International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-5| 2026 Published: |22-05-2026|

THE IMPORTANCE AND APPLICATION FEATURES OF ANTISEPTIC AND DISINFECTANT AGENTS IN MEDICAL PRACTICE

https://doi.org/10.5281/zenodo.20181516

Rahimova Mohinur Shamsuddinovna
Termez University of Economics and Service
E-mail: moxinurraximova42@gmail.com
Kibriyeva Maxfirat Abdurakhmonovna
Teacher, Department of Morphological Sciences, Termez University of Economics and Service
E-mail: kibriyeva1@gmail.com
ORCID: https://orcid.org/0009-0007-7053-8526

Abstract

This article analyzes the importance of antiseptic and disinfectant agents in medical practice, their mechanisms of antimicrobial action, areas of application, and role in ensuring infection safety. Antiseptics are used on living tissues, particularly the skin and mucous membranes, to reduce the number of microorganisms or inhibit their growth. Disinfectants are mainly intended for decontamination of environmental objects, medical devices, working surfaces, and patient-care items. The analysis shows that the effectiveness of these agents depends on their chemical composition, concentration, exposure time, application technique, and the degree of contamination of the treated object. Based on scientific sources, the article highlights the main groups of antiseptic and disinfectant agents, their advantages, limitations, and the potential risks associated with improper use.

Keywords

antiseptic, disinfection, infection control, hand hygiene, chlorhexidine, alcohol-based solutions, medical safety.

INTRODUCTION

Ensuring infection safety in medical practice is one of the most important areas of clinical activity. Healthcare-associated infections, purulent-septic complications after surgical procedures, and pathogenic microorganisms transmitted through the skin and mucous membranes directly affect patient health, treatment outcomes, and healthcare system costs. Therefore, the evidence-based

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-5| 2026 Published: |22-05-2026|

use of antiseptic and disinfectant agents is an integral component of modern medicine.

Antiseptic agents are used to destroy, reduce, or inhibit the growth of microorganisms on living tissues. They are mainly applied to the skin, mucous membranes, wound areas, the surgical field, and before medical manipulations. Disinfectants, in contrast, are intended for the decontamination of inanimate objects, medical instruments, working surfaces, rooms, laboratory equipment, and patient-care items. This distinction between antisepsis and disinfection is a key criterion when selecting appropriate agents.

The World Health Organization considers infection prevention and control to be one of the main mechanisms for ensuring the safety of both patients and healthcare workers. In the recommendations of the Centers for Disease Control and Prevention, disinfection and sterilization are described as essential stages in ensuring the safety of medical devices and environmental surfaces [1, 2].

Today, antiseptic and disinfectant agents are widely used in surgery, dentistry, dermatology, obstetrics and gynecology, laboratory diagnostics, intensive care, and outpatient practice. Hand hygiene, injection safety, skin antisepsis before invasive procedures, and proper reprocessing of medical devices are particularly important in infection prevention.

The aim of this study was to analyze the importance, main groups, mechanisms of action, application features, and role of antiseptic and disinfectant agents in ensuring infection safety in medical practice based on scientific sources.

MATERIALS AND METHODS

This article is an analytical review. International scientific literature, infection control recommendations, practical guidelines, and regulatory approaches related to antiseptic and disinfectant agents were studied. Particular attention was paid to data presented by the World Health Organization, the Centers for Disease Control and Prevention, and modern scientific sources on infection control.

In the literature analysis, antiseptic and disinfectant agents were evaluated according to the following criteria: field of application, spectrum of antimicrobial activity, mechanism of action, concentration and exposure time, safety level, clinical effectiveness, and risks associated with improper use.

During the analysis, the agents were grouped as antiseptics used on living tissues and disinfectants used on inanimate objects. In addition, medical devices were classified according to the level of infection risk into critical, semi-critical, and non-critical categories, and appropriate decontamination approaches were summarized.

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-5| 2026 Published: |22-05-2026|

RESULTS

Main groups of antiseptic agents. The analysis showed that the most commonly used antiseptic agents in medical practice include alcohol-based solutions, chlorhexidine, iodine compounds, hydrogen peroxide, octenidine, and some cationic active substances. These agents differ in their antimicrobial spectrum, field of application, safety profile, and duration of residual activity.

Alcohol-based antiseptics, particularly ethanol- and isopropanol-based solutions, are characterized by rapid action, ease of use, and effectiveness against many vegetative bacteria and some viruses. They are widely used for hand hygiene and short-term skin antisepsis. However, alcohol-based solutions may be less effective in the presence of visible organic contamination. Therefore, in such situations, washing with soap and water is required first.

