10–15 minutes. After a work shift, syringes are disinfected, pre-sterilization

cleaned and sterilized, like other dental instruments. Sterilization is carried out by the dry-heat method at a temperature of 180 °C for 60 minutes or by autoclaving under a pressure of 2 atm, at a temperature of 120 °C — 45 minutes. Before use the carpule is wiped twice with a 70 % solution of ethyl alcohol.

Tips for dental units, endodontic, ultrasonic and others are disinfected according to the manufacturer's instructions. Disinfection of the tips is carried out by wiping with a napkin soaked in a disinfectant solution (alcohol) according to the manufacturer's recommendations. The following steps are mandatory:

– product tip placed in a transparent polyethylene bag to prevent the spread of infected aerosol, after which air and spray are supplied for 10–15 seconds to clean the internal channels of the tip;

– cleaning the outer surface, remove the tip from the sleeve and wipe it twice with 70 % ethyl alcohol or an antiseptic solution at 15-minute intervals;

– lubricate the internal cavities of the tip with a spray under pressure;

– the tip is placed in a container or craft bag and loaded into the autoclave according to the instructions. Processed tips should be stored under conditions that prevent recontamination.

In surgical rooms, it is strictly necessary to supply sterile water to the tip; water should only flow through sterile conductors and from a sterile container. Sufficient provision of tips is required (for uninterrupted operation, taking into account the processing time between manipulations).

Effective cleaning and disinfection of tips can be carried out in special automatic devices that can be installed directly at the workplace. The Assistina device is registered in the Republic of Belarus (Fig. 14), in which the tip is blown with a disinfectant solution and treated with an oil spray in automatic mode under a pressure of 3.5 bar for 3 seconds. Due to the use of a filtration system, the device emits only purified air, ensuring the protection of personnel.

Fig. 14. Apparatus for automatic cleaning and lubrication of tips

Manufacturers have established the production of automatic autoclaves for tips, which combine cleaning, lubrication, sterilization, drying without personnel intervention, which eliminates any risks of contamination and the occurrence of the human factor (Fig. 15). The time for all stages takes 12–15 minutes.

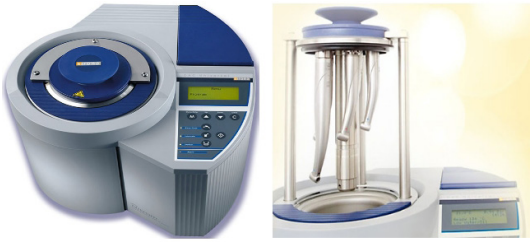

Fig. 15. Automatic autoclave for tips

The surface of photopolymer **lamps** is treated at the beginning and end of the shift, and necessarily as it gets dirty by wiping with exposure to a disinfectant (alcohol) according to the manufacturer's instructions. The tip (light guide) of the lamp is disinfected before starting work and after each patient by wiping with a napkin soaked in a solution of a disinfectant (alcohol) according to the manufacturer's recommendations. The light guide is cleaned of restorative materials with a blunt plastic instrument, after which it is sterilized by the cold sterilization method or autoclaving at a temperature of 120 °C, a pressure of 1.1 bar for 45 minutes. With the cold sterilization method, the light guide is immersed in a 70 % solution of ethyl alcohol for 30 minutes or sterilized in "Sidex", in a 1 % solution of "Steranios" for 15 minutes, after which it is washed with distilled water and dried. It is recommended to use protective covers for light guides or wrap them in polymer film individually for each patient, followed by disposal of the film (cover) and mandatory disinfection of the lamp.

To combat airborne infections, use:

1. Mandatory wearing of masks by medical personnel.

They are used to reduce the release of droplets of secretion from the nasopharynx and oral cavity into the external environment during breathing medical staff.

There are two types of masks: filtering and reflective. Filtering masks primarily include gauze masks. Three-layer gauze masks that cover the mouth and nose retain 70 % of exhaled microorganisms, four-layer masks — 88 %, six-layer masks — 96 %. However, the more layers, the more difficult it is for the surgeon to breathe. When gauze is moistened, the filtering capacity decreases. After 3 hours, 100 % of three-layer gauze masks are abundantly seeded with microflora. To give the masks a greater effect, they are impregnated with an antiseptic, dried and autoclaved.

The properties of such masks are preserved for 5–6 hours. Modern disposable cellulose masks are usually effective for 1 hour. In reflective masks, condensate from exhaled air flows down the walls of the mask into special containers. They are practically not used now. Masks must be used when performing any manipulations associated with damage to the integumentary tissues.

2. Bactericidal lamps that emit ultraviolet rays of a certain wavelength, which have a maximum bactericidal effect.

Such rays are harmful to humans. Therefore, the lamps have a certain protection. In addition, there is a mode of operation in which the lamps operate when there are no personnel or patients in the room. One bactericidal lamp for 2 hours sterilizes up to 30 cubic meters of air and destroys germs on open surfaces.

3. Ventilation and ventilation of rooms reduces air pollution by microorganisms by 30 %. With the additional use of air conditioners with bacterial filters, the efficiency increases to 80 %. When creating ultra-clean operating rooms, supply and exhaust ventilation with bacterial filters is installed to create a laminar air flow. In this case, all particles that get into the air when members of the operating team and the patient breathe are effectively removed.

PREVENTION OF HIV INFECTION IN DENTISTRY

Counteracting the AIDS pandemic is a social problem that cannot be closed only within the framework of medical activity. At present, the emphasis in the fight against AIDS has been shifted to prevention, the development of special social and legislative acts and their steadfast implementation. The global strategy for the prevention and control of AIDS was first developed in 1985–1986 by WHO and adopted by all countries in 1987.

