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Department of Surgical Diseases No. 1

ASEPSIS AND ANTISEPTICS

Training-методическое manual on general surgery for студентов medical university students

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ISSUES COVERED

- General injury issues
- Wounds
- Traumatic brain injury
- Breast injuries
- Abdominal injuries
- Closed soft tissue injuries
- Dislocations
- Bone fractures
- Burns
- Frostbite
- Electrical injury
- Radiation damage

INTRODUCTION

The rudiments of healing emerged at the earliest stagesof human existence. At the same time, ancient surgeons faced one of the key problemsof surgical treatment — infectious complications.

This continued until the end ofthe 19th century, when the doctrine of asepsis and antiseptics was widely spread.

There are five stages in the development of asepsis and antisepsis:

- Empirical period (the period of application of certain unsubstantiatedscientific methods);
- dolisterovskaya antiseptics of the XIX century;
- Lister's antiseptics;
- occurrence of Asepsis;
- modern aseptics and antiseptics;

Empirical period

Even in ancient times, empiricalattempts were made to disinfect wounds in various ways. So, already Hippocrates (466-377 BC) recommended using wine and boiled water for this purpose. The laws of Moses forbaderepenting with one's own hands. In the Middle Ages, wounds were decontaminated by cauterizing them with hot iron, pouring boiling oilover them, and finally treating them with ethyl alcohol.

Dolisterovskaya antiseptics of the XIX century

One of the main prerequisites for the rapid development of surgery in the late XIX — early XX centuries was the development of a scientifically based set of measures aimed at preventingsuppuration of surgical wounds and treating purulentprocesses. A special role in this period was played by I. Semmelweis and N. I. Pavlov.

Lister's Antiseptics

The era of development of sterilization methods began with Louis Pasteur, who in 1863 proved that the processes of fermentation and putrefaction are caused by microorganisms. The English surgeon Joseph Lister used the discovery of L. Pasteur in surgery and drew parallels between putrefaction and suppuration of wounds, considering thecause of suppuration of wounds to be the penetration of microbes from outside. To prevent infection from falling from the air

into the wound, D. Lister in 1867 suggested using bandages moistened with 5% carbolicacid solution, spraying it in operating rooms anddressing rooms, and treating surgical instruments and hands of the surgeon. The effect of wound disinfection was unquestionable, butcarbolic acid had a toxic effect on personnel and a pathological effect on the skin, which was a prerequisitefor further research and technological developmentof new antiseptics.

Antiseptic measures for Lister:

- carbolic acid spray in the operating room air
- treatment of the operating field with the same solution
- treatment of instruments, suture anddressing materials, as well as surgeon's hands with 2-3% carbolic acid solution
- treatment of the operating field with the same solution
- use of a multi-layer special dressing impregnated withcarbolic acid and other substances.

Occurrence of asepsis

The founder of the physical prevention of germs in the wound — Austrian surgeon who previously worked in ROSFIC, Ernest Bergman in 1890 at the X International Congress of surgeons in Berlin showed evidence sterilesausage action of high temperature. E. Bergman with his student K. Himmelbaum has developed a technology obraprocessing of dressing and suture material and surgical insof frumentarii flowing steam, hot air and boiling.

Further development of the complex of measures to influenceinfectious agents is based on the phenomenon of antibiosis (antagonism of microbes), discovered in 1877 by L, Pasteur and A. Joubert. In 1929, A. Fleming discovered a substance (penicillin) secreted by the mold fungi Penicillinumand suppressing the growth of pyogenic microbes. Currently, new types and generations of antibiotics are being introduced into practice. This is dueto adaptive mechanisms in the body of microbes: the development of special enzymes that destroy antibiotics, and the emergence of antibiotic-resistant and antibiotic-dependent strains of pathogens.

Currently, more and more attention is paidto the impact on the defense mechanisms of the macroorganism. In medical practice, agents that stimulatecellular and humoral immunity are widely used, as well as biologicalpreparations that directly interact withmicroorganisms and their toxins and stimulate the production of particles that bind infectious agents in the body.

Modern development of the principles предупреждения инфекof preventing infection in the body has led to the emergence of a new direction in medicine — gnotobiology (treatment in a microbial-free environment).

All measures of exposure to infectious agents are conditionally divided into 2 areas: asepsis and antiseptics. ***Aseptika*** is a Greek word consisting of the prefix a - (negation) and the root-*sepsis*(putrefaction). **Asepsis is usually understood as a system of measures that preventmicrobes from falling into the wound.** ***Antiseptics is*** a Greek word consisting of the prefix *anti*- (against) and the same root. **Antiseptics is understood as aset of measures aimed at eliminatingmicrobes in a wound, a pathological focus, orthe body as a whole.**

Both sets of measures are aimed at combating infection, which is understood as the process of interaction between a pathogenic microorganism (the causative agent of infection) and a susceptible macroorganism, which leads to the development of an infectious disease.

SECURITY QUESTIONS:

- Who first created a set of measures aimed at combating an infectious agent.
- What was the basis for the emergence of antiseptics.
- The role of Louis Pasteur in the development of antiseptics.

TOPIC: ASEPSIS

Goal:

Introduce students to infection prevention methods. Operating unit. Sterilization. Preparing your hands for surgery. Preparation of the operational field. Preparation and

sterilization of suture and ligature materials.

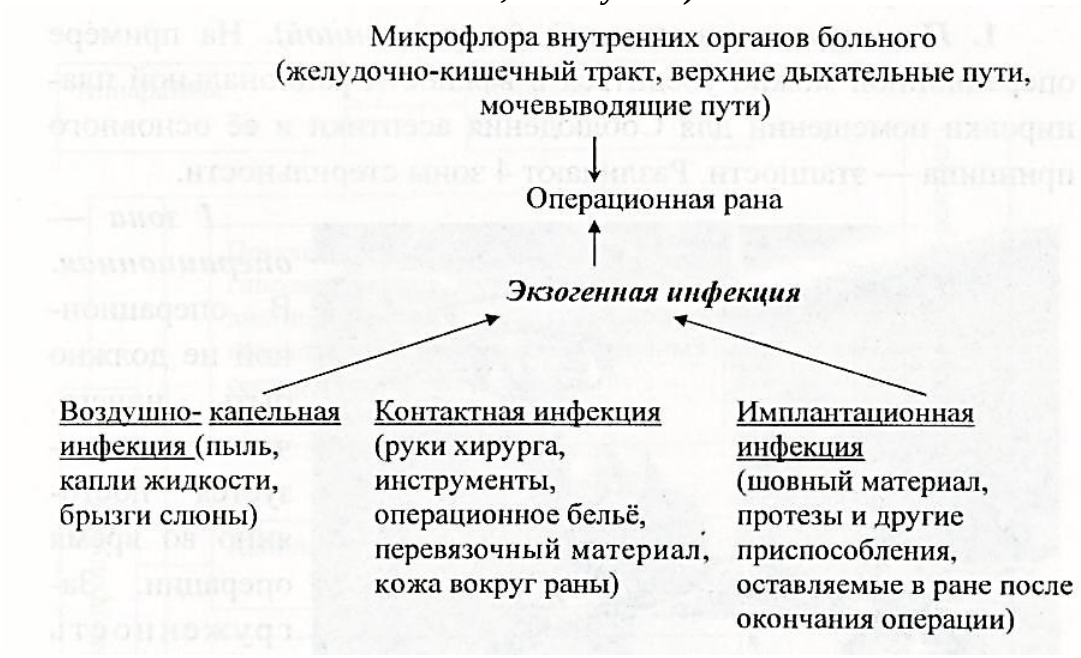
Content of the topic.

According to the localization of the sources of surgical infection, there are two main types of it — exogenous and endogenous.

Endogenous infection, the sources of whichare located in the patient's own body, can spread through the blood vessels (hematogenically), through the lymphatic vessels (lymphogenically), and directly through the tissues. An exogenous infection canenter the wound in the following ways:: **by airborne droplets,contact and implantation.**

Endogenous infection

Microflora of the patient's internal organs (gastrointestinal tract, upper respiratory tract, urinary tract)



Prevention of exogenous infection

All measures to prevent exogenous infection are basedon the traditional basic principle of asepsis: *everything thatcomes in contact with the wound must be sterile*. For this purpose, in addition to sterilization, a clear and well-thought-out organization of work is necessary, which consists in dividing allsurgical patients into two streams — "clean" and "purulent" — and observingstages in all activities related to aseptic issues.

Measures to prevent airborne infection

The concept of airborne infection includes the entryof microorganisms into the wound from the surrounding air withdust particles, drops of secretions from the upper respiratory tract or wound discharge. Prevention of air and droplet infections in the surgical department and operating unitdepends on their design and equipment, organization of work in them and implementation of measures aimed at reducingcontamination of the air with microbes and at destroying the bacteria already present in it.

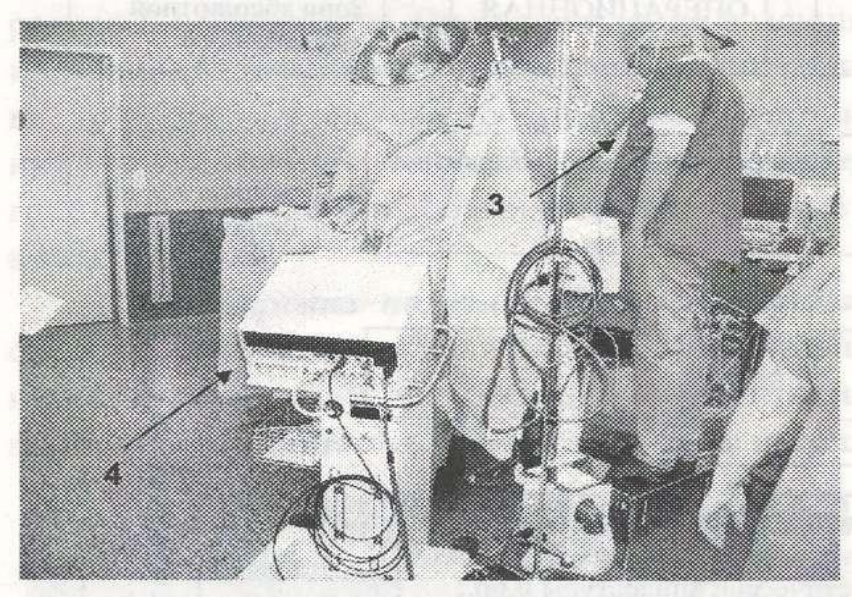
1. Layout of the premises (operating room). Using the example of the operating room, you can see the importance of rational planningof premises to comply with asepsis and its main principle — phasing. There are 4 zones of sterility.

Zone I — operating room. There-should be nothing in the operation that is not-constantly used.yanno during the operation.

Therlarge operating roomатруднямakes cleaning difficult and-creates difficulties in sterilizing the air. On the side of the foot end of the operating table, there is an area of increasedsterility, where there are: a large instrument table (1) a small instrument table (2) sterile bixes and a table with cutting tools, suture material,antiseptic solutions and local anesthesia agents.A person in an area of high sterility should wear sterile clothing.

1.

In another part of the operating room, an anaesthetistteam (3) works in non-sterile medical uniforms. Here are also located the devices(4)**,** necessary for the provisionof anesthetic benefits.



zone II-preoperative-and anaesthetic.

Premises that have a directconnection to the operation. Iнпepационной к операции готорreparation for the operation, personnel are prepared to take up their duties.

direct contact with the wound (surgical team and operating nurse). Here, surgeons put on aprons and wipe theirhands. *The sterilization* room can be assigned to both zones I and II, since the sterilization room communicates with the operating room through a transfer window and, at the same time, is located between the pre-operation and operating rooms, that is, between both zones I and II.

zone III — productionfacilities for operation of the operating unit. This zone includes roomsthatprovide communication between zones IV and II, as well астельные помещеauxiliary roomsthat communicate with zone III, where additional equipment or other-additional equipment of the operating room is located. Only the staff of the operational unit and persons involved in the operation can be present here. It begins with thesanitary clinic, where the staff brings their appearance in accordance with the requirements of asepsis (wearing masks, shoe covers, etc.). There should be a shower room and a changing room next to the sanitary pass. In the sectionvalka, the operating team puts on operating suits 5. The shower is taken after the operation. A hot shower with soap and water before surgery leads to the opening of the ducts of sebaceous and sweat glands on the skin and the spread of fumes of their secretions in the operatingroom. In zone III, there must be a room where the used dressing material is brought after each operation and where various liquids accumulated in thebody during the operation are drained.

