



CLINICAL

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THE FIRST STEP IN INFECTION CONTROL IS HAND HYGIENE

Clean hands are more than a matter of soap and water

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When I started my career as a dental assistant in the seventies, we didn't wear gloves. We spent a lot of time washing our hands before and after each patient. However, this didn't help one of my co-workers when she accidentally stuck her thumb with a scaler. The bacteria on her hand caused a staph infection to develop. The muscle tissue around the wound became necrotic and had to be surgically removed. After months of painful recuperation, she was finally able to return to work but holding dental instruments without the padding of her thumb was uncomfortable.

Today as dental professionals, we diligently wash our hands to remove bacteria and other organisms. We don new gloves for each patient and then wash our hands again after removing gloves. We might wash our hands as many as fifty times per day, maybe more. If we don't pay attention to what products we put on our hands, we could subject our hands to painful irritation, damage, dryness or discomfort.

Evidence supports the premise that improved hand hygiene can reduce health care associated infection rates. Failure to perform appropriate hand hygiene is considered one of the leading causes of health care associated infections and has been recognized as a substantial contributor to outbreaks. However, frequent and repeated use of hand hygiene products, particularly soaps and other detergents, are a primary cause of chronic irritant contact dermatitis among health care workers.¹ Discomfort due to irritation can interfere with adherence to recommended hand hygiene practices. This article will address the selection of hand hygiene

products and recommendations for performing proper hand hygiene in accordance with the CDC Guidelines.

History of hand hygiene

According to the 2002 Centers for Disease Control (CDC) guidelines for hand hygiene in health care settings, the concept of cleansing hands with an antiseptic agent probably emerged in the early 19th century. In 1961, the U.S. Public Health Service produced a training film on hand washing techniques directing health care workers to wash their hands with soap and water for 1–2 minutes before and after patient contact.

In 1975 and 1985, (CDC) issued written guidelines on hand washing practices in hospitals. The guidelines recommended hand washing with non-antimicrobial soap between the majority of patient contacts and washing with antimicrobial soap before and after performing invasive procedures or caring for patients at high risk. Use of waterless antiseptic agents (e.g., alcohol-based solutions) was recommended only in situations where sinks were not available.¹ However, this recommendation has changed. The current *CDC Guidelines for Hand Hygiene in Health Care Settings* issued in October 2002 state that alcohol-based hand rubs are recommended for routine decontamination of hands for all clinical indications (except when hands are visibly soiled) and as one of the options for surgical hand hygiene.

Selection of hand hygiene products

There are a variety of preparations used for hand hygiene, from plain soap to waterless antiseptic agents. In the United States, antiseptic hand wash products intended for use by health care workers are regulated by the Food and Drug Administration (FDA) Center for Drug Evaluation and Research, Office of Drug Evaluation IV, Over-the-Counter Drug Products. Below are some examples of preparations used for hand hygiene.

- Plain Soap
- Alcohols
- Chlorhexidine
- Chloroxylenol
- Hexachlorophene
- Iodine and Iodophors
- Quaternary Ammonium Compounds
- Triclosan

The proper selection of hand hygiene products can help reduce the colonized bacteria that are present on hands. This bacteria is divided into two categories; transient flora and resident flora. Transient flora are considered the contaminating flora, and most likely to be associated with infection. Transient flora are easily removed by hand washing. Resident flora are attached to the deeper layers of the skin and are more difficult to remove. Resident flora are less likely to be associated with infection.

The preferred method for hand hygiene depends on the type of procedure, the degree of contamination and the desired persistence of antimicrobial action on the skin. For routine dental examinations and nonsurgical procedures, hand washing and hand antisepsis is achieved by using either plain or antimicrobial

soap and water. If the hands are not visibly soiled, hand antisepsis can also be achieved through using an alcohol-based hand rub.

Plain soaps are detergent based products which can remove dirt, soil and other organic materials from the hands. Plain soap and water can remove transient flora from the hands but have minimal antimicrobial activity.

An antiseptic handwash is performed with water and an antimicrobial soap. Types of antimicrobial soaps include products that contain triclosan, chlorhexidine, iodine and iodophors or chloroxylenol. The purpose of an antiseptic hand wash is to remove or destroy transient microorganisms and reduce resident flora.

Frequent hand washing with soap and water can be irritating to skin. The 2003 CDC Guidelines cite that the use of alcohol-based hand rubs containing various emollients were better tolerated by health care workers than washing hands with non-antimicrobial soaps or antimicrobial soaps.

