



# Hand Hygiene and the Role of Disinfectants: A White Paper

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# Abstract

Hand hygiene is a critical aspect of infection control, contributing significantly to reducing the transmission of pathogens and preventing healthcare-associated infections. Disinfectants play a crucial role in maintaining proper hand hygiene by eliminating harmful microorganisms from the skin. This white paper provides an overview of hand hygiene, the importance of hand disinfection, and the different types of disinfectants commonly used. It also explores the efficacy, guidelines, and considerations for selecting appropriate disinfectants to ensure optimal hand hygiene practices. By presenting a comprehensive analysis, backed by evidence-based research, we aim to shed light on the essential role of disinfectants as a complementary approach to handwashing, ensuring optimal infection prevention and control.

# Introduction

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Hand hygiene is universally recognised as a fundamental measure in preventing the spread of infections. It involves the removal or destruction of microorganisms from the hands to minimise the risk of transmission. While handwashing with soap and water is the preferred method, the use of disinfectants is essential when access to water and soap is limited or in healthcare settings where strict infection control measures are crucial.



# Importance of Hand Disinfection

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Healthcare-associated infections (HAI) pose a significant threat to patient safety, with hand transmission being the primary mode of pathogen spread. Extensive evidence supports the effectiveness of hand hygiene in reducing the incidence of HAIs.

Hand disinfection serves as a critical line of defence against pathogens. It helps to:

## 1 Reduce the transmission of infectious agents

Many pathogens, including bacteria, viruses, and fungi, can survive on the skin and contribute to the spread of diseases. Proper hand disinfection significantly reduces the microbial load on the hands, minimising the risk of transmission.

## 2 Prevent healthcare-associated infections (HAIs)

HAIs are a major concern in healthcare settings. Effective hand disinfection by healthcare professionals helps prevent cross-contamination between patients and reduces the incidence of HAIs.

## 3 Protect public health

Hand disinfection is not only essential in healthcare settings but also in everyday life. Regular hand disinfection can reduce the risk of common infections, such as respiratory and gastrointestinal illnesses, and contribute to overall public health.

## 4 Community-wide impact

Hand disinfection is not limited to healthcare settings alone. It plays a crucial role in preventing the transmission of infectious diseases within the wider community. By practicing regular hand disinfection, individuals can help break the chain of infection and protect vulnerable populations, including children, the elderly, and those with weakened immune systems.





## **5 Occupational settings**

Hand disinfection is vital in various occupational settings, such as food handling, childcare, hospitality, and manufacturing industries. Proper hand hygiene practices, including disinfection, are essential for preventing the contamination of food, surfaces, and products, ensuring a safe and healthy working environment.

## **6 Emerging infectious diseases**

With the constant emergence of new infectious diseases and the potential for pandemics, hand disinfection becomes even more critical. It serves as a key preventive measure in reducing the spread of novel pathogens and mitigating the impact of outbreaks.

## **7 Personal protection**

Hand disinfection not only helps protect others but also safeguards individuals from acquiring infections. By practicing regular hand disinfection, individuals can minimise the risk of self-contamination and stay healthier.

## **8 Behavioural change and education**

Promoting proper hand disinfection requires effective communication and education. By raising awareness about the importance of hand disinfection and providing education on proper techniques, we can encourage behavioural change and enhance overall hygiene practices in both healthcare and non-healthcare settings.

# Challenges with Hand Hygiene

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Despite the proven benefits of hand hygiene, compliance rates among healthcare workers (HCWs) remain sub-optimal, with published studies reporting rates below 50%. Various factors contribute to non-compliance, including inadequate placement of dispensers or sinks, time constraints, forgetfulness or distraction, ineffective education, lack of accountability, skin irritation concerns, language and cultural barriers and insufficient safety culture.

Occupational dermatitis is often attributed to ABHR, but in reality, soap and water have a more significant impact on skin condition. Hence, selecting ABHR products that prioritise efficacy, skin-health and user-safety should be a crucial factor.

Addressing these challenges requires a multi-faceted approach, including comprehensive education and training programs, implementation of effective monitoring systems, fostering a positive safety culture, ensuring easy access to hand hygiene products, and addressing systemic issues such as workload and staffing levels. By addressing these challenges, healthcare facilities can improve hand hygiene compliance and ultimately enhance patient safety and reduce healthcare-associated infections.



# Critical Moments for Hand Hygiene

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The WHO recognises five critical moments when hand hygiene should occur:

## 1 Before patient contact

Prior to any direct contact with a patient, it is crucial to perform hand hygiene. This helps prevent the transmission of microorganisms from the hands to the patient.