IV zone — a zone of general hospital regime (administrative offices, nurses ' room on duty, toilet and otherplaces that can be moved to the surgical department if necessary without much damage to the operation of the operating unit). This association is almost always

present inthe surgical departments of district hospitals, which are designed fora small number of beds. The autoclave is located in the III or IV zone of the operating unit, depending on its purpose. If the autoclave serves only a specific operating unit, then its location in IIIzone III is allowed. At the same time, ifthe autoclave serves not only the operating unit in which it is located, but also other units of the medical institution, then its location is limitedto zone IV.

2. *Cleaning and organization of work in the opera block.* Cleaning in the operatingroom is strictly regulated, depending on the operating mode. It includes 5 types:

A. Pre-cleaning, which is carried out at the beginning of the operational day. During pre-cleaning, wipe all horizontal surfaces in the operating room with a wetcloth. The operating table is covered with a clean sheet. The operatingnurse washes her hands and puts on a sterile mask, dressing gown, and gloves to set the large instrument table. The table is covered with a sterile oilcloth, on top of whichsterile sheets are laid in 2 layers. On the sheet, lay out the necessary tools for the whole day and cover them with 2 layers of a sterile sheet and a sterile oilcloth. From the tools laid out on a large tool table, a small tool table is completed for a specific upcomingoperation. An additional set of tools is selected for the stages of the operation that involve the risk of infection.

B. Routine cleaning performed during the operation. In the process of such cleaning, wipe the floor around the operating table if fluids from the patient's body (ascites, blood, etc.) or antiseptic solutions drain onto it. The operating nurse dischargesthe bandages, catheters, drains, and surgical instruments used during the operation into the pelvises. During the current cleaning process, nothingis taken out of the operating room.

B. Cleaning after each operation involves changingthe bed on the operating table and removing the contents of the basins.The surgical nurse, after treating the hands and changingthe sterile gloves and gloves, sets up a small instrument table for the next operation.

D. Final cleaning, which is carried out at the end ofthe working day. In the course of its implementation, wet treatmentof the floor and all horizontal surfaces is carried out. The operating nurse takes apart the large instrument table and sends all the instruments to the sterilization room to prepare for the new working day.

D. General cleaning, which is carried **1** out once a week on the established sanitary day. In the process of generalcleaning, all surfaces of the room andequipment are treated in a wet way with the addition of antiseptics.

In a planned operating room, when schedulingoperations at the beginning of the working day, operations with the lowest risk of contamination of the room during the operation are assigned. As the order progresses, the nature of the planned operationincreases the risk of contamination of the operating room.

In the emergency operating room, which operates dailyall-day-round, they combine final and preliminary cleaning, and carry out cleaning during the shift of the duty team. Planning of operations depending on the degree of riskof contamination of the operating room is not observed, but betweenoperations more thorough cleaning is carried out with measures of increasedexposure to air (breaks, quartz formation, etc., if the degree of urgency of the subsequent operation allows).

3. Providing a microclimate. Microorganisms inthe operating room spread together with dust particles whenthe air layers are displaced.

A distinction is made between convective (circulating) air flows that occur dueto temperature differences near and far from heat sources (heating devices, medical personnel, etc.) and in the upper layers of the room and air near the windows), as well as vortex air flows that are excited by mechanical movements in the operating room. For maximum reduction of air flow in the operatingroom, the heating devices are walled up in the walls. The presence in the operating room and movement around it of persons who are not directly involved in the operation should be aslimited as possible.

The better the ventilation, the less contamination возthere is in the operating room. With a 20-fold change of air within one hour, the contamination of the operating room air is reduced to

500 microbial bodies in 1^{m3} of air and below, which meets the standards. Optimally, regular air changes in the operatingroom are carried out using an air conditioner. At the same time, the air flow should have a vertical direction and be removed from the operating room near the ceiling. The operating room temperature should be 18-22° C. Humidity — 50-55%. An increase in temperature and humidity leads to an increasein the contamination of the operation area.

Для стерилизации воздуха в операционной применяют бакShort-wave bactericidal ultraviolet lamps are used to sterilize the air inthe operating room. They are installed at a height of 2 m. Each lamp creates a wokaround itself, a sterile area that covers a space of 2-3 m. It is especially important to install lamps above the entrance to the operating room and above the large instrument table. After 2-3 hours of operation of bactericidal lamps, microbial contamination of the air decreases by 50-80%.

Some typesof surgery or the patient's postoperative condition require sterile conditions. In these cases, a controlled abacterial environment is used. In gnotobiological operating rooms, wards orcabins in a confined space, laminar (Straightlinear) streams of sterile air are used. Sterilization of air is achieved by passing it through bacterial filters and ultraviolet radiation.

4. Personal hygiene of personnel. Personnel working in the operating room should be dressed in clean work clothes withtheir hair tucked under the cap. A four-layer gauze or special mask covering the mouth and nose should be worn on the face, and shoe covers should be worn on the feet. Hands should be clean and well-groomed. The oral cavity should be sanitized.Do not allow the presence of pustular skin diseases. Conversations and movingaround in the operating room should be kept to a minimum. All these measures are aimed at reducing the risk of air and droplet infection.

Control of the sterility of the operating roomis carried out by taking crops from the surface of the wallsof various equipment, as well as air by seeding it witha centrifuge. The results of sowing are recorded in a special journal.

Criteria for assessing microbial contamination of air in surgical clinics

Bacteriological study of the air environment provides:

- determination of the total microbial content in 1 cubic meter of air.
- determination of the content of Staphylococcus aureus in 1 cubic meter of air.

Air sampling for bacterial testingis carried out in the following rooms: operating units; dressingrooms; postoperative wards; departments and wards of rehabilitationand intensive care, and other rooms that require aseptic conditions.

Air samples are taken by the aspiration method using the Krotovapparatus.

Fence location	Working conditions	Total number of colonies in 1 cubic meter of air	The amount of pathogenic phylococcus CTAin 250 liters
Операцион-Operational data	Before starting work	no more than 500	it shouldn't be
	During operation	not higher than 1000	it shouldn't be

SECURITY QUESTIONS:

- What is asepsis?
- Types of asepsis
- Sources of infection
- Methods of prevention of air and droplet infectionции
- Rules of dressing and behavior of students for working in the operatingroom
- What measures to prevent exogenous and endogenousinfection should be learned in the context of surgery
- Operating unit device
- Sterility zones in the operating room
- Types of cleaning of the operating unit

Measures to prevent contact infection

The source of contact infection is all objects that directly or indirectly come into contact with the surgicalwound. These are surgical instruments, bandages and operating underwear, as well as the surgeon's hands and the patient's skin in the area of the operating field. During their preparation, the following disinfection and sterilization conditions must be met: absolute effectiveness, safety for patients and medical staff, and harmlessness in relation tothe objects undergoing sterilization.

1. Sterilization of surgical instruments (seeAppendix No. 2). From a functional point of view, surgicalinstruments are divided into: conventional metal, cutting, plastic and rubber, as well as optical instruments. The main regulatory document for processingmedical instruments is: "Industry Standard.Sterilization and disinfection of medical devices. Methods, tools, and modes". (OST 42-21-2-85.Order of the Ministry of Health of the USSR of 10.06.85.). Taking into account the unfavorable epid. The OST was supplemented by Order No. 222/80 of the Ministry of Health of the Russian Federation and the Ministry of Health of the Russian Federation dated 27.06.00. According to these documents, the followingconsecutive stages of processing medical devices are expected: disinfection, pre-sterilization cleaning and sterilization.

Disinfection is carried out in order to protect medicalpersonnel from infection during-manipulations on the processing of instruments. Boiling, steam andair methods of sterilization in a hospital setting are practically not used because of the bulkiness, insufficient efficiency or reduced quality of the instruments. When applied chemistryical methods are used in the following ways: a) 3% of the racestvor chloramine — 60 min; b) 6% solution of hydrogen peroxide — 60 min; C) 6% solution of hydrogen peroxide + 0.5% solution of detergent — 60 min; d) 4% solution of formalin (formaldehyde) — 60 min; d) 4% solution of hydrogen peroxide and 90 min; e) of therat ""Sidex "" — 15 min. All tools are filled with one of these solutions until they are completely submerged. After disinfection, they are washed with running water.

Pre-sterilization cm (Appendix No. 2, Table No. 2,3) cleaning is performed to remove protein, fat, and mechanical contaminants, as well as drugs. During pre-sterilization cleaning, the following steps are performed sequentially:: a) soaking in detergent solution for 15 minutes, consisting of: hydrogen peroxide 3% — 156 ml cleanser — 5 g water to a volume of 1 liter; b) the individualor washing each product in the detergent complex for 30 sec; C) rinse off with fresh water after use moing funds — not less than 3 min; d) rinsing distillerbath water for the flushing of salts; e) drying toolRiya until the complete disappearance of moisture.

Actually sterilization. The previously used boiling method retains its value only for disinfection.If the previous steps are carried out during the sterilization of all types of instruments without differentiation, then during direct sterilization, different methods are used differentially, depending on the type of instrument being sterilized.

Conventional metal tools (Table No. 4,5)are sterilized in a dry-fire cabinet or in an autoclave.

Sterilization in a dry-fire cabinet is carried out with hot air for 1 hour at t=180°With no

packaging (open method). To control the quality of sterilization in a dry-fire cabinet, the following test indicators are used: hydroquinone (the indicatorturns black) and thiourea (the indicator turns yellow to orange).

Autoclave sterilization occurs as a resultof exposure to water vapor. The autoclave consists of 2 metal chambers enclosed in one another and hermetically sealedwith a side cover. Steam from the steam generator enters the outerchamber, from it to the inner chamber, and then to the condenser. If the valves are not closed, the steam constantly circulates in the autoclave, and *the liquid steam is sterilized* atthe natural atmospheric pressure in the inner chamber. Ifthe outlet valve from the inner chamber is closed, the steam pressure in the inner chamber begins to increase. In parallel, the steam temperature rises to 132°C at 2 atm. Conventional metal surgical instruments are *sterilized at a pressure* of 2 atm. for 20 minutes. Sterile instruments made of closed Schimmelbusch bix can be used for 3 days. If bixes are equipped with filters, then the period of use is allowed for 20 days. Autoclave sterilization tools can be packed in a double-layer cotton cloth or special bags made of laminated paper and polyethylenefilm. With such packaging, the tools must beused within 3 days. Open methodsterilization without packaging should not be carried out in an autoclave! To control the spacecraftin the number of sterilization in the autoclave used the following test inthe indicators: ampoule with white benzoic acid, acquiring after sterilization purple color; white paper tape (EC-120, EC-132) coated with a composition, which at a certain temperature (120°C And 132°C) converted to BUing color. Similar tapes exist for dry-fire cabinets (IS-160 IS-180), which are converted to brown color, respectively, at a temperature of 160°C and 180°C.

There are chemical methodsfor sterilizing instruments: (Table # 6,7) with a 6% solution of hydrogen peroxide at atemperature of 18°C for 6 hours, paraform or 16% aqueous formaldehyde solution in sealed chambers for 48 hours, as well as an alcoholic solution of chlorhexidine.

Cutting metal tools (scalpels, surgical needles, scissors, etc.) are sterilized by cold methods), so that they do not become blunt — under the influence of hot steam. Hydrogen peroxide and an alcoholic solution of chlorhexidine are most often used for this sterilization. Allow the scissorsto be sterilized in a dry oven. Industrial radiation sterilization of scalpels and atraumatic suture material with a single application is optimal.

Plastic, rubber, and optical instruments. Thermal method possible sterilization of rubber and plastic products in an autoclave at a pressure of 1.1 atmfor 45 minutes. Currently, mostly single-use gloves sterilizedby industrial radiation are used, but in extreme conditions, the sterilization of rubber gloves canbe carried out byautoclaving. For the chemical method of sterilization, formalin vapors, ethanol, etc. are used.

When sterilizing optical devices (endoscopes), in additionto the gas method, an alcoholic solutionof chlorhexidine, pervomur or sidex is used.

2. Sterilization of bandages and surgicalunderwear. Bandages and underwear include-large and small gauze napkins, gauze swabs, otherspecial gauze and cotton products, as well as sheets, diapers and dressing gowns. A set of materials for autoclaving is called the ukladka. Autoclaving is performed in Schimmelbusch bix, metal bix with filters, as well as in cotton sheets or diapers. Bixes are provided with labels that should contain information about the contents of the bix and its belonging to a particular operating room or dressing room. The process of preparing the dressing material for surgery ordressing is divided into 3 stages.

