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The Dental Learning Network

Infection Control: 12 Hours

12 Homestudy Credit Hours

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Table of Contents

Course Objectives

Upon completion of this course, the student should be able to:

- List and define important terms in Infection Control.
- Describe diseases like Tuberculosis, Hepatitis B, and AIDS.
- Give the reasons for immunization against the Hepatitis B Virus.
- List the common forms of barrier techniques and the rationale for each.
- Describe correct aseptic technique for dental procedures.
- List the steps in correct instrument processing to achieve sterility.

Course Introduction

Everyone recognizes the importance of preventing the spread of disease during routine dental care. Dental professionals live and work in a time that calls for competent, thorough, modern infection control procedures. Patients are concerned about the sterile procedures used in dental office. Dental Professionals need to understand recommended Infection Control measures to be confident in the routines of their daily practice.

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Introduction

It is important from the beginning of this course that everyone understands important terms.

Consider the following definitions from The Webster's New World Dictionary:

- ***Clean:*** *free from dirt and impurities; unsoiled*
- ***Sterile:*** *free from living microorganisms*
- ***Disinfect:*** *to destroy the harmful bacteria, viruses, etc., in; sterilize*

Unfortunately, this is an unacceptable definition of "disinfect." Disinfection is not the same as sterilization. For the precise needs of the dental and medical industry, an item is clean if debris, dirt, or visible blood is removed from the surface. Cleaning alone does not remove all the microorganisms, but it is an important first step to the correct sterile procedure. True sterilization involves killing **all** microorganisms including hardy bacterial spores on a certain surface or instrument. Disinfection lies somewhere in between these two.

The following terms will be used throughout this course[i,ii]:

Selections from a slide set prepared by the CDC to accompany the CDC “Guidelines for Infection Control in Dental Health-Care Settings – 2003” are included in this course. The slides are intended to give pictorial amplification for this course’s text, tables, and diagrams.

Universal Precautions: The same infection control procedures and barrier techniques are determined by the procedure, and are used on all patients, regardless of their disease state. The procedures are designed to prevent transmission of HIV, HBV, and other bloodborne pathogens in health care settings.

Standard Precautions: is a set of combined precautions that include the major components of universal precautions (designed to reduce the risk of transmission of bloodborne pathogens) and body substance isolation (designed to reduce the risk of transmission of pathogens from moist body substances). Similar to *universal precautions*, standard precautions are used for care of all patients regardless of their diagnoses or personal infectious status.

Standard Precautions

- Apply to <u>all</u> patients
- Integrate and expand Universal Precautions to include organisms spread by blood and also
    - Body fluids, secretions, and excretions except sweat, whether or not they contain blood
    - Non-intact (broken) skin
    - Mucous membranes

Sterilization: kills all forms of microbial life.

Disinfection: Destruction of most forms of microorganisms, but not bacterial and mycotic spores, which are highly resistant.

Sanitization: Using chemicals or procedures that reduce the microbial flora to a safe public health level.

Asepsis: Using techniques designed to keep all microorganisms out of the working field and from spreading to other areas.

Disinfectant: A chemical that can be applied on an inanimate object or surface that kills microorganisms.

Antiseptic: A chemical that can be applied on living tissues to kill or inhibit microorganism activity.

The basic aim of infection control is to reduce the number of pathogenic (disease causing) microbes in the field of operation to a level where the body's normal resistance can prevent infection.

The major areas of infection control are:

- aseptic technique;
- patient screening and evaluation;
- personal protection;
- instrument sterilization;
- environmental surface disinfection;
- equipment asepsis;

Types of Microorganisms

Bacterial spores (endospores): The most difficult to kill. Dormant forms of bacterial encapsulated in a tough shell.

Small non-lipid viruses: Like the AIDS virus.

Fungi: Can cause a variety of diseases.

Medium sized lipid viruses: Including hepatitis B.

Vegetative bacteria: Causes diseases like syphilis and cholera, *streptococcus pyogenes* causes more diseases than any other organisms.

Chemical Agents That Kill Microorganisms

Chemical sterilizer: Most effective method. Kills all microorganisms in a certain amount of time, usually 10 hours.

High-level disinfection: kills some, but not necessarily all bacterial spores. This process kills *mycobacterium tuberculosis var bovis*, bacteria, fungi, and viruses.

Intermediate-level disinfection: kills *mycobacterium tuberculosis var bovis* indicating that many human pathogens are also killed, but does not necessarily kill spores.

Low-level disinfection: is the least effective disinfection process, kills some bacteria, viruses and fungi, but does not kill bacterial spores or *mycobacterium tuberculosis var bovis*, a laboratory test organism used to classify the strength of disinfectant chemicals.

Germicides: are agents destructive to microbes. All germicides must be used in accordance with intended use and label instructions.

Classification of Common Dental Items

Critical instruments: are surgical and other instruments used to penetrate soft tissue or bone.

Semi-critical instruments: are surgical and other instruments that are not used to penetrate soft tissue or bone, but contact oral tissue.

Non-critical instruments and devices: are instruments and devices that contact intact skin.

Personal Protective Equipment: includes items such as gloves, masks, protective eyewear and protective attire (gown/labcoats) which are intended to prevent exposure to blood and body fluids.

Other Potentially Infectious Materials (OPIM): means any one of the following:

(A) human body fluids such as saliva in dental procedures and any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids;

(B) any unfixed tissue or organ (other than intact skin) from a human being (living or dead);

(C) HIV-containing cell or tissue cultures, organ culture and blood, or other tissues from experimental animals.

All dental health personnel shall comply with and enforce the following minimum precautions to minimize the transmission of pathogens in health care settings:

(1) Standard precautions shall be practiced in the care of all patients.

(2) A written protocol shall be developed for proper instrument processing, operatory cleanliness, and management of injuries.

Tuberculosis

Tuberculosis is an infection of the lungs caused by *Mycobacterium tuberculosis*. Prolonged exposure to the disease is usually required for infection. The dental team's relatively brief interaction reduces the risk of transmission during treatment.

Signs and symptoms of active TB include productive cough, swelling in the neck (due to enlarged lymph nodes) and an increased heart rate. The patient will show a positive tuberculin skin test (+PPD) within 6 to 12 weeks.

More than 90% of current TB cases occur in people who have been previously infected with the disease (reactivation rather than new onset).

The CDC recommends the following protocol for treating dental patients with tuberculosis[iii]:

(1) Ask patients about TB symptoms and history of TB.

(2) Refer patients with symptoms of active TB to a physician for evaluation.

(3) Postpone elective dental treatment until diagnostic tests rule out active tuberculosis.

(4) Implement isolation protocol in a medical center if emergency dental care is required. Limit treatment to relieve immediate pain. Dental care providers must use HEPA-filter masks during treatment.

(5) Refer any dental health care worker with TB symptoms to a physician for evaluation. The worker may return to practice after diagnostic tests rule out active tuberculosis or once therapy has eliminated infectivity.

CDC Guidelines for Dental Care Settings can be found in the appendices.

AIDS

Acquired immune deficiency syndrome (AIDS) was identified for the first time in 1981. It is caused by a retrovirus, called human immunodeficiency virus (HIV). After infection, the patient may be completely asymptomatic for a prolonged period (even up to 7 years). However, during this time the infected person is still able to transmit the disease to others.

Many patients who test positive for HIV infection may have been carrying the disease undiagnosed for a long time. The dentist may notice some lesions present in the mouth that may indicate that the patient may be infected. These include fungal infections, exacerbated forms of gingivitis and periodontitis, ulcerations and neoplasms.

HIV is transmitted through sexual contact, direct exposure to infected blood or blood components, and perinatally from mother to neonate. HIV has been isolated from saliva, but the CDC has removed it from the list of body fluids requiring universal precautions, except in the dental setting where saliva is usually contaminated with blood.

Health Care Workers with Documented and Possible Occupationally Acquired HIV/AIDS

CDC Database as of December 2002

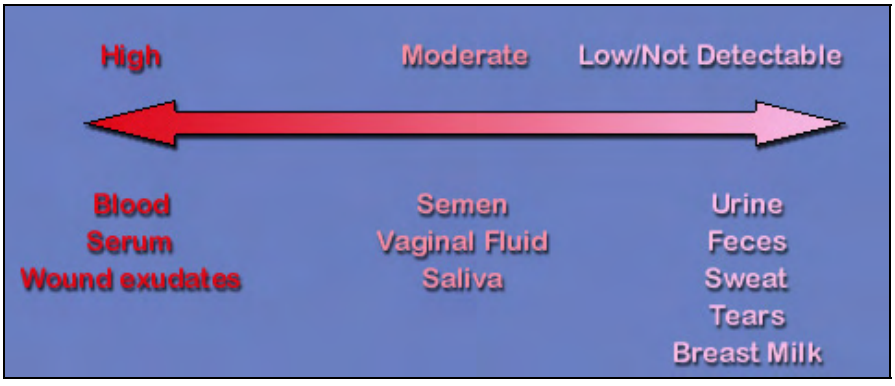
	Documented	Possible
Dental Worker	0	6 *
Nurse	24	35
Lab Tech, clinical	16	17
Physician, nonsurgical	6	12
Lab Tech, nonclinical	3	__
Other	8	69
Total	**57**	**139**
* 3 dentists, 1 oral surgeon, 2 dental assistants		

Hepatitis

There are five main categories of hepatitis: A, B, C, D, and E. Hepatitis A and E are spread through contaminated food or water. Hepatitis B, C, and D are spread through direct contact with infected body fluids.

