

***In* CONTROL**

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DENTAL INFECTION CONTROL AND SAFETY COURSE

2003 ORGANIZATION FOR SAFETY AND ASEPSIS PROCEDURES (OSAP) ANNUAL SYMPOSIUM

FROM THE LITERATURE

STERILIZATION MONITORING

HAND HYGIENE (INCLUDING INFORMATION ON ALCOHOL-BASED HANDRUBS)

SMALLPOX UPDATE

INFECTION CONTROL Q & A

CONTINUING EDUCATION

HAND HYGIENE OVERVIEW (ATTACHMENT 1)

SMALLPOX DISEASE (ATTACHMENT 2)

The year 2003 was off to a great start with our OSAP/Federal Services Dental Infection Control and Safety Course in Atlanta. The program was very successful. It was a wonderful opportunity to meet many of you and for everyone to share their infection control experiences and ideas. For those of you unable to attend this year, mark your calendars for next January.

This edition of InControl introduces an opportunity for federal dental service personnel to earn one hour of infection control continuing education. To answer some of the questions you may have about the CE program, please visit our Frequently Asked Questions (FAQ) page.

If you have any ideas or would like to contribute to this publication, please do not hesitate to contact me. As always I am available to answer your individual calls, e-mails, or letters. My contact information is:

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DENTAL INFECTION CONTROL AND SAFETY COURSE

In 2001, the United States Air Force developed a partnership with the Organization for Safety and Asepsis Procedures (OSAP) to conduct the Dental Infection Control and Safety Course. The second annual co-sponsored course was held in Atlanta, GA 27-31 January 2003 with over 120 attendees from the Air Force, Army, Navy, Public Health Service, Veterans Administration, and civilian institutions and practices. The next course is scheduled for 27-30 January 2004 in Atlanta, GA. Planning is underway for the 2004 course and as soon as registration information is available it will be posted on the DIS and OSAP Web sites.

January 2004						
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2003 ORGANIZATION FOR SAFETY AND ASEPSIS PROCEDURES (OSAP) ANNUAL SYMPOSIUM



The 2003 Organization for Safety and Asepsis Procedures (OSAP) Annual Symposium will be conducted from 19-22 June in Tucson, AZ. The meeting will feature the latest information on dental infection control and office safety issues. This annual symposium offers a unique opportunity to exchange ideas with top experts in the field of dental infection control and safety, and provides

a wealth of information on new developments. Contact OSAP for information on the upcoming symposium.

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FROM THE LITERATURE



Reviews of the following infection control articles can be found in **DIS # 68**.

Adverse reactions associated with an alcohol-based hand antiseptic among nurses in a neonatal intensive care unit. Cimiotti JP, Marmur ES, Nesin M, Hamlin-Cook P, Larson EL. *Am J Infect Control* 2003;31:43–48.

Allergic contact dermatitis in dental professionals. Hamann C, Rodgers PA, Sullivan K. *J Am Dent Assoc* 2003;134:185–194.

Clearance of biofilms from dental unit waterlines through the use of hydroperoxide ion-phase transfer catalysts. Shepherd PA, Shojaei MA, Eleazer PD, Stewart AV, Staat RH. *Quintessence Int* 2003;32:755–761.

Evaluation of aloe vera gel gloves in the treatment of dry skin associated with occupational exposure. West DP, Zhu YF. *Am J Infect Control* 2003;31:40–42.

Local anesthetic cartridges and latex allergy: a literature review. Shojaei AR, Haas DA. *J Can Dent Assoc* 2002;68:622–626.

Managing the care of patients infected with bloodborne diseases. DePaola LG. *J Am Dent Assoc* 2003;134:350–358.

Nosocomial transmission of hepatitis C virus associated with the use of multidose saline vials. Krause G, Trepka, MJ, Whisenhunt RS, Katz D, Nainan O, Wiersma ST, Hopkins RS. *Infect Control Hosp Epidemiol* 2003;24:122–127.

Occupationally acquired human immunodeficiency virus (HIV) infection: national case surveillance data during 20 years of the HIV epidemic in the United States. Do AN, Ciesielski CA, Metler RP, Hammett TA, Li J, Fleming PL. *Infect Control Hosp Epidemiol* 2003;24:86–96.

Portable dentistry in an austere environment. Meyer RD, Eikenberg, S. *Gen Dent* 2002;50:416–419.

Surface contamination in the dental operator: a comparison over two decades. Williams HN, Singh R, Romberg E. *J Am Dent Assoc* 2003;134:325–330.

STERILIZATION MONITORING

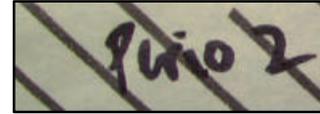
Sterilization monitoring is an essential infection control process. Monitoring not only evaluates the sterilizer performance, but also personnel performance and the materials used. Attention to all aspects of the sterilization process will help achieve and maintain the sterility of processed items (e.g., orientation and continuing education for personnel staffing the dental instrument processing center [DIPC], sterilization monitoring, sterilization, visual inspection of packaging materials, maintaining appropriate documentation). The sterilization procedure should be monitored routinely by using a combination of mechanical, chemical, and biological indicators to evaluate the sterilizing conditions.

Mechanical monitoring of each sterilization cycle involves observing gauges, displays, or computer printouts on the equipment for correct temperature, pressure, and exposure time. Correct readings do not guarantee sterilization, however incorrect readings may be the first indication that a problem has likely occurred.



Chemical indicators use sensitive chemicals (vs. live spores as in biological monitoring) to assess the physical conditions during the sterilization process. Chemical indicators do not verify sterility, but they do allow detection of certain equipment malfunctions, and they may help in identifying certain procedural errors. A chemical indicator should be placed within each package; when the indicator is not visible from the outside of the package, a separate chemical indicator should be used on the exterior of the package. If a chemical indicator suggests inadequate processing, the item should not be used.

External indicators (e.g., sterilizer indicator tape, special markings on sterilization bags) used on the outside of packages or cassettes demonstrate exposure to the sterilization process. The indicator should be examined after sterilization and before use of the item to verify that the item has been exposed to the sterilization process. This can prevent the accidental clinical use of nonsterilized items.



Internal indicators should be used within each package or cassette to be sterilized to ensure the sterilizing agent penetrated the packaging material and actually reached the instruments inside. A single-parameter internal indicator only provides information about one sterilization parameter (i.e., time, temperature, or pressure). Multi-parameter indicators are designed to react to two or more parameters (i.e., time and temperature or time, temperature, and the presence of steam) and can provide a more reliable indication that sterilization conditions have been met. Presently, multi-parameter indicators are only available for steam sterilizers (i.e., autoclaves).