I stage — pre-sterilization, preparation of the material.

The gauze cloth is cut into pieces of various sizesdepending on what is to be made: small napkins, large napkins, tampons, etc. The gauze should be soft and hygroscopic. The dressing materialis folded so that the loose edges aretucked inside the napkins ortampons.

II stage — laying and preparing the material for sterilization. There are 3 main types of bix styling. *Universalstyling* is commonly used in dressings and small operations. At the same time, the material is placed in bixes in sectors (in one sector — small napkins, in another-largenapkins, in the third — tampons, etc.), so that sterility does not haveto be violated when

searching for a particular type of material. *Targeted placement* includes everything necessaryfor performing typical manipulations, procedures and small operations (laying for tracheostomy, for subclavianvein catheterization, for peridural anesthesia, etc.). All necessary tools, dressings and underwear are placed in the bix. *The view layout* is used for largeoperational blocks. At the same time, one type of dressing material or linen is placed in the bix (in one-dressing gowns, in another—sheets, in the third — napkins, etc.).

Currently, single-use surgical underwear made of nonwoven fabric (sheets, diapers, dressing gowns, caps and masks), as well as packaging with gauzenapkins for industrial radiation sterilization, is increasingly used.

Stage III-sterilization. Laundry is sterilized by autoclaving at a pressure of 2 atm. at a temperature of 132°C for 20 minutes. Before loading into the autoclave, check whether the holes in the bix are open. After sterilization, the holes in the bix are closed with a metalrotating tape during its removal from the autoclave, and the date of sterilization is marked on the bix body.

The quality control of autoclave sterilization is carried out with a tape test indicator, as inthe case of instrument sterilization.

Asepsis in case of anaerobic infection (see appendix No. 4)

Disinfection of hands and the operating field. The problemwith effective hand disinfection is that the use of radical means of sterilization damages the living cells of the treated skin. In addition, with effective actionon the surface layers of the skin,the secret of sweat and sebaceous glands, containing a sufficient number of microbes, continues to flow from its deep layers to the surface. Due to the lack of universal effective treatment, many different methods of treating the skin of the hands or the surgical field are used. To increase the effectiveness of these methods, carefulhygienic hand care is necessary. When disinfecting the skin, there are 3 main principles::

a) mechanical cleaning of the skin (peeling) due to the accumulationof microbial colonies under the layers of exfoliating epidermis;

b) antiseptic effects on the skin to remove micro-organisms on its surface; c) exposure to tanning agents on the skin in order to temporarily close the ducts on its surface when tanning. Treatment of the skin in general and hands in particular should always be directed from cleaner areas to less clean ones. Of the many known methods, it is advisable to know the simplest and most accessible traditional ones (Brun and Spasokukotsky-Kochergin methods), as well as the most effective and fast modern ones (ultrasound, pervomur and chlorhexidine treatment). Before using any method, your hands should be pre-washed under running water and soap.

Brun's method. Rub the skin for 10 minutes. 96° etazero.

The Spasokukotsky-Kochergin method. Wash your hands with a napkinin 2 basins with a 0.5% solution of ammonia, alternately in each for 3 minutes. Subsequently, the brushes are additionallytreated with 96° ethanol for 5 minutes, and the nail beds are treated with 5% iodine tincture.

Method of processing hands with May Day (recipe C-4 cmappendix No. 1). At the first stage, a concentrated solution is prepared from 171 ml of 33% hydrogen peroxide and 81 ml

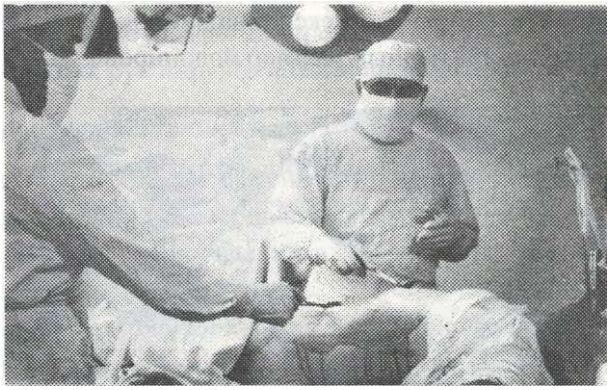
of 85% formic acid, which is stored for 7 days. At the second stage, before use, it is diluted with water 40 times. The duration of hand treatment is 1-1. 5 minutes. In one basin with 5 liters of solution, 10 people wash their hands.

Method of hand treatment with chlorhexidine. Napkins with 0.5% alcohol solution of chlorhexidine are treated twicefor 2-3 minutes.

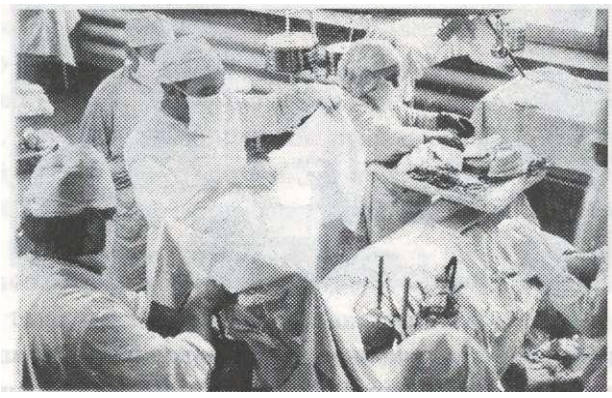
Method of hand treatment with degmin (degmicide). СалфетА napkin with a 1% solution of degmin is treated twice for 3 minutes.

Method of processing by ultrasound.In special applications with ultrasonic baths, washing and disinfection takes place within1 min by immersing your hands in water or an antiseptic solution (0.05% gibitan solution).

After hand treatment, personnel who come into directcontact with the surgical wound wear a sterile dressing gown and gloves. The mask is put on before the hands are treated.



Disinfection of the operating field is carried out on the operating table. Immediately before the patient is brought to the operating room, the skin is carefully shaved in the area of the operating field, followedby rubbing with alcohol. Treatment of the operating fieldis performed in the operating room and always begins with the least contaminated areas, and then the most infected ones are treated. If the operation is carried out on a clean operating field, then treatment begins from the place of the expected incision and completion of the periphery, as well as in the places of the greatest naturalcontamination(umbilical lark, skin folds). If the operation is performed in the area of infected pathological formations, then treatment begins from the periphery of the surgical field and is completed in areas adjacent to purulent wounds and fistulas. The surgical field is isolated fromsurrounding tissues with sterile linen (if the operation is performed under local anesthesia, it is performed after isolation of the surgicalfield). According to the Grossich - Filonchikov method,the skin is treated with a 0.5% alcohol solution of chlorhexidinea. The first time is a wide processing before isolation of the operational field. The second time, the skin is treated with 0.5% alcohol solution of chlorhexidinea before the skin incision, the third-before applying skin sutures, and the fourth-after applying skin sutures and before applyinga postoperative dressing to the wound. Mogut can be used: an aqueous solution of 1: 3 iodonate, 1% aqueous solution of degmin, 1% inone solution of iodopyrone.



Control of the effectiveness of disinfection of the skin of hands is carried out by direct bacteriological method (seeding), but it isnecessary to remember that the result of the study, even ifthere is insufficient disinfection of hands (careless handling and the presence of foci of infection on the hands), information about the results of controlwill be obtained after the operation. To exclude objective factors (poor quality of antiseptic, contamination of napkins, errors when taking a smear, etc.), inoculation is carried out in all personnel who have disinfected their hands. Analysis of the results allows us to find out the true cause of insufficientdisinfection.

SECURITY QUESTIONS:

- Measures to prevent contact infection.
- Sterilization of surgical underwear, dressingmaterials, gloves and instruments.
- Methods of sterilization of surgical instruments, operating and dressing clothes.
- Methods of sterility control.
- Device and operating modes of the autoclave.
- Dry-fire cabinets and their operating modes.
- Treatment of the surgeon's hands and the operating field.

Measures to prevent implantation infection

The source of implantation infection is everything that remains in the wound after the operation is completed (suture material, drains and catheters, prostheses, metal structures, special devices, transplants).

1. Suture material. According to the nature of biodegradation (decomposition and excretion from the body), all types of suture material are divided into absorbable, slowly absorbable and non-absorbable.

Natural absorbable material is *catgut*, obtained from the submucosal layer of the intestinesof cattle. The time of complete biodegradation of catgut is 3 months, and its strength is lost within2-1 days, however, catgut gives a pronounced local reaction and has a greater adsorption capacity than other materials. The synthetic absorbable suture material is*polyglycolide*(polysorb, vicril, dexon, maxon), which has a higher strength than catgut and does not cause such a pronouncedreaction.

The slow-absorbing materials arenatural *silk* and synthetic *polyamide* (nylon).

Не рассасывающимся является*Polypropylene* (dacron, surgylene, surgylene, surzhidak, mercylene, ethibond), *металлиmetal wire and metal brackets are non-absorbable.*

According to the structure, the suture material can consist of a single thread (monofilament thread) or of many twisted or braided threads (polyfilament thread). Monofilament fabrics, having high strength, do not have a sawing effect when applying seams, but, at the same time, they are more elastic and it isnecessary to tie 4-5 knots for strength. All types of suture material are inserted into the surgical needle directly during the operation or rolled into special single-use needles using the factory method (atraumatic suture material). In the factory productionof an atraumatic suture material, sterilization is carried out by rays, and eachthread with a needle is packed individually.

Currently, silk, polyamide, polypropylene, and metal brackets can be sterilized in the operating room by autoclaving. Storage of the suture material is carriedout in alcohol, and sterility control is carried out by bacteriologicalmethod.

2. Explants. Explants are understoodas materials of non-biological origin placed in the body for a long time. The method of sterilization of explantsis determined by the type of material from which it is made. Most of the polymer explants (synthetic suture material, strengthening nets made of polypropylene and polyamide, vascular prostheses, ligament prostheses) are produced by well-known companies already sterilized in industrial conditions. They cannot be sterilized in the operating room due to the destructionof some components (silicone coatings on meshes, immobilized heparin on vascular prostheses, etc.). Metal and cermet explants (joint prostheses, plates, pins and screws for osteosynthesis) are sterilized in a dry-fire cabinet.

3. Transplants. Under understand grafts placed in the body for long term biological materialsecological origin (kidney, heart, etc.). The problem implantation of infection in transplantation has 2 aspects: the origin of the transmission syndrome (infection transmission from donor to recipient) and local septic complications, youzywienie pathogens trapped in the body from the environment in the process of transplantation.In these conditions, the priority areas for combating implantationinfection are the suppression of the immune response and the

use of antiseptics.

Security questions:

- Main types of suture material
- Methods of sterilization of suture material (Kocher silk, nylon, catgut, horsehair).
- Explants
- Transplants

Prevention of endogenous infection

Prevention of endogenous infection of the surgicalwound is carried out in accordance with general biological principles.

1. ***Identification and rehabilitation of foci of chronic infection.*** Such foci may include carious teeth, chronicinflammatory diseases of the upper respiratory tract, kidneys,genitals, local pustular processes in the surgical area, etc. When performing planned surgical interventions at the stage of preoperative preparation, sourcesof chronic infection are identified, they are eliminated, or a preventive course of anti-inflammatory and antibacterial therapy is carried out. Thepreparation of the large intestine is carried out as astage of pre — operative preparation for elective operations.

2. ***Effects on the transmission pathwaysof infectious*** agents (blood and lymph). In the process of preoperative preparation, conditions are created for microbes to die in the internal environment of the body before they reach the places of possible developmentof infectious complications (immune status, the contentof antiseptics in the blood and lymph).

3. ***Elimination of possible substratesfor microbial reproduction in the operation area.*** Tissues with impaired nutrition and necrotic tissues are a goodbreeding ground for the development and reproduction of microbes. Sparing treatment of tissues, careful treatment of blood vessels create prerequisites for rapid restoration of the viability of operated tissues. Reliable hemostasis is an effectivemeasure to prevent the occurrence of hematomas and their suppuration. To evacuate the wound discharge, which isa breeding ground for the development of bacteria, it is necessary to drainthe wound.

The concept of hospitalism

A hospital-acquired (nasocomial) infection refers to diseases or complications that are associated with infectionof the patient during his stay in a surgical hospital.

