Infection Control: That Thing You Do

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THE DENTAL ADVISOR

Disclosures:
-- Consultant, Hu-Friedy Manufacturing, Inc
-- Consultant, SciCan, Inc

Infection Control Guidelines, Standards, Regulations
1. Occupational Safety and Health Administration (OSHA)
   Bloodborne Pathogens Standard
   Hazard Communications Standard
2. Centers for Disease Control and Prevention (CDC)
3. Environmental Protection Agency (EPA)
   Hospital-level disinfectants, hazardous waste disposal, infectious waste
4. Food and Drug Administration (FDA)
   Regulates manufacturers of medical devices, sterilants, high-level disinfectants

Evidence-based rankings

Recommendations: Each recommendation is categorized on the basis of existing scientific data, theoretical rationale, and applicability.

Category IA. Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiological studies.
Category IB. Strongly recommended for implementation and supported by certain experimental, clinical, or epidemiological studies and a strong theoretical rationale.
Category IC. Required for implementation, as mandated by federal or state regulation or standard.
Category II. Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
No recommendation. Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exist.

Evidence-Based Recommendations

- Do not administer medication from a syringe to multiple patients, even if the needle on the syringe is changed. (IA)
- Wear medical gloves when a potential exists for contacting blood, saliva, OPIM, or mucous membranes. (IB)
- Use single-use devices for one patient only and dispose of them properly. (IC)
- Keep fingernails short with smooth, filed edges to allow thorough cleaning and prevent glove tears. (II)
- Pre-procedural mouth rinses. (No Rec)
Are Your IC Precautions Effective?

Hepatitis B, C, etc
SARS
Drug Resistance
Vaccines
Waterborne Diseases
HIV/AIDS
MDR - Tuberculosis
Prions (CJD)
Pertussis
Bacterial Pneumonia
Viral Respiratory Tract Infection

WHY Continue To Be Scrutinized For IC?
✓ 2007 (NV): Hepatitis C transmission in med practice associated with re-use of multi-dose anesthetic vials
✓ 2