## 2 Before an aseptic task

Before undertaking any aseptic procedures, such as inserting an intravenous line or performing a surgical procedure, hand hygiene should be practiced. This reduces the risk of introducing pathogens into sterile areas or the patient's body.

## 3 After exposure to body fluids

Following any contact with body fluids, such as handling wound dressings or assisting with patient care involving bodily secretions, hand hygiene is imperative. This minimises the potential transmission of pathogens from contaminated surfaces to oneself or others.

## 4 After patient contact

After every interaction with a patient, it is essential to perform hand hygiene. This includes situations where physical contact may not have occurred but contact with the patient's immediate environment or belongings has taken place.

## 5 After contact with patient surroundings

Once contact with the patient's immediate surroundings, equipment, or the healthcare environment has occurred, hand hygiene should be performed. This helps prevent cross-contamination and the spread of pathogens to other patients or healthcare settings.





# Differential Effect of Soap and ABHR on the Skin

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Hand hygiene in healthcare facilities involves a combination of soap and water and ABHR. Soap usage, particularly surfactants, can damage the stratum corneum (SC) by dissolving lipids, compromising the skin's barrier function, and reducing water-holding capacity. Soap-induced skin damage leads to dryness, flakiness, inflammation, and increased sensitivity to subsequent insults.

The effects of soap and ABHR on the skin can vary depending on individual factors such as skin type, pre-existing skin conditions, and personal sensitivities. Some individuals may be more prone to experiencing adverse effects from soap, while others may tolerate it well. Recognising

these individual differences and tailoring hand hygiene practices accordingly can help promote better skin health.

In contrast, ABHRs containing ethanol have minimal impact on the SC and are generally milder on the skin. Shifting hand hygiene behaviours from soap to ABHR can significantly reduce the incidence of irritant contact dermatitis (ICD) and promote better skin health. Furthermore, water-based disinfectants such as SANI-99™, which is neither soap nor alcohol-based, provide an alternative choice for hand hygiene that can minimise the potential for skin irritation and offer a more skin-friendly solution.

# Impact of Hand Hygiene Regimens on Skin

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The frequency of hand hygiene events in healthcare facilities, particularly in high compliance environments, can result in increased exposure to hand hygiene products and potential skin damage. HCW are often expected to perform numerous hand hygiene events per hour, amplifying the risk of skin irritation. Studies have shown that average hand hygiene compliance rates are below 50%, highlighting the need for better regimens and products. A pilot study demonstrated that increasing the frequency of ABHR use to over 100 times per day resulted in significantly higher trans-epidermal water loss (TEWL) and skin damage, indicating that ABHR alone may not address the skin health needs in very high compliance environments. Again, products such as SANI-99™ offer hand hygiene which is neither soap or alcohol based and is therefore better for the skin in high compliance settings.



# Recommendations

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Hand hygiene is a critical measure for reducing healthcare-associated infections, but the intensified focus on compliance has led to potential skin health issues among HCW. Existing product formulations, including soap and ABHR, may not adequately address the skin health needs arising from very high compliance environments. It is essential to develop products specifically designed to meet the demands of these situations while promoting optimal skin health, such as SANI-99™.

Healthcare facilities should prioritise the selection and use of hand hygiene products that minimise skin damage and promote compliance, whilst advocating for continued research and development efforts to improve disinfectant formulations specifically tailored for hand hygiene.

We should encourage further collaboration between healthcare facilities, manufacturers, regulatory bodies, and infection prevention experts. This collaboration can foster the exchange of knowledge and expertise to develop guidelines and best practices for the use of disinfectants in hand hygiene that prioritise both efficacy and skin health.

More research is also needed around the compatibility of disinfectants with commonly used Personal Protective Equipment (PPE), such as gloves. Recommending a selection of disinfectants that are compatible with PPE materials to prevent degradation and maintain the integrity of protective equipment.

By addressing the specific skin health needs of HCW in high compliance environments, healthcare-associated infections can be effectively prevented while safeguarding the well-being of healthcare workers.

# Types of Disinfectants

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Several types of disinfectants are available for hand hygiene practices. These include:



## 1 SANI-99™

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This water-based medical-grade product has proven to be a perfect balance between a high level of efficacy and safety. Regular use doesn't damage the skin and no PPE is required, and no special procedures are required to dispose of the product. In fact, by disposing of SANI-99™ in the water system has proven to be beneficial. SANI-99™ kills a wide range of bacteria and viruses and its active ingredient is ECCA approved.