Of these viruses, Hepatitis B (HBV) is the greatest threat to dental professionals. Hepatitis B is spread in infected blood and other bodily fluids such as semen, vaginal secretions, saliva, open sores, and breast milk. A vast majority of cases (90%) are limited meaning that the body is able to effectively fight off the disease.

Concentration of HBV in Body Fluids



The greatest concentration of HBV in an infected patient's mouth is at the gingival sulcus. The dental hygienist is at high risk for infection because of the bleeding associated with

routine prophylaxis, as is the assistant or dentist packing cord for crown impressions or during oral surgery. The hepatitis C virus is the cause of 30% of acute viral hepatitis cases in the U.S. It is a bloodborne disease known to be transmitted through intravenous drug abuse, blood transfusion, or occupational exposure.

Occupational Risk of HCV Transmission among HCP

- Inefficiently transmitted by occupational exposures
- Three reports of transmission from blood splash to the eye
- Report of simultaneous transmission of HIV and HCV after non-intact skin exposure

The hepatitis D virus needs part of the hepatitis B virus to complete its life cycle. Hepatitis A and E are not an occupational risk to dental workers because transmission is primarily via the fecal-oral route.

Hepatitis B Vaccine

Dentists and their staff are at a high risk of contracting hepatitis B from their patients. The American Dental Association and The Centers for Disease Control,[iv] recommend that dental professionals be vaccinated against hepatitis B.

The plasma-derived hepatitis B vaccine, "Heptavax-B" was introduced in the United States in 1982. 96% of young, healthy adults seroconvert and have the correct antibody levels to prevent infection by the end of the series. Vaccines available are made using recombinant DNA technology, and results in 99% of healthy adults seroconverting. Anyone who is hypersensitive to yeast should consult their personal physician before being immunized with these products.

The standard protocol for administration of the HBV vaccine is three doses in the deltoid muscle. The first dose should be given at baseline, the second, one month later, and then the third 6 months later. If an unvaccinated person is exposed to HBV, a single dose of hepatitis B immunoglobulin is given within 24 hours of exposure and the first of the normal 3 doses of vaccine within 7 days. If someone is exposed while in the middle of their series, one dose of immunoglobin is given immediately and then the series continues as scheduled. Anyone who has been vaccinated and then is exposed to HBV should have his or her blood tested. If they have a low antibody response, they should be given a booster dose of the vaccine and a dose of hepatitis B immunoglobin. People who are exposed to HBV but have been unresponsive to the vaccine should have a dose of hepatitis B immunoglobin immediately, then another one month later. Everyone should have a blood test after completing the vaccine series to confirm its effectiveness, and every 5 years to determine if a booster is needed.

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Introduction

Dental care professionals are exposed to bacteria, viruses, fungi, and other disease-producing microbes during the normal course of their day. Universal precautions dictate that personal protective attire choices are based on the procedure rather than the patient's health history. If the patient is an infectious disease carrier (tuberculosis; hepatitis B, C, D) and spatter is expected, gown, booties, and head covering should be worn. HIV is not considered highly infectious, so barrier protection, which might be considered out of the ordinary, could be considered discriminatory.

Handwashing

Dental care workers should wash their hands for a minimum of 15 seconds with an antimicrobial handwash at the beginning of the day, between every patient and at the end of the treatment day. Dental care workers shall wash contaminated or visibly soiled hands with soap and water and put on new gloves before treating each patient. If hands are not visible soiled or contaminated, an alcohol based hand rub may be used as an alternative to soap and water. Alcohol rubs that contain between 60%-95% ethanol or isopropanol are acceptable according to CDC guidelines (2003). Any member of the dental team who has an exudative lesion or weeping dermatitis will refrain from direct patient contact and from handling equipment until the wound is completely healed.

Efficacy of Hand Hygiene Preparations in Reduction of Bacteria

Gloves

Gloves are not a substitute for handwashing!

Washing hands thoroughly with antimicrobial soaps can disinfect the hands, but will not make them sterile. Medical exam gloves shall be worn whenever there is a potential for contact with mucous membranes, blood or OPIM. For most dental procedures, single- use non-sterile rubber gloves are acceptable. Use sterile surgical gloves for surgical extractions and more invasive procedures. Gloves should be worn when touching surfaces or items that have blood, body fluids, or secretions on them. Properly fitting gloves should be snug but not restrictive, and should cover the cuffs of a long sleeved gown. Gloves must be discarded upon completion of treatment and before leaving laboratories or areas of patient care activities. Wear a new pair of gloves for each patient. Dental care workers shall perform

hand hygiene procedures after removing and discarding gloves. Wash hands after each use. Do not wash, disinfect, or sterilize gloves for reuse.

Special Hand Hygiene Considerations

- Use hand lotions to prevent skin dryness
- Consider compatibility of hand care products with gloves (e.g., mineral oils and petroleum bases may cause early glove failure)
- Keep fingernails short
- Avoid artificial nails
- Avoid hand jewelry that may tear gloves

The chemicals in disinfectants can cause defects in the material of the glove, so it is better to use heavy utility gloves when using or mixing chemicals. Do not use petroleum or oil-based lotions before donning gloves because it can damage the gloves and reduce their effectiveness.

Care should be taken to avoid injury during procedures. If gloves are torn, cut, or punctured they must be changed as soon as it is safely possible. Wash hands thoroughly and replace gloves before continuing with the procedure.

Cover cuts with a Band-Aid. Use an antibacterial ointment underneath if indicated. Slip one layer of gauze between the Band-Aid the glove to help keep the Band-Aid from becoming moist from the gloves, or being contaminated by the powder inside the gloves.

Inexpensive plastic foodhandler's gloves used for handling food can be put over the gloves during treatment to write in charts, or to retrieve an item out of a drawer. These gloves may not be used alone as a hand barrier or for intraoral patient care.[v]

Some health care workers have reported allergies to the latex or the powder used in gloves. The three types of skin reactions to latex are: irritation contact dermatitis, delayed contact dermatitis (rash), and immediate allergic urticaria (hives). Repeated exposure to latex increases chances of an allergic episode. Most dental professionals wear gloves 8 to 10 hours daily, 4 to 5 days a week. Histories of allergies, asthma, and eczema have been linked to latex glove reactions. Dermatitis should be treated by a physician and the worker should not be exposed to the latex until the condition is completely healed. Some dermatitis problems may result from moisture accumulating under gloves. Be sure to dry hands thoroughly before putting on gloves. Cotton glove liners are available to provide a barrier between the skin and the latex. Dental professionals who exhibit skin rash, itching, or wheezing should seek the care of a physician for diagnosis.

Latex Allergy

- Type I hypersensitivity to natural rubber latex proteins
- Reactions may include nose, eye, and skin reactions
- More serious reactions may include respiratory distress–rarely shock or death

Photo credit: Arto Lahti, MD, Department of Dermatology, University of Oulu, Finland.

Patients with spina bifida are particularly vulnerable to life-threatening latex reactions. Patients who have undergone repeated surgery with prolonged contact with rubber tubes or post-surgical drains, and those with history of other allergies are most likely to have reactions to rubber gloves or the rubber dam. For these patients it would be advisable to wear a non-latex glove (vinyl or other non-synthetic polymer) over the latex gloves.

Wear heavy utility gloves when cleaning, disinfecting, handling contaminated instruments or trash, mixing chemicals, and changing ultrasonic solutions.

Gowns

Health care workers shall wear reusable or disposable protective attire when their clothing or skin is likely to be soiled with blood or OPIM. The garment should be fluid-resistant, high-necked, and provide coverage to the knees. Change gowns between patients when they are visibly soiled or moist or at least daily. Protective attire must be removed when leaving laboratories or areas of patient care activities and placed in laundry or disposal bags after use. Wash uniforms in hot soapy water and bleach. Reusable gowns shall be laundered in accordance with the Cal-DOSH Bloodborne Pathogens Standards, Title 8, Cal. Code of Regs., section 5193 [vi]. Machine dry at least at 100º F.

Masks

Wear surgical masks in combination with either chin-length plastic face shields or protective eyewear to protect the face, mouth, and nasal cavity when spatter of blood or OPIM or when splashing of blood or OPIM and other body fluids is expected. The pleated, soft type of mask has a higher filtration than the cup style. Use a mask with at least a filtration of 95% of 3.5 micron in diameter. [v] After each patient and during patient treatment if applicable, masks shall be changed. Microbes pass more easily through moisture, so change the mask if it becomes wet or visibly soiled. Some professionals use a new mask with each patient. Others change masks after an hour of use. Depending on the procedure, a mask may be worn longer if it is not wet or soiled, but do not use the same mask for the whole day. Be careful not to touch the mask with soiled gloves if it is to be reused. After each patient, face shields and protective eyewear shall be cleaned; and if visibly soiled, clean and disinfect.

Protective Eyewear

Wear protective eyewear to shield your eyes from spatter of contaminated material. Debris can be irritating to the eye, and microorganisms can enter the body through this route. Protective eyewear also reminds the health care worker not to touch their eyes during procedures and when mixing chemicals. Disinfect protective eyewear and face shields after each use. If prescription glasses are worn, use sideshields for better protection. Goggle-type wrap around styles and face shields are recommended.

