Hoshko Kseniia Olexandrivna
2-nd year student of the specialty "Dentistry"
Donetsk National Medical University, Faculty of Medicine No. 3, Ukraine

ANALYSIS OF THE EFFICIENCY OF THE METHODS
DISINFECTION AND STERILIZATION IN DENTAL

Abstract. Scientific approbation is devoted to the issues of disinfection and sterilization in dentistry, requirements for the prevention and prevention of transmission of infectious diseases through unsterilized medical instruments and equipment. The paper provides basic information on research and development in this area, describes certain methods of sterilization, control over the quality of its implementation and the effectiveness of these measures. Basic hygiene requirements were identified to improve the quality of treatment and the level of dental care. The main difficulties, difficulties and errors that employees of a medical institution may encounter during disinfection and sterilization in dentistry are considered and studied.

Keywords: sterilization, disinfection, nosocomial infections, hygiene requirements.

Today, a dental clinic, due to its specific features, is a place with a high degree of infection of patients and medical personnel with viral diseases. The problems of nosocomial infections (NI), or infections associated with the provision of medical care (IAMC) are becoming increasingly relevant. Despite the study of issues related to the general problems of IAMC, certain aspects of the diagnosis and prevention of this pathology in medical and prophylactic organizations of a narrow profile remain without due attention. Most of the studies examining NI are associated with surgical hospitals, maternity hospitals and other high-risk facilities, although there is a significantly greater risk of infection for patients and medical personnel associated with the provision of dental care.

Insufficient development of the issues of IAMC prevention in dentistry is due to the peculiarities of the organization of this type of medical care, the lack of...
statistical accounting at the state level of its volume and quality, which does not allow judging the frequency of complications arising at a dental appointment.

The increased risk of transmission of infections in dental practice is due to the presence of pathogenic microflora in the secretions of the body, in particular in saliva – influenza virus, hepatitis, herpes, syphilis bacteria, tuberculosis, gram-negative and gram-positive bacteria, fungi. In this regard, the risk of transmission of infection to patients and medical personnel through instruments, casts, dentures and other dental products in contact with the oral cavity increases significantly [10].

The high probability of transmission of infections in dental facilities is associated with the service of patients without preliminary clinical examination for possible infectious diseases, as well as the irresponsibility and negligence of a number of dentists who neglect sanitary-hygienic and anti-epidemic measures during admission [6].

The complexity of organizing and conducting disinfection measures in dentistry lies in the fact that they are performed in the presence of patients, with the constant activity of medical personnel, and the methods and means of disinfection used must have a wide range of antimicrobial activity and speed of sterilization, but at the same time, do not provide harmful effects on operating personnel, patients and the environment. So, when taking impressions, disinfectants should not affect the properties of materials and the quality of the resulting models [9].

In accordance with the IAMC National Concept of Prevention, the priority areas are to reduce the degree of aggression of medical technologies, to limit the use of highly invasive procedures, to use epidemiologically safe medical technologies, to increase the efficiency of disinfection and sterilization measures, providing for the improvement of means and methods of disinfection, pre-sterilization cleaning and sterilization. All of the above applies to dentistry: it is necessary to minimize the risks associated with treatment of any type by improving its quality, as well as optimizing methods for sterilizing critical instruments, taking into account the specifics of the medical care provided.

Thus, the purpose of the work is to study the effectiveness, methods and means of disinfection carried out in hospitals, as well as the requirements for sterilization of dental instruments and materials.
The main measures limiting the spread of infection at the dental office are represented by the concepts of antiseptics and disinfection, which are widely used in various sciences and activities.

Antiseptics is a method of treating bacterially contaminated and infected wounds, purulent anaerobic and putrefactive processes by combating infectious agents that have invaded the wound or tissue.

Disinfection – the destruction in the external environment of pathogens of infectious diseases (bacteria, viruses, rickettsia, protozoa, fungi).