The main objectives of the strategy:

1. Reducing the impact of HIV infection on the individual and society.

2. Mobilization and unification of national and international activities aimed at combating AIDS.

The modern fight against HIV infection is based on the following measures to prevent the spread of infection:

1. Prevention of HIV transmission during sexual intercourse:

– information and familiarization that indicate how it is possible to avoid becoming infected or transmitting HIV;

– medical and social assistance (health education, advisory assistance, early diagnosis and treatment);

– a favorable environment, the introduction and maintenance of norms of social behavior, the elimination of prejudice and discrimination against people infected with HIV, favorable economic conditions.

2. Prevention of parenteral transmission of HIV infection:

– HIV transmission through blood transfusions can be prevented through the rational use of blood and its products (providing donors with consultation before their initial screening and at subsequent stages), testing blood obtained from donors, training personnel in the qualified performance of various procedures, and conducting explanatory work among doctors;

– among people who inject drugs, the main goal is to reduce drug injection. In some countries, sterile needles were distributed during the health education campaign;

– prevention of HIV transmission in medical institutions: complete sterilization, provision of all necessary instruments and equipment.

3. Prevention of perinatal transmission of HIV infection: refusal of pregnancy by infected persons.

HIV control in dentistry. According to the Instructions for the prevention of nosocomial HIV infection and the prevention of professional infection of medical workers (Appendix 5 to the order of the Ministry of Health of the Republic of Belarus No. 351 of 16.12.1998) Every person seeking medical care should be considered as potential carrier of the human immunodeficiency virus. Accordingly, each workplace must ensure measures to prevent the transmission of the human immunodeficiency virus from a possible virus carrier or AIDS patient to other patients and medical personnel.

By the order of the institution, work on the prevention of parenteral HIV infections is assigned to the commission on hospital infections, in each department a person responsible for ensuring regime issues is appointed, a system for monitoring the work of personnel in the evening and at night, and monitoring the quality of instrument processing is determined. Workplaces are provided with extracts from instructional and methodological documents, first aid kits for emergency prevention in emergency situations.

When working in a dental office, you should pay attention to comply with the following requirements.

Medical history. In all cases, a thorough history should be taken, which should include questions about drug therapy, current illnesses, hepatitis, recurrent illnesses, unexplained weight loss, lymphadenopathy, oral soft tissue lesions, other infections, and the patient's risk group status.

Use of protective equipment and methods:

1. To protect staff and patients when in contact with blood, saliva, and oral mucosa, gloves must be used. After finishing work with one patient, hands should be washed, gloves should be changed for new ones, and only then should the next patient be treated. It is not recommended to reuse gloves, since the material they are made of may have defects, which significantly reduces their barrier role. Healthcare workers with injuries (wounds) on their hands, eczema, dermatitis are

removed from providing medical care to patients and from contact with items used to care for them for the duration of their illness.

2. If there is a possibility of blood or saliva splashing, surgical glasses or protective screens should be used.

3. Gowns and other work clothes should be washed with hot water and detergents, changed daily or immediately if they come into contact with blood.

4. All procedures and manipulations with potentially infected patients should be carried out very carefully to minimize the formation of splashes and aerosols. This is facilitated by the use of a cofferdam, saliva ejector, vacuum cleaner, as well as compliance with ergonomic rules.

5. Impermeable paper, aluminum foil, or clean plastic wrap may be used to cover surfaces that may be contaminated with blood or saliva and that are difficult or impossible to disinfect. Coverings should be changed to clean ones for each patient.

Use of sharp instruments and needles:

1. Sharp instruments (needles, scalpels, scissors, hooks, scalers, etc.) are considered potentially infected and must be handled with great care to prevent accidental injuries and cuts.

2. Disposable syringes and needles, scalpels and other sharp instruments should be kept in puncture-proof containers located as close as possible to the place where the instruments are used.

3. To prevent injuries, the needle is not removed from the syringe after use. Before immersing the syringe with the needle in the disinfectant solution, only the piston is removed.

4. Since some dental procedures may require multiple injections with the same syringe, it is advisable to place the uncovered needle in a "sterile field" rather than capping and uncapping it between injections.

Guidelines for high-level disinfection and sterilization of instruments. Surgical and other instruments used to cut soft tissue and bone (forceps, scalpels, scalers, dental drills, etc.) should be sterilized after each use. However, if sterilization is not possible, these instruments should be subjected to high-level disinfection.

High-level disinfection or sterilization methods. Prior to high-level disinfection and sterilization, instruments must be free of organic matter. Thorough cleaning can be accomplished with soap and water or detergent, and an ultrasonic cleaner may be used. Persons cleaning instruments should wear heavy rubber gloves to prevent cuts to the hands. Metal instruments are sterilized with pressurized steam, dry heat, or a chemical steam inhaler. Heat-sensitive instruments may require 10 hours of soaking in a disinfectant liquid, followed by rinsing with distilled water. High-level disinfection can be accomplished by boiling the instruments for 10 minutes, or the instruments can be placed in the disinfectant for the time recommended by the manufacturer.

Cleaning of external surfaces. After completion of the treatment procedure, the stands and surfaces that may be contaminated with blood or saliva should be wiped with an absorbent towel, then disinfected with a suitable chemical hermecide (sodium hypochlorite solution diluted 1 : 10; 1 : 100). However, it should be Remember that sodium hypochlorite is corrosive to metals.