Chlorhexidine gluconate is widely used in surgical antisepsis, preparation of the skin for invasive procedures, and dental and dermatological practice due to its longer residual antimicrobial activity. Iodine compounds, especially povidone-iodine, have a broad spectrum of antimicrobial action and are effective against bacteria, fungi, and some viruses. Hydrogen peroxide is used in some cases of mechanical cleaning and superficial decontamination because of its oxidizing properties.

Main groups of disinfectant agents. Disinfectant agents include chlorine compounds, aldehydes, alcohols, hydrogen peroxide and peracetic acid compounds, phenols, quaternary ammonium compounds, and other chemical substances. CDC guidelines emphasize that the choice of chemical disinfectants should take into account the type of object, degree of contamination, spectrum of microorganisms, exposure time, and safety requirements [2, 3].

Chlorine compounds have a broad spectrum of action and may be effective against bacteria, viruses, and some spore-forming microorganisms. However, their corrosive properties, odor, and potential to irritate the skin and respiratory tract at inappropriate concentrations require caution. Aldehydes, such as glutaraldehyde and ortho-phthalaldehyde, are used for high-level disinfection, but their use is limited by toxicity and the need for strict safety measures.

Quaternary ammonium compounds are used for the disinfection of non-critical surfaces and environmental objects. They are effective against certain bacteria and enveloped viruses, but their activity against spores and some resistant microorganisms may be limited. Peroxide compounds, due to their oxidizing action, are considered relatively environmentally favorable and widely used disinfectants.

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-5| 2026 Published: |22-05-2026|

Levels of decontamination of medical devices. Medical devices are divided into critical, semi-critical, and non-critical groups according to infection risk. Critical items come into contact with sterile tissues or the vascular system and therefore require sterilization. Semi-critical items come into contact with mucous membranes or damaged skin and require high-level disinfection. Non-critical items mainly come into contact with intact skin, for which low- or intermediate-level disinfection may be sufficient.

This classification helps in the rational selection of antiseptic and disinfectant agents. For example, high-level chemical sterilants are not required for ordinary surfaces used in patient care, while simple disinfection is not sufficient for instruments used in invasive procedures.

Practical importance of antiseptic and disinfectant agents. The analysis indicates that antiseptic and disinfectant agents perform complementary functions in infection prevention. Antiseptics reduce the number of microorganisms on the patient's body, thereby lowering the risk of infection during invasive procedures, surgical interventions, and patient care. Disinfectants limit the persistence and spread of pathogens in the external environment.

Hand hygiene is the most important component of this system. WHO recommendations identify hand hygiene as a key component of infection control. Alcohol-based hand antiseptics are convenient, rapid, and effective for healthcare workers; however, when visible dirt, blood, or biological fluid contamination is present, washing with soap and water remains the priority [4, 5].

Group of agents	Main application	Advantages	Limitations
Alcohol-based solutions	Hand hygiene, skin antisepsis	Rapid action, convenient use	Reduced effectiveness in organic contamination; flammable
Chlorhexidine	Surgical field, skin and mucous membrane antisepsis	Residual antimicrobial activity	May cause allergic reactions and irritation in some cases
Povidone-iodine	Antiseptic treatment of the skin and wound area	Broad-spectrum antimicrobial activity	Iodine sensitivity; may stain the skin
Chlorine compounds	Surfaces, sanitary objects	Broad-spectrum disinfection	Corrosion, odor, and irritant properties
Aldehydes	High-level disinfection	Effective for complex medical instruments	Toxicity and special safety requirements
Quaternary ammonium	Non-critical surfaces	Easy to use; safe for some surfaces	Limited activity against spores and

International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-5| 2026 Published: |22-05-2026|

compounds			some resistant microbes

Table 1. Comparative characteristics of antiseptic and disinfectant agents.

DISCUSSION

The clinical effectiveness of antiseptic and disinfectant agents is determined not only by their chemical composition but also by proper selection, storage, preparation, application, and monitoring. The same chemical substance may have different effects at different concentrations. In addition, if the recommended exposure time is not observed, the probability of incomplete microbial inactivation increases.

When antiseptic agents are used, the patient's age, skin condition, allergic history, mucosal sensitivity, and type of procedure must be considered. For example, the use of certain antiseptics requires caution in infants, pregnant women, patients prone to allergic diseases, and individuals with extensive skin lesions.