The patient should also be given the option of wearing protective eyewear. Some offices use sunglasses to reduce the glare of the overhead light and to protect the patient's eyes from spatter. Disinfect patient eyewear after each use.

Personal Hygiene

The staff should wear clean, fresh uniforms every day. Wear a long sleeved fluid resistant lab coat (or a disposable gown) over your uniform when any spatter is possible (even during cleaning). Do not wear the lab coat or uniform out of the office. Wash uniforms in hot soapy water and bleach. Machine dry at least at 100ºF. Cleaning of the uniforms should be done on site or by a third party.

Pull longer hair back away from the face. False fingernails can lift at the edge, creating an area for fungi and microorganisms to breed. Keep fingernails trimmed so they do not stress or puncture gloves. Keep cuts and sores always covered, not just when treating patients. Do not touch your face, nose, or mouth with contaminated gloves.

Surface Covers

Many surfaces in the dental operatory become contaminated, but they are too difficult to clean or cannot be autoclaved. Cover chair buttons, control buttons on the air/water syringe, switches on the unit, light handles, hoses, handpiece and air/water syringe holders) with plastic wrap, aluminum foil, or other material impervious to water. Replace with fresh covers after each patient. It is faster and easier to remove and throw away these coverings after dismissing the patient than to clean and disinfect the area. Make sure not to contaminate the underlying surface by touching it or carelessly removing the covers.

Surface Cleaning

Some surfaces like countertops can be disinfected after each patient. If items or surfaces likely to be contaminated are difficult to clean and disinfect they shall be protected with disposable impervious barriers.

Clean and disinfect all clinical contact surfaces that are not protected by impervious barriers using an EPA registered, hospital grade low- to intermediate-level disinfectant after each patient. The low-level disinfectants used shall be labeled effective against HBV and HIV. Use disinfectants in accordance with the manufacturer's instructions. Clean all housekeeping surface (e.g. floors, walls, sinks) with a detergent and water or EPA registered, hospital grade disinfectant.

Preclean surfaces before disinfection with a detergent cleaner. Carefully follow the manufacturer's directions on the disinfectant product label. Use water to dilute concentrates, not alcohol or any other chemical. Wear utility gloves, a mask, protective eyewear, and protective clothing during surface cleaning and disinfection to reduce chances of direct contamination of the skin, mucous membranes, or eyes. Generously spray the cleaner onto the surface and wipe or scrub with paper towels or a brush. If possible, rinse over a sink. After precleaning, spray enough disinfectant to stay moist and leave undisturbed for 10 minutes, or the time specified in the directions. (Spray - Wipe - Spray)

Spilled Blood

Absorb any spilled blood with paper toweling saturated with bleach and dispose in appropriate containers. Always wear utility gloves when cleaning up spilled blood.

Disposal of Contaminated Wastes

Contaminated solid waste shall be disposed of according to applicable local, state, and federal environmental standards. Local ordinances vary from area to area in regards to waste management.

Regulated Medical Waste Management

- Properly labeled containment to prevent injuries and leakage
- Medical wastes are “treated” in accordance with state and local EPA regulations
- Processes for regulated waste include autoclaving and incineration

Photo credit: NIOSH Web site.

Limiting Contamination

Perform dental procedures by conscientiously limiting the amount of droplet nuclei, spatter, and aerosols. Use high-speed evacuation, proper patient positioning, and a rubber dam if appropriate. Avoid field contamination by not touching charts, telephones, cabinets, computer keyboards, and pens with contaminated gloves. Use overgloves if it is necessary to make a chart entry during treatment.

Anything used in the patient's mouth must be sterile. This includes handpieces, impression trays, instruments, prophy angles, prophy cups, and saliva ejectors. Put all instruments for a single patient on a sterile tray with a sterile cover, and place all instruments back onto this tray after use. Wipe down the area where the tray rests with disinfectant after each patient.

Preprocedural Mouthrinsing

It is an excellent idea to use a pre-procedural mouth rinse with residual activity to reduce the microbial levels in the patient's mouth.

There is no mouthwash currently available that would make a perfect preprocedural mouthrinse. Chlorhexidine gluconate seems to be the best currently available wide spectrum mouthrinse.

- Studies show a 0.12 percent chlorhexidine gluconate (CHG) preoperative rinse clinically reduces the incidence of alveolar osteitis in extraction patients by 60%. The American Heart Association recommends chlorhexidine rinses as an adjunct to antibiotic prophylaxis, especially if the patient is of high risk or has poor oral hygiene.

Repeated rinsing will not shift the normal oral flora. It also has a virucidal effect on herpes simplex virus, cytomegalovirus, influenza A., parainfluenza, and hepatitis B viruses. CHG helps to control the onset of opportunistic infections in compromised patients who have bone marrow transplants, cancer, or HIV infection. [vii]

Needles

Use a new, sterile disposable needle and fresh carpule of anesthetic for every patient requiring local anesthesia. Handle needles and sharp instruments like scalpels and scalers very carefully because they easily puncture gloves and injure skin. Needles shall be recapped only by using the scoop technique or a protective device. Needles shall not be bent or broken for the purpose of disposal. Disposable needles, syringes, scalpel blades or other sharp items and instruments shall be placed into sharps containers for disposal according to all applicable regulations. Use hemostats or pliers to remove the needle from the syringe and place directly into the container.

Other Areas of the Practice

Disinfect the other areas of the office regularly, including pens, countertops, bathroom surfaces, waiting room hard surfaces, doorknobs, computer keyboards, phones, desks, and chairs.

Suitable Disinfectants

All products to be used as disinfectants on precleaned surfaces must be EPA-registered as effective against HIV, HBV, Mycobacterium ssp and TB. Check compatibility of material before use on dental/medical equipment.

For a list of EPA approved disinfectants, visit the following website:
http://www.epa.gov/oppad001/chemregindex.htm

Introduction

Disinfection will kill disease-producing microorganisms, but not bacterial spores. If the chemical used is not sporicidal, it is called a disinfectant (for example, iodophors, synthetic phenolics, phenols, alcohol/phenolics, sodium hypochlorite, low-concentration glutaraldehyde) and will not completely sterilize the surface. Liquid glutaraldehydes (at concentration levels for immersion sterilization) are not acceptable as surface disinfectants because of dangerous vapors and odors. The best solution to use is one that has a precleaning ability so fewer products need to be used after every patient. Properly diluted iodophor, sodium hypochlorite, and complex phenol preparations have been shown to be superior in comparison with other disinfectants for initial precleaning.

An ideal disinfectant should:

- have a wide spectrum of antibacterial activity;
- be tuberculocidal, effective against hepatitis B, and HIV;
- be fast acting;
- be effective in the presence of bioburden and debris;
- compatible with soaps and other chemicals;
- non-corrosive, non-staining, non-toxic;
- have a residual effect;
- be odorless, economical, and easy to use. [i]

Read the labels and ask your product representative for information regarding a disinfectant before using it in the office. It is important to consider all the above qualities and make sure it is registered with the EPA.

Iodophor Solutions

Iodophors are probably the most commonly used surface disinfectants. They have a low toxicity, no offensive odor, and are not irritating to skin. There is a residual effect on the treated surface. Iodophors are rated by the EPA as a tuberculocidal hospital disinfectant. Some solutions are poor detergents, so the surface must be precleaned with another product. Check the instructions on the bottle. The residual effect is cumulative with each treatment. A more effective, longer lasting disinfection action will result if allowed to dry completely. Follow the manufacturer's directions for mixing and contact time.

Pros

- EPA licensed
- broad spectrum, tuberculocidal
- effective against viruses
- economical
- few side effects
- disinfection in 3 to 30 minutes, depending on the bioburden
- surfectant carrier keeps area moist

- residual biocidal action even after dry

Cons

- not sterilants
- may be corrosive to some metals
- inactivated by hard water, alcohol
- unstable at high temperatures
- loses activity with age
- prolonged exposure to be sporicidal
- may discolor light colored surfaces

Complex Phenolics

Some complex or synthetic phenols are excellent for surface disinfection. They have a good detergent effect, so the same solution can be used for precleaning and disinfection.

Pros

- EPA licensed
- broad spectrum, tuberculocidal
- good detergent for precleaning
- economical
- residual biocidal action even after dry

Cons

- not sterilants
- disinfection in 10 minutes
- must be mixed weekly
- follow dilution directions carefully

Alcohol-Quaternary Ammonium Compounds

Alcohol combined with quaternary ammonium compounds (quats) enhances the antimicrobial spectrum. Alcohol-quats are appropriate disinfectants.[viii]

Pros

- EPA licensed
- broad spectrum, tuberculocidal

Cons

- not sterilants
- sensitive to organic material and anionic detergents.

Sodium Hypochlorite (Bleach)

Bleach should be mixed with water in a dilution of 1 to 10 or 1:100 of a 5.25% solution. Use a 1:100 solution when blood and debris are present. Make a fresh solution every day and wear heavy utility gloves. A bleach and water mixture is not recommended as a surface disinfectant after every patient because of its odor and corrosive nature. It is a good solution for applying to contaminated paper products before their disposal. Any instruments that may have been sprayed with bleach should be rinsed well before soaking in a detergent/disinfectant.