About cleaning of impressions, dentures. Casts, dentures, impressions, etc. should be carefully and thoroughly cleaned of blood and saliva, especially before grinding and polishing teeth. They should be disinfected both before and after the dental laboratory. Hermecides, which are effective against mycobacteria and viruses, are offered as disinfectants.

Spent material. Teeth removed during operations, bone tissue, dental crowns, materials used in providing medical care (disposable instruments, bandages, cotton wool, plaster, wax, etc.) are disinfected in accordance with the decree Ministry of Health of the Republic of Belarus No. 14 dated 7 February 2018 with subsequent disposal.

Measures for injuries, contacts with blood and other biological materials of patients. According to the instructions for the prevention of hospital-acquired HIV infection and the prevention of professional infection of medical workers (Appendix 5 to the Order of the Ministry of Health of the Republic of Belarus No. 351 of 16.12.1998), in the event of detection of a fact of hospital-acquired infection, a commission is created by order of the Ministry of Health to identify the causes that led to the infection and take measures to eliminate them. It includes members of the regime commission of the Ministry of Health, epidemiologists of the republican and regional AIDS prevention centers, chief specialists of health authorities in accordance with the profiles of the hospital, laboratory where the infection occurred.

The accident logbook shall record emergency situations involving the contact of a large amount of blood or other biological material with a large wound surface and mucous membranes. The following data shall be recorded in the logbook: the last name, first name, and patronymic of the injured worker; the date and time of the accident; the type of work performed at the time of the accident; a description of the nature of the accident; a description of the source of possible infection and its testing for HIV. The head of the institution and the representative of the nosocomial infections commission shall be immediately informed of the accident that occurred and the measures taken in connection with it.

Any damage to the skin, mucous membranes, or contamination of them with biological materials of patients during the provision of medical care should be qualified as possible contact with material containing HIV or another infectious disease agent.

In accordance with the Resolution of the Ministry of Health of the Republic of Belarus No. 11 of February 6, 2013 No. “Requirements for the organization and

implementation of sanitary and anti-epidemiological measures aimed at preventing the occurrence and spread of viral hepatitis", with the Collection of regulatory documents on the problem of HIV/AIDS, Ministry of Health of the Republic of Belarus, 1995, the following recommendations are given in case of contamination of objects with biological fluids.

If it happened contact with blood or other biological fluids in case of violation of the integrity of the skin (injection, cut) or a cut, the victim must:

– remove gloves with the working surface inward;

– squeeze blood out of a wound (preferably in a cotton ball with iodine solution);

– treat the damaged area with one of the disinfectants 70 % alcohol, 5 % iodine tincture — for cuts, 3 % hydrogen peroxide solution — with injections;

– wash your hands thoroughly under running water with soap and then wipe 70 % alcohol;

– apply a plaster to the wound and put on a finger cot;

– if necessary to continue working, put on new gloves.

If contamination with blood or other biological fluid occurs without damaging the skin, it is necessary:

– urgently treat the contaminated area with one of the disinfectants skin with 70 % alcohol, 3 % hydrogen peroxide solution hydrogen, 3 % chloramine solution;

– wash the contaminated area with water (preferably running) with soap and re-treat with alcohol or other disinfectant.

If the biomaterial comes into contact with mucous membranes:

– mouth cavity — rinse with 70 % alcohol rinse with water;

– nasal cavity — instill 20–30 % solution of albucid;

– eyes — rinse with water (with clean hands), put in 20–30 % albucid solution. A 0.05 % solution potassium permanganate can be used to treat the nose and eyes.

If biomaterial gets on a gown or clothing:

– before removing clothes, gloves are disinfected one of the disinfectants (3 % hydrogen peroxide solution, 3 % chloramine solution);

– in case of minor contamination, remove the clothes and place them in a plastic bag until washing;

– if the clothes are significantly dirty, they are pre-soaked (before washing) for 2 hours in one of the disinfectant solutions;

– clothing contaminated with biological fluids is washed in hot water (not lower than 70°) with detergent;

– the skin of the hands and other areas of the body under the contaminated clothing is wiped with a disinfectant (from the first aid kit) 70 % alcohol, then washed with soap and water and wiped again with alcohol disinfectant;

– contaminated shoes twice at intervals of 15 minutes, wipe with a rag soaked in a solution of one of the disinfectants;

– when cleaning biological fluids with visible blood impurities from surfaces, excess moisture is removed from the contaminated area with a dry rag or a ball of paper, and then the surface is wiped twice with a rag soaked in a disinfectant solution (10 % chloramine solution) with a 15-minute interval;

– after finishing work, treat the gloves with a 3 % chloramine solution without removing them, wash with soap and water, then remove them with the working surface facing inward;

– gloves, as well as blood-soaked material, should be placed in a waterproof bag for subsequent disposal.

First aid kit for emergency medical care in an emergency:

– finger pads — 5 pcs;
– adhesive tape roll — 2 pcs;
– latex gloves (rubber) — 3 pairs;
– scissors — 1 pc;
– tincture of iodine 5 % — 10 ml — fl.;
– hydrogen peroxide 20 % — 20 ml — fl.;
– albucid (sulfacyl sodium) — 30 % — 5 tubes or 2 fl.;
– chloramine weighed in at 30 g — 5 pcs;
– bandage 5/10 — 2 pcs;
– medical wipes — 2 pcs;
– 1 liter capacity for diluting chloramine.