Biological indicators (i.e., spore tests) are the most valid method for monitoring the sterilization process because they assess the sterilization process directly by using the most resistant microorganisms, and not by merely testing the physical and chemical conditions necessary for sterilization. The type of biological indicator selected must be appropriate for the sterilization process being used. The incubation time and temperature varies depending on the type of test used. Follow manufacturer instructions for placement and incubation recommendations.



Spore testing must be performed at least weekly on all sterilizers including sterilizers considered “ready-to-use” as a “back-up”. A biological indicator must be used in each load containing an implantable device and the implantable device should not be used until the results are known to be negative. A control biological indicator (not processed through the sterilizer) from the same lot as the test biological indicator should be incubated in the same manner as the test biological indicator. The control biological indicator should yield positive results for bacterial growth. All biological indicator test results, including the control results, should be documented in the sterilization records.



Various types of biological indicators are available and the type used depends on the specific needs, resources, and sterilization equipment being used in the facility. In the past, biological indicators required up to seven days of incubation, however a biological indicator with enzyme-based early-readout capability is now available and can provide results in as early as one hour. This enzyme-based early-readout biological indicator can provide test results and feedback on the sterilization cycle on a timelier basis. To be most effective, the enzyme-based early-readout biological indicator should be used in each sterilization cycle.

When using the enzyme-based early-readout biological indicator, the following three conditions must also be met:

- The biological indicator must be used within an appropriate challenge test pack.
- Mechanical and chemical monitoring processes must be performed.
- The performance of the sterilization process must be periodically verified **on at least a weekly** basis, including the use of a control biological indicator. The periodic verification may be either continued incubation of the biological indicator with enzyme-based early-readout capability (according to manufacturer's instructions) or the use of a conventional biological indicator.

Spore Testing Indications

WHEN	WHY
Once per week	To verify proper use and function
Whenever a new type of packaging material or cassette is used	To ensure the sterilizing agent is getting inside to the surface of the instruments
After training of new sterilization personnel	To verify proper use of the sterilizer
During initial uses of a new sterilizer*	To make sure unfamiliar operating instructions are being followed
First run after repair of a sterilizer*	To make sure the sterilizer is functioning properly
With every implantable device	Extra precaution for sterilization of an item to be implanted into tissues
After any other change in the sterilizing procedure*	To make sure change does not prevent sterilization

* enzyme-based early-readout biological indicators should not be used for these assessments
 Adapted from: Miller CH, Palenik CJ. Instrument processing. In: Miller CH, Palenik DJ, eds. Infection Control and Management of Hazardous Materials for the Dental Team, 2nd ed St. Louis: Mosby: 1998;159 and Association for the Advancement of Medical Instrumentation. Steam sterilization and sterility assurance in health care facilities. Arlington, VA: AAMI, 2002 in ANSI/AAMI ST46-2002.

What To Do When A Spore Test Is Positive

Positive biological indicator test results should be documented and reported immediately. The sterilizer should not be used until it has been inspected or repaired. Recall instrument packs from the suspect load, as they may not be sterile. Review all records of chemical and mechanical monitoring since the last negative test. Review sterilizer-operating procedures including packaging, loading, and spore testing with all those who work in the DIPC. The sterilizer can be returned to service following a medical equipment repair evaluation and/or repairs, and three consecutive negative spore tests.

Sterilizer Documentation

Sterilization records are a component of an overall quality assurance program. Minimum documentation should include, but not be limited to:

- Type of sterilizer and cycle used.
- Load identification number and contents.
- Mechanical (e.g., exposure time and temperature), chemical, and biological monitoring results.
- Operator's name.
- Air removal test results (only applicable for prevacuum steam sterilizers).
- Nature and date of any malfunctions or repairs.

If the sterilizer is equipped with a printer or other automated system, the printout may be maintained as the record of sterilizer performance. Maintain records according to local policy or two years, whichever is longer.

In summary, all personnel staffing the DIPC should be properly trained. Important aspects of a sterility assurance program include mechanical monitoring of each sterilization cycle, placing chemical indicators on the inside and outside of each package or cassette, and at least weekly spore testing (including a control indicator) of each sterilizer. Because the results of mechanical and chemical monitoring are

obtained immediately following the sterilization cycle, they may provide the first indication of a problem with the sterilizer since spore test results are not usually obtained immediately. It is this entire process that ensures instruments are sterile before being used on patients.

Selected References:

Association for the Advancement of Medical Instrumentation. Steam sterilization and sterility assurance in health care facilities. Arlington, VA: AAMI, 2002 in ANSI/AAMI ST46-2002.

Association of Perioperative Registered Nurses. AORN standards and recommended practices for perioperative nursing. Denver, CO: AORN, 1987. Section III:14.1-III:14.11.

Association of Perioperative Registered Nurses. Recommended practices for sterilization in perioperative practice settings. In: Fogg D, Parker N, eds. 2003 standards, recommended practices, and guidelines, Denver, CO: AORN, 2003:357–366.

Bryce EA, Roberts FJ, Clements B, MacLean S. When the biological indicator is positive: investigating autoclave failures. *Infect. Control Hosp. Epidemiol.* 1997;18:654-6.

Miller CH, Palenik CJ. Instrument processing. In: Miller CH, Palenik DJ, eds. *Infection Control and Management of Hazardous Materials for the Dental Team*, 2nd ed St. Louis: Mosby: 1998:135–174.

Miller CH, Palenik CJ. Sterilization, disinfection, and asepsis in dentistry. In: Block SS, ed. *Disinfection, sterilization, and preservation*, 5th ed. Philadelphia;Lippincott Williams & Wilkins, 2001:617–41.

Molinari JA, Rosen S, Runnells RR. Heat sterilization and monitoring. In: Cottone JA, Terezhalmay GT, Molinari JA, eds. *Practical infection control in dentistry*, 2nd ed. Baltimore: Williams & Wilkins, 1996: 149–160.

HAND HYGIENE



Hand hygiene is the single most important infection control measure. Normal human skin is colonized with bacteria, which can be divided into two categories: transient and resident. Resident (or “colonizing”) flora are attached to deeper layers of the skin. They are considered permanent residents of the skin and are not readily removed from the skin by mechanical friction accompanying handwashing. Transient (or “contaminating”) flora colonize the superficial layers of the skin and are more amenable to removal by routine handwashing. Health-care personnel (HCP) acquire them

during direct contact with patients or contact with contaminated environmental surfaces. Transient flora are the organisms most frequently associated with health-care-associated infections, so it’s fortunate they are readily removed by handwashing.