Rinse and flush the spray bottle with plain water each day because the bleach can be corrosive to the metal parts of the spray mechanism and can ruin the sprayer.

Pros

- effective as a hard surface disinfectant
- low cost
- easily purchased
- broad spectrum, tuberculocidal

Cons

- corrosive to many metals
- toxic if swallowed
- irritating to eyes and hands
- odor

For a full list of FDA approved sterilants and high-level disinfectants visit the following site: http://www.fda.gov/cdrh/ode/germlab.html

Unacceptable Solutions

Quaternary Ammonium Compounds (Quats)

All older quaternary ammonium compounds have been declared unacceptable for use in dentistry by The Council for Dental Therapeutics of The American Dental Association. Do not use any compound that contains benzalkonium chloride, dibenzalkonium chloride, cetylpyridinium chloride or alkyldimethylbenzylammonium chloride. They are not tuberculocidal, sporicidal, or virucidal and will not kill all gram-negative bacteria. They are inactivated by soap, hard water, and organic debris.

Alcohol

Alcohol (both types: ethyl and isopropyl) is ineffective against bacterial spores, irregular in killing viruses, evaporates rapidly, has no residual effect, and is inactivated by organic matter. Alcohol is not EPA approved for instrument or surface disinfection

Introduction

Instrument Processing Area

- Use a designated processing area to control quality and ensure safety
- Divide processing area into work areas
    - Receiving, cleaning, and decontamination
    - Preparation and packaging
    - Sterilization
    - Storage

Presoaking

Soak contaminated instruments in a mild detergent or an instrument disinfectant/sterilant until a more convenient time for processing. This will prevent blood, saliva, and debris from drying on the instruments. If possible, use the ultrasonic cleaner basket set in a pan of presoak, so the instruments can be directly immersed in the ultrasonic cleaner without additional handling. Always wear heavy utility gloves, protective eyewear, a mask, and protective clothing when handling contaminated instruments.

Precleaning

Preclean debris and blood from instruments and surfaces after the presoak and before a sterilization cycle because this bioburden will prevent chemicals or heat from contacting the instruments. Clean instruments by hand or by submerging in an ultrasonic cleaner. Risks of injury and cross-contamination increase dramatically with hand cleaning of instruments because of the close contact with sharp edges and spatter of contaminated fluids.

If hand scrubbing is the only option, wear heavy utility gloves, a mask, protective eyewear, and protective clothing. If safe, try to scrub instruments while submersed in a sink of water and use careful, light motions. Always rinse and dry instruments.

Ultrasonic cleaners are very effective and greatly reduce the risk of puncture injury to the health care worker. Arrange the cleaning area so the ultrasonic cleaner is on one side, a sink in the middle, and sterilizer on the other side. Use solutions designed specifically to aid in cavitation. These solutions are generally not disinfectants, so the instruments will emerge free from bioburden but still contaminated. Match the cleaning activity with the type of instruments being cleaned (e.g., a light purpose cleaner for lightly soiled instruments, heavy duty for very soiled instruments.)

Place the instruments in the basket before submersion to avoid spatter and keep them off the bottom of the ultrasonic cleaner. Use bur blocks, and be careful of overloading sharp instruments which may be dulled by contact with other items. Check manufacturer directions for burs, some can not be cleaned ultrasonically.

Visually inspect the tips of instruments to make sure the bioburden is removed. Use heavy utility gloves for handling instruments from the ultrasonic since they will still be

contaminated. Instruments must be rinsed and dried before sterilization. Wet instruments may corrode in chemical vapor sterilizers and cause paper wraps to burst making the packaged instruments open to air and contamination after the sterilization process.

Change solutions in the ultrasonic cleaner daily. Use heavy utility gloves, mask, protective eyewear, and protective clothing when changing the solution. The inside of the chamber should be disinfected, rinsed, and dried. Then fill the container with fresh solution. Occasionally test the ultrasonic by suspending a piece of aluminum foil in the chamber and cavitate for 10 minutes. There should be small holes in the foil from the ultrasonic action. Keep the foil pieces for comparison.

Burs and drills can be carefully scrubbed with a wire brush before autoclaving. Remember to heat sterilize the wire brush and disinfect other brushes after use.

Corrosion Control and Lubrication

Rust inhibitors are available to protect non-stainless instruments in steam autoclaves. If the manufacturer recommends lubrication before sterilization, be sure to remove excess lubricant so it does not bleed on the bags.

Packaging

Always use the correct type of instrument packaging for the sterilizing system you use. Wraps that may work fine in a dry heat sterilizer (like closed metal or glass, and aluminum foil) can prevent penetration by steam or chemicals in other types. Sterility will not be achieved if the sterilizing agent does not contact the surface of the instruments for the correct amount of time. Plastics may melt in dry heat, causing damage to the sterilizing unit and the instruments. When using paper, make sure it is strong enough to hold the sharp tips of instruments within the bag to avoid contamination and possible injury. Use transparent materials or mark the contents clearly on the paper to avoid opening packages needlessly. Use self-sealing bags, autoclave tape, heat-sealing, or double fold the open end of the bags to contain the instruments. Staples and paper clips rust easily and are not reliable for sealing bags. Use containers of some type because loose instruments will become easily contaminated between the sterilizer and the operatory, especially if stored in a drawer then sorted out later.

High-Speed Handpiece Asepsis

All high-speed dental hand pieces, low-speed hand piece components used intraorally, and other dental unit attachments such as reusable air/water syringe tips and ultrasonic scaler tips, shall be heat-sterilized between patients. Especially stressed is to flush the handpiece waterline after use for 20 to 30 seconds to wash the internal lines. Anti-retraction valves are common on units manufactured after the mid-1980's. Any unit without these valves should be retrofitted with them. Check on retraction frequently. Operate high-speed handpieces and air/water syringes for 30 seconds after each patient to flush the lines. To avoid spraying aerosols into the environment, operate the handpiece over a vacuum line to suction excess lubricant.

If you do not have the directions and information regarding a handpiece's tolerance to heat or the recommended sterilization and lubrication regimen, contact the manufacturer with the model number and request a written copy. Some must be lubricated before, after, or before

and after sterilization. Some do not need lubrication at all.

Slow Speed Handpieces, Contra Angles, and Prophy Angles

Since slow speed handpieces do not contact the patient's mucosa, they do not need to be sterilized. Follow manufacturer's directions for cleaning and disinfection, using a hard surface disinfectant that will not corrode the exterior casing.

Use heat sterilizable or disposable prophy angles and contra angles. If treating an immunocompromised patient, a sterile angle is recommended. Some disposables can be autoclaved prior to first use, check manufacturer's directions.

Air/Water Syringes and Ultrasonic Scaler

Units that dispense water into the patient's mouth should be flushed for 30 seconds into a vacuum line between each patient. The tips of both air/water syringes and ultrasonics should be removable and sterilized if possible. Plastic disposable tips are available for the air/water syringes.

Lasers, Curing Lights, Electrocautery Devices

Follow manufacturer's directions for all devices. Use barrier protection when possible, and preclean removable tips before sterilization.

Laser/Electrosurgery Plumes and Surgical Smoke

- Destruction of tissue creates smoke that may contain harmful by-products
- Infectious materials (HSV, HPV) may contact mucous membranes of nose
- No evidence of HIV/HBV transmission
- Need further studies

Disposable Items

Single use disposable instruments (e.g. prophylaxis angles, prophylaxis cups and brushes, 3 tips for high-speed evacuators, saliva ejectors, air/water syringe tips) shall be used for only patient only and discarded.

Saliva Ejector and High Speed Evacuation System

The saliva ejector tip is disposable and should be thrown away after every patient. However, if the interior of the vacuum line is not disinfected, it is contaminated with microorganisms and debris. Many health care workers incorrectly instruct the patients to close their lips around the ejector tip, which causes a suck back effect. A study of saliva ejectors by Watson and Whitehouse published in 1993[ix] clearly demonstrated suck back. Out of 97 tests using 15 different dental units at 9 different locations, 20 cases of red dye aspiration into participants' mouths were documented. Several times the red dye was observed to come up the clear saliva ejector towards the patient's mouth, but these were not counted as positive

results. Since many offices do not decontaminate their suction lines after every patient, it is likely that some patients will aspirate bacteria and even debris from infected suction lines if they seal off the saliva ejector. More effective methods of preventing accidental suck back are currently being investigated (like safety valves and changing the construction of the saliva ejector). Patients should be directed **not** to close their mouths around the suction tips.

Flush the high speed evacuation system after every patient with a 2% glutaraldehyde or any other non-foaming agent recommended by the manufacturer for disinfecting the lines. At the end of the day, flush with a disinfectant that will remain in the vacuum system overnight to help reduce the number of microorganisms. Handle evacuation system traps with utility gloves, empty into the toilet, and clean with a high-level disinfectant every day.

X-ray Equipment and Film

Cover or disinfect collimating tubes between each patient. Once the film is inserted into the patient's mouth it is considered contaminated. Use disposable gloves in the darkroom to open the packets. Remove the films from the packets without touching them, and collect contaminated packets on a disposable paper towel. When all films are out of the packets, discard the towel and the packets and remove the gloves. After washing hands, process the films as usual and the darkroom equipment will not be contaminated. The film packets could also be decontaminated by wiping them with bleach before taking them into the darkroom.