Characteristic features of hospitalinfection are: a) resistance to antibiotics and antiseptics; b)its development in patients weakened as a result of illness or surgery;c) the mass nature of damage by one strain of the microorganism. The causative agent is usually conditionally pathogenic flora (Escherichia coli, proteus, staphylococci, klebsiella and others). Hospital flora is more often a superinfection as a result of adaptation of nosocomial infection to certain types of antibiotics (antibiotic resistance).

Measures to prevent hospital infection include: a)shortening the preoperative bed-day; b) early discharge of patients; c) timely replacement of antiseptics and antibiotics used in hospital treatment; d) rational prescribingof antibiotics; e) periodic closure of the hospital for rehabilitation, *(see Appendix No. 3 to OrderNo. 720 of the Ministry of Health of the USSR of 31.07.1978)*

HIV infection and viral hepatitis C by parenteral transmission

Providing medical care to surgical patients involves contact with blood and other fluidsof the patient's body, which in itself poses a high risk of infection of medical personnel if the patient has HIV infection and viral hepatitis c by parenteral transmission. Infection prevention measures include active identification of virus carriers and patients with AIDS andviral hepatitis c by parenteral transmission,and compliance with safety regulations.

Safety precautions include::

1. Mandatory use of gloves during manipulations, when contact with blood or other fluids fromthe patient's body is possible.
2. Use of special masks (glasses) duringthe operation.
3. Treatment of the skin or mucous membranes (conjunctiva, etc.) of personnel with antiseptics according to the instructions whenany fluids of the patient fall on them.
4. Disinfection of equipment and instruments that are not subjectto sterilization (tables, microscopes, etc.), in case of contact with biological fluids.
5. Reuse of test tubes from the laboratory onlyafter sterilization. Prevention of HIV infection andviral hepatitis c by parenteral transmission is facilitated by the maximumuse of single-use instruments and, above all, syringes. Modern rules for sterilizing instruments are described above, taking into account the prevention of HIV infection.

Security questions:

- Ways of endogenous contamination of wounds.
- What measures to prevent endogenousinfection should be learned in the context of surgery?
- Safety techniques for working with HIV-infected people.
- What methods of preventing hospital infection do you know?

TOPIC: ANTISEPTICS

Goal:

Familiarization with types of antiseptics, antisepticproducts and methods of their application. Methods of infection control.

Content of the topic.

По механизму действия According to the mechanism of action, the following types of antiseptics are distinguished: mechanical, physical, chemical, and biological.септики: механическую, физическую, химическую и биологичесSome of the methods used combine elements of two or more basic types of antiseptics. There is alsoa concept of complex antiseptics, whenseveral main types of antiseptics are used simultaneously or sequentially.

According to the method of application, there are general and local antiseptics. различают общую и местную антиThe latter is divided into shallow and deep. In general antiseptics, a chemical or biological factor is introduced into the internal environment of the body (IV, iv, endo-lymphatically), affecting the body as a whole.Local antiseptics imply the local actionof antiseptic factors. With surface antiseptics, the surface of the wound or affected by the purulent-inflammatory process of the integument (skin and mucous membrane) is affected. When deepbokoy antiseptic factors impact deep tissue or cavities, where it is localized inflammatory lesion (introductiontion of antibiotics and chemical antiseptics in the tissues and cavities of the body by injection, puncture, electrophoresis, Phono-phoresis, etc.). This classification also has some degree of conditionality, for example, intra-arterial introduction of antiseptics and can be regarded as General antiseptics, and how deep local antiseptics.

According to the spectrum of antimicrobial action, the following types of antiseptics are distinguished:: a) antiseptic universal spectrum of action aimed at all types of microorganisms (some types of physical and chemical antiseptics — lowfrequency ultrasound, high-energy laser beam, plasma beam, iodine, chlorine, formaldehyde, hydrogen peroxide); b) antiseptick a wide range of actions aimed at basic Massu causative agents of surgical infections are gram — positive and gram-negative bacteria (broad-spectrum antibiotics); C) antiseptic narrow spectrum of action aimedtion on a small group of microorganisms (Mycobacterium, enterobacteria, agents dermatomicosis etc.); g) antiseptika reducing populations of microorganisms, but does not destroy the microbial population as a whole (mechanical methods and chemical antiseptics from the group of detergents);

According to the direction of action, thereare antibacterial, antiviral, antifungal and antiparasitic.

According to the mechanism of action, there are microbocidal and microbostatic antiseptics. Inmicrobocidal therapy, the membrane loosened in the mitotic phase is destroyed. With microbostatic therapy, DNA synthesis is disrupted and the mitosis phase is prevented.

By goal — preventive, therapeutic and binar(antiseptic and disinfecting action).

Mechanical antiseptics

Destruction and removal of microorganisms by mechanical methods (removal of infected foreign bodies, damaged and non-viable tissues, infected blood clots, purulent exudate from the wound) is called mechanical antiseptic. Mechanical antiseptics arethe main type of control against surgical infection, without which the use of all other types is ineffective.

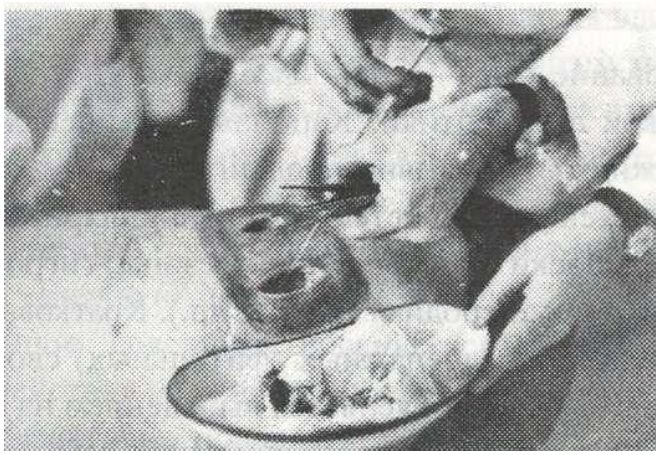
Toilet of the wound is carried out with almost any dressing and when providing first aid at the scene of the accident. The bandage or coveringforeign objects are removed from the wound surface; the skin around the wound is treated with antiseptics. Use tweezers, scissors, and gauze balls to remove exfoliatedepidermis, foreign bodies, blood clots, and purulent exudate.

Механическая антисептика

Туалет раны	Первичная хирургическая обработка	Вторичная хирургическая обработка	Другие операции и манипуляции
Очищение кожи и раневой поверхности. Удаление инородных тел, сгустков крови и экссудата	Ревизия раны при, необходимости ее расширение. Иссечение краев, стенок и дна раны. Восстановление целости тканей.	Иссечение нежизнеспособных тканей (некрэктомия). Вскрытие и санация гнойных затеков	Пункция и вскрытие гнойных очагов. Промывание свищей и полостей (проточно-промывные системы).

Primary surgical treatment of the wound allows you to transferan infected wound to a sterile one. Secondarysurgical treatment of the wound is performed when an inflammatory reaction has developed in the wound. At the same time, necrotic tissues are removed from the wound, which are a good breeding ground for microbes. Depressions, pockets and lumps expand andallow free exudate outflow.

If there is a purulent cavity, then the pus from it should beremoved by puncture or by opening it, followedby ensuring the outflow. The effectiveness of sanitation is increased by flushingthe cavity, applying a pulsating stream of antiseptic.



Physical antiseptics

The use of various physical factors that either directly destroy microbial cellsin a limited area of the body (high temperature, some types of electromagnetic radiation), or create:- unfavorable conditions for the development of microbes.

Wound drainage is the most commonly usedmethod of physical antiseptics. Capillary drains are based on the ability of a liquid to actively move through a narrow tube with a wetted wall. The simplest capillary drainsare glove rubber strips and hygroscopic materials (gauze, carbon cloth, etc.). The short-termeffectiveness (up to 24 hours) of the drainage (wick) properties of hygroscopicmaterials is explained by the loss of fibrin on the drainage surface. Tubular drains are most often manufactured from medical plastics coated with silicone. To ensureoutflow from the wound in a natural way, the drainage tubeis installed so that the level in any container where liquid accumulates outside is lower than the level in the cavity from which the evacuation takes place. **Flushing (running, irrigation-aspiration) drains** are most effective whenmaintaining the tightness of the flushed cavity (puncturing it or applying skin sutures over the flushed cavity). The leading and diverting drains at the same time providethe possibility of direct flow of antiseptic in the lumen of the wound or purulent cavity. Sometimes the discharge tubeis connected to the suction device (aspiration, vacuum drains)to increase the efficiency of the outflow.

Osmotically active preparations used to wet the dressing material left in the wound include a0% NaCl solution andvarioushigh-concentration chemicals (25a 40% solution of magnesium sulfate, a 40% solution of hexamethylenetetramine, etc.). However, low-molecular-weight substances lose their draining ability after 4-6 hours and quickly migrate to the wound compartment. The new generation of osmoticallyactive preparations is based on high—molecular organic compounds-polyethyleneoxides (water-soluble ointments-levosin,левомelevomecol, dioxicol, iodopyron ointment, etc.). Gauze soaked in these materials-retains gyroscopic properties for up to 24 hours.

Surface sorption is similar in its mechanismto the action of osmotically active drugs. Activated carbon is most often used as materials with sorption properties. Recently, various wound coverings (specialized wipes) containing carbon "Algipor", etc. are widely used.

Continuous improvement of various technical means of influencing the wound surface and the body as a whole makes it possible to effectively suppress the vital activity of microbes.

The effect of high temperature on the surface of the wound leads to its sterilization. Although the method of cauterizing a wound with a red-hot iron has a purely historical significance, the principle of itsuse is still preserved in modern antiseptic methods performed under anesthesia, such as spray electrocoagulation, plasma coagulation, and exposure to high-

energy carbon laser beams.Gammaradiation, vacuumaspiration, hyperbaric oxygenation, anda controlled abacterial environment are highly effective. Suchtechniques as UFO and ultrasound are widely used. One of the new directions in the development of physical antiseptics is extracorporeal methods of exposure to microorganisms and their toxins: hemosorption, plasmasorption and lymphosorption,plasmophoresis (removal of the liquid part of blood-plasma and its replacement with donor plasma or plasma-substituting fluids), UV, extracorporeal blood irradiation, etc.

Drying of the wound is aimed at the formation of a scab — a kind of biological dressing, under which microorganisms die as a result of exposureto immunity factors.

When a scab forms under aseptic conditions, it protects thewound from secondary infection. Wound healing in gnotobiological isolation wards is based on this principle.

Chemical antiseptics

The destruction of microorganisms by variouschemical substances is called chemical antiseptics, and substances that have an antiseptic effect are called chemicalantiseptics. According to the purpose and method of application, there are 2 main groups of chemical antiseptics: antiseptics for external use (skin treatment, washing wounds and mucous membranes) and chemotherapeutic agentsthat are administered internally to suppress the growth of bacteria insidethe body.

The following mechanismsof antimicrobial action of chemical antiseptics are distinguished: destructive, oxidative, membrane-activating, as well as antimetabolic and-antifermentic.*Destructive* means the process of irreversible destruction of cell structures. Chemical antiseptics are generally classifiedaccording to their chemical structure.96° C ethyl alcohol, concentrated phenol,halogenes, acids, heavy metal salts, and detergents have this effect. First, the flagella and fimbria of the microorganism are destroyed, which disrupts the adhesion process and leads to a microbostatic effect.Then the proteins and lipids of the cytoplasmic membrane are destroyed, which means cell death. механизмом дейсHydrogen peroxide, potassium permanganate, and halogens have an oxidative mechanism of action. Their action is realized through peroxidation, which resultsin the destruction or inactivation of macromolecules and cell death.*Membrane-activating* antiseptics disrupt the permeability of microbial cell membranes. Antiseptics with a similar effect include detergents, some antibacterialagents, imidosol preparations, 70° ethyl alcohol, as well as phenols and iodophores in low concentrations.*антиметаболическим*Antimetabolic antiseptics include structural analogues of normal metabolites that bind the active centers of enzymes and blockthe metabolism of microbial cells. Suchantiseptics are sulfonamides. Anti-enzyme antiseptics affect the redox enzymes of the cell membrane, as well as extracellular enzymes — toxins that are factors of aggression. Oxy-quinolines, which inactivate metal-containing enzymes, heavy metals, and some antibiotics, have an anti-enzyme mechanism of action.

Antiseptics mainly for external use

A group of halides.