Hand hygiene is a general term that applies to either handwashing, antiseptic handwash, antiseptic hand rub, or surgical hand antisepsis. Mechanical friction and thorough rinsing are essential for effective handwashing. Plain soap or detergents can be used. Adding an antimicrobial agent to the handwashing detergent destroys most of the remaining transient flora and even some, but not all, of the resident flora. Hand hygiene techniques and definitions are presented in Attachment 1: Hand Hygiene Overview.

HAND HYGIENE INDICATIONS

- Before and after treating each patient (e.g., before glove placement and after glove removal)
- After barehanded touching of inanimate objects likely to be contaminated by blood or saliva
- When visibly soiled
- Before regloving after removing gloves that are torn, cut, or punctured
- Before leaving the dental operator

Using gloves does not eliminate the need for hand hygiene. Likewise, the use of hand hygiene does not eliminate the need for gloves. Gloves reduce hand contamination by 70 to 80 percent, prevent cross-contamination, and protect patients and health-care personnel from infection.

Hand-Hygiene Products

In the U.S., antiseptic handwash and surgical hand scrub products intended for use by HCP are evaluated using a standardized method and are regulated by the Food and Drug Administration's (FDA) Division of Over-the-Counter Drug Products. U.S. guidelines recommend that agents used for surgical hand scrubs should substantially reduce microorganisms on intact skin, contain a nonirritating antimicrobial preparation, have broad-spectrum activity, and be fast-acting and persistent.

Chlorhexidine gluconate is a fairly broad-spectrum antimicrobial agent and has substantial residual activity. Addition of low concentrations of chlorhexidine to alcohol-based preparations results in greater residual activity than alcohol alone. Allergic reactions to chlorhexidine are rare.

Iodine-containing preparations used for hand hygiene are usually iodophors. Iodophors are active against a wide variety of microorganisms, however they have poor persistent activity and their activity is substantially reduced in the presence of organic substances (e.g., blood). Iodophors cause more irritant contact dermatitis than other antiseptic hand-hygiene products.

PCMX is a halogen-substituted phenolic compound. It is fairly active against many microorganisms, but is generally less antimicrobial than other commonly used preparations. It exhibits some residual activity, but less than chlorhexidine gluconate. The product is usually well tolerated and allergic reactions are uncommon. Lower concentrations of PCMX are most useful as routine handwashing agents, than as surgical scrubs.

Triclosan is commonly found in soaps and numerous household products. Triclosan has a broad range of antimicrobial activity and is not affected by organic substances. Like chlorhexidine, triclosan has persistent activity on the skin. The majority of formulations containing < 2% triclosan are well-tolerated and seldom cause allergic reactions.

Most alcohol-based hand antiseptics contain isopropanol, ethanol, n-propanol, or a combination of two of these products. Alcohol-based hand rubs have been used extensively for years in Europe; however traditionally in the U.S. their use was limited to situations where soap and water weren't available. The Centers for Disease Control and Prevention (CDC) is now recommending alcohol-based hand products (i.e., preparations containing 60-95% alcohol) as an option for routine use, and not just when soap and water aren't available. Alcohol-based hand rubs have been proven effective and they may help improve adherence to hand-hygiene protocols in many health-care settings. The CDC guideline states that alcohol-based handrubs significantly reduce the number of microorganisms on skin, are fast acting and cause less skin irritation. Alcohol-based hand rubs are available as low-viscosity rinses, gels, and foams for use in health-care settings.



In dentistry, waterless hand-hygiene products should be readily available for use when water facilities are unavailable (e.g., dental screenings in schools, humanitarian or military deployments, during boil-water advisories). However alcohol-based hand-rub products are also acceptable, but not required, options for hand hygiene in the dental clinic on a daily basis. Careful evaluation is indicated before deciding to purchase any new product(s). Before introducing an alcohol-based hand rub or any new hand-hygiene product into your practice, consult with your infection control committee and consider factors that can affect the overall efficacy and acceptance of such products including:

- Current hand-hygiene practices and compliance.
- The relative efficacy of antiseptic agents against various pathogens.

- Input from the staff regarding the feel, fragrance, and skin tolerance of any products under consideration (i.e., products that are not well-accepted by personnel can be a deterrent to frequent handwashing).
- Ensuring dispenser systems function adequately and deliver an appropriate volume of product.
- Information from manufacturers regarding any known interactions between products used to clean hands, skin care products, and the types of gloves used in your practice (e.g., petroleum-based lotion formulations can weaken latex gloves; certain alcohol hand rubs may interact with residual powder from gloves on the hands of personnel, resulting in a gritty feeling on the hands).

Alcohol-based hand rubs do not replace the need for sinks or other hand-hygiene supplies (e.g., soap, paper towels) because when hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or other body fluids, they must be washed with either a non-antimicrobial soap and water or an antimicrobial soap and water. Also, because personnel may experience a "build-up" of emollients on their hands after repeated use of alcohol-based products, certain manufacturers recommend washing hands with soap and water after 5–10 applications of a gel.

Another consideration when deciding to introduce alcohol-based products into your practice is the potential for confusion between soap and alcohol hand-rub dispensers. Alcohol hand-rub dispensers should not be placed adjacent to sinks. This may cause personnel to routinely wash their hands with soap and water after each use of an alcohol hand rub, which is not necessary and is not recommended, because it may lead to dermatitis.



Alcohols are flammable. As a result, alcohol-based hand rubs should be stored away from high temperatures or flames in accordance with National Fire Protection Agency recommendations. If using a wall-mounted dispenser, do not install it above a heat source or electrical outlet. In Europe, where alcohol-based hand rubs have been used extensively for years, the incidence of fires associated with such products has been low. One recent U.S. report described a flash fire that occurred as a result of an unusual

series of events, which included a health-care worker applying an alcohol gel to her hands, immediately removing polyester isolation gown, and then touching a metal door before the alcohol had evaporated. Removing the polyester gown created a substantial amount of static electricity that generated an audible static spark when the health-care worker touched the metal door, igniting the unevaporated alcohol on her hands. This incident emphasizes the need to rub hands together after application of alcohol-based products until all the alcohol has evaporated.