Impression Materials

Rinse impressions to remove debris, saliva, and blood. Disinfect before casting with die stone or sending out to the laboratory. Different impression materials require different disinfectants. Polysulfides and silicones can be disinfected by immersion in any EPA accepted tuberculocidal disinfectant without distorting the impression. Time of immersion for disinfection will vary with different chemicals, so consult the directions on the bottle. Polyether impressions may be distorted if immersed. These impressions should be disinfected using a chlorine compound spray that has a short disinfection time of 2 to 3 minutes. After this time, rinse the impressions thoroughly.

Introduction

METHOD	STANDARD STERILIZING CONDITIONS*	ADVANTAGES	PRECAUTIONS	SPORE-TESTING
Steam autoclave	20-30 min at 250 F 3-10 min at 273 F	Time efficient; Good penetration; Sterilize water-based liquid	Do not use closed containers; May damage plastic and rubber items; non-stainless steel metal items corrode; Use of hard water may leave deposits	*Bacillus stearothermophilus* strips, vials, or ampules.
Unsaturated chemical vapor	20 min at 270 F (20-40 psi)	Time efficient; No corrosion; Items dry quickly after cycle	Do not use closed containers; May damage plastic and rubber items; Must use special solution; Predry instruments or dip in special solution; Provide adequate ventilation; cannot sterilize liquids.	*Bacillus stearothermophilus* strips
Dry heat oven Dry heat	60-120 min at 320 F	No corrosion; Can use closed containers; Large capacity per cost; items are dry after cycle	Longer sterilization time; cannot sterilize liquids; May damage plastic and rubber items; Do not open door before end of cycle	*Bacillus subtilis* strips
Rapid Heat Transfer	12 min at 375 F (for wrapped items) 6 min at 375 F (for unwrapped items	No corrosion; Short cycle; items are dry after cycle.	Predry instruments; Cannot sterilize liquids; May damage plastic and rubber items; Do not open door before end of cycle; Small capacity per cost; Unwrapped items quickly contaminated after cycle.	*Bacillus subtilis* strips

* These conditions do not include warm-up time and they may vary depending upon the nature and volume of the load. Sterilizing conditions in your office sterilizer should be defined by results of routine spore-testing.

C.H. Miller. "Sterilization and disinfection: what every dentist needs to know.", JADA vol 123:46 © 1992 Reprinted by permission of ADA Publishing Co., Inc.

The Centers for Disease Control and the American Dental Association recommend sterilization of any instruments, burs, and handpieces that come into contact with oral tissue, or penetrate soft tissue or bone after each use. Heat stable critical and semi-critical instruments shall be cleaned and sterilized before use by using steam under pressure (autoclaving), dry heat, or chemical vapor. FDA cleared chemical sterilants/disinfectants shall be used for sterilization of heat-sensitive critical items and for high level disinfection of heat-sensitive semi-critical items.

Critical and semi-critical instruments or containers of critical and semi-critical instruments

sterilized by a heat vapor method shall be packaged or wrapped before sterilization if they are not to be used immediately after being sterilized. These packages or containers shall remain sealed unless the instruments within them are placed onto a setup tray and covered with a moisture impervious barrier on the day the instruments will be used and shall be stored in a manner to prevent contamination.

The four main sterilizing methods used in dentistry today are steam heat autoclave, unsaturated chemical vapor, dry heat, and rapid heat transfer. The effectiveness of these types of sterilizers can be tested with commercial spore testing. Precleaned instruments submerged in glutaraldehyde solution at 2.0 percent or 3.2 percent concentration for 10 hours will also kill bacterial spores, but there is no test to verify the results. Currently, no single system will work for all the items used in a dental office. Most offices use steam autoclaves as a primary source of sterilization with glutaraldehyde as a secondary.

The best and safest approach to preventing disease transmission from patient to patient via the instruments is to sterilize all reusable instruments that are contaminated with blood or saliva instead of sterilizing some and disinfecting others. Sterilizers must be used correctly to achieve sterilization with every load of instruments.

Examples of common mistakes include:

- overloading of sterilizer chamber;
- lack of separation between packs or trays in the chamber;
- wrong packaging material for method of sterilization;
- more than two layers of wrap, inhibiting penetration;
- closed container not penetrated by steam or chemical vapor;
- starting timing for sterilization before sterilizing temperature is reached;
- dry heat sterilizer door opened to add more items without starting sterilization time over;
- sterilizer timer malfunction;
- improper cleaning of items to be sterilized. [i]

Sterilization Monitoring

The best way to ensure correct use of heat sterilizers (including operation, packaging, loading and timing) is by using spore tests. Proper functioning of the sterilization cycle shall be verified at least weekly with a biological indictor (such as a spore test). Test results must be maintained for 12 months.

The spore test should be specific for the type of sterilizer used. The test should be placed in the same type of container normally used for instruments, then run through a normal cycle with other instruments. The time, temperature, and pressure are recorded. The test and another control sample that has not been processed are then returned to the laboratory for culturing. Spores should grow on the control but not on the test. The laboratory then notifies the office of the results. There are many spore-testing services for steam, dry heat, unsaturated chemical vapor and ethylene oxide gas sterilizers. They send the appropriate biological indicator strips, instructions, and return envelopes. They call immediately for failures, and send written reports for each test. Special sterilizing bags, tapes, or strips are

available to test if the packages have been exposed to heat, steam, or chemical vapor. These should always be used in addition to, not instead of, spore tests, because they do not indicate that all microbes have been eliminated, just exposure to the proper elements.

Routine spore testing is done weekly. Spore test when any new packaging material is used, during and after sterilizer training of staff members, when a new sterilizer is used, after a sterilizer has been repaired, after any change in sterilizer loading procedure, and with every implantable device. Do not proceed with implantation until test results are verified.

Glutaraldehyde as a Sterilant

Glutaraldehyde is highly corrosive and toxic. Since instruments sterilized in this manner are not wrapped in sterilization pouches, it is necessary to either immediately use them after sterilization or to transfer them to a sterilized container (per the ADA's infection control recommendations).

Introduction

The lab should set up a receiving area separate from the production area for all incoming cases. The countertop should be disinfected daily with an acceptable disinfectant according to the directions on the bottle.

Unless the technicians are certain that the case has been disinfected properly, they should disinfect each case as it is received. Case containers should be disinfected also. Anyone receiving cases before their disinfection should wear a uniform or laboratory coat, a mask, protective eyewear, and disposable gloves. Utility gloves and other standard protective attire should be used when working with disinfectant chemicals.

All equipment and surfaces in the production area should be disinfected daily. Splash shields and equipment guards shall be used on dental laboratory lathes. Fresh pumice and a disinfected, sterilized, or new ragwheel shall be used for each patient. Devices used to polish, trim or adjust contaminated intraoral devices shall be disinfected or sterilized. Ragwheels should be cleaned and autoclaved after each case. Pumice should be dispensed in small individual amounts for each case, and discard all excess. Mix 5 parts sodium hypochlorite (bleach) with 100 parts distilled water and three parts soap with the pumice to provide a disinfectant effect.

Instruments, attachments, and materials used on new prostheses should be kept separate from the ones used on an appliance that has contacted a patient's mouth. Intraoral items such as impressions, bite registrations, prosthetic and orthodontic appliances shall be cleaned and disinfected with an intermediate-level disinfectant before manipulation in the laboratory and before placement in the patient’s mouth. Such items shall be thoroughly rinsed prior to placement in the patient’s mouth.

Disinfect cases before returning to the dental office. The dentist and laboratory should communicate with each other about proper infection control regarding all lab cases.

Introduction

Water from dental unit water lines (DUWL) usually contains higher levels of bacteria than municipal water supplies, yet no widespread health problems have been associated with this water. Concern over DUWL contamination has been fueled by an increase in awareness of infection control issues, media reports of contaminated water from dental units, and case reports associating illness with dental water contamination.

Dental unit water contains approximately the same types of bacteria found in drinking water, but in a higher concentration. Municipal water is normally maintained with below 500 colony forming units per milliliter (CFU/mL) of heterotrophic bacteria per milliliter of water. Several studies show water from dental handpieces and air-water syringes contaminated at levels exceeding 100,000 CFU/mL.[x] The ADA has recommended a goal of 200 CFU/mL.

Microbes enter the tubing from incoming water. These microbes adhere to the walls of the tubing and begin to multiply. The microbes produce a slime layer (biofilm) and more microbes from the water attach to the slime. The flow of the water can dislodge the microbes from the slime layer and release them into the flowing water. The tubing is constantly replenished with more microbes, stagnation of the water facilitates growth of the slime layer, and the small diameter of the tubing results in a large surface-to-volume ratio. Water heating systems in dental units are designed to heat the water to human body temperature. This may increase the numbers of microorganisms and encourage bacterial growth in the waterlines. Water heating systems should not be used.

Dental unit water lines shall be anti-retractive. The dental unit line shall be flushed between each patient for a minimum of 20 seconds.

Waterlines should be flushed after each patient to remove material that may have been retracted during the procedure. This will also dislodge some of the biofilm. However, flushing only, without chemical treatment, filtration, or other valid intervention should be used only as an interim measure until methods that are more effective are available to bring the water quality up to the ADA goal of 200 CFU/mL.