* **CHLORAMINE B**-for disinfection of hands,appliances andtools-0.25-0.5% r-r;1-3% r — r-a strongantiseptic, which is used for sanitizing wounds, washing cavities, as well as for disinfection of rubber, plastic and metaltools. The drug has a pronounceddeodorizing effect.

- **LYUGOL's r — r** is used for sterilization ofcatgut, lubrication of mucous membranes; 5% alcohol Lyugol's r — r is used for disinfection of the skin around wounds; hand treatment; cauterization of abrasions and small wounds.
- **IODINE SOLUTION ALCOHOL 1-5%** - for externaluse (treatment of skin, surface wounds — - a strong antiseptic, which has a pronounced tanning and microbocidal effect. Concentrated solutions cancause burns, especially in children.*Iodonate* and*iodopirone* are

used in the form of a 1% solution for the treatment of the surgical field.

GROUP OF OXIDIZING AGENTS

- **HYDROGEN PEROXIDE**-antiseptic action is caused by the release of atomic oxygen. A 3% solution is used to wash the wounds. Hydrogen peroxide, forminga rich foam, simultaneously plays the role of a mechanical antiseptic. A 6% solution is used for disinfection and sterilization of instruments. It is used as a decontaminating agent in thetreatment of purulent and putrefactive wounds.
- **POTASSIUMHPERMAGANATE** — 0.1-0.5% solution for washing wounds and cavities, at a higher concentration (5-10%) has atanning effect - for the treatment of burns.

Acid Group

- **BORIC ACID**-2-3% water solution-forния washing wounds and cavities.
- **NADMURAVYINACETIC ACID** (May day;C-4 cm) application No. 1).

Pervomur: 81 ml of 85% formic acid +171 ml of 33% $H2o_2About_2$.It is used for processing the surgeon's hands, the operating field, gloves, suture material, and rubber products.

GROUP OF ALKALIS

- 2% sodium bicarbonate solution-sterilization by boiling.
- 0.9% solution of isotonic sodium chloride-iv, having a long-term oxidative effect, in therapeutic concentrations does not damage tissues. It is used topically to treat wounds and wash cavities, as well as intravenously. Thedrug has a pronounced detoxification effect due to the oxidationof toxins directly in the bloodstream.
- 3-5% - 10% hypertensive solution - for the treatment of purulent wounds.

N/a-YOU CAN'T-NECROSIS!

- 0.5% solution of ammonia - treatment of the surgeon's hands according to the Spasokukotsky-Kochergin method.

Heavy metal salts

- **SULEMA (mercury chloride) 1: 1000**-disinfection of rubbergloves; silk.
- **SILVER NITRATE (lapis)** - has a wide spectrumof bactericidal action. At a concentration of 0.5-2%, it is used as eye drops with anti-inflammatory effect. At a concentration of 5-10%, it has a tanning effect and is usedfor cauterizing excess granulations. *Collargol* is a colloidalsolution containing 70% metallic silver.The concentration and indications for use of the drug are similar to silver nitrate. *Protargol* is a stable colloidal solution with a high silver content and with the same indications for use as protargol. *Zinc oxide* is a weak antiseptic, practically insoluble in water, used as a powder and is a part of zinc paste

ETHYL ALCOHOL

- Ethyl alcohol is used in the form of a 70% solution forcleaning hands, the operating field, as well as for disinfection ofliving instruments that are not subject to heat treatment. At 96% concentration, it has a pronounced tanning effect and thereforedoes not have a virucidal effect, it is used for sterilization and storage of silk. The use of other types of alcohols that are similar in organoleptic properties to ethyl alcohol is prohibited in domestic medicine. Propanol and isopropanol are widely used abroad instead of ethanol.

GROUP OF ALDEHYDES

FORMALDEHYDE is a strong antiseptic with a broad spectrumof action. 4% solution is used for disinfection.More weak solutions are used for skin treatment andrinsing, it is an integral part of the "triple solution" for instrument sterilization. *Lysoform* consists of 40% formaldehyde(formalin) and 40% liquid potassium soap.*Hexamethylenetetramine* releases active formaldehyde in an acidic environment, is administered orally and intravenously.

DYE GROUP

- **BRILLIANT GREEN**-0.1% -2%alcohol or an aqueous solution is used as an external antiseptic for treating surface wounds andmucous membranes.
- **METHYLENE BLUE**—-1-2% alcohol or water solution is used externally for

burns or forpainting fistulas and purulent congestion during surgery, as well as for the treatment of mucosal candidiasis, 0.02% water solution isused for cystitis and urethritis, for washing wounds.

DETERGENTS (surfactants). When they are used, the surface tension increases, which destroys the shell of microbes. They belong to the group of quaternary ammonium bases (cationic detergents).

- **CHLORHEXIDINE** *(gibitan)* - has a wide spectrumof action. Alcohol solution is used to treat the surgical field, the surgeon's hands, and the sterilization of surgical instruments.ных ран и полостей исА 0.5 % aqueous solution is used to wash surgical wounds and cavities05.
- **CERIGEL** is a product for external use. It is used for hand treatment (film-forming antiseptic).
- **DEGMIN** — is a part of degmicide, used for preoperative treatment of hands and the surgical field. It has pronounced washing properties.*Etonium* has a bactericidal, bacteriostatic and detoxifying effect. Apply the drug topically for purulent wounds andinfectious lesions of the mucous membranes in the form of solutions or ointments. Green soap (potash liquid)is superior to solid sodium in its antiseptic activity and is used for hygienicskin treatment.

NITROFURANS

- **FURATSILIN** — currently has limited indications for use for washing wounds and mucous membranesin the form of an aqueous solution of 1:5000, it is non-toxic.*Furagin* — effective against gram-positive and gram-negative microbes. It is used as a 0.1% aqueoussolution for washing wounds and cavities.
- **Lifuzol** — furacilin preparation in aerosolpackaging.
- **Furoplast** is a syrupy film-forming preparation of furacilin, which is applied as an antiseptic to the cleaned surface of the wound.
- **Algipore** is a wound covering that includes furacilin. In addition to chemical antiseptic action, it has the ability to adsorb wound discharge.
- **Furadonin, furazolidone, and furagin** — антисептики шиare broad-spectrum antiseptics used orally for urinarytract, intestinal, and respiratory tract infections.

Antiseptics mainly of chemotherapeutic action

SULFONAMIDES

All drugsof this group have a broad spectrum of action. They are introduced into cellular metabolism and have a bacteriostatic effect.

- **Sulfadimethoxine,** hasa prolonged action with a wide spectrum.
- **Biseptol** (bactrim), a combination drug containing sulfamethoxazole and a diaminopyrimidine derivative (trimethoprim), is used in the same clinical situationsas other sulfonamide preparations.

QUINOXALINS

Of the quinoxaline derivatives, the most commonly used are:

- **Quinoxidine and dioxidine.** Having a wide spectrum of action, the drugs have an effect on anaerobicflora and flora resistant to other chemotherapeuticagents.
- **Dioxicol** is applied topically asa water-soluble ointment.

8-HYDROXYQUINOLINE derivatives

- **Intestopan** hasantimicrobial and antiprototicactivity, is used for intestinal infection.
- **Nitroxolin (5-NOK)** - a broad-spectrum drug, absorbed in the intestines and excretedunchanged in the urine. It is used for infectionsof the genitourinary tract.

QUINOLONES

By inhibiting DNA gyrase, as well as affecting other organs of microbes, they lead to the death of bacteria. The drugs actmainly on aerobicgram-negative bacteria, but there is a high

sensitivity of gram-positive bacteria to them. Quinolones include: *nalidixic acid* (nevigramon, negram), *oxolinic acid* (gramurin, dioxacin), *кислота пипемидопипемidonic acid* (palin).

FLUOROQUINOLONES

Theyare both highly active against gram-positive microorganisms, lessactive against gram-positive microbes, and most anaerobes are resistant to fluoroquinolones. These drugsare used for various infections of the respiratory and urinarytract, diseases of the genitals and gastrointestinal tract, as well as skin and soft tissues. Fluoroquinolones include: perfloxacin (abactal), ofloxacin (tarivid), ципрофлоксациprofloxacin (quintor, ciprobay, ciprolet, cyfran), norfloxacin (nolicin, norbactin, norilet, noroxin), lomefloxacinmaxaquin), enoxacin (penetrex), fleroxacin, sparfloxacin (zagam).

NITROIMIDAZOLES

Effective drugs inrelation to protozoa, giardia. Recently, a high activity of nitroimidazoles against obligate anaerobic bacteria has been detected. This group of drugs includes metronidazole (klion, metrogil,fazil, trichopol, efloran), tinidazole(tiniba, tinigin, trikanix, fazizhin).

Biological antiseptics

Unlike other types, biological antiseptics canhave a direct and indirect effect on-microorganisms. Direct action implies the direct actionof biological antiseptics on microorganisms.Biological substances and various methods that affect the patient's body and stimulate its abilitiesto destroy microorganisms are referred to as biologicalantiseptics of indirect action.

Methods of non-specific influence on the immune улучsystem improve the function of the immune system, lead to activation of phagocytosis, the complement system, improvethe oxygen transport function of blood and its rheological properties. Transfused donor red blood cells or blood products have astimulating effect on the immune system.

Substances and methods of indirect action	**Direct-acting substances**
Methods that stimulate non-specific resistance: UV and laser irradiation of blood, the use of perfusate and xenosplenic cells, vitamintherapy, proper nutrition, etc. Substances for non-specific immune stimulation:thymus gland preparations (t-activin, thymoline), levamizole, interferons, interleukins, vitamins, etc. Substances for active specificimmune stimulation: vaccines, toxoids	Meansof passive immunity:therapeutic serums, antitoxins, gammaглобулglobulins, bacteriophages, hyperimmunoplasma. Proteolyticenzymes: trypsin, chymotrypsin, chymopsin, terrelitin, iruxol, etc. Antibiotics

Means of non-specific influence on the immune включsystem include thymus gland preparations that affect theratio of T - and B-lymphocytes, and stimulate phagocytosis. Levomizole and prodigiosan stimulate the function of lymphocytes.Interferons and interleukins have a more targeted and strong effect on the immune system. The most effective drugs are those obtained by genetic engineering: reaferon, roferon, betaleukin and roncoleukin.

Active immunization products. The most commonly used staphylococcal and tetanus toxoid.

Means of passive immunization. The most commonly used drugs are tetanus and anti-gangrenousantibiotics, tetanus gammaglobulin, bacteriophages (anti-staphylococcal, anti-streptococcal, and polyvalent), hyperimmuneplasma (anti-staphylococcal and anti-pseudomonas), and native plasma from donors immunized with the corresponding toxoid.

Proteolyticenzymes. Use mewithtno inthe treatment of purulent wounds and trophic ulcers. During dressing, napkins moistened with an enzyme solution are applied to the surface of wounds or ulcers after their preliminary treatment, orenzyme powder is applied to wounds and ulcers. Some enzymes are used in the form of ointments (iruxol, asperase). Preparations are useduntil the wounds are completely cleansed of necrotic tissues and pus.

Enzyme solutions can be administered inside cavities: in the pleural cavity for purulent pleurisy, in the suture cavityfor purulent arthritis, in the abscess cavity, etc. In the treatment of inflammatory infiltrates and purulent wounds, enzymesare used by electrophoresis. Enzymatic preparationsare of plant, animal, and bacterial origin. Herbal preparations include caripazine and lekozyme, obtained from the dried milky juice of the dyntree (papaya). Terrilitin is a productof mold activity. Preparations of animal origin are prepared mainly from the pancreasof cattle. These include trypsin, chymotrypsin, chymopsin, ribonuclease, and deoxyribonuclease. Preparations of bacterial origin are products of thevital activity of bacterial cultures. These

include lyzoamidase, profezim, and others.

Antibiotics. Antibiotics include products of the vitalactivity of microorganisms (natural antibiotics) or chemical derivatives of natural antibiotics obtained artificially (semi-synthetic antibiotics).

Beta-lactam antibiotics

1. Natural penicillins. All antibioticsof this group are bactericidal, the mechanism of action consists in their ability to penetrate the bacterial cell wall and disrupt the structure of the cell wall. Natural penicillins are active against streptococci, gram-negative cocci, and some anaerobes, but they are inactive againstenterococci. These drugs include*бензилпенициллbenzylpenicillin, procaine* penicillin (novocaine salt of penicillin),*benzatine penicillin*(bicillin),*phenoxymethylpenicillin.*The latter is not destroyed by hydrochloric acid of the stomach and is administered orally.