Irritant Contact Dermatitis Associated with Hand Hygiene

Frequent and repeated use of hand-hygiene products, particularly soaps and other detergents, is a primary cause of chronic irritant contact dermatitis among HCP. The potential for detergents to cause skin irritation can vary considerably and can be ameliorated by the addition of emollients and humectants. Irritation associated with antimicrobial soaps may be caused by the antimicrobial agent or by other ingredients of the formulation. Irritant contact dermatitis is more commonly reported with iodophors. Other antiseptic agents that can cause irritant contact dermatitis (in order of decreasing frequency) include chlorhexidine, PCMX, triclosan, and alcohol-based products. Skin that is damaged by repeated exposure to detergents may be more susceptible to irritation by alcohol-based preparations. Frequent use of alcohol-based formulations for hand antisepsis can cause drying of the skin unless emollients, humectants, or other skin-conditioning agents are added to the formulation. Other factors that can contribute to dermatitis associated with frequent handwashing include using hot water for handwashing, low relative humidity, failure to use supplementary hand lotion or cream, and the quality of paper towels. Shear forces associated with wearing or removing gloves and allergy to latex proteins may also contribute to dermatitis of the hands of HCP.



The 2002 CDC hand-hygiene guideline recommends several potential strategies for minimizing hand-hygiene-related irritant contact dermatitis which include replacing hand-hygiene products with high irritation potential with preparations that cause less damage to the skin, educating personnel regarding the risk of irritant contact dermatitis, and providing health-care professionals with moisturizing skin-care products or barrier creams. Although hospitals have provided personnel with non-antimicrobial soaps in hopes of minimizing dermatitis, frequent use of such products may cause greater skin damage, dryness, and irritation than antiseptic preparations. One strategy for reducing the exposure of personnel to irritating soaps and detergents is to promote the use of alcohol-based hand rubs containing various emollients. Several recent studies with alcohol-based products containing emollients have been associated with improvements in skin health and improved compliance with hand hygiene compared with traditional handwashing products. If alcohol hand rubs are used, it is necessary to inform personnel that routinely washing hands with soap and water immediately after using the alcohol product may lead to dermatitis.

Allergic Contact Dermatitis Associated with Hand Hygiene

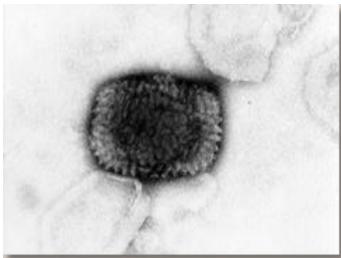
Contact allergies resulting from products applied to the skin may present as delayed type reactions (i.e., allergic contact dermatitis) or less commonly as immediate reactions (i.e., contact urticaria). The most common causes of contact allergies are fragrances and preservatives; emulsifiers are less common causes. Liquid soaps and hand lotions or creams may contain ingredients that cause contact allergies among HCP. Allergic reactions to antiseptic agents, including quaternary ammonium compounds, iodine or iodophors, chlorhexidine, triclosan, PCMX and alcohols have been reported. Allergic contact dermatitis associated with alcohol-based hand rubs is uncommon. However, with increasing use of such products by HCP, true allergic reactions to such products likely will be encountered.

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CDC. Guideline for hand hygiene in health-care settings: Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAAC/SHEA/APIC/IDSA Hand Hygiene Task Force. *MMWR* 2002;51(No. RR-16):1–46. Available at: <http://www.cdc.gov/handhygiene>. Accessed April 2003.

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SMALLPOX UPDATE



Smallpox is an acute, contagious, and sometimes fatal disease caused by the variola virus (an orthopoxvirus), and marked by fever and a distinctive progressive skin rash. There is no specific treatment for smallpox disease, and the only prevention is vaccination. Routine smallpox vaccination among the American public stopped in 1972 after the disease was eradicated in the United States. Until recently, the U.S. government provided the vaccine only to a few hundred scientists and medical professionals working with smallpox and similar viruses in a research setting. After the events of September and October 2001, however, the U.S. government took further actions to improve its level of preparedness against terrorism. For smallpox, this included updating a response plan and ordering enough smallpox vaccine to immunize the American public in the event of a smallpox outbreak. The plans are in place, and there is sufficient vaccine available to immunize everyone who might need it in the event of an emergency. In addition, in December of 2002 the Bush Administration announced a plan to better protect the American people against the threat of smallpox attack by hostile groups or governments. This plan includes the creation of smallpox health-care teams that would respond to a smallpox emergency. Members of these teams are being vaccinated against smallpox.

History and Potential Use As A Biological Weapon

The concept of using smallpox as a weapon is not new. During the French and Indian Wars (1754–1767), smallpox was used by the British forces in North America. Smallpox epidemics occurred, killing more than 50% of American Indian tribes as a result of soldiers intentionally distributing blankets that had been used by smallpox patients. In 1796, Edward Jenner recognized that an infection caused by cowpox protected against smallpox by injecting a healthy child with cowpox virus. He then reinoculated the child with the smallpox virus and the child did not develop smallpox. The worldwide practice of vaccination greatly diminished the potential threat of smallpox as a bioweapon.



The World Health Organization (WHO) began a global campaign in 1967 and ultimately succeeded in eradicating smallpox in 1977. The last case of smallpox in the U.S. was in 1949. The last naturally occurring case in the world was in Somalia in 1977. In 1980, after the disease was eliminated from the world, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.

Today, the deliberate use of smallpox as a biological weapon by terrorists or governments hostile to the U.S. is a possibility and would result in a public health crisis. In early January 2003, the U.S. Department of Defense began smallpox vaccinations of selected U.S. military forces, and emergency-essential civilians and contractors deployed or deploying in high threat areas.

The Disease

The name smallpox is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person. There are two clinical forms of smallpox. Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90% or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of about 30%; however, flat and hemorrhagic smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1% or less.



Transmission

Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Humans are the only natural hosts of variola. Smallpox is not known to be transmitted by insects or animals.

Attachment 2 presents an overview of smallpox.

The Vaccine



The smallpox vaccine helps the body develop immunity to smallpox. The vaccine is made from a virus called *vaccinia* which is a “pox”-type virus related to smallpox. The smallpox vaccine contains the “live” vaccinia virus—not dead virus like many other vaccines. For that reason, the vaccination site must be cared for carefully to prevent the virus from spreading. Also, the vaccine can have side effects. The vaccine does not contain the smallpox virus and cannot give you smallpox. Currently, the U.S. has a big enough stockpile of smallpox vaccine to vaccinate everyone in the country who might need it in the

event of an emergency. Production of new vaccine is underway.

Length of Protection

Smallpox vaccination provides high-level immunity for 3 to 5 years and decreasing immunity thereafter. If a person is vaccinated again later, immunity lasts even longer. Historically, the vaccine has been effective in preventing smallpox infection in 95% of those vaccinated. In addition, the vaccine was proven to prevent or substantially lessen infection when given within a few days of exposure. It is important to note, however, that at the time when the smallpox vaccine was used to eradicate the disease, testing was not as advanced or precise as it is today, so there may still be things to learn about the vaccine and its effectiveness and length of protection.