Preventive disinfection is carried out as planned, according to epidemiological and sanitary and hygienic indications. With routine preventive disinfection in healthcare facilities, disinfection of all nosocomial surfaces, medical products (surfaces, channels and cavities) is carried out to eliminate bacteria and viruses, hygienic treatment of the hands of medical personnel, treatment of the operating and injection fields. This type of disinfection is done to prevent the spread of NI pathogens and their vectors in wards. For sanitary and hygienic reasons, disinfection is carried out as a one-time event in rooms that are in an unsatisfactory sanitary condition. to remove contaminants and reduce microbial activity of the premises, general cleaning is performed. During general cleaning, they wash, clean and disinfect the surfaces of premises, doors, furniture, equipment, apparatus at least once a month [4].

Pre-sterilization cleaning and sterilization is carried out in centralized sterilization departments when preparing products for medical manipulations in which these products come into contact with blood, a wound surface, or there is a risk of damage to the mucous membranes. The purpose of sterilization is to ensure the death of all types of microorganisms on and inside the products.

The methods and means of sterilization used in practice must have the following properties: destroy microorganisms and their spores; be safe for patients and medical staff; do not impair the working properties of products; sterilization - measures aimed at the complete destruction of all forms of microbes and their spores under the influence of high temperatures and other physical factors, chemicals, ionizing radiation on medical products and drugs. Everything that comes into contact with the wound surface, in contact with blood and other biological fluids or injectable
preparations, as well as certain types of products that come into contact with the mucous membrane during operation and can cause damage to it, are sterilized.

Before sterilization, medical devices are subject to pre-sterilization treatment in order to remove protein, fat, mechanical impurities and residual amounts of drugs from them. Products are subjected to pre-sterilization cleaning after use; if necessary, preliminary disinfection – after disinfection. When carrying out pre-sterilization treatment, the use of detergents, inhibitors and other additives is allowed; carried out manually or mechanically. The detergent solution is used until it becomes pink, indicating blood contamination. A washing solution of hydrogen peroxide with the addition of synthetic detergents is used within 24 hours from the moment of preparation, if the color of the solution has not changed, such a solution can be heated up to six times. Rules for pre-sterilization treatment of medical devices.

The quality of pre-sterilization cleaning of products is assessed: for the presence of blood – by setting an azopyram sample; for the presence of residual amounts of alkaline components of the detergent – by setting a phenolphthalein test; for the presence of fat – by setting a sample with Sudan-3.

Disinfection is carried out by mechanical, physical or chemical methods. The choice of the method is due to the functional purpose of the room, the properties of the material of the working surfaces of the dental office and equipment, design features and properties of the material from which the medical device is made.

The mechanical disinfection method does not kill microorganisms. Removal of contamination from medical devices is achieved by filtering air, water through various filter designs, processing hard and soft surfaces with a vacuum cleaner [8].

Physical methods of sterilization include boiling, steam, air, infrared methods [2].

The method of boiling in distilled water with the addition of 2% sodium bicarbonate (baking soda) is used for disinfection of glass, rubber, heat-resistant polymer materials and metals. Water at a temperature of 100°C has a detrimental effect on many microorganisms.

The air method can only be used for products that are not contaminated with organic substances. Before air sterilization, products must be dried in a drying oven until visible moisture disappears.
The most active method of disinfection is the steam method, since steam is able to penetrate deeply into the treated objects and ensure the death of all types of microorganisms. This method is implemented in steam sterilizers for disinfection at a temperature of 110 °C with an exposure time of 20 minutes. This method is used to disinfect medical products, overalls, patient care items, etc. [3].

Ultraviolet bactericidal radiation is an effective preventive sanitary and anti-epidemic agent aimed at suppressing the vital activity of microorganisms in the air and on the surfaces of premises. It is one of the means to reduce the spread of infectious diseases, complements the mandatory observance of the current sanitary norms and rules for the design and maintenance of premises.

Disinfection with ultraviolet radiation is carried out by using bactericidal irradiators – wall, ceiling, mobile, screened and recirculating. Unshielded ones are allowed to be used only in the absence of people, shielded ones – for a short time (no more than 15 minutes) in the presence of people, and recirculating ones – for an unlimited time in the presence of people. One of the main requirements for the use of germicidal lamps is to control the lamp life. The use of open-type lamps with an expired shelf life negatively affects the health of personnel and leads to the development of antibiotic resistance factors from microorganisms. [one]

At present, in the dental clinic, chemical methods of sterilization are widely used (solutions of chemical agents, gas, plasma methods) [5].