Antiseptic hand rubs are waterless, alcohol-based products that may include antiseptics such as triclosan, chlorhexidine, quaternary ammonium compounds or octenidine. The purpose of an antiseptic hand rub is to remove or destroy transient microorganisms and reduce resident flora.

Alcohols are rapidly germicidal when applied to the skin but are not appropriate for use when hands are visibly soiled or contaminated with proteinaceous materials. The antimicrobial activity of alcohols can be attributed to their ability to denature proteins. Alcohol solutions containing 60–95 percent alcohol are most effective for killing bacteria (*Figure 1 below*). Higher concentrations are less potent because proteins are not denatured easily in the absence of water.¹

Surgical antisepsis is performed with water and antimicrobial soap or plain soap followed by an alcohol-based surgical hand-scrub with persistent activity. The purpose of surgical hand anti- ➤



Figure 1

METHODS	AGENT	PURPOSE	AREA	DURATION (minimum)
Routine Handwash	Water and non-antimicrobial soap (i.e., plain soap ¹)	Remove soil and transient ² microorganisms	All surfaces of the hands and fingers	15 seconds ³
Antiseptic handwash	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan)	Remove or destroy transient microorganisms and reduce resident ⁵ flora (persistent activity) ⁸	All surfaces of the hands and fingers	15 seconds ³
Antiseptic handrub	Alcohol-based handrub ⁴	Remove or destroy transient microorganisms and reduce resident ⁵ flora (persistent activity) ⁸	All surfaces of the hands and fingers	Until the hands are dry
Surgical Antiseptics	Water and antimicrobial soap (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan) Water and non-antimicrobial soap (i.e., plain soap ¹) followed by an alcohol-based surgical hand scrub product with persistent activity	Remove or destroy transient microorganisms and reduce resident flora (persistent activity)	Hands and forearms ⁶	2-6 minutes Follow manufacturer instructions for surgical hand scrub product with persistent activity ⁷

Figure 2

Footnotes for Figure 2

1. Pathogenic organisms have been found on or around bar soap during and after use. Using liquid soap with hands-free controls for dispensing is preferable.
2. Transient microorganisms often acquired by health care personnel during direct contact with patients or contaminated environmental surfaces. Transient microorganisms most frequently associated with health-care-associated infections and are more amenable to removal by routine hand washing than resident flora.
3. Time reported as effective in removing most transient flora from the skin. For most procedures, a vigorous, brief (at least 15 seconds) rubbing together of all surfaces of premoistened lathered hands and fingers followed by rinsing under a stream of cool or tepid water is recommended. Hands should always be dried thoroughly before donning gloves.
4. Resident flora are species of microorganisms that are always present on or in the body; not easily removed by mechanical friction; and less likely to be associated with health-care-associated infections.
5. Waterless products (e.g., alcohol-based hand rub) are especially useful when water facilities are unavailable (e.g., during dental screenings in schools) or during boil-water advisories. Alcohol-based hand rubs should not be used in the presence of visible soil or organic material.
6. Removal of all jewelry, washing as described above, holding the hands above the elbows during final rinsing, and drying the hands with sterile towels.
7. Before beginning surgical hand scrub, remove all arm jewelry and any hand jewelry that may make donning gloves more difficult, cause gloves to tear more readily, or interfere with glove usage (e.g., ability to wear the correct-sized glove or altered glove integrity).
8. Persistent activity. Prolonged or extended activity that prevents or inhibits proliferation or survival of microorganisms after application of a product. Previously, this property was sometimes terms residual activity.

sepsis is to eliminate transient flora and reduce resident flora for the duration of a procedure to prevent introduction of organisms in the operative wound if gloves become punctured or torn. Skin bacteria can rapidly multiply under surgical gloves if hands are washed with soap that is not antimicrobial. Agents used for surgical hand antisepsis should substantially reduce microorganisms on intact skin, contain a nonirritating antimicrobial preparation, have a broad spectrum of activity, be fast-acting, and have a persistent effect.³

For an overview of hand hygiene methods and agents discussed above, please refer to Figure 2 (*opposite page*).

The primary function of the skin is to reduce water loss, provide protection against abrasive action and microorganisms, and act as a permeability barrier to the environment.¹ The primary defense against infection and transmission of pathogens is healthy, unbroken skin.³ Lotions are often recommended to ease the dryness resulting from frequent hand washing or hand antisepsis. When selecting hand lotions or barrier cream, be sure to choose a medical grade product. Hand lotions and creams that contain humectants and various fats and oils can increase skin hydration and replace altered or depleted skin lipids that contribute to the barrier function of normal skin.