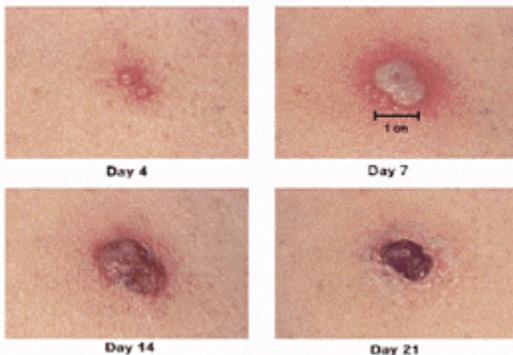
Receiving the Vaccine

The vaccine is given using a bifurcated (two-pronged) needle that is dipped into the vaccine solution. When removed, the needle retains a droplet of the vaccine. The needle is used to prick the skin a number of times in a few seconds. The pricking is not deep, but it will cause a sore spot and one or two droplets of blood to form. The vaccine usually is given in the upper arm.



If the vaccination is successful, a red and itchy bump develops at the vaccine site in three or four days. In the first week, the bump becomes a large blister, fills with pus, and begins to drain. During the second week, the blister begins to dry up and a scab forms. The scab falls off in the third week, leaving a small scar. People who are being vaccinated for the first time have a stronger reaction than those who are being revaccinated.

The following pictures show the progression of the site where the vaccine is given (Days 4 through 21):



Benefit of Vaccine Following Exposure

Vaccination within 3 days of exposure will prevent or significantly lessen the severity of smallpox symptoms in the vast majority of people. Vaccination 4 to 7 days after exposure likely offers some protection from disease or may modify the severity of disease.

Post-Vaccination Care



After vaccination, it is important to follow care instructions for the site of the vaccine. Because the virus is live, it can spread to other parts of the body, or to other people. To avoid this, the vaccination site must be cared for carefully until the scab that forms after vaccination falls off on its own (in 2 to 3 weeks). CDC recommendations for caring for the vaccination site can be found by visiting:

<http://www.bt.cdc.gov/agent/smallpox/vaccination/pdf/site-care-pub.pdf>.

Smallpox Vaccination Adverse Effects

The smallpox vaccine prevents smallpox. For most people, it is safe and effective. Most people experience normal, typically mild reactions to the vaccine, which indicate that it is beginning to work. Some people may experience reactions that may require medical attention.

Normal, Typically Mild Reactions (these reactions usually go away without treatment):

- The arm receiving the vaccination may be sore and red where the vaccine was given.
- The glands in the armpits may become large and sore.
- The vaccinated person may run a low fever.
- One out of 3 people may feel bad enough to miss work, school, or recreational activity or have trouble sleeping.

Serious Reactions

In the past, about 1,000 people for every 1 million people vaccinated for the first time experienced reactions that, while not life-threatening, were serious. These reactions may require medical attention:

- A vaccinia rash or outbreak of sores limited to one area. This is an accidental spreading of the vaccinia virus caused by touching the vaccination site and then touching another part of the body or another person. It usually occurs on the genitals or face, including the eyes, where it can damage sight or lead to blindness. Washing hands with soap and water after touching the vaccine site will help prevent this (inadvertent inoculation).
- A widespread vaccinia rash. The virus spreads from the vaccination site through the blood. Sores break out on parts of the body away from the vaccination site (generalized vaccinia).
- A toxic or allergic rash in response to the vaccine that can take various forms (erythema multiforme).

Life-Threatening Reactions

Rarely, people have had very bad reactions to the vaccine. In the past, between 14 and 52 people per 1 million people vaccinated for the first time experienced potentially life-threatening reactions. These reactions require immediate medical attention:

- Eczema vaccinatum. Serious skin rashes caused by widespread infection of the skin in people with skin conditions such as eczema or atopic dermatitis.
- Progressive vaccinia (or vaccinia necrosum). Ongoing infection of skin with tissue destruction frequently leading to death.
- Postvaccinal encephalitis. Inflammation of the brain.

People with certain medical conditions—including people with weakened immune systems or certain skin conditions—are more likely to have these reactions and should not get the smallpox vaccine unless they have been exposed to smallpox. Based on past experience, it is estimated that between 1 and 2 people out of every 1 million people vaccinated may die as a result of life-threatening reactions to the vaccine.

Important Note: Statistical information about smallpox vaccine adverse reactions is based on data from two studies conducted in 1968. Adverse event rates in the U.S. today may be higher because there may be more people at risk from immune suppression (from cancer, cancer therapy, organ transplants, and illnesses such as HIV/AIDS) and eczema or atopic dermatitis. The outcome associated with adverse events may be less severe than previously reported because of advances in medical care. Rates may be lower for persons previously vaccinated.

Detailed information concerning adverse effects and excellent photographs can be found by visiting: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5204a1.htm>.

Selected References:

CDC. Public Health Emergency Preparedness and Response. Smallpox Information. Available at: <http://www.cdc.gov/smallpox>. Accessed April 2003.

CDC. Smallpox vaccination and adverse reactions: guidance for clinicians. MMWR 2003;52 (No. RR-4):1-28. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5204a1.htm>. Accessed April 2003.

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INFECTION CONTROL Q & A

Ultrasonic Cleaner Test Procedure (Aluminum Foil Test)

Question: Is there a method to test the function of an ultrasonic cleaner?

Answer: The aluminum foil test is a simple and fast method to check for an even distribution of the cleaning power in an ultrasonic cleaner. In the absence of manufacturer's recommendations, the following procedure can be used:



1. Using standard lightweight or regular household aluminum foil, cut a piece of foil to fit the width of the cleaner chamber. For example: A tank with dimensions of 9 inches long by 5 inches wide by 4 inches deep would require a foil sample measuring 9 inches by 5 inches.
2. Prepare a fresh solution of ultrasonic cleaning solution and fill the tank according to the manufacturer's instructions. Do not turn the heater on for the test.
3. Insert the foil vertically into the cleaner chamber, with the length of the foil running the length of the chamber and the bottom of the foil about one inch above the bottom.
4. Holding the foil as steady as possible, turn on the ultrasonic cleaning unit for 20-60 seconds (if the unit is supplied with a high/low switch, it should be set in the high position).
5. Remove the foil sample and observe for small indentations (pebbling) on the foil. Some holes may also be present.