First aid kits should be stored in a place that provides easy access to them. The official appointed by the order of the institution is responsible for the timely replenishment and completeness of the first aid kits. To prepare a 3 % chloramine solution, 30 g of chloramine are poured into 1 liter of tap water and mixed thoroughly. When using sodium sulfacyl in bottles, eye droppers (3–5 pieces) are placed in the first aid kits.

Drug prevention of occupational HIV infection in health workers. The main objective of preventing occupational infections among healthcare workers is to maximally prevent parenteral contacts with infected blood and biological fluids.

Since 1992, surveillance of occupational infections among US health care workers has identified and documented HIV infection as a result of needle sticks in 84 % of cases, blood on mucous membranes in 13 %, and skin and mucous membranes in 3 %.

It is known that any preventive measures reduce, but do not eliminate completely eliminate the risk of professional HIV infection. Therefore, chemoprophylaxis of possible infection of a health worker with the anti-HIV drug azidothymidine is of particular importance.

Post-exposure prophylaxis of HIV infection is a medical measure aimed at preventing the development of infection after probable contact with a pathogenic

microorganism. It is prescribed according to indications to persons at risk of HIV infection.

Azidothymidine prophylaxis regimen. This prophylaxis is carried out when a large amount of infected blood or biological fluid gets on the wound surface or mucous membranes. It is recommended to take 200 mg of azidothymidine every 4 hours × 3 days, then 200 mg every 6 hours × 25 days.

Azidothymidine should be administered within 24 hours after the accident, preferably 1–2 hours later, without waiting for the examination of the patient who may be the source of infection. If the patient's examination result is negative, chemoprophylaxis is stopped. Before taking the drug, the health care worker's serum should be taken to check for seronegativity. Subsequently, the health care worker is examined every 6 months to confirm the absence or presence of seroconversion. During this period, the health care worker is recommended to carefully note all signs of ill health, refrain from donating blood, observe safe sex practices, and women avoid pregnancy. This prevention scheme is recommended for implementation in medical institutions of the Republic of Belarus.

The recording, registration and analysis of iatrogenic infections in medical and preventive institutions of the Republic of Belarus is carried out in accordance with the Collection of normative documents on the problem of HIV/AIDS of the Ministry of Health of the Republic of Belarus, 1995. Emergency situations associated with the contact of a large amount of blood or other biological material with an extensive wound surface or mucous membrane are subject to registration in the "Registration Log of Emergency Contacts of Employees of Healthcare Organizations with Biological Material of Patients".

The following forms of iatrogenic and nosocomial infections are subject to registration (registration is understood as a systematic measurement of morbidity based on the counting of individual cases of the disease) in all types of healthcare institutions of the Republic of Belarus:

– all highly contagious infectious diseases subject to mandatory registration and notification;

– all cases and forms of sepsis (septicopyemia), as well as bacterial shock that developed after medical interventions;

– all cases and forms of iatrogenies and nosocomial infections associated with dental interventions (stomatitis, sinusitis, abscess and phlegmon of soft tissues, osteomyelitis, brain abscess, etc.).

The basis for the entry is the data from the inpatient medical record or the outpatient medical record.

Registration is carried out by the senior nurse of the inpatient department or outpatient clinic under the supervision of the head of the department (outpatient clinic).

If the healthcare facility has a hospital epidemiologist or assistant epidemiologist on staff, these individuals make entries in the journal.

A practicing physician should remember that the action or inaction of a physician that results in harm to a patient due to carelessness (due to frivolity or negligence) entails legal liability. Improper performance of professional duties by a medical worker leads to criminal liability (Article 162 of the Criminal Code of the Republic of Belarus).

Thus, since the frequency of development of nuclear diseases and their severity in the Republic of Belarus is no less than in other countries, the health service and the entire economy of our republic suffer heavy socio-economic losses from them. This dictates the need for urgent strengthening and improvement of measures to combat and prevent nuclear diseases. The experience of a number of countries and research groups, including ours, indicates the reality and cost-effectiveness of the task of significantly reducing nuclear diseases within the Republic of Belarus.

TEST-CONTROL QUESTIONS

1. Hospital-acquired infections are infections that occur during the provision of medical care:

a) in hospitals;
b) in clinics;
c) at home when visiting a doctor;
d) in production.

2. Are iatrogenic infections of medical origin?

a) yes; b) no.

3. What are the ways of infection with PU?

a) endogenous; d) autoinfections;
b) exogenous; e) all of the above.
c) metastatic;

4. The microbiological background of hands is represented by the flora:

a) resident; c) infectious;
b) transient; d) anaerobic.

5. What links does the epidemiology of UI consist of:

a) source of infection;
b) factors and routes of transmission;
c) a susceptible group with special immune system features;
d) all of the above.

6. Categories of people affected by UI:

a) sick;
b) health workers;
c) healthy patients;
d) all of the above.

7. Name the groups of pathogens:

a) bacterial;
b) fungal;
c) viral;
d) protozoa;
e) metazoans.

8. What is the localization of the EI process?

a) local;
b) systemic;
c) generalized.

9. How are UI differentiated by severity?

a) carriage of microbes;
b) asymptomatic infection;
c) clinical (mild, moderate, severe).

10. What are the consequences of UI?

a) medical;
b) economic;
c) social;
d) legal;
e) political.

11. What levels of disease intensity are recorded in hospitals:

a) sporadic;
b) epidemic;
c) main.

12. What links does the epidemiology of "opportunistic" UI consist of?

a) source of infection;
b) consequences of infection;
c) factors and routes of transmission of nuclear diseases;
d) receptive team.