Sterile coolant and irrigating solutions shall be used for surgical dental procedures involving soft tissue or bone. Sterile coolants/irrigants must be delivered using a sterile deliver system. The US Food and Drug Administration classifies dental water treatment and delivery systems as medical devices. They are subject to pre-market standards and must have a 510(k) clearance.

Any chemical germicides used must be EPA registered and produce water that must:

- be compatible with dental restorative materials,
- not exceed than 200 CFU/mL of heterotrophic mesophilic bacteria, and
- not contain toxic or carcinogenic chemicals.

Current options for maintaining adequate bacterial levels in waterlines include water filtration, water purification and chemical treatments.

Monitoring Options

- Water testing laboratory
- In-office testing with self-contained kits
- Follow recommendations provided by the manufacturer of the dental unit or waterline treatment product for monitoring water quality

Ethical and Legal Considerations Regarding AIDS and HIV

Introduction

All patients should be treated with compassion and dignity, regardless of their HIV status. There is an extremely minute risk of contacting AIDS through dental procedures if the recommended infection control procedures are followed carefully. The ADA Council on Ethics, Bylaws and Judicial Affairs presented the following advisory opinion about patient selection:

"A dentist has the general obligation to provide care to those in need. A decision not to provide treatment to an individual because the individual has AIDS or is HIV seropositive, based solely on that fact, is unethical. Decisions with regard to the type of dental treatment provided or referrals made or suggested, in such instances, should be made on the same basis as they are made with other patients, that is, whether the individual dentist believes he or she has need of another's skills, knowledge, equipment or experience and whether the dentist believes, after consultation with the patient's physician if appropriate, the patient's health status would be significantly compromised by the provision of dental treatment."

Currently, it is illegal to refuse to treat a patient because they are HIV positive. If the individual is a patient of record, it is considered abandonment if the dentist refuses them treatment.

If a dentist or auxiliary is carrying an infectious disease, especially HIV or hepatitis B, he or she is obliged to take the precautions necessary to ensure that the disease is not transmitted to the patients. The laws are changing rapidly in this area, so the dentist or auxiliary who is a carrier of a disease should consult with their physician and lawyer to find out if there are any current laws that might restrict their practice or force them to advise patients of their disease state.

The Acer Case

In July of 1990, The Centers for Disease Control published the only documented cases of transmission of HIV from an infected health care worker to patients during invasive dental procedures. Five patients of Dr. Acer of Florida have been diagnosed as HIV positive. Each patient had undergone invasive dental procedures, and all reported that the dentist wore a mask and gloves. Epidemiological and molecular biological investigations confirmed that the infection was transmitted from the dentist. All the patients had dental care from the dentist after he was diagnosed HIV positive. Treatment records do not indicate any unusual circumstances involving any of the procedures, and the dentist denied any needlestick injuries since his HIV positive diagnosis. None of the patients had confirmed exposures to HIV other than the dental treatment by Dr. Acer. Cross-infection by dental instruments has been ruled out because none of the patients had appointments on the same day. Intentional transmission of HIV may be another theory, but no evidence exists to support this, through interviews with family, staff, and others. The virus was passed through direct patient exposure to the dentist's blood, but the exact route of transmission remains unknown.

Sharpe vs. Breglio

The Hampshire County Superior Court in Massachusetts decided a landmark case regarding contraction of AIDS in the Dental Office. Mr. Sharpe contended that he contracted

AIDS by unsterilized dental equipment at Dr. Breglio's office.

Dr. John Molinari, a recognized expert in Infection Control, testified that it was "remotely possible" that the virus was transmitted through the dental equipment. The jury was not convinced that the high-speed hand piece was the mode of transmission for the virus. The case (concluded February 16, 1996) confirms the necessity of heat sterilizing dental equipment (including dental hand pieces), and gives additional documentation that the virus is not spread by dental visits.[xi]

The Bragdon Case

Ms. Sidney Abbott sought dental care from Dr. Randon Bragdon on Sept 16, 1994. She indicated that she had AIDS on her medical information sheet. During the examination, Dr. Bragdon found a carious lesion on a mandibular molar. He informed her that he would need to fill the tooth in a hospital because of his infectious disease policy and she would be responsible for the additional costs. Ms. Abbott sued. A federal judge and then the 1st U.S. Circuit Court of Appeals found that Bragdon had violated federal law in refusing to treat her in his office. Bragdon appealed to the nation's highest court. [xii]

The Supreme Court delivered a decision in June, 1998 that HIV infected individuals are protected under the Americans with Disabilities Act (AWDA). The AWDA requires that a "major life activity" be impaired in order to be covered. Sydney Abbott claimed that her HIV status forced her to decide not to have children, and the judges agreed that reproduction is a major life activity. This ruling does not necessarily mean every HIV-positive person is covered by the act, but they most likely will be able to demonstrate they are covered by the AWDA in some way. The AWDA bans discrimination against disabled people, but there is an exception whereby care providers are not required to treat an infected person if the condition poses a significant safety risk. The Supreme Court directed the U.S. Court of Appeals for the First Circuit to further investigate the question of risk involved in the case. According to Justice Anthony M. Kennedy, the Supreme Court could not decide on the matter "since it should be limited to 'objective, scientific information.'"[xiii]

The federal court of appeals ruled against Dr. Bragdon on March 5, 1997 and found him guilty of violating federal and state laws by refusing to treat Ms. Abbott in his dental office.

The American Dental Association released a statement on September 29, 1998 reaffirming that patients with HIV may be safely treated in a dental office. ADA policy based on current scientific information states: "Current scientific and epidemiological evidence indicates that there is little risk of transmission of infectious disease through dental treatment if recommended infection procedures are routinely followed. Patients with HIV infection may be safely treated in private dental offices when appropriate infection control procedures are employed." In addition, a decision not to provide treatment to an individual based solely on their AIDS or HIV seropositive status is unethical.[xiv]

Introduction

In outline form, here are some of the main points of infection control for the dental office:

Before the patient is seated for treatment:

- All health care workers in direct contact with patients should be immunized against the hepatitis B virus.
- Each patient should fill out a thorough medical health history form. Update at each appointment and document.
- Prostheses and appliances to be delivered to the patients should be disinfected before fitting.
- Disposable coverings should be placed prior to seating patient in operatory, and all surfaces should be disinfected.
- Take a few seconds to look over the setup to see if anything is missing.

During patient treatment:

- Treat all patients as potentially infectious.
- Use protective wear and barrier techniques when in contact with body fluids or mucous membranes: gloves, mask, protective eyewear, and gowns, lab coats, or uniforms.
- X-ray films that are contaminated should be opened for processing in the darkroom with gloves, being careful not to touch the film.
- Conduct procedures with the minimum amount of droplets, spatters, and aerosols. Use a rubber dam when appropriate. Use a high-volume aspirator.
- Use gloves correctly to protect hands. Wash hands before and after gloving. Change gloves in between each patient. Change gloves that are torn, cut, or punctured.
- Avoid injury to hands by being careful with sharp items, placing disposable needles in an appropriate receptacle, and recapping needles using a recommended technique.
- Do not be interrupted to leave the room if possible.
- Use an overglove if answering the phone or going into a drawer.
- Do not touch your face or hair.
- At end of treatment: discard mask and gloves, wash hands, and remove gown.
- Make notes in chart and dismiss patient.

After the patient leaves:

- Wear heavy rubber gloves while disinfecting surfaces after each patient and handling instruments.
- Clear off all instruments that can be soaked and put them in a container.
- Clean all debris from instruments.
- Sterilize instruments that penetrate soft tissue or bone. Also sterilize, when possible, all instruments that encounter oral mucous membranes, body fluids, or any contaminated secretions of patients. High level of disinfectant must be used if item is heat sensitive or odd sized.
- Run air/water syringe, ultrasonic scaler, and/or handpiece for 30 seconds to flush lines.
- Clean suction lines with disinfectant by aspirating an acceptable, non-foaming solution.
- Dispose of all disposable items after one use.
- Clean and sterilize handpieces if possible; but must be sterilized for intraoral use of handpieces- follow manufacturer's directions.
- Use caution when handling sharps, especially disposable needles and scalpels. Place them in a puncture-resistant container before disposal.
- Decontaminate all environmental surfaces. Use absorbent paper toweling and a detergent type disinfectant to preclean surface and remove debris. Dispose of towels appropriately. Spray area liberally with disinfectant and leave wet for the time indicated by the directions. Dispose of and replace any protective coverings on switches, light handles, x-ray unit head.
- Decontaminate all outgoing materials such as impressions, bite registrations, and appliances being sent to a laboratory.
- Use only small individual amounts of pumice in a disposable container for each patient, and discard any unused portion.
- Appropriately dispose of wastes. Any blood, suctioned fluids, or other liquid waste, if your state allows it, should be poured in a drain connected to a sanitary sewer system. Solid wastes contaminated with blood or saliva, including tissue, extracted teeth, and bloody (dripping) gauze should be sealed in a sturdy impervious bag and disposed of according to local, state, and federal environmental regulations.
- Wash hands after removing gloves.