With a properly functioning unit, the entire foil surface will be uniformly "peppered" (covered with a tiny pebbling effect). If areas greater than ½ inch square show no pebbling, the unit may require servicing.

Residual Air Removal Test for Pre-Vacuum Sterilizers

Question: What is a Bowie-Dick test?

Answer: The Bowie-Dick test is an air removal test for prevacuum steam sterilizers. The test is designed to detect air leaks and inadequate air removal. Residual air remaining in the chamber prevents steam from contacting the items in a load and therefore interferes with sterilization. Air removal tests do not apply to gravity-displacement sterilizers. The test is conducted daily in an empty chamber, before the first processed load of instruments. Generally, a short cycle is run first to properly heat the sterilizer, then the test pack is placed in the empty sterilizer chamber, near the door, over the drain, however manufacturer's instructions should be followed for the specific product being used. In addition to the daily test, the Bowie-Dick test should also be performed during initial sterilizer installation, following sterilization failures (i.e., positive biological indicator), and after sterilizer relocation, malfunction or repair. See **DIS 68** for a synopsis of air removal tests available for prevacuum steam sterilizers.

Reference:

Association for the Advancement of Medical Instrumentation. Steam sterilization and sterility assurance in health care facilities. Arlington, VA: AAMI, 2002 in ANSI/AAMI ST46-2002.

Single-Use Disposable Dental Burs and Endodontic Instruments?

Question: Should dental burs and endodontic files be considered single-use disposable items?

Answer: A single-use device, also referred to as a disposable device, is intended for use on one patient. It is not intended to be reprocessed (cleaned, disinfected/sterilized) and used on another patient. Single-use devices used in dentistry are usually not heat tolerant and cannot be reliably cleaned. Items may include, but are not limited to, syringe needles, prophylaxis cups and brushes, and plastic orthodontic brackets. Some items such as prophylaxis angles, saliva ejectors, high-volume evacuator tips, and air/water syringe tips are available in a disposable form, and must be disposed of appropriately after each use. Single-use devices should be sterile at the time of use for any surgical procedure.

Although some devices may be used multiple times, it may often be safer, as well as more efficient and cost-effective to consider them single use. Due to the physical construction of some devices (e.g., endodontic broaches), cleaning tooth and tissue debris from the device safely and efficiently may be difficult. Cleaning and sterilizing dental burs and hand and rotary endodontic instruments may also be difficult. During reprocessing, deterioration can occur on the cutting surfaces of some carbide and diamond burs and after repeated reprocessing cycles, alteration of some types of endodontic files occurs potentially leading to breakage during patient treatment. Several dental supply companies now market single-use dental burs (e.g., Sullivan-Schein, Patterson Dental, SS White, NeoDiamond, TriHawk). If you aren't already using single-use products, the above factors coupled with the knowledge that burs and endodontic instruments exhibit signs of wear during normal use, may make the decision to consider them single-use more practical.

**References:**

Kazemi RB, Stenman E, Spngberg LSW. The endodontic file is a disposable instrument. *J Endod* 1995;21:451–5.

Filho IB, Esberard RM, Leonardo R, del Rio CE. Microscopic evaluation of three endodontic files pre- and post instrumentation. *J Endod* 1998;24:461–4.

Rapisarda E, Bonaccorso A, Tripi TR, Guido G. Effect of sterilization on the cutting efficiency of rotary nickel-titanium endodontic files. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999;88:342–7.

US Department Of Health and Human Services, Food and Drug Administration. Labeling recommendations for single-use devices reprocessed by third parties and hospitals;final guidance for industry and FDA, July 30, 2001.

Villasenor A, Hill SD, Seale NS. Comparison of two ultrasonic cleaning units for deterioration of cutting edges and debris removal on dental burs. *Pediatr Dent* 1992;14:326–30.

Clinical Attire vs. Personal Protective Equipment (PPE)

Question: What is the difference between clinical attire and personal protective equipment? Is it necessary to wear a long-sleeve gown when doing operative dentistry without a rubber dam?



Answer: Personal protective equipment is designed to protect the skin and the mucous membranes of the eyes, nose, and mouth from exposure to infectious or potentially infectious materials. Examples of PPE include gloves, protective apparel (i.e., disposable or reusable long sleeve gowns or jackets), surgical masks, protective eyewear with solid side shields, chin length face shields (worn with a surgical mask), hair and shoe covers.

Clinical attire is the basic clothing ensemble worn for dental treatment. Selection of clinical attire (e.g., scrub suits, uniform) is based upon facility preference. According to OSHA, general work clothes (i.e., clinical attire) not intended to function as protection against a hazard are not considered to be PPE. Clinical attire must be supplemented with PPE when exposure to blood or other potentially infectious material (e.g., saliva) is reasonably anticipated. PPE does not have to be fluid impervious or fluid resistant to meet OSHA standards, but must prevent contamination of clinical attire or skin. Cotton or cotton/polyester scrubs are acceptable as PPE when the sleeve length is long.

Using a rubber dam or other appropriate isolation procedures in combination with high-volume evacuation are considered effective engineering controls that permit the use of short-sleeved clinical attire. Long-sleeved clothing covers or gowns must be worn when exposure to blood and other potentially infectious materials (OPIM) in the form of droplet, spray and spatter are anticipated (e.g., prophies, operative or prosthodontic procedures using rotary instruments **without** a rubber dam, periodontal surgery, oral surgery).

”Latex Free” or ”Latex Safe”?

Question: Is it necessary to have a designated “latex-free” dental operatory to treat latex allergic patients?

latex safe

Answer: Dental providers need to prevent latex exposure when treating latex-allergic patients. Persons with a latex allergy should not have direct contact with latex-containing materials and should be treated in a “**latex-safe**” environment. A dental operatory should be identified for treatment of latex-allergic patients, preferably closest to the entrance of the clinic. All latex-containing products should be identified and then removed (or covered if removal is not physically possible) from the operatory **before** patient treatment. Individuals also may be allergic to the chemicals used in the manufacturing of natural rubber latex gloves, as well as metals, plastics or other materials used in the provision of dental care. A thorough health history and appropriate avoidance of contact with potential allergens can minimize the possibility of adverse reactions. Considerations in providing safe treatment for patients with possible or documented latex allergy include (but are not limited to) the following:

- Screen all patients for latex allergy (e.g., health history, medical consultation when latex allergy is suspected).
- Educate all dental health-care personnel on the different types of reactions to latex (i.e., irritant contact dermatitis, allergic contact dermatitis, and latex allergy) and the risks that these pose for patient and staff.
- Consider sources of latex other than gloves. Dental patients with latex allergy histories may be at risk from a variety of dental products including, but not limited to, prophylaxis cups, rubber dams, and orthodontic elastics.