2. ***Semi-synthetic penicillins*** are divided into several groups. A. Penicillins resistant to penicillinase**include*methicillin, oksacillin, cloxacillin, flucloxacillin, dicloxacillin.***This group of penicillins is inferior in antimicrobial activity to natural ones, but drugs of this group are stable against beta-lactamases of staphylococci, so they are widely used in the treatment of staphylococcal infection. **B.Aminopenicillins** include *ampicillin, amocicillin,bacampicillin, and pivampicillin.* They are characterizedby a broad spectrum of antimicrobial activity, and are active against microbes that are affected by natural pericillins. They are inactive against staphylococcithat produce beta-lactamases. They are highly activeagainst gram-negative bacteria of the intestinal group. **In.Anti-purulent penicillins,** whichinclude carboxypenicillins (carbenicillin, ticarcillin) and*ureidopenicillins* (piperacillin, azlocillin, meslocillin), hasa very broad spectrum of action. When usingdrugs in large doses, there is a risk of hypokalemia and increased bleeding.

3. Preparations containing penicillins and beta-lactamase inhibitors have the property of irreversiblyinactivating a wide range of beta-lactamases-enzymes producedby various microorganisms. As a result, antibiotic-resistant strains of microorganisms become-sensitive to them. These combinationmedications*include* unazine (ampicillin / sulbactam),*augmentin, acoxyclav*(amoxicillin/clavulanic acid),*timentin* (ticarcillin/clavulanic acid),*and tazocin* (piperacillin/tazobactam).

4. Cephalosporins are the mostcommonly used antibiotics. Cephalosporins have a broadspectrum of action and a bactericidal mechanism of action. These drugs are well tolerated by patients and have a low frequency ofside effects. According to the spectrum of antimicrobial activity, cephalosporins are represented by 4 generations. **A. Cephalosporins of the first generation —***cephaloridin* (ceporin),*cephalotin* (keflin), *cefapirin* (cefatrexil),*cefradin, cefazolin* (kefzol, cefamizin),*cephalexin* (ceporex). **B. Second-generation cephalosporins***: cefamandol*(lekacef),*cefuroxime* (ketocef),*цефоксицефоxitin* (mefoxin),*cefmetazole, and cefotetan.*

V. III generation Cephalosporins —*Cefotaxime* (klaforan),*cefoperazone* (of cefobid),*Ceftriaxone* (of lonazep, rocephin), ceftazidime (kefadim, miraze, Fortum),*will cefodizime* (modelid);*ceftizoxime, cefmenoxime, cefixime* (suprax, cefspan),*latamoxef* (moxalactam, moxam),*loracarbef* (lorabid),*ceftibuten* (tsedeks),*capitaladequacy* (globose), has cefpodoxime (vantin, orelox).

D. Cephalosporins of the fourth generation —*cefpir* (keiten, cefrom),*cefepime*. Drugs containing betalactamase inhibitors include*sulperazone* (cefoperazone/ sulbactam).

5. ***Monobactams*** have entered clinical practicerelatively recently. These include*aztreonam.* It has a bactericidaleffect and is active only against gram-negative aerobic bacteria.

6. ***Carbapenems*** have the widest spectrum and are not active only against chlamydia and mycoplasmas. They are used to treat severe infections with an unknown pathogen. Drugs in-

this group include imopenem /cilastatin and meropenem (meronem). Imopenem is inactivated in the body due to hydrolysis of the betalactam ring by a renal enzyme.Therefore, it is used together with the renal dehydropeptidase inhibitor cilastatin.

7.*Fluoroquinolones.* Drugs of the quinolone class, bytheir mechanism of action, are fundamentally different from otherantimicrobial drugs, which ensures their activity against resistant, including polyresistant, strains of microorganisms. The class of quinolones includes two main groupsof drugs that fundamentally differ in structure, activity, pharmacokinetics, and the breadth of indications for use: nonfluorinated quinolones and fluoroquinolones. Quinolones are classified according to the time of introduction of new drugs with improvedantimicrobial properties. Accordingto the working classification proposed by R. Quintiliani(1999), quinolones are divided into four generations:

Classification of quinolones

I generation:nalidixic acid, oxolinic acid, and pipemidic (pipemidic) acid.

II generation:lomefloxacin, norfloxacin, ofloxacin, pefloxacin, ciprofloxacin.

III generation:levofloxacin, withparfloxacin.

IV generation:moxifloxacin.

Other classes of antibiotics

1. ***Aminoglycosides*** have a bactericidal effect and a wide spectrum of action. There are 3 generations of aminoglycosides. **I generation —** *streptomycin, monomycin, kanamycin.* **Second generation**-*gentamicin* (garamycin), *tobramycin, sizomycin*.**III generation**-*izepamitsinamikatsin.* Drugs of thisgroup have reversible nephrotoxicity and irreversible ototoxicity.

2. ***Tetracyclines*** are broad-spectrum antibiotics. They are highly active against many gram-positive and gram-negative microorganisms (aerobes and anaerobes). In addition, tetracyclinesare active against chlamydia, mycoplasma, rickettsia, vibrio cholerae, spirochaetes, and actinomycetes. Tetracyclines include: tetracycline, *rolitetracycline* (reverin),*oxytetracycline* (terramycin), *chlortetracycline, morphocycline, metacycline* (rondomycin),*doxycycline* (vibramycin),and*minocycline* (minocin). The most effective drugs are doxycycline and minocycline.

3. ***Macrolides*** are similar in their spectrum topenicillins. Macrolides includeerythromycin.ПолусинтетиPolyusynthetic macrolides (roxithromycin, clarithromycin, azithromycin) are more effective against gram-negative flora. Macrolides are mainly used for pneumonia,especially microflora-atypical pneumonia, streptococcal nasopharyngeal infection, non-specific urethritis,diphtheria and whooping cough.

5. Lincosamines have a bacteriostatic effect. The drugs are effective against staphylococci and streptococci.Lincosamines are the drugs of choice forprocesses caused by anaerobic infection in the abdominal cavity, pelvic cavity and lungs. These include*lincomycin*and*clindamycin.*

6. Glycopeptides have a bactericidal effect. All strains of gram-positive cocci are sensitive to glycopeptides. These drugs are used for resistant infections (staphylococci and enterococci). Glycopeptides include*vancomycin* and*teicoplanin.*

7. Chloramphenicol (levomycetin) is a broad-spectrum antibiotic active against gram-positive and gram-negative cocci.

8. Rifampicin (benemycin) is a narrow spectrumpaantibiotic that is active against Mycobacterium tuberculosis, meningococci, and gonococci.

9.*Polymyxins*are active against gram-negative microorganisms and inactive against gram-positive microorganisms and anaerobes. The drugs have a bactericidaleffect. These include*polymyxin B* and*polymyxin*E (colistin).

Complications of antibiotic therapy

When treating with antibiotics, there are 3 groupsof complications: immune reactions, dysbacteriosis, and toxiceffects.

Immune responses do not depend on the dose of the antibiotic. They are characterized by the appearance only after re-appointment of antibiotics that caused them or are similar in chemical structure. According to the rate of occurrence, some reactions occurimmediately: anaphylactic shock, angioedema (angioedema), bronchospasmicraticaria.Some reactions develop after 24-48 hours (delayed reactions): polymorphic rash, erythema, arthritis, hemolytic anemia, eosinophilia, thrombocytopenia, leukopenia, agranulocytosis, interstitial nephritis, vasculitis, and fever. If immune reactions occur, do not slowly cancel the drug without re-introducing it after-eliminating the symptoms. Antihistamines, sympathomimetics, and saline solutions are urgently administered; furasemide is additionally administered for angioedema; and in severe cases, prednisone. In addition, antibiotic therapy has a pronounced immunosuppressive effect.

Dysbacteriosisis associated with inhibition of growth not only of pathogenic-microorganisms, but also of saprophytes involved innormal intestinal activity. At the same time, fungi (candida) begin to multiply intensively, which in turn can cause a septic state (candidiasis), and otherarousals. The most severe clinical picture occurs in pseudomembranous colitis caused by Clostridium Difficile.Treatment consists of discontinuing the antibiotic and prescribing anti-mycotic agents, which include:*nystatin, levorin, acfotericin B* (fungizon, fungilin),*miconazole, mycoheptin, fluconazole* (diflucan, mycosist, forkan). Parenteralnutrition and infusion of colloidal and crystalloid solutions are performed. Treatment is carried out under the control of blood electrolytes.

The direct toxic effect of someantimicrobials may have pronounced clinical manifestations. Aminoglycosides, polymyxins, and vancomycin have the most pronounced nephrotoxic effect, withincreased urea and creatinine, proteinuria,and oliguria. Semi-synthetic penicillins, aztreonam, tetracyclines and lincosamines have hepatotoxic effects. Icteric sclera and skin may appear, and bilirubin increases. Aminoglycosides and vancomycin have an ototoxic effect, and irreversible hearing loss mayoccur. Cephalosporins of II-III generations can cause hemorrhagicsyndrome.

Principles of rational antibacterial therapy

1. **Availability of indications for prescribing antibacterialagents.** The main symptoms of bacterial infection are fever and changes in the peripheral blood, although in elderly and senile patients, even severeinfection can occur without these manifestations. A viral infection does not require antibacterial therapy.
2. **Identification of the reasons that prevent effective antibacterial therapy.** In case of obstruction of the biliary and urinary tracts, the presence of unopened purulent congestion and abscesses, as well as in the presence of devitalized tissues in the infected wound, antibacterial therapybecomes ineffective.
3. **Identification of microorganisms that caused an infectious disease, determination of the sensitivity of microbes to drugs.** Bacteriological research is crucial in the identification of microbes: microscopic examinationof native preparations and Gram-stainedones, cultural research (inoculation on artificialnutrient media, isolation and identification of pure culture). In cases of difficulty in carrying out the direct above-mentioned bacteriological methods of pathogen identification (anaerosis), an indirect method of microbial identification, such as chromatography, is also used. In the processof culture research, the sensitivity of the pathogen to various antimicrobial agents is revealed. Material for bacteriological research should be taken before prescribing antibacterial therapy.
4. Selection of optimal treatment regimens, taking into account the localization of the infectious process (empirical therapy) or anti-pathogenic microorganism(targeted therapy). In practice, the patient assumes a given infection exciter and his sensitivity to antibacterial agents

within 2to 3 days, that is, the time required for conducting a culture study. At the first stage, empiricalantimicrobial therapy is performed, that is, based on clinical signs, the most likely causative agent of infection is assumed and themost effective antibacterial agent is selected in accordance with the assumption. At the second stage, after isolation and identification of the pathogenic microorganism, targeted antibacterial therapy is performed. It allows you toselect an antibacterial agent, taking into account the sensitivity of the isolated microorganism to it.

5. **The choice of an antibacterial agent, taking into account the featuresof the disease, the patient, and the clinical pharmacokinetics of the drug.** The antibacterial agent shouldbe prescribed taking into account the possibility of developing direct and cross-allergy to the drug. In case of concomitant diseases, it is necessaryto take into account the side effects of a particulardrug used. Many drugs penetrate the placental barrier, so they should not be prescribed during pregnancy.

The pharmacokinetics and metabolism of drugs during pregnancyare significantly different, which is associated with changes in the functions of many organs and systems inherent in pregnancy (hormonalchanges, decreased detoxification function of the kidneys and liver, etc.). The combination of these changes leads toa certain slowdown in the metabolism of drugs and their delayed release from the body of the pregnant woman.

Embryotoxic and teratogenic effects are usually manifestedin the early stages of embryo development (the first 6-8 weeks of pregnancy). In the later stages of pregnancy, some medications may have a negative effect on the organs and systems of the fetus, mainly due to the functional and morphological immaturity of these systems. Along with a large number of drugs that are harmless to pregnancy, there are a number of drugs that are contraindicated during pregnancy (absolute teratogens) or that should be used with caution (insmall doses and for a short time).

Absolute teratogens: antimetabolites, alkylating compounds, antibiotics.

Tetracyclines — occurrence of developmental anomalies (provedin experimental conditions). In the late stages of pregnancy, it is accompanied by a slowdown in fetal growth, damage to the rudiments of baby teeth, and hepatotoxicity.

Levomycetin has a negative effect onthe hematopoietic organs (hypoplastic anemia).

Streptomycin — the fetus may experience irreversible hearing nerve dilatation with the development of congenital deafness.