Dental Laboratories

Incoming Cases

- Wear appropriate protective gear including lab coats or uniforms, masks, and appropriate gloves (utility type when working with chemicals, disposable type when handling infected cases).
- Have a specific receiving area where all cases are placed before being taken to the production area.
- Properly disinfect each case when it is received. (If impressions cannot be disinfected without distorting, pour up and then disinfect the model).
- Disinfect case containers.
- Disinfect countertops and work areas daily by precleaning and then spraying with a suitable disinfectant, following the manufacturer's directions.
- Any solid waste contaminated with blood or saliva should be placed in sturdy bags and disposed of according to local, state, and federal environmental standards.

Production Area

- Use appropriate protective wear, safety glasses and masks.
- Clean and disinfect work surfaces daily.
- Have different sets of instruments, attachments, and materials: one for new cases and others for cases that have already been in a patient's mouth.
- Use small, individual amounts of pumice for each case and discard any remaining.
- Clean and disinfect brushes and other equipment used on contaminated prostheses.
- Clean and autoclave ragwheels.

Outgoing Cases

- Disinfect all outgoing cases.
- Communicate clearly with the dental office about infection control procedures the laboratory uses and what must be done to each case in the dental office.

Timetable Checklist

Daily

- Clean and disinfect floors, work surfaces, doorknobs, sink handles, drawer pulls, and anything else that may have been touched but not disinfected after each patient. Clean sterilizing area, disinfect brushes, and wipe down heat sterilizers.

Weekly

- Clean and disinfect lower areas of walls, front office areas, phones, and other areas not disinfected daily. Check stock and supplies to make certain you have an adequate amount of barrier products, chemicals, solutions, and supplies for the next week. Check the expiration date on all chemicals like glutaraldehyde. Test heat sterilizer with biological test strips.

Monthly

- Clean out drawers and storage spaces, disinfect with a product that has a long lasting effect.

Annually

- Review cross-infection control system. Check that your hepatitis B vaccine is up to date (usually needs a booster every 5 years). Communicate with the laboratory regarding infection control of incoming/outgoing cases.

The Absolute "Bottom Line"

- Take a full medical history on each patient.
- Be vaccinated against hepatitis B.
- Treat all patients as if they were infectious.
- Have patients use an antiseptic mouthrinse before invasive procedures.
- Use an antiseptic handwash.
- Wear a disposable mask or faceshield.
- Wear disposable latex gloves any time you touch mucous membranes.
- Wear protective eyewear.
- Wear a disposable gown or lab coat when spatter is expected.
- Wear clinical attire at all times.
- Use a rubber dam when appropriate.
- Put needles and other sharps in a puncture resistant container.
- Use sterilizable handpieces.
- Use an ultrasonic cleaner instead of hand scrubbing instruments.
- Package instruments correctly for sterilization.
- Use a heat sterilizer.
- Monitor the sterilizer with appropriate spore tests weekly.
- Use glutaraldehyde for items that cannot be heat sterilized for the appropriate time recommended.
- Use an appropriate surface precleaner.
- Use an appropriate surface disinfectant for the time recommended by the manufacturer.
- Use surface covers.
- Have an adequate waste disposal system according to local regulations.

Test

Please mark only one **best** answer to the following questions on the one page answer sheet. This test contains 25 questions. Please mark your answers in spaces numbered 1 through 25 on your answer sheet.

1. The definition of disinfection used in this course is:

    a. To sterilize.
    b. destruction of most forms of microorganisms, but not bacterial and mycotic spores, which are highly resistant.
    c. destruction of all forms of life including viruses, bacteria, fungi, and spores.
    d. none of the above.

2. Bacterial spores are harder to kill than fungus.

    a. True
    b. False

3. Which of the following can cause damage to a latex glove?

    a. oil or petroleum based hand cream
    b. disinfecting chemicals
    c. antimicrobial hand wash
    d. a sharp instrument
    e. all of the above

4. Which of the following items should not be worn while treating a patient?

    a. band-aid over cuts
    b. jewelry like wedding rings, bracelets, earrings
    c. hair bands to keep hair off the face
    d. masks

5. Electrical switches on the dental unit and chair are best cleaned and disinfected by:

    a. spraying with an iodophor.
    b. wiping with alcohol.
    c. keeping isolated from contamination by covering with a disposable cover like plastic wrap, foil, or another material impervious to water; replacing after every patient.
    d. dismantling, put in ultrasonic cleaner, dried, and autoclaved.

6. In some special circumstances, you do not need to wash your hands before putting on gloves.

    a. True
    b. False

7. An ideal disinfectant solution should:

    a. have a wide spectrum of antibacterial ability
    b. be fast acting
    c. be tuberculocidal, effective against hepatitis B and HIV
    d. be odorless, economical, and easy to use
    e. all of the above

8. Sodium hypochlorite (bleach) is recommended:

    a. as a surface disinfectant after every patient.
    b. as a surface disinfectant after a high-risk patient.
    c. as a sterilizing soak for metal instruments.
    d. as a solution to apply to contaminated paper products before their disposal.

9. A preprocedural chlorhexidine gluconate rinse may be indicated:

    a. prior to oral surgery.
    b. as an adjunct to premedication if they have poor oral hygiene.
    c. patients who are immunosuppressed because of AIDS.
    d. all of the above.

10. Older quaternary ammonium compounds that contain benzalkonium chloride, dibenzalkonium chloride, cetylpyridinium chloride or alkyldimethylbenzylammonium chloride can be used for disinfection in the dental office.

    a. True
    b. False

11. Disposable needles should be disposed of after every patient.

    a. True
    b. False

12. Autoclavable handpieces should be heat sterilized after each use.

    a. True
    b. False

13. Suction lines should be disinfected between each patient.

    a. True
    b. False

14. X-ray films are not really contaminated after they have been used if there is no visible blood on them, so they can be handled with bare hands.

    a. True
    b. False

15. Heat sterilizers should be spore tested:

    a. daily.
    b. weekly.
    c. yearly.
    d. when instruments start looking dirty after a cycle.

16. Glutaraldehyde is recommended for immersion use only and is not recommended for use as a surface disinfectant.

    a. True
    b. False

17. If the Dental Laboratory technicians are not sure that an impression (or case) has been disinfected, they should:

    a. send it back to the dental office for disinfection.
    b. disinfect it as it is received.
    c. work with it as it is.
    d. autoclave it.

18. It is illegal to refuse treatment to a patient because of his/her HIV status.

    a. True
    b. False

19. According to the ADA Statement on the Bragdon case, it is safe to treat a patient with HIV in a dental office when appropriate infection control procedures are used.

    a. True
    b. False

20. If you need to retrieve an item in a drawer during a procedure and your gloves are contaminated, you should:

    a. use an overglove or take off the gloves, wash hands, retrieve the object, put on a new pair of gloves.
    b. wash gloves with an antimicrobial soap and dry thoroughly.
    c. wipe gloves with a dry towel, retrieve the item, wipe gloves with a dry towel again.
    d. use your pinkie fingers to get the object because they don't usually come in contact with the patient's mouth.

21. Water lines should be flushed for 30 seconds and the evacuation system should be disinfected after every patient.

    a. True
    b. False

22. Heavy rubber gloves should be worn when disinfecting surfaces and handling contaminated instruments.

    a. True
    b. False

23. It is ok to use the same toothbrush for demonstrating oral hygiene instructions in patient's mouths if they are sprayed with a disinfectant between each use.

    a. True
    b. False

24. It is important to train everyone in the office about infection control, even temporary help.

    a. True
    b. False

25. Which of the following should be cleaned daily?

    a. floors
    b. work surfaces
    c. door knobs, sink handles, drawer pulls
    d. All of the above and anything else that may have been touched but not disinfected after each patient.

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CDC Guidelines for Dental Care Settings

The CDC recommends the following for reducing the risk of TB transmission in the dental office, depending on the facility's level of risk:

"In general, the symptoms for which patients seek treatment in a dental care setting are not likely to be caused by infectious TB. Unless a patient requiring dental care coincidentally has TB, it is unlikely that infections TB will be encountered in the dental setting. Furthermore, generation of droplet nuclei containing M. tuberculosis during dental procedures has not been demonstrated. Therefore, the risk for transmission of M. tuberculosis in most dental settings is probably quite low. Nevertheless, during dental procedures, patients and dental workers share the same air for varying periods of time. Coughing may be stimulated occasionally by oral manipulations, although no specific dental procedures have been classified as "cough inducing". In some instances, the population served by a dental care facility, or the HCW's in the facility, may be at relatively high risk for TB. Because the potential exists for transmission of M. tuberculosis in dental settings, the following recommendations should be followed:

A risk assessment [Section II.B] should be done periodically, and TB infection-control policies for each dental setting should be based on the risk assessment. The policies should include provisions for detection and referral of patients who may have undiagnosed active TB, management of patients with active TB relative to provision of urgent dental care; and employer-sponsored HCW education, counseling and screening.

While taking patients' initial medical histories and at periodic updates, dental HCW's should routinely ask all patients whether they have a history of TB and symptoms suggestive of TB.

Patients with a medical history or symptoms suggestive of undiagnosed active TB should be referred promptly for medical evaluation of possible infectiousness. Such patients should not remain in the dental care facility any longer than required to arrange a referral. While in the dental care facility, they should wear surgical masks and should be instructed to cover their mouths and noses when coughing or sneezing.

Elective dental treatment should be deferred until a physician confirms that the patient does not have infectious TB. If the patient is diagnosed as having active TB, elective dental treatment should be deferred until the patient until the patient is no longer infectious.