Several controlled trials have demonstrated that regular use (e.g., twice a day) of such products can help prevent and treat irritant contact dermatitis caused by hand hygiene products.¹ These products should be compatible with latex gloves and not interfere with antimicrobial properties of chlorhexidine gluconate (CHG). In addition, petroleum-based lotion formulations can weaken latex gloves and increase permeability. For that reason, lotions that contain petroleum or other oil emollients should only be used at the end

of the work day to help lock in moisture after a day of sanitizing and washing.³

Is your hand washing protocol effective?

Effective hand washing is accomplished by wetting hands and applying an antimicrobial or plain soap. The next step includes vigorously rubbing hands together to create a lather covering all the surfaces of the palms, tops of the hands, between the fingers, base of the fingers and thumbs, backs of the fingers, wrists and fingernails. The hands should then be rinsed thoroughly to remove all the lather. Washing and rinsing should be performed with cool water as hot water can be drying to skin. Remember not to touch the faucet with freshly washed hands; use a paper towel to turn the water off.

To facilitate better hand washing and ease of donning gloves, fingernails should be no longer than one-quarter inch from the nail bed. Hand carriage of gram negative organisms has been determined to be greater among wearers of artificial nails than among non-wearers, both before and after hand washing. In addition, artificial fingernails or extenders have been epidemiologically implicated in multiple outbreaks involving fungal and bacterial infections in hospital intensive care units and operating rooms. Freshly applied nail polish on natural nails does not increase the microbial load from periungual skin if fingernails are short; however, chipped nail polish can harbor added bacteria.³

Wearing jewelry, such as rings, can make effective hand hygiene more difficult. Several studies have demonstrated that skin underneath rings is more heavily colonized than comparable areas of skin on fingers without rings. One study found that 40 percent of nurses tested harbored gram-negative bacilli on skin

under rings and that certain nurses carried the same organism under their rings for several months.¹

The amount of time spent washing hands is important to reduce the transmission of pathogens to other people and environmental surfaces. Drying hands thoroughly is also important. Wet hands have been known to transfer pathogens much more readily than dry hands or hands not washed at all. The residual moisture determines the level of bacterial and viral transfer following hand washing.⁴ Hands should be completely dry prior to donning gloves as moisture trapped under gloves can cause irritation to skin.

Summary

A dental health care worker (DHCW) has an obligation to prevent the spread of health care associated infections. Adhering to proper hand hygiene procedures, selecting appropriate hand hygiene products and the use of gloves are all important elements of infection control. The *CDC Guidelines for Hand Hygiene* state that improved hand hygiene practices can reduce transmission of pathogenic microorganisms to patients and personnel in health care settings.

DHCWs must also protect themselves by recognizing pitfalls such as irritants or allergies that may pose obstacles to proper hand hygiene. Occupational irritants and allergies can be caused by frequent hand washing, exposure to hand hygiene products, exposure to chemicals and shear forces associated with wearing or removing gloves.

Since the primary defense against infection and transmission of pathogens is healthy, unbroken skin, DHCWs must take steps to ensure that their skin remains healthy and intact. These steps include evaluating different types of hand hygiene products, lotions and gloves for

the best compatibility. If the DHCW sees a breakdown of his or her skin barrier, steps should be taken to determine the cause and remedy. Remedies can include the use of alcohol-based hand sanitizers containing emollients and moisturizers and regular use of a medical grade hand lotion. The bottom line: healthy skin protects you at work and at home. Selection and use of appropriate hand hygiene products, including moisturizers, are an essential part of a dental office infection control program.

My coworker lost the use of her thumb for several months due to complications of a staph infection. She was unable to work and found even simple tasks such as closing a button hard to do. Think of how difficult your work would be if something happened to your hands. Injury, irritation or allergies could alter your ability to work or even perform routine tasks. Our hands provide us with the ability to work in clinical dentistry. It makes good sense to protect your hands, your most valuable tools. ❖

Resources

Centers for Disease Control
and Prevention (CDC.gov)

Guideline for Hand Hygiene
in Health-Care Settings—2002

Guidelines for Infection Control in
Dental Health-Care Settings—2003

The Organization for Safety,
Asepsis and Prevention
(www.OSAP.org)

The Association for Professionals
in Infection Control and
Epidemiology (www.APIC.org)

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