## 2 Chlorhexidine gluconate

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Chlorhexidine-based products possess excellent antimicrobial activity and persistent effects. They are commonly used in healthcare settings, particularly in surgical hand preparations.



## 3 Iodine-based disinfectants

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Iodine solutions or iodophors are effective against a wide range of microorganisms. They are used for surgical hand disinfection and in some specific situations.



#### 4 Quaternary ammonium compounds (QACs)

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QACs are commonly found in hand sanitisers used in non-healthcare settings. They have good antimicrobial activity but may be less effective against certain viruses and spores.



#### 5 Triclosan

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Triclosan, an antimicrobial agent, has been used in some hand sanitisers and soaps. However, due to concerns about bacterial resistance, its use has been restricted in some regions.



#### 6 Alcohol-based hand sanitisers

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These sanitisers typically contain high concentrations of ethanol or isopropyl alcohol, which act as the active ingredients. When applied to the hands, these sanitisers can kill a wide range of microorganisms, including bacteria and viruses. However, one significant concern is with repeated use they can lead to skin irritation and dryness, which may further progress into Dermatitis.

# Efficacy and Guidelines for Hand Disinfection

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## **a** Efficacy

The effectiveness of a disinfectant depends on factors such as the concentration of the active ingredient, contact time, and proper application technique. SANI-99™, which contains zero alcohol has proven in many European Norm tests, to be highly effective against most virulent pathogens. These tests provide evidence of SANI-99™'s effectiveness and its ability to meet the demands of hand disinfection in various settings.

## **b** Guidelines

Various organisations, including the World Health Organization (WHO) and the NHS, provide comprehensive guidelines for hand hygiene practices. These guidelines specify the correct techniques for hand disinfection and the recommended types of disinfectants for different settings.



# Considerations for Disinfectant Selection

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Improving disinfectants is essential for enhancing infection control measures in various settings. Advances in spectrum of activity, persistence, environmental compatibility, delivery systems, synergy with other measures, and rapid-acting formulations can collectively contribute to more effective disinfection protocols.



## Enhanced Spectrum of Activity

Effective disinfectants should possess a broad spectrum of activity to combat a wide range of microorganisms. Scientists and researchers can focus on developing disinfectants that target multiple pathogens, including bacteria, viruses, fungi, and protozoa. By expanding the spectrum of activity, disinfectants can offer comprehensive protection against a variety of infectious agents, reducing the risk of cross-contamination and outbreaks. Those making decisions about infection control and ordering new disinfectants need to ensure disinfectants have a broad spectrum of activity.



## Increased Persistence and Residual Efficacy

One critical improvement in disinfectants lies in enhancing their persistence on surfaces and residual efficacy over time. Traditional disinfectants may lose their effectiveness shortly after application, requiring frequent reapplication. By formulating disinfectants with prolonged persistence, they can provide longer-lasting protection against microbial colonisation, reducing the need for repeated application and minimising the risk of infection transmission.



## Advanced Environmental Compatibility

As society becomes more environmentally conscious, there is a growing demand for disinfectants that are eco-friendly and sustainable. Researchers should focus on developing disinfectants that are biodegradable, non-toxic to humans and animals, and have minimal impact on ecosystems. Innovations in green chemistry can pave the way for environmentally compatible disinfectants without compromising their antimicrobial efficacy.



## Innovative Delivery Systems

The effectiveness of disinfectants can be further improved by developing innovative delivery systems. For example, incorporating disinfectants into nanotechnology-based carriers or encapsulating them in polymers can enhance their stability, control release, and target specific areas. These advancements enable better penetration into hard-to-reach surfaces, increase contact time, and enhance disinfection efficacy, especially in complex healthcare settings.



## Synergy with Other Infection Control Measures

Disinfectants should be designed to complement other infection control measures, such as hand hygiene and surface cleaning. Integration of disinfectants with antimicrobial coatings, engineered materials, or self-cleaning surfaces can create synergistic effects, providing a multi-layered defence against microbial contamination. Such innovations can reduce the reliance on a single intervention and enhance overall infection control effectiveness.



## Rapid-Acting Formulations

In certain situations, rapid disinfection is paramount. Developing disinfectants with quick action and minimal contact time can be invaluable, particularly in high-risk environments such as healthcare facilities or during disease outbreaks. Rapid-acting formulations such as SANI-99™ would allow for efficient disinfection without compromising efficacy, ensuring prompt control of pathogens and reducing the potential for transmission.