13. Does the epidemiological surveillance system include monitoring the health status of medical personnel?

a) yes;
b) no.

14. Does the epidemiological surveillance system include epidemiological analysis of the incidence of nosocomial infections?

a) yes;
b) no.

15. What methods are crucial in establishing the etiological diagnosis of PU?

a) histological;
b) histochemical;
c) microbiological.

16. What is the main method for diagnosing PUs?

a) immunological;
b) microscopic;
c) bacteriological.

17. Are there methods of microbiological diagnostics that allow identification of the pathogen without isolating a pure culture?

a) yes; b) no.

18. What principle is bacteriological diagnostics based on?

a) population; d) dynamic;
b) biocenatic; e) chemotherapeutic;
c) quantitative; f) epidemiological.

19. After how many days of hospital stay is it necessary to conduct repeated bacteriological studies in order to establish superinfection, reinfection, and correct treatment and preventive measures?

a) daily; c) every 4–5 days;
b) every 2 days; d) every 10 days.

20. Which of the listed diseases can be transmitted by treatment of dental diseases?

a) AIDS; e) flu;
b) hepatitis A, B, C; f) syphilis;
c) herpes; g) candidiasis.
d) vitiligo;

21. What are the routes of transmission of NI?

a) contact; d) aerosol;
b) instrumental; e) implantation.
c) parenteral;

22. What are the factors of transmission of EI?

a) household;
b) medical;
c) social.

23. What are the risk groups for susceptibility to UI?

a) newborns;
b) elderly people;
c) patients with immunodeficiency;
d) diabetes;
e) blood diseases;
f) oncological diseases;
g) postoperative.

24. What are the nuclear reservoirs?

a) equipment;
b) medicinal products;
c) shared towels;
d) washbasins;
e) telephone.

25. Are the following items nuclear weapons reservoirs?

a) clamps for x-ray film;
b) boxes for storing dentures;
c) impression spoons;
d) instruments for polishing dentures.

26. Where should the highest level of hygiene be maintained?

a) 1st zone;
b) 2nd zone;
c) 3rd zone.

27. Which antiseptics are classified as narrow-spectrum drugs?

a) dyes;
b) local purpose AS;
c) nitrofuran drugs.

28. Which antiseptics are classified as limited-spectrum drugs?

a) nitrofuran drugs;
b) quaternary ammonium compounds;
c) dyes.

29. Which antiseptics are broad-spectrum drugs?

a) nitrofuran drugs;
b) dyes;
c) phenols;
d) oxidizing agents;
e) formaldehyde;
f) acids.

30. The process of complete destruction or removal of vegetative and dormant forms of microorganisms from environmental objects is:

a) sterilization;
b) disinfection;
c) decontamination.

31. An event aimed at the complete destruction of vegetative and dormant forms of certain groups of microorganisms in environmental objects and aimed at preventing the transmission of pathogens from an infected organism to an uninfected one is:

a) sterilization;
b) disinfection;
c) decontamination.

32. Specify the sequence of stages of the sterilization process:

a) storage of sterile materials;
b) drying (in a sterilization chamber);
c) control over sterilization;
d) disinfection;
e) cleaning of the material;
f) assembly, grouping and placement of material in the sterilizer chamber;
g) sterilization itself.

33. What is the purpose of sterilization control?

a) reduction of the number of microbes on the object;
b) complete removal of microbes from the object;
c) checking the effectiveness of sterilization.

34. The methods of sterilization are:

a) gas;
b) heat;
c) ferry;
d) chemical;
e) infrared;
f) glass bead;
g) ionizing radiation;
h) plasma;
i) all of the above.

35. The effectiveness of sterilization is controlled by the following methods:

a) mechanical;
b) physical;
c) chemical;
d) biological.

36. What are the measures to prevent the spread of HIV infection?

a) prevention of HIV transmission during sexual intercourse;
b) prevention of parenteral transmission of HIV infection;
c) prevention of perinatal transmission of HIV infection;
d) all of the above.

37. Rubber gloves be used a second time to prevent HIV infection?

a) yes; b) no.

38. Should medical workers with injuries to their hands, eczema, or dermatitis be excluded from providing medical care to patients?

a) yes; b) no.

39. What protective equipment should be used in the event of possible blood and saliva splashes in the dental office?

a) surgical glasses; b) protective screens.

40. Which of the listed means are used for prophylactic purposes? HIV infections in dentistry?

a) cofferdam; c) saliva ejector;
b) vacuum cleaner; d) tip.

41. Are disposable syringes, needles, and scalpels a means of HIV prevention in a dental office?

a) yes; b) no.

42. What does the unified system for recording and analyzing nosocomial and iatrogenic infections include?

a) all highly contagious infectious diseases;
b) all cases and forms of sepsis;
c) all cases and forms of iatrogenies and nosocomial infections associated with dental interventions.

Answers: 1 — a, b; **2** — a; **3** — e; **4** — a, b, c; **5** — d; **6** — d; **7** — b, c, e; **8** — a, b, c; **9** — c; **10** — a, b, d; **11** — a, b; **12** — a, d; **13** — a; **14** — a; **15** — c; **16** — c; **17** — a; **18** — a, b, c, d, e, f; **19** — c; **20** — a, b, c, e, f, g; **21** — a, b, c, e; **22** — a, b; **23** — a, c, d, e, g; **24** — a, b, c, d, e; **25** — a, b; **26** — a; **27** — a, b; **28** — a, b; **29** — c, d, e, f; **30** — a; **31** — b; **32** — d, e, b, f, g, c, a; **33** — c; **34** — i; **35** — a, c, d; **36** — d; **37** — b; **38** — a; **39** — a, b; **40** — b, c; **41** — a; **42** — a, c.