- Use only non-latex containing materials in the treatment environment as alternatives. Ensure a latex-safe environment or one in which no personnel use latex gloves and no patient contact occurs with other latex devices, materials, and products.
- Remove all latex-containing products from the patient's vicinity. Adequately cover/isolate any latex containing devices that cannot be removed from the treatment environment.
- Be aware that latent allergens in the ambient air can cause respiratory and or anaphylactic symptoms in people with latex hypersensitivity. Therefore, it may be advisable to schedule patients with latex allergy as the first appointment of the day to minimize inadvertent exposure to airborne latex particles.
- Frequently clean all working areas contaminated with latex powder/dust.
- Frequently change ventilation filters and vacuum bags used in latex-contaminated areas.
- Have latex-free kits (e.g., dental treatment and emergency) available at all times.
- Be aware that allergic reactions can be provoked from indirect contact as well as direct contact (e.g., being touched by someone who has worn latex gloves). Hand hygiene, therefore, is essential.
- Communicate latex allergy (e.g., verbal instructions, written protocols, posted signage) to other personnel to prevent them from bringing latex containing materials into the treatment area.
- If latex-related complications occur during or after the procedure, manage the reaction and seek emergency assistance as indicated. Follow current medical emergency response recommendations for management of anaphylaxis.

References

American Dental Association Council on Scientific Affairs. The dental team and latex hypersensitivity. *J Am Dent Assoc* 1999;130:257–264.

Department of Health and Human Services National Institutes of Occupational Safety and Health (NIOSH). Preventing Allergic Reactions to Natural Rubber Latex in the Workplace. DHHS(NIOSH) Publication No. 97-135, June 1997. Available at <http://www.cdc.gov/niosh/latexalt.html>. Accessed April 2003.

Department of Health and Human Services National Institutes of Occupational Safety and Health (NIOSH). Latex Allergy: A Prevention Guide. Questions and Answers about identifying and preventing latex allergy. DHHS NIOSH Publication No. 98-113. Available at <http://www.cdc.gov/niosh/98-113.html>. Accessed April 2003.

Department of Health and Human Services National Institutes of Occupational Safety and Health (NIOSH). NIOSH Facts page on Latex Allergy. DHHS NIOSH 1997. Available at <http://www.cdc.gov/niosh/latexfs.html>. Accessed April 2003.

InControl Number 21—May 2003 Continuing Education

Federal dental service personnel can receive infection control continuing education by reading the May InControl and by completing this test. One hour of continuing education credit will be awarded for answering at least ten questions correctly. Please mail or fax the answer sheet **before 31 August 2003** to:

USAF Dental Investigation Service
Detachment 1, USAFSAM
310C B Street, Bldg 1H
Great Lakes, IL 60088
Fax Number: 792-7667 DSN or (847) 688-7667 Commercial.

To answer some of the questions you may have about the CE program, please visit our Frequently Asked Questions (FAQ) page.

-
1. Exposure to the smallpox virus is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about
 - a) 1 to 3 days
 - b) 5 to 9 days
 - c) 12 to 14 days
 2. With smallpox, a rash emerges **first** as small red spots on the
 - a) tongue and in the mouth
 - b) face
 - c) arms and legs
 - d) hands and feet
 3. The smallpox vaccination site must be cared for carefully to prevent the virus from spreading because the vaccine contains
 - a) smallpox virus
 - b) "live" vaccinia virus
 - c) dead vaccinia virus
 4. A sterility assurance program includes
 - a) mechanical monitoring of each sterilization cycle
 - b) using external and internal chemical indicators on/in each package or cassette being sterilized
 - c) use of biological and control indicators
 - d) all of the above
 5. A positive biological indicator is usually the first indication of a problem with the office sterilizer.
 - a) True
 - b) False
 6. Multiparameter indicators can provide a more reliable indication that sterilization conditions have been met.
 - a) True
 - b) False
 7. *Bacillus stearothermophilus* spores are used in the biological indicator test for
 - a) steam sterilizers
 - b) unsaturated chemical vapor sterilizers
 - c) dry heat sterilizers
 - d) a and b
 - e) b and c
 8. Spore testing must be performed at least _____ on all sterilizers including sterilizers considered "ready-to-use" as a "back-up"
 - a) daily
 - b) monthly
 - c) weekly
 9. Hand hygiene is a general term referring to
 - a) handwashing
 - b) antiseptic hand wash
 - c) surgical hand antisepsis
 - d) all of the above
 10. For most procedures, a vigorous, brief _____ second rubbing together of all surfaces of pre-moistened lathered hands and fingers followed by rinsing under a stream of cool or tepid water is recommended.
 - a) 10
 - b) 15
 - c) 30
 11. Alcohol-based hand rubs must be used when hands are visibly soiled with blood.
 - a) True
 - b) False
 12. Frequent use of alcohol-based formulations for hand antisepsis can cause drying of the skin unless _____ are added to the formulation
 - a) high concentrations of alcohol
 - b) emollients
 - c) antimicrobials

May 2003 InControl #21 Answer Sheet
(Valid 1 May–31 August 2003)

Name: _____ Rank/Grade: _____

Duty Location: _____ DSN: _____

Your Mailing Address: _____

Provide your answers below:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

I affirm that these answers are the result of my work alone and that I have not received assistance from others.

(Signature) _____ (Date)

Please mail or fax **ONLY THIS SHEET** to DIS at:
USAF Dental Investigation Service
Detachment 1, USAFSAM
310C B Street, Bldg 1H
Great Lakes, IL 60088-5259
Fax number: DSN: 792-7667 or commercial (847) 688-7667

ATTACHMENT 1: HAND HYGIENE OVERVIEW

Methods	Definition	Area	Duration (minimum)
Routine handwash	Washing hands with plain (i.e., non-antimicrobial) soap and water.	Fingertips to the wrist	15 seconds ¹
Routine hand antiseptics		Fingertips to the wrist at a minimum	
<i>Antiseptic handwash</i>	Washing hands with water and soap or other detergents containing an antiseptic agent (e.g., chlorhexidine, iodine and iodophors, chloroxylenol [PCMX], triclosan).		15 seconds ¹
<i>Antiseptic hand rub</i>	Applying an antiseptic hand-rub (i.e., alcohol-based hand rub ²) product to all surfaces of the hands to reduce the number of microorganisms present.		Rub hands until the agent is dry ²
Surgical hand antiseptics	Antiseptic handwash or antiseptic hand rub performed preoperatively by surgical personnel to eliminate transient and reduce resident hand flora. Antiseptic detergent preparations often have persistent antimicrobial activity.	Hands and forearms ³	2–6 minutes with water and antimicrobial agent/detergent Follow manufacturer instructions for an alcohol-based surgical hand-scrub product with persistent activity. ⁴

¹ For most procedures, a vigorous, brief (at least 15 seconds) rubbing together of all surfaces of pre-moistened 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.