The following requirements are imposed on chemical disinfectants used in health care facilities: they must have a bactericidal effect, high efficiency, ensure the disinfection of the object when used in low concentrations in a short time, have a large amount of active substance; dissolve quickly in water. Physicochemical indicators of funds must comply with the requirements of regulatory and methodological documents. Disinfectants should not be corrosive, destroy and discolor fabrics, wallpaper, damage varnished, polished, synthetic surfaces, pollute the environment, i.e. be biodegradable. The effectiveness of disinfection depends on the following factors: the chemical nature and concentration of the active substance, the type of microorganisms that are causative agents of infection, the physicochemical properties of the treated object, the method of processing the object
with a disinfectant, and the time of exposure of the disinfectant solution to microorganisms.

Plasma method, using sterilizing agents based on hydrogen peroxide in plasma sterilizers, sterilize surgical, endoscopic instruments, optical devices, probes, metal products, latex, plastics [7].

Products made of various materials are sterilized by the gas method, using ethylene oxide, formaldehyde, ozone as sterilizing agents.

**Table 1**

<table>
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<tr>
<th>Method</th>
<th>Benefits</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>Steam sterilization</td>
<td>Safe for the environment and medical personnel, short exposure, non-toxic, low cost, does not require aeration.</td>
<td>The quality of sterilization can be compromised by the ingress of air, high humidity of materials and poor quality of steam, products that are sensitive to high temperature and humidity can be damaged.</td>
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<tr>
<td>Air sterilization</td>
<td>Low corrosive properties, deep penetration into the material, safe for the environment, does not require aeration.</td>
<td>Long exposure, temperature conditions and sterilization time differ, heat-sensitive products may be damaged.</td>
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<tr>
<td>Sterilized with 100% ethylene oxide</td>
<td>Penetration into packaging materials and plastic bags, can be used to sterilize most medical devices, easy to handle and control.</td>
<td>Time required for aeration, small size of sterilization chamber, ethylene oxide is toxic, likely carcinogen, highly flammable, ethylene oxide packaging should be stored in fireproof rooms.</td>
</tr>
<tr>
<td>Sterilization with hydrogen peroxide vapor</td>
<td>Low temperature, no aeration required, safe for the environment and medical personnel, the end products are non-toxic, easy to handle, operate and control.</td>
<td>It is not recommended to sterilize paper products, linen and solutions, small size of the sterilization chamber, products with long or narrow internal channels cannot be sterilized, synthetic packaging is required.</td>
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<tr>
<td>Sterilization with vapors of formaldehyde solution</td>
<td>Fire and explosion proof, can be used to sterilize most medical devices.</td>
<td>The need to wash the surface from formaldehyde residues, is toxic and allergenic, long exposure, long procedure for removing formaldehyde after sterilization.</td>
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Thus, the main criterion for sterilization is the quality of its conductivity. Sterilization control includes checking the operation of the sterilizer, sterilization parameters and assessing its effectiveness, which is assessed based on the results of bacteriological studies when monitoring the sterility of medical devices.

Hygienic requirements for the organization of sterilization measures include: the presence in institutions of officially published sanitary and epidemiological rules and regulations, the appointment of persons responsible for sterilization, the organization of laboratory and instrumental studies and visual control over the implementation of sanitary measures.

When preparing disinfectant solutions, it is necessary to use personal protective equipment for the respiratory organs, eyes, skin, provided for in the instructions for use for specific drugs.

On the basis of the foregoing, it can be concluded that the “ideal” technology should ensure the processing of products of various designs from any dissimilar materials in modern automated equipment in the shortest possible time, be easily controllable, and also economically and environmentally acceptable. Moreover, such a sterilization technology should allow the processing of packaged products and not require the removal of the remains of sterilizing agents. Currently, the technology that meets all the specified requirements has not yet been developed.

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