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BASIC TERMS AND CONCEPTS IN THE FIELD OF IATROGENIC AND NOSOCOMIAL INFECTIONS

Antibiotics are chemotherapeutic substances of microbial semi-synthetic or synthetic origin, which in low concentrations cause inhibition of reproduction or death of microbes and tumor cells sensitive to them in the internal environment of the animal organism.

Antiseptics — a set of methods for suppressing the growth and reproduction of potentially dangerous microorganisms on intact and/or damaged skin and mucous membranes of the body of humans and other animals.

Antiseptic drug — antiseptics — chemical preparations microbiostatic action, used for therapeutic or prophylactic antisepsis of the skin, mucous membranes, wounds, cavities.

Asepsis — a set of measures aimed at preventing potential pathogens from getting onto surfaces, into organs and patient's cavity.

Autoinfection (self-infection) — an infectious process that occurs during the natural or artificial transfer of a pathogen from one location in the human body to another biotope.

Virulence — the degree of pathogenicity (the level of potential the ability of a given microorganism to cause disease in a specific host). The concept includes the degree of infectivity, invasiveness and toxicity.

Hospital-acquired (hospital-acquired, hospital-acquired, nosocomial) infections — according to the WHO definition — any clinically recognizable a microbial disease that affects a patient as a result of his admission to a hospital or his seeking medical care there, or a hospital employee as a result of his work in this institution, regardless of the appearance of symptoms of the disease during or after the stay in the hospital.

Community-acquired strains — strains of opportunistic microorganisms that do not or differ little from the typical strains of the species.

Secondary infection — re-infection of the pathological focus with new secondary types of microorganism.

Hospital ecovars (hospital strains) — variants microorganisms adapted to life in hospitals (ecosystems). They are characterized by multiple resistance to antibiotics, increased resistance to antiseptics, disinfectants, antagonists, higher virulence, antagonistic activity, intrapopulation variability, more intensive exchange of genetic material and increased migration in hospital conditions.

Disinfection (disinfection) is a measure aimed at the complete destruction of vegetative and dormant forms of certain groups of microorganisms on objects of the external environment (exosomatically) and aiming to prevent the transmission of the pathogen from an infected organism to an uninfected one, i.e. breaking the epidemic chain.

Ongoing disinfection is a set of disinfection measures that ensure continuous monitoring of the sanitary condition of the premises of a healthcare facility and the objects located therein.

Disinfection of chaga is a set of measures, carried out directly at the site of the current infectious disease, or in case of suspicion of it.

Final disinfection is a set of measures that are carried out after the complete isolation of the patient after the end of his stay in the outbreak.

Disinfectants (disinfection agents) — chemicals microbicidal action, used for disinfection purposes.

Decontamination is a set of methods for destroying microorganisms in environmental objects.

Infection introduction — an infectious disease that a patient has at the time of admission to hospital or that manifested itself in hospital but was acquired before hospitalization.

Incubation period — the time interval between contact with a pathological agent and the appearance of the first clinical symptoms of the disease.

Infection — the process of interaction between a macroorganism and a microorganism, during which the microorganism penetrates the body host, reproduction of the microorganism and possible damage (invasion) in as a result of direct action, including the release of toxins by the microorganism, or through immune reactions.

Infection control — a system of activities based on epidemiological diagnostics and aimed at preventing the emergence and spread of infectious diseases in healthcare facilities

Source of infection — natural biotic and abiotic habitat of microorganisms, where their growth and reproduction are ensured and from which they are released into the external environment.

Source of nosocomial infection — a place where a microorganism accumulates, from which it is directly transmitted to a susceptible person.

Healthcare-associated infections (HAI) are any clinically evident disease of microbial origin that affects a patient as a result of his admission to a hospital or seeking medical care, regardless of whether the patient develops symptoms of the disease during his stay in the hospital or after his discharge, as well as an infectious disease of an employee of a medical organization as a result of his infection while working in this organization.

Colonization (insemination) — the proliferation of microorganisms in cavities or on the surfaces of the host's body in the absence of tissue damage and clinical signs of infection.

Contamination (pollution) — the entry of infectious, organic or chemical agents or materials into tissues and cavities that are normally sterile (clean) or have other permanent inhabitants.

Microbiological diagnostics — a set of bacterioscopic, cultural (bacteriological), serological and genetic methods that ensure the establishment of the etiology of the disease.

Microbiological control — a set of cultural methods that provide indication of pathogenic and opportunistic microorganisms in hospital environment objects and in the human body.

Microbiocenosis (microbial community, association) — a set of populations of different types of microorganisms living in a certain biotope.

Opportunistic pathogenic microbes — representatives of the normal (syngeneic, resident) microflora of the human body, possessing a limited set of virulence factors and capable of causing disease in the host organism upon passive penetration into the internal environment, massiveness of the infecting dose and (or) a decrease in the immunological state of the host organism.

Transmission mechanism — an evolutionarily developed ability of a pathogen to move from one host to another. In hospital conditions, it is realized, as a rule, only in cases of introduction of pathogens of traditional highly contagious infections.

Carriage is the presence of a pathogenic microorganism in the host's body without clinical manifestations of infection.

Pathogenicity is the ability of a microorganism to cause disease.