² Preparations containing 60-95% alcohol. Alcohol-based hand rubs should not be used in the presence of visible soil or organic material. If using an alcohol-based hand rub, apply adequate amount to palm of one hand and rub hands together, covering all surfaces of the hands and fingers, until hands are dry. Follow manufacturer's recommendations regarding the volume of product to use. If hands feel dry after rubbing hands together for 10–15 seconds, an insufficient volume of product likely was applied.

³ Removal of all jewelry, vigorous rubbing together of all surfaces of premoistened lathered hands and forearms. Recent studies have shown neither brushes or sponges are necessary to reduce bacterial counts on the hands of surgical personnel to acceptable levels.

⁴ Before applying the alcohol solution, pre-wash hands and forearms with water and a non-antimicrobial soap and dry arms and forearms completely. After application of the alcohol-based product as recommended, allow hands and forearms to dry thoroughly and immediately don sterile gloves

Hand Hygiene Definitions

Alcohol-based hand rub. An alcohol-containing preparation designed for application to the hands for reducing the number of viable microorganisms on the hands. In the United States, such preparations usually contain 60%–95% ethanol or isopropanol.

Antimicrobial soap. Soap (i.e., detergent) containing an antiseptic agent.

Antiseptic agent. Antimicrobial substances that are applied to the skin to reduce the number of microbial flora. Examples include alcohols, chlorhexidine, chlorine, hexachlorophene, iodine, chloroxylenol (PCMX), quaternary ammonium compounds, and triclosan.

Antiseptic handwash. Washing hands with water and soap or other detergents containing an antiseptic agent.

Detergent. Detergents (i.e., surfactants) are compounds that possess a cleaning action. They are composed of both hydrophilic and lipophilic parts and can be divided into four groups: anionic, cationic, amphoteric, and nonionic detergents. Although products used for handwashing or antiseptic handwash in health-care settings represent various types of detergents, the term “soap” is used to refer to such detergents in this guideline.

Hand antisepsis. Refers to either antiseptic handwash or antiseptic hand rub.

Hand hygiene. A general term that applies to either handwashing, antiseptic handwash, antiseptic hand rub, or surgical hand antisepsis.

Handwashing. Washing hands with plain (i.e., non-antimicrobial) soap and water.

Persistent activity. Persistent activity is defined as the prolonged or extended antimicrobial activity that prevents or inhibits the proliferation or survival of microorganisms after application of the product. This activity may be demonstrated by sampling a site several minutes or hours after application and demonstrating bacterial antimicrobial effectiveness when compared with a baseline level. This property also has been referred to as “residual activity.” Both substantive and nonsubstantive active ingredients can show a persistent effect if they substantially lower the number of bacteria during the wash period.

Plain soap. Plain soap refers to detergents that do not contain antimicrobial agents or contain low concentrations of antimicrobial agents that are effective solely as preservatives.

Substantivity. Substantivity is an attribute of certain active ingredients that adhere to the stratum corneum (i.e., remain on the skin after rinsing or drying) to provide an inhibitory effect on the growth of bacteria remaining on the skin.

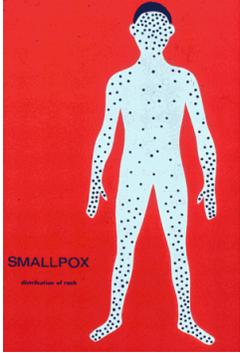
Surgical hand antisepsis. Antiseptic handwash or antiseptic hand rub performed preoperatively by surgical personnel to eliminate transient and reduce resident hand flora. Antiseptic detergent preparations often have persistent antimicrobial activity.

Visibly soiled hands. Hands showing visible dirt or visibly contaminated with proteinaceous material, blood, or other body fluids (e.g., fecal material or urine).

Waterless antiseptic agent. An antiseptic agent that does not require use of exogenous water. After applying such an agent, the hands are rubbed together until the agent has dried.

More hand hygiene definitions can be found by visiting: <http://www.cdc.gov/handhygiene>.

ATTACHMENT 2: SMALLPOX DISEASE

<p>Incubation Period (Duration: 7 to 17 days) Not contagious</p>	<p>Exposure to the virus is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about 12 to 14 days but can range from 7 to 17 days. During this time, people are not contagious.</p>
<p>Initial Symptoms (<i>Prodrome</i>) (Duration: 2 to 4 days) Sometimes contagious</p>	<p>The first symptoms of smallpox include fever, malaise, head and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the <i>prodrome</i> phase and may last for 2 to 4 days.</p>
<p>Early Rash (Duration: about 4 days) Most contagious Rash distribution:</p> 	<p>A rash emerges first as small red spots on the tongue and in the mouth.</p> <p>These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes most contagious.</p> <p>Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better.</p> <p>By the third day of the rash, the rash becomes raised bumps.</p> <p>By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. (This is a major distinguishing characteristic of smallpox.)</p> <p>Fever often will rise again at this time and remain high until scabs form over the bumps.</p>
<p>Pustular Rash (Duration: about 5 days) Contagious</p>	<p>The bumps become pustules—sharply raised, usually round and firm to the touch as if there’s a small round object under the skin. People often say the bumps feel like BB pellets embedded in the skin.</p>
<p>Pustules and Scabs (Duration: about 5 days) Contagious</p>	<p>The pustules begin to form a crust and then scab. By the end of the second week after the rash appears, most of the sores have scabbed over.</p>
<p>Resolving Scabs (Duration: about 6 days) Contagious</p>	<p>The scabs begin to fall off, leaving marks on the skin that eventually become pitted scars. Most scabs will have fallen off three weeks after the rash appears.</p> <p>The person is contagious to others until all of the scabs have fallen off.</p>
<p>Scabs resolved Not contagious</p>	<p>Scabs have fallen off. The infected person is contagious until the last smallpox scab falls off.</p>

* Smallpox may be contagious during the *prodrome* phase, but is most infectious during the first 7 to 10 days following rash onset.

CDC. *Smallpox Overview Fact Sheet*. Available at

<http://www.bt.cdc.gov/agent/smallpox/overview/disease-facts.asp>. Accessed April 2003.