Antibacterial agents during pregnancy		
Dangerous ones	**Potentially dangerous**	**Non-dangerous ones**
Amphotericin B TTetracyclines FluoroquinolonesChloramphenicolmetronidazole Sulfonamides	Aminoglycosides Methicillin Nitrofurans	Aztreonam Penicillins Macrolides Cephalosporins Miropenem

Depending on the disease, antibacterial agentsare prescribed, which penetrate the blood-brain barrier in different ways, and are secreted in different secretions (saliva, bile, sputum, etc.).

6. **A rational combination of antibacterial agents.** In some cases, combinations of antibacterial agents are used to increase the effectiveness of exposure to the pathogen. These drugs include:*ampiox* (ampicillin+oxacillin),*ericycline* (erythromycin+ oxytetracycline),*oletetrin, tetraolean, sigmamycin* (oleandomycin+tetracycline), etc. When using antibacterial agents in combination, it is necessary to take into account their compatibility and usecombinations that lead to a synergistic antibacterialeffect. Do not combine bactericidal and bacteriostatic antibacterial agents, as there is a risk of infection.the regularity of mutual weakening of their actions. A combination of two bactericidal or two bacteriostatic agents is optimal.

7. **Determination of the optimal method of administration.** Anti-bacterial agents

can be applied topically, orally, intramuscularly and intravenously. Parenteral administration of antibacterial agents is indicated for severe orgeneralized infection, difficulty or inability to take the drug enterally, impaired absorption of the drug inthe gastrointestinal tract, as well as in the absence of dosage forms for taking enterally. In the treatment of woundinfection in surgical practice, as well as local inflammatoryprocesses, it is advisable to apply topicaldosage forms to create their maximum concentration in the lesion.

Bactericidal agents	**Bacteriostatic agents**
Penicillins	Macrolides
Cephalosporins	Tetracyclines
Aztreonam	Chloramphenicol
Carbapenems	Lincosamines
Vancomycin	Sulfonamides
Aminoglycosides	Nitrofurans
Polymyxins	Quinoxaline derivatives Produce8-hydroxyquinol
Fluoroquinolones	
Nitroimidazoles	

8. Determination of an adequate doseof the drug. Antibacterial agents should be prescribed in effective doses depending on the severity of the infection, body weight, and ageof the a - patient. Dosesof antibacterial drugs are indicated in the annotationsbased on 1 kg of body weight or based on a body weight of 70 kg. When the mass exceeds50-90 kg, theformulaD= (DDD/70) is used to determine the dose)M, where DD is the daily dose for a patient weighing 70 kg, M is the patient's body weight. The creationof an optimal concentration of an antibiotic in the patient's blood is achievedby a certain multiplicity of drug administration into the patient's body.

9. Exercise adequate control duringthe treatment process. The clinical effect is estimated within 48-72 hours. Under the influence of the drug, fever and generalintoxication decrease.

10. Determination of the optimal duration ofantimicrobial therapy. The durationof treatment varies depending on the specific clinical situation. It is not advisable to conduct unnecessarily short courses of therapy (2-3 days or until the temperature normalizes). Against the background of a positive clinical effect, there may not be apositive bacteriological effect (elimination of pathogenicmicroorganisms). There is a risk of relapse of the disease and selection of resistant strains of microorganisms. Excessively long courses of therapy are not desirable because of the risk of developing superinfection (bacterial, fungal) or toxic effects of medications.

SECURITY QUESTIONS:

- Antiseptics and types of antiseptics
- Characteristics of individual types of antiseptics
- Characteristics of chemical antiseptics
- Biological antiseptics
- Methods of applying antiseptics.

SITUATIONAL TASKS

1. Antiseptics of the oxidizing agent group are: a) chlorinehexidinabigluconate b)potassium permanganate c) dioxydin d) yodopirone. Choose the correct answer combination:

1. a, b
2. b, c
3. b, d
4. d, d
5. everything is correct.

2. Antisepticsbelonging to the group of halogens and halogen-containingcompounds are: a) potassium permanganate b) sodium hypochloride c) dioxydin d) povidoniodine e) iodonate. Youtake the correct combination of answers:

1. a, b
2. b, d
3. c, d, d
4. b, d, d
5. everything is correct.

3. What methods apply to physical antiseptics? a) ultrasound cavitation of the wound; b) antibiotic-novocaine blockade of the purulent-inflammatory focus; c) vacuum aspiration; d) wound treatment with an effective antiseptic solution; e)using laser radiation. Choose the correct answer combination:

1. a, d, d
2. a, b, c
3. c, d, d
4. a, b, d
5. a, b, D.

4. Ways of endogenous contamination of wounds: a) through non-sterilesurgical instruments; b) penetrationdirectly from the hollow organ; c) through the handsof medical personnel; d) through bacterial contaminatedabdominal exudate; e) with the flow of lymph or blood from the purulent-inflammatory focus. Choose the correct answer combination:

1. a, b, c
2. c, d, d
3. a, d, d
4. b, d, d
5. everything is correct.

5. Which of the above applies to methods of preventing the contact route of microflora spread? a) sterilization of linen, b) sterilization of instruments; c) sterilization of suture material; d) treatment of the surgeon's hands; e) treatment of the surgical field. Choose the correct answer combination:

1. a, b, c, d
2. a, c, d, d
3. a, b, c, d
4. b, c, d, d
5. a, b, d, d

6. Indications for the prophylactic use of antibioticsin surgery are: a) operations in patients with primaryimmunodeficiency; b) operations related tothe implantation of foreign material (vascular grafts, heart valves, etc.); c) operations for advanced peritonitis; d) operations related to the removal of varicose veins of the lower extremities; e) elective hernia sections. Choose the correct answer combination:

1. a, b, c
2. b, c, d
3. a, b, d
4. c, d, d

5. a, b, d

7. The effect of proteolytic enzymes in purulentprocesses consists in: a) lysis of necrotic tissues, b) increased blood clotting, c) fibrinolysis, d) potentiationof the action of antibiotics, e) antibacterial action, f) anti-inflammatory action. Choose the correct answer combination:

1. a, b, c
2. a, b, d
3. c, d, e
4. c, d, e
5. everything is correct.

8. Exogenous sources of contamination of surgical wounds include: a) bacterial-contaminated abdominal exudate, b) bacterial transmission among medicalpersonnel, c) non-sanitized foci of chronic infection in the patient, d) microbial air pollution in operating rooms, wards and dressings. Choose the correct answer combination:

1. a, b, d
2. d, d
3. b, c
4. b, d, d
5. a, b

9. Organizational activities of asepsis include: a)the use of disposable underwear, suture material,tools, b) disinfection of personnel's hands before and after each contact with the patient, c) identification and sanitationof bacterial carriers in the hospital, d) primary surgical treatment of wounds, e) use of antibiotics. Choose the correct answer combination:

1. b, d
2. a, b, c
3. b, c, d
4. c, d, d
5. a, d

APPLICATIONS

Appendix # 1

Table # 1

Number of ingredients for preparing the "S-4" recipe»

Quantity working solution (l)	Number of ingredients			
	30-33% hydrogen peroxide (ml)	Formic acid		Water (L)
		100% (ml)	85% (ml)	
1	17,1	6,9	8,1	up to 1
2	34,2	13,8	16,2	up to 2
5	85,5	34,5	40,5	up to 5
10	171,0	69,0	81,0	up to 10

Appendix # 2

Preparing tools for the operation

1. Pre-sterilization treatment is carried out manually or mechanized.
2. Manual pre-sterilization treatmentis performed in the following sequence::

• soaking in a washing solution with the product completely submerged for 15 minutes at a temperature of $50^{o°}$ C;

• washing in the detergentsolution with a brush or cotton-gauze swab — 0.5 minutes;

• rinsing with running and then distilled water — 0.5 minutes; in the case of using detergents "Lotus" or "Astra", the rinsing time is 1.0 minutes;

• drying in dry-air sterilizers with hot airat a temperature$^{of\ 80\text{-}85\ ^\circ C.}$ Lms of complete disappearance of moisture.

3. As a detergent, use:

• complex of hydrogen peroxide with detergents "Progress", "Trias-A", "Lotus" or " Astra»;

• the drug "Biolot".

4. Mechanized car wash.

Mechanized processing of tools is carried out inspecial-purpose washing machines: for needles, syringes,and tools, according to the instructions attached to the device.

Quality control of pre-sterilization treatment of instruments

Table #2

Stages of pre-sterilization cleaning of medical devices

Cleaning processes	Cleaning mode				Equipment used
	temperature in deg. C		exposure time in min.		
	nominal value	before.deviation.	the nominal value.	before.deviation.	
Pre-rinsing under running water			0,5	+0,1	Bath, sink
Soaking in a cleaning solution when the product is completely submerged			15,0	+1,0	Tank, bath, ra-kovina
Washing each product in a detergent solution using a brush or cotton swab	50 <*>	+5	0,5	+0,1	
When using the detergent preparation" Biolot»			3,0		Bath, sink with a device for jet water supply
When using detergents "Trias A", "Progress", "Lotus", " Astra»			5,0 10,0	+1,0	
Rinsing in distilled water			0,5	+0,1	
Hot air drying (air sterilizer)	85	+/-5	Until the moisture completely disappearsновения влаги		

<*> — The temperature of the solution is not maintained during the mo<*> processй.

Table #3

Preparation of cleaning solutions

Name of components	Numberof components for preparation of 1 l of cleaning solution	Applicabilityмость
Cleaning agent "Bio-lot", g Drinking water according to GOST 2874-73, ml	3 997	It is used for mechanicalcleaning
Cleaning agent "Bio-lot", g Drinking water according to GOST 2874-73, ml	5 995	Used for manual cleaning
Solution of hydrogen peroxide (perhydrol) according to GOST 177-71, ml Detergent ("Progress", "Tri-as-A", "Ast-ra", "Lotos"), g Drinking water according to GOST 2874-73, ml	20 5 975	It is used for manual and mechanized-cleaning

10. The quality of washing surgical instruments, syringes, and needles is determined by setting up benzidine, orthotolidine, or amidopyrine samples.

11. Benzidine sample.

There are two modifications of the sample:

I sample with hydrochloric acidbenzidine. Mix 0.5-1% benzidine hydrochloric acid solution prepared indistilled water with an equal amount of 3% hydrogen peroxide solution.

II sample with sulfuric acidbenzidine. 5 ml of 3% hydrogen peroxide is added to a solution consisting of 5 ml of 50% acetic acid and 0.025 g of benzidine sulfate dissolved in it.

12. Orthotolidine test. There are three modifications of the sample.

I. Prepare a 4% solution of orthotolidine in 96% ethyl alcohol. The solution is stored in the refrigerator. For everyday use, a small amount (5-10 ml) is taken from the main alcohol solution and an equal amount of 50% acetic acid and the same amount of distilled water is added to it.2-3 drops of the solution and 1-2 drops of 20% hydrogen peroxide are applied to the controlled object.

II. 5 ml of 3% hydrogen peroxide solution is added to the reagent consisting of 5 ml of 50% acetic acid and 0.025 g of orthotolidine dissolved in it.

III. Mix equal amounts of 1% aqueous solution of ortotolidine prepared in distilled water and 3% solution of hydrogen peroxide.

13. Amidopyrin test.

Mix equal amounts of 5% alcohol solution of amidopyrin, 30% acetic acid and 3% solutionof hydrogen peroxide (2-3 ml each).

14. Sampling procedure: 2-3 drops of reagent are applied to the controlled product. In the presence of blood contamination, a blue-green staining appears.

15. Phenolphthalein test.

Prepare a 1% alcohol solution of phenolphthalein. Apply 1-2 drops of the solution to the washed product. In the presence of residual amounts of detergent, a pink color appears.

16. Products that give a positive test for blood or detergent are re-treated until a-negative result is obtained.

Table #4

Individual object sterilization modes

a) Steam method

NN **n/a**	**Item names**	**Sterilization modes**				**Usemy equipment-дование**	**Sterilization conditionsции**
		steam pressure kgf / sq. cm		**exposure time min.**			
		nominalvalue-ние	**limit deviation**	**nominalvalue-ние**	**limit deviation**		
1.	Dressings, surgical instruments, parts of devices anddevices (in contact with the wound surface) made of corrosion-resistant metals and alloys. Syringes with the inscriptionSue 200 deg.C, glassware.	2.0 (132°C)	+/-0,1	20	+2	Steam sterilizer-рилизатор	Стери-Sterilization is carried out in sterilizationbags or in a 2-ply soft package made of calico or in parchmentpaper of brand A or B
		1.1<*> (120°C)	+ 0,1	45	+3		

< * > —Mode 1.1 (120 °C) with a sterilization time of 45 minutes is recommended, in additionto the above-mentioned objects, for rubber products.