A population of microorganisms is a community of individuals of the same species capable of interbreeding, living in a certain territory (biotope).

Prevention of hospital-acquired infections — a system of architectural planning, sanitary and hygienic, anti-epidemic, treatment and preventive and organizational measures aimed at the timely identification and neutralization of sources of infection, the fight against pathogenic and opportunistic microorganisms in the external hospital environment and in the internal environment of people in healthcare facilities, as well as increasing the general and local anti-infective resistance of hospital patients and healthcare workers.

Transmission route — a set of transmission factors operating under specific conditions during a given infection.

Reservoir of infection — a long-lasting source of infection that supports the existence of a parasitic species in nature.

Reinfection is a complete replacement of variants of a pathological focus with new variants of the same type of microorganism.

Mixed infection — an infectious process caused by microorganisms of different types.

Sterilization — disinfection: 1) the process of complete destruction or removal of vegetative or dormant forms of microorganisms from environmental objects; 2) a set of physical, chemical and mechanical methods for the complete removal of living organisms from environmental objects microorganisms.

Superinfection is an additional infection of a pathological focus with new variants of the same type of microorganism.

Sustainability — the ability of a microbial population to survive under the influence of physical, chemical and biological factors.

Transmission factors are elements of the environment through which the transmission of the infectious agent to the biotopes of the human body occurs.

Chemotherapy — treatment of infectious and parasitic diseases with chemotherapeutic agents.

Sensitivity of microorganisms — suppression of reproduction or death of populations of microorganisms under the influence of physical, chemical, biological factors of the external environment or eliminating factors of the host organism.

Exogenous infection is an infection that develops as a result of contamination by microorganisms from external biotic and abiotic sources.

Ecology — a science that studies the relationships between organisms and physical and biological environmental factors.

Endogenous infection — an infection caused by representatives of the host's own (endogenous) flora of the skin and mucous membranes, as well as the patient's digestive, respiratory, and urinary tracts, or caused by microorganisms that previously colonized the patient's biotopes.

Epidemiology — the science that studies the causes of the occurrence and distribution of normal (health) and pathological conditions (diseases) in human populations. Epidemiology is usually understood as the science of the patterns of the epidemic process and measures to prevent and combat infections.

Epidemiological surveillance is a system of continuous comprehensive observations of the dynamics of the epidemic process (morbidity, carriage, mortality), factors influencing the spread of nosocomial infections, as well as data analysis in order to obtain objective information on the state and development trends of the epidemic process to justify rational measures to combat and prevent nosocomial infections.

Epidemic level of morbidity — a level of morbidity that exceeds the usual (ordinary) or expected level in a particular population during a certain period of time.

Iatrogenesis is a disease or injury that occurs in patients and medical workers as a result of the provision of any type of medical care.

Iatrogenic infections — infectious diseases contracted during the provision of any type of medical care.

Appendix 2

LIST OF LEGISLATIVE, REGULATORY AND INSTRUCTIONAL-METHODOLOGICAL DOCUMENTS

1. *On the sanitary* and epidemiological well-being of the population [Electronic resource] : Law of the Republic of Belarus dated 07.01.2012 No. 340-3. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

2. *On approval* of the Sanitary Norms and Rules "Sanitary and Epidemiological Requirements for Organizations Providing Medical Care, Including the Organization and Implementation of Sanitary and Anti-Epidemiological Measures for the Prevention of Infectious Diseases in These Organizations [Electronic resource] : Resolution of the Ministry of Health of the Republic of Belarus dated 05.07.2017 No. 7-3. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

3. *On approval* of the Sanitary norms and rules "Sanitary and epidemiological requirements for handling medical waste" [Electronic resource] : Resolution of the Ministry of Health of the Republic of Belarus dated 07.02.2018 No. 14. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

4. *On the introduction* of sanitary rules and regulations [Electronic resource] : Resolution of the Chief State Sanitary Doctor of the Republic Belarus No. 18 dated 04/29/1998. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

5. *About* approval of the Sanitary Norms and Rules "Requirements for the procedure for carrying out disinfection, disinfestation and deratization measures" and recognition of the invalidation of the resolution of the Chief State Sanitary Doctor of the Republic of Belarus dated December 26, 2002 No. 143 [Electronic resource] : Resolution of the Ministry of Health of the Republic of Belarus dated 21.03.2013 No. 24. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

6. *On approval* of specific sanitary and epidemiological requirements [Electronic resource] : Resolution of the Council of Ministers of the Republic of Belarus dated 03.03.2020 No. 130. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

7. *On approval* of specific sanitary and epidemiological requirements [Electronic resource] : Resolution of the Council of Ministers of the Republic of Belarus dated 01.02.20 No. 66. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

8. *On the implementation* of disinfection and sterilization by healthcare institutions [Electronic resource] : order of the Ministry of Health of the Republic of Belarus dated 25.11.2002 No. 165. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

9. *On approval* of the Sanitary norms and rules "Requirements for the organization and implementation of sanitary and anti-epidemic measures aimed at prevention of the emergence and spread of viral hepatitis" and repealing the resolution of the Ministry of Health of the Republic of Belarus dated November 14, 2011 No. 112 [Electronic resource] : resolution of the Ministry of Health of the Republic of Belarus dated 06.0 2.2013 No. 11. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

10. *On the revision* of departmental regulations governing issues related to the HIV/AIDS problem [Electronic resource] : order of the Ministry of Health of the Republic of Belarus dated 16.12.1998 No. 351. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

11. *On approval* of the Sanitary norms and rules “Requirements for medical products and medical equipment” [Electronic resource] : Resolution of the Ministry of Health of the Republic of Belarus dated 12/16/2013 No. 128. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

12. *On approval* of good storage practices for medicines [Electronic resource] : Resolution of the Ministry of Health of the Republic of Belarus dated 10.23.20 No. 88. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

13. *On hygienic* and surgical antisepsis of hands of medical personnel [Electronic resource] : instructions in accordance with the requirements of the European standard EN-1500. – URL: https://mid.by (date of access: 20.09.2023).