## Safety for Users

The safety of healthcare workers and other individuals using the disinfectant is paramount. Select disinfectants that have been thoroughly evaluated for their safety profile, including potential skin and respiratory irritants. Look for products with low toxicity, minimal allergenic potential, and clear instructions for safe handling and use.



## Compatibility with Surfaces and Materials

Different surfaces and materials may have specific requirements for disinfectant compatibility. Ensure that the selected disinfectant is compatible with the surfaces commonly found in healthcare settings, such as stainless steel, plastics, or electronics. Using incompatible disinfectants may lead to surface damage or reduced efficacy.



## Ease of Use and Convenience

Consider the ease of use and convenience of the disinfectant product. Look for options that are easy to handle, require minimal preparation, and have clear instructions for use. These products can enhance efficiency and compliance with disinfection protocols.



## Cost-Effectiveness

Evaluate the cost-effectiveness of the disinfectant, considering factors such as the price per unit, required dosage, and effectiveness against target pathogens. Conduct a thorough cost analysis, including factors like storage requirements, shelf life, and any additional equipment needed for application.





## Regulatory Compliance

Ensure that the selected disinfectant meets regulatory standards and guidelines established by relevant authorities. Consider certifications and approvals from regulatory bodies, as these indicate that the product has undergone rigorous testing and meets established efficacy and safety standards.



## Accessibility and Availability

Assess the availability and accessibility of the disinfectant product. Consider factors such as the manufacturer's reliability, supply chain stability, and the product's ability to meet the demand of your healthcare facility consistently.



## Scientific Evidence and Research

Review the scientific evidence supporting the effectiveness of the disinfectant. Look for published studies, clinical data, and real-world application data that demonstrate its efficacy in reducing pathogen transmission. Evidence-based selection ensures a higher level of confidence in the chosen disinfectant's performance.



## Training and Support

Consider the availability of training resources, technical support, and customer service provided by the manufacturer or supplier. Accessible training materials and ongoing support can help healthcare workers correctly use the disinfectant and address any concerns or questions that may arise.



# New Innovations: The Future of Disinfectants

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Healthcare facilities must carefully select disinfectants based on their efficacy against the most common and clinically significant pathogens encountered in healthcare settings. However, most consumers are unaware of the many ways in which disinfectants can harm one's health. By their very nature, all chemical disinfectants are potentially harmful or toxic to living organisms, including humans. While disinfectants are intended to protect us from getting sick, they're a bit of a double-edged sword. Many disinfectants contain volatile organic compounds, known as VOCs, which have been known to cause chronic respiratory and other health related problems. They can also trigger allergies and asthma, cause cancer and autoimmune diseases and damage one's skin.

There are new solutions to this problem though. SANI-99™, for example, is a powerful, medical grade and eco-friendly disinfectant that has been developed to target and kill pathogens. Completely free of either alcohol and chlorine, which along with its extraordinary efficacy, potency and safety - this disinfectant that can be used on any hard surface or as a hand sanitiser. It is almost 2,000 times more potent than concentrated (undiluted) bleach (per million pathogens) and infinitely safer as well as being longer lasting than standard disinfectants.

As has been discussed above, there are many aspects to look at when choosing new disinfectant products but efficacy, increased lasting effect, plus safety, we believe make SANI-99™ one to watch for the NHS and wider worldwide healthcare industry.





# The Solution

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Effective hand hygiene programs require comprehensive education and training for HCWs. Initial and regular education sessions should be provided to ensure that HCWs understand when and how to perform hand hygiene correctly. Discipline-specific training that contextualises hand hygiene within daily work processes is essential. Monitoring compliance rates and providing feedback to HCWs are strongly encouraged to reinforce adherence to established protocols.

# Conclusion

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Hand hygiene is a critical element in ensuring patient safety within healthcare facilities. To establish and maintain effective hand hygiene practices, it is crucial to select products that are designed to be efficacious, promote skin health, and provide a pleasant user experience. Additionally, comprehensive education, monitoring compliance, and providing feedback to HCWs are vital components of a successful hand hygiene program. Strategies for improvement should be multi-modal and multi-disciplinary. By prioritising hand hygiene and implementing the recommended guidelines and strategies, healthcare facilities can significantly reduce the risk of healthcare-associated infections and improve overall patient outcomes.



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## About Scientific Sanitation Solutions

Scientific Sanitation Solutions (Scisan) is a pioneering and diverse UK based organisation that is driven by innovation, technology, and science to redefine the future of water sanitation, disinfection, and organic farming. By combining scientific expertise with a deep understanding of sustainability, they create solutions that address the pressing challenges of today while paving the way for a greener future.

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