Table #5

b) Air sterilization method

Item names	Sterilization modes				Applicable equipment	Conditions prove-Denia sterilizationsзации
	temperature in deg. C		exposure time in min.			
	nominal-valueние	limit value rejection rate	nominal value meaning	предельное отmaximum deviation		
Surgical, gynecological and dental instruments, parts and components	180	+/-11	60	+5	Air sterilizer with chamber volume up to 25 cubic dm	Стерилизации подвергаются cyDry products are sterilized
devices and apparatuses (not touching the wound surface), including those made of corrosion-resistant materials and alloys.	180	+/-12	60	+5	with a cabin volumeof more than 25 to 500 cubic meters. dm	Sterilization is carried out in upaforging or without upaforging (in open containers)
Syringes labeled 200 deg. C, glassware.	180	+/-14	60	+5	with an ice rink volumeof over 500 cubic meters. dm	

Table # 6

c) Chemical method of sterilization (solutions of chemical preparations)

Item names	Sterilizing-agent	Sterilization modes				Equipment used	Sterilization conditionsния стерилизации
		temperature in °C		exposure time in min.			
		nominalvalue	limit deviation	nominal value	limit deviation		
Surgical instruments made of corrosion-resistant metals and alloys.	Hydrogen peroxide according to GOST 177-71 6% solution<*>	nevertheless 18 50	*+1-2*	360 180	+/-5 +/-5	Closedbones made of glass, plastic or covered with enamel (enamel without damage)	Sterilization is carried out when the product is completely immersedin the solution for the duration of sterilization exposure, after which theproduct is washed with sterilewater
Products made of rubberand plastic materials, including metal parts of corrosion-resistant metalsand alloys.	deoxone-1 1% solution<**> (over acetic acid<**>)	not less than 18		45	+/-5		

< * > - a solution of hydrogen peroxide can be used within 7 days from the date of preparation, provided that it is stored in a closed container.

< * * > - Deoxone-1 solution can be used within 24 hours.

Table # 7

Chemical method of sterilization (gas)

Item names	Sterilizingagent	Sterilization modes					gas dose g / l	Applicable-equipment-вание	Sterilization conditions-ния стерилизации
		temperature in deg. C		Относи-Relative humidity of the air as a percentage	recovery timein min.				
		nominal value	limit deviation		nominal value	limit deviation			
Endoscopes, products made ofplastic materials, including those with metalparts. Products made of rubber andplastic materials, including single-use ones	Ethylene oxide according to GOST 756873 with methyl bromide (mixture of OB, OKEBM) in the ratio 1: 2.5 (by weight coresponsibly)	55	+/-5		360	+5	2.0	стацио-stationary gas sterilizer-затор	Sterilizationis carried out in a package made of polyethylene film with a thickness of 0.06-0.2 mm according to GOST 10354-73, or in parchment paper A or B according to GOST 1841-74 or in paper bags
		not less-than 18			960	+/-10	3,0	Micro-anaero-stat MI	

Products sterilized by the gas method are used after they have been kept in a ventilated room for a long time.:

4 days — for metal and glass products;

5 days — for products made of rubber and polymer materials;

14 days — for products that have prolonged (over 30 minutes) contact with the wound surface;

21 days — for products used for children;

1. Sterilization ensures the deathof vegetative and spore forms of pathogenic and non--pathogenic microorganisms in the sterilized material.

2. Sterilization is carried out by various methods: steam, dry hot air, chemical solutions andgases. The choice of one or another method of sterilization depends on the characteristics of the object being sterilized.

3. Steam sterilizers are used to sterilize: linen, dressings, surgical instruments, parts of devices and apparatuses made of corrosion-resistant metals and alloys: syringes marked 200 °C, glassware, rubber products (gloves, tubes, catheters, probes, etc.).

4. Before sterilization, rubber glovesare sprinkled with talcum powder inside and outside the gun to protect them from sticking together. Gauze is laid between the gloves; each pair of gloves is wrapped separately in gauze and placed in bix in this form. Surgical linen, dressings, rubber gloves, and surgical instruments are sterilized in standard bixes, loosely laying them for free steam flow.

5. As packaging materials, a double layer of calico fabric or single-layer envelopes made of vegetable parchment GOST 1341-60 are used.

6. Surgical, gynecological and dental instruments, parts and assemblies of devices and apparatuses, including those made of corrosion-resistant materials and alloys, syringes with the inscription 200 °C, cutting tools are sterilized in air sterilizers.Metal pencil cases, kraft paper packaging are used as packaging materials, and the seams of the envelope are sealed with 10% polyvinyl alcohol glue or 5% starch glue.

7. Surgical instruments made of corrosion-resistant metalsand alloys, products made of rubber and plastic materials, including those with metal parts, are sterilizedwith drug solutions.

8. For solution sterilization, enamel, glass or plastic containers with a tightly closedlid are used. Products to be sterilized are freelyplaced in containers with the solution and straightened out. With a large length of the product, it is laid in a spiral. Whenthe product is sterilized, it is completely immersed in the solution. Afterthe end of the sterilization exposure, the products are immersed twice for 5 minutes in sterile water, changing it each time, then the products are transferred with a sterile cornzang to a sterile bix linedwith a sterile sheet.

9. The gas sterilization method is used forendoscopic instruments, extracorporeal blood-circulation devices, plastic products, and catgut.

10. Double bags made of polyethylene film with a thickness of 0.06-0.2 mm (GOST 10354-73) or parchment paper of grade A or B (GOST 1341-74) are used as packaging materials.

11. Examination instruments (otolaryngological, stomatological, etc.) are decontaminated by boiling orimmersion in solutions. After immersion, the products are rinsed in running water.

Appendix # 3

INSTRUCTIONS FOR BACTERIOLOGICAL EXAMINATION TO IDENTIFY CARRIERS OF PATHOGENIC STAPHYLOCOCCUS AND CONDUCTREHABILITATION SERVICES

General provisions

The manual was developed by the All-Union Scientific Research Institute of Disinfection and Sterilization ofthe Ministry of Health of the USSR.

Over the past two decades, there has been an increase in nosocomial infections, one of the causative agents of which ispathogenic Staphylococcus. According to the accepted classification, the Micrococaccae family Micrococaccaeincludes 3 genera: Micrococcus, Staphylococcus, and Planococcus. For medical practice, it is most important to differentiatestaphylococci from micrococci, which havea similar cell morphology to Staphylococcus and are often isolatedfrom the same objects. The genusStaphylococcusconsists of three species: St. aureus, St. epidermidis, St. saprophyticus. Currently, the etiological significance in purulent-septicdiseases of the St type is clearly shown. aureus. The role of the St type. epidermidisis much smaller and is possible in debilitated patients with diabetes, receiving large doses of X-ray and radiotherapy, as well as in diseases of the urinary tract.

The spread of staphylococcal infection occurs through airborne droplets and contact routes. The main sourceof staphylococcal infection in medical institutions is a person (a sick or healthy bacterialcarrier) from among the:

- patients with purulent-septic acute and chronic processes,
- medical and service personnel (withlocalization of the pathogen on the mucous membranes of the nose, pharynx, on the skin and in the wound surface). One of the measures to prevent nosocomial complications is timely isolation of patients and identification of carriers of pathogenic Staphylococcus followed by rehabilitation.

Organizational measures to identify bacterial carriers

• Every employee who enters a health care facility undergoes a full medical examination, including an examination by an otolaryngologist anda stomatologist.

• Working personnel should be taken under dispensary supervision for timely detection and treatmentof carious teeth, chronic inflammatory foci in the upper respiratorytract and oral cavity, subtrophic conditions of the nasal and pharyngeal mucosa, as well as timely detection of carriers by St personnel. aureus(1 time in 6 months — routine examination).

• When conducting routine bacteriological examinations, it is mandatory to study mucus from the anterior parts of the nose. Examination of pharyngeal mucus can be carriedout selectively. The material is collected by the senior nurse of the medical and preventive institution. The results of routinebacteriological examinations and examinations by theOPspecialist and dentist should be clearly recorded in the individual card of the employee of the medical and preventive institution.

• Preparation of sanitizing agents is carried out by pharmacies of medical and preventive institutions.

• Before undergoing rehabilitation, carriers undergo mandatoryconsultation with specialists in otolaryngology, because ina certain percentage they suffer from allergic orchronic diseases of the upper respiratory tract, tonsillitis, etc., which require mandatory special treatment.

Sanitation of bacterial carriers

• For daily sanitation of personnel, the following sanitizing agents should be used:

furacilin 1: 5000,rivanol 1:5000, 1% boric acid, potassium permanganate (rosyred solution), Lugol's solution (water or glycerin), eucalyptus leaf infusion, lysozyme, staphylococcal-bacteriophage.

- Hexachlorophen (1%), tribask (3%), and chlorophyllint should be used to sanitize personnel during the period of epidemiological distress.
- To obtain the most effective resultsof bacterial carrier sanitation, sanitizing agents should be changed every 7 days.
- During the period of epidemiological problems (an outbreak of acute respiratory infections, an increase in the incidence of nosocomial infections, significant contaminationof environmental objects with staphylococci, etc.) in medical institutions, all the staff of the institution should be sanitized simultaneously.
- In cases where it is not possible toreduce or completely eliminate the Staphylococcus carrier by rehabilitation, it is necessary to insist on the correct wearing of a mask covering the mouth, nose and hair. At the same time, it is necessary to have a schedule for wearing masks and change masks every three hours.
- In the absence of positive results in the treatment of chronic inflammatory diseases of the upper respiratory tract and oral cavity, medical workers are transferred to otherjobs.

Appendix #4

Sanitary and hygienic regime in wards for patients with sanaerobic infection

The source of infection is patients with gas gangrenein any form: emphysematous, edematous-toxic,mixed and gas-purulent. Pathogens of gas gangrene (C1. perfringens, CI. oedematicus, CI. septicum, CI. histolyticum)belong to the genus of pathogenic clostridium-anaerobic spore-bearing bacilli. As a rule, the association of microbes can consist of pathogenic clostridium or a mixture of pathogenic and low-pathogenicclostridium, as well as a mixture of clostridium with aerobic bacteria: Staphylococcus, Escherichia coli, proteus. Themain route of infection transmission is contact. Infection can occur when the causative agent of gas gangrene gets on damaged skin or mucous membranes with dirt, dirty laundry, clothing, as well as when using insufficiently sterilized instruments, syringes, needles, suture and dressing materials.

• Для лечения больных газовой гангреной выделяют отдельные палаты по возможности со специальным входом, операционную — перевязочную, оснащенные приточно-вытяжной вентиляцией, не сообщающейся с другими отделениями.

• Уборку палат производят не реже 2 раз в день влажным способом с применением 6% раствора перекиси водорода с 0,5% моющего средства.

• Перевязочную оборудуют стационарными бактерицидными облучателями. Для снижения микробной обсемененности в перевязочной рекомендуется установка воздухоочистителей передвижных рециркуляционных (ВОПР-0,9 или ВОПР-1,5).

• Хирург, процедурная сестра перед входом в перевязочную одевают маску, бахилы. Во время операции или перевязки надевают клеенчатый фартук, который после каждой операции или перевязки протирают ветошью, обильно смоченной в 6% растворе перекиси водорода с 0,5% моющим средством.

• Перевязочный материал используют однократно, во время операции или перевязки его собирают в специально выделенный бикс, автоклавируют при 2 кгс/кв. см (132 град. С +/- 2) в течение 20 минут и уничтожают. Примечание: категорически запрещается выбрасывать материал без обеззараживания.

• Инструментарий, используемый во время операции или перевязки, собирают в емкость.

• Уборку операционной-перевязочной производят влажным способом не реже 2-х раз в день с применением 6% раствора перекиси водорода с 0,5% моющего средства, с использованием индивидуальных средств защиты: респираторы типа РУ-60 и перчатки. После дезинфекции помещение моют горячей водой и включают бактерицидные облучатели (ОБИ-150 или ОБН-ЗОО) на 1,5-2 часа.

• После проведения операции или перевязки весь инструментарий, шприцы, иглы погружают в 6% раствор перекиси водорода с 0,5% моющего средства на 60 минут или кипятят в течение 90 минут.

• Последующая методика предстерилизационной обработки инструментария и его стерилизация аналогична описанной выше.

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