14. *Quality* control of sterilization of medical devices No. 90-9908 [Electronic resource] : guidelines. – URL: https://minzdrav.gov.by (date of access: 20.09.2023).

Appendix 3

PLAN OF HYGIENIC WORKS IN DENTAL INSTITUTIONS

Object to be processed	Type of processing	Agent (disinfectants)	Time of the hygienic event	Responsible or trusted person
Medical instruments	Soaking with full immersion (the solution should cover the instruments by 1 cm): Stage 1: washing the instrument in container No. 1 Stage 2: full immersion in container No. 2 with a time delay according to the instructions	KDI 1 % — 15 min Slavin 0.5 % — 60 min Triacid 2 % — 15 min Polydez 1 % — 45 min Hexadecon 0.5 % — 30 min Anasept 1 % — 60 min. Solutions are approved for repeated use. Must be visually clean before each dive	Immediately after use – composite instruments — disassemble; – cavities and channels in instruments — fill with solution	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Small dental and endodontic instruments Mirrors	Soaking with full immersion (the solution should cover the instruments by 1 cm): Stage 1: washing the instrument in container No. 1 Stage 2: full immersion in container No. 2 with a time delay	See medical instruments 6 % hydrogen peroxide — 60 min	Immediately after use	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Tips	Rub 2 times with an interval of 15 minutes Including a channel for the bore	See medical instruments 70 % ethanol — 30 min	Before and after treatment	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization

Object to be processed	Type of processing	Agent (disinfectants)	Time of the hygienic event	Responsible or trusted person
Imprints	Full immersion soaking Rinsing Place in a sealed bag	See medical instruments	After contact with the patient	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Spittoon	Full immersion soaking	See medical instruments	– after each patient and as indicated; – after finishing work	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Gloves Rags Mouthwash glass Breast napkin Disposable towels	Full immersion soaking	See medical instruments	After use	Specially trained personnel of the healthcare facility, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Teeth	Full immersion soaking	See medical instruments	After removal	Specially trained personnel of the healthcare facility, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization

Object to be processed	Type of processing	Agent (disinfectants)	Time of the hygienic event	Responsible or trusted person
Syringes	Full immersion soaking: – rinsing the syringe with the needle 2–3 times in container No. 1; – in container No. 2 fill the needle and cannula with the disinfectant solution; – remove the needle with tweezers and soak it in a container for disinfecting needles with an exposure time; – disassemble the syringe and soak the cylinder and piston in container № 2 for syringe disinfection	See medical instruments	After use	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Carpule syringes	Full immersion soaking	See medical instruments	After use	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization

End of the Appendix 3

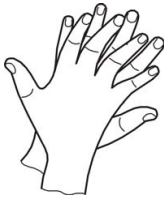
Object to be processed	Type of processing	Agent (disinfectants)	Time of the hygienic event	Responsible or trusted person
Medical equipment: Photopolymerizers Ultrasonic scalers Photodynamic therapy devices Apex locators Endodontic motors Obturator, etc.	Wiping (irrigation): – rags soaked in disinfectant solution twice with an interval of 15 minutes; – after finishing work, apply a disinfectant solution to the surface and leave it for an exposure time	See medical instruments	Multiple times; Before, during work, after work	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization
Walls	Wiping (irrigation): – rags soaked in disinfectant solution twice with an interval of 15 minutes; – after finishing work, apply a disinfectant solution to the surface and leave it for the required exposure time according to the instructions	See medical instruments + detergents + textile products (disposable and reusable)	Daily at least 2 times a day. General. Surgical room — once every 7 days. Other offices — once a month	Specially trained medical facility personnel, in accordance with orders and instructional and methodological documents. The responsibility lies with the head of the organization

EUROPEAN HYGIENIC HAND CARE STANDARD EN 1500

Follow steps 1 to 6 (apply 3 ml of the reference handrub to the cupped hands; for the product under test, apply the volume indicated by the manufacturer).

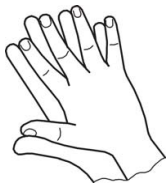
Step 1

Palm to palm



Step 2

Right palm over left dorsum and left palm over right dorsum (five times)

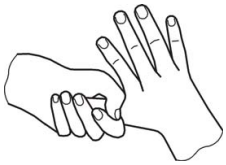


Step 3

Palm to palm with fingers interlaced (five times)

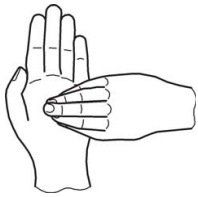
Step 4

Backs of fingers to opposing palms with fingers interlocked (five times)



Step 5

Rotational rubbing of right thumb clasped in left palm and vice versa (five times)



Step 6

Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa (five times)

For the reference handrub, continue rubbing hands for a contact time of 30 s and repeat the whole procedure for another 30 s. For the product under test, follow the manufacturer's instructions regarding the contact time and eventual repeats!

CONTENTS

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