If urgent dental care must be provided for a patient who has, or is strongly suspected of having, infectious TB, such care should be provided in facilities that can provide TB isolation (Sections II.E and G) Dental HCWs should use respiratory protection while performing procedures on such patient.

Any dental HCW who has a persistent cough (i.e., a cough lasting 3 weeks), especially in the presence of other signs or symptoms compatible with active TB e.g., weight loss, night sweats, bloody sputum, anorexia, and fever), should be evaluated promptly for TB. The HCW should not return to the workplace until a diagnosis of TB has been excluded or until the HCW is noninfectious. In dental-care facilities that provide care to populations at high risk for active TB, it may be appropriate to use engineering controls similar to those used in general-use areas (e.g., waiting rooms) of medical facilities that have a similar risk profile."

ADA Statement on Dental Unit Waterlines

Preface to ADA Statement on Dental Unit Waterlines

The issue of biofilm in dental unit waterlines has been actively addressed by the ADA Division of Science. In the past two years, workshops have been held that reviewed current research in this area -- in particular, methods to prevent or control biofilm formation in dental unit waterlines. Most recently, an expert panel was brought together to focus on what the goal should be for dental unit water quality and to identify critical research and development needs. The panel developed a statement addressing these areas, which was subsequently adopted by the ADA Council on Scientific Affairs. In turn, the Council recommended that the statement be adopted by the ADA Board of Trustees. The Board approved a resolution adopting the statement as the position of the Association on December 13, 1995. The complete statement follows.

American Dental Association Statement on Dental Unit Waterlines

Adopted by the American Dental Association Board of Trustees, December 13, 1995, and ADA Council on Scientific Affairs, September 28, 1995

Background: Organized dentistry has traditionally assumed responsibility for assessing and improving the quality of dental care provided to patients. The widespread adoption of enhanced infection control methodologies by dental practitioners is just one example of the profession's commitment to high quality patient care.

The Council is sensitive to heavy regulatory burden imposed on dentists in recent years by various federal, state and local government agencies. In some cases, the regulations have been based on limited science. The Council reaffirms its strong belief that both the profession and the public are served when recommendations affecting dental practice are based on sound science and take into account their cost in light of their expected benefit. The recommendations that follow are made in light of these considerations.

Through its continued monitoring of scientific literature, the Council has become aware that the microbiologic quality of water used in dental treatment could be improved. Although there is no evidence of a public health risk due to this phenomenon, steps should be taken to improve the quality of water used in patient care as soon as feasible. The profession, the dental industry, and the research community all have an important role to play in this process. Dental unit waterlines (the tubes that connect the high-speed handpiece, air/water syringe and ultrasonic scaler to the water supply) have been shown to harbor a wide variety of microorganisms including bacteria, fungi, and protozoans. These microorganisms colonize and replicate on the interior surfaces of the waterline tubing, inevitably resulting in adherent heterogeneous microbial accumulations termed "biofilms." Biofilms, once formed, serve as a reservoir significantly amplifying the numbers of free-floating microorganisms in the water exiting the waterlines. It has been suggested that heating dental unit water to increase patient comfort, as is the practice in some dental offices, may further augment biofilm formation. In unmaintained dental unit waterline systems, these microbial accumulations can contribute to occasional objectionable odors and visible particles of biofilm material exiting the system.

Water Quality Improvement: Dental unit water systems currently designed for general dental practice are incapable of delivering water of an optimal microbiologic quality. The Council recommends an ambitious and aggressive course to encourage industry and the research community to improve the design of dental equipment so that by the year 2000, water delivered to patients during nonsurgical dental procedures consistently contains no more than 200 colony forming units per milliliter (cfu/ml) of aerobic mesophilic heterotrophic bacteria at any point in time in the unfiltered output of the dental unit; this is equivalent to an existing quality assurance standard for dialysate fluid that ensures the fluid delivery systems in hemodialysis units have not been colonized by indigenous waterborne organisms.

Manufacturers of dental equipment are encouraged to develop accessory components that can be retrofitted to dental units currently in use, whatever the water source (public or independent), to aid in achieving this goal. Further, the ADA should urge industry to ensure that all dental units manufactured and marketed in the U.S.A. in the future have the capability to be equipped with a separate water reservoir independent of the public water supply. In this way, dentists not only will have better control over the quality of the source water used in patient care, but also will be able to avoid interruptions in dental care when "boil water" notices are issued by local health authorities.

At the present time, commercially available options for improving dental unit water quality are limited and will involve some additional expense.

They include the use of:

- Independent water reservoirs
- Chemical treatment regimens
- Daily draining and air purging regimens
- Point-of-use filters

Preliminary data suggest that some combination of the above strategies will be necessary to control biofilm formation and to achieve the desired level of water quality. To date, however, there are insufficient data to establish the effectiveness of available methods. Industry and independent researchers should be strongly encouraged to explore as wide a range as possible of alternatives and adjuncts to the above listed options. Dental practitioners should always consult with the manufacturer of their dental units before initiating any waterline treatment protocol.

Water Quality Monitoring: Simple and inexpensive methods to estimate the number of free-floating heterotrophic bacteria in dental unit water need to be developed to test the effectiveness of control measures. A well-designed water quality indicator (WQI) should be self-contained and easy to use in-office; accurately detect a wide concentration range and type of aerobic mesophilic heterotrophic waterborne bacteria within a reasonable incubation time at room temperature; and be relatively inexpensive to use. The Council is aware that technology meeting these criteria is already available and could possibly be adapted for use in dentistry with minimal developmental cost.

Training and Education: The ADA should enhance its efforts to educate dental practitioners regarding microbial contamination and biofilm formation in dental unit waterlines, and the need for improvement in the quality of water delivered to patients. Additionally,

manufacturers should maintain an active approach in training and educating the profession in the proper use and maintenance of their systems.

Critical Research and Development Needs Identified by the Council:

(1) Research is needed to define the natural history of biofilms, specifically to more clearly determine the relationship of the numbers and types of microorganisms in the fixed population (sessile) to their free-floating (planktonic) counterparts.

(2) Improved, research-based, methods need to be developed to effectively eliminate existing biofilm and prevent or control formation of new biofilm in dental unit waterlines.

(3) Alternative devices for monitoring the microbial quality of water used during dental care should be developed that are simple, reliable, and cost-effective.

In summary, the Council recognizes that the scientific literature supports the need for improvement in dental unit water quality. The Council will continue to work with industry and the research community to address research and development needs that will allow the delivery of water of an optimal microbiological quality to the dental patient. The Council recommends dissemination of this information to dentists as part of the ADA's on-going service to the profession and the public.

ADA Statement on Saliva Ejectors

A recent study published in the Journal of the American Dental Association raised the issue of possible cross contamination among dental patients as a result of backflow from the saliva ejector when, and if, the patient's lips form a seal around the ejector tip. The plastic tip suctions excess saliva from the patient's mouth during dental procedures.

As part of the Association's ongoing commitment to monitoring infection control developments, its Council on Scientific Affairs is reviewing the issue at its scheduled meeting in February. If called for, the Council will recommend updated guidance to dentists on this issue.

Current infection control recommendations call for the disposal of saliva ejector tips after use on each patient. The dental profession has undertaken stringent infection control measures to help ensure patient safety.

While the ADA and Centers for Disease Control and Prevention are not aware of any adverse health effects associated with the saliva ejector, dentists may wish to remind patients not to close their lips around the saliva ejector tip during use.

- ALERT: Allergy to Latex Education and Resource Team, Inc. http://www.latexallergyresources.org/
- Centers for Disease Control and Prevention http://www.cdc.gov/
- Environmental Protection Agency http://www.epa.gov/
- United States Food and Drug Administration http://www.fda.gov
- HIV Dent http://www.hivdent.org
- International Health Care Worker Safety Center at the University of Virginia http://www.healthsystem.virginia.edu/internet/epinet/
- Medscape Infectious Diseases http://www.medscape.com/
- National Institute of Health http://www.nih.gov/ OR: http://www.fedworld.gov/
- National Library of Medicine http://www.nlm.nih.gov/ (National Institute of Health)
- OSAP (Office Safety & Asepsis Procedures Research Foundation): Home Page http://www.osap.org/
- World Health Organization http://www.who.org

Endnotes

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[ii] Amendent of Section 1005 of Division 10 Title 16 of the California Code of Regulations. http://www.dbc.ca.gov/order_adopt1005.html
[iii] Centers for Disease Control and Prevention Guidelines for preventing the transmission of Mycobacterium tuberculosis in Health Care Facilities, 1994.
[iv] ADA, CDC.
[v] OSAP Dental Infection Contro and Office Safety Resource Guide 1999.
[vi] http://www.dir.ca.gov/title8/5193.html
[vii] Molinari, J.A.; Molinari, G.E. (1992). Is mouthrinsing before dental procedures worthwhile? *JADA*, 123 (3), 75-80.
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[x] Santiago, J et. al. (1994). Mictobial contamination of dental unit waterlines: Short and long term effects of flushing. *Gen. Dent.,* 42 (6), 528-544.
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[xiii] Greenhouse, Linda. (June 26, 1998). *Justices, 6-3, Bar Veto of Line Items in Bills; See H.I.V. as Disability.* New York Times, A1.
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