When working with disinfectants, healthcare workers must use personal protective equipment, prepare working solutions at the prescribed concentration, observe the expiration period of solutions, and avoid arbitrary mixing of chemicals. Some disinfectants, when mixed incorrectly, can produce toxic vapors or lose their effectiveness.

The WHO global report of 2024 emphasizes that strengthening infection prevention and control systems is a priority for healthcare facilities. In this context, hand hygiene, environmental cleaning, reprocessing of medical devices, staff training, and monitoring mechanisms should be considered as a unified system [1].

One of the common problems in practice is the use of antiseptic and disinfectant agents for the same purpose without proper differentiation. Some disinfectants may be dangerous when applied to the skin or mucous membranes. Conversely, some skin antiseptics may not be sufficiently strong to fully decontaminate medical instruments. Therefore, each agent should be used according to its instructions and clinical purpose.

Excessive or improper use of antiseptic and disinfectant agents may also lead to skin dryness, contact dermatitis, allergic reactions, chemical burns, respiratory irritation, and damage to medical equipment. Thus, effective infection control is achieved not by excessive use of agents, but by their appropriate, safe, and standardized application.

CONCLUSION

Antiseptic and disinfectant agents are of great importance in medical practice for infection prevention, patient safety, and maintenance of hygienic conditions in

the medical environment. Antiseptics are used on living tissues, while disinfectants are used on environmental objects and medical devices to reduce or eliminate microorganisms.

The analysis shows that the effectiveness of these agents depends on their correct selection, use at the recommended concentration, adherence to exposure time, and proper application technique. Hand hygiene, antisepsis of the surgical field, reprocessing of medical devices according to risk level, and regular disinfection of environmental surfaces are the main directions of infection control.

In conclusion, the evidence-based use of antiseptic and disinfectant agents is an important preventive measure against healthcare-associated infections, surgical complications, and the spread of microorganisms. Each healthcare facility should develop standard operating procedures for the selection, storage, preparation, application, and monitoring of these agents, and staff should be trained regularly.

PRACTICAL RECOMMENDATIONS

1. Antiseptic and disinfectant agents should be strictly differentiated according to the object of application.

2. Alcohol-based antiseptics should be used for hand hygiene; in the presence of visible contamination, washing with soap and water is recommended.

3. Disinfectants should be used only according to the manufacturer's instructions and at the prescribed concentration.

4. Medical devices should be classified into critical, semi-critical, and non-critical groups, and an appropriate reprocessing method should be selected for each category.

5. Healthcare workers should be regularly trained in disinfection, antisepsis, personal protective equipment, and chemical safety.

6. Internal monitoring and quality control should be established for the use of antiseptic and disinfectant agents.

REFERENCES:

1. World Health Organization. Global report on infection prevention and control 2024. Geneva: World Health Organization; 2024. Available from: https://www.who.int/publications/i/item/9789240103986

2. Rutala W.A., Weber D.J. Guideline for Disinfection and Sterilization in Healthcare Facilities / Healthcare Infection Control Practices Advisory Committee. Centers for Disease Control and Prevention; 2024. Available from: https://www.cdc.gov/infection-control/media/pdfs/guideline-disinfection-h.pdf

3. Centers for Disease Control and Prevention. Chemical Disinfectants: Guideline for Disinfection and Sterilization in Healthcare Facilities. CDC; 2023. Available from: https://www.cdc.gov/infection-control/hcp/disinfection-sterilization/chemical-disinfectants.html

4. World Health Organization. WHO Guidelines on Hand Hygiene in Health Care. Geneva: World Health Organization; 2009. Available from: https://www.ncbi.nlm.nih.gov/books/NBK144013/

5. World Health Organization. Hand hygiene. Infection prevention and control. WHO; 2024. Available from: https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene

6. Centers for Disease Control and Prevention. Clinical Safety: Hand Hygiene for Healthcare Workers. CDC; 2024. Available from: https://www.cdc.gov/clean-hands/hcp/clinical-safety/index.html

7. World Health Organization. Global action plan and monitoring framework for infection prevention and control 2024-2030. Geneva: World Health Organization; 2024.

8. Rutala W.A., Weber D.J. Disinfection and Sterilization in Health Care Facilities: An Overview and Current Issues. Infectious Disease Clinics of North America. 2016;30(3):609-637.

9. Kampf G. Antiseptic Stewardship: Biocide Resistance and Clinical Implications. Cham: Springer; 2018.

10. McDonnell G., Russell A.D. Antiseptics and disinfectants: activity, action, and resistance. Clinical Microbiology Reviews. 1999;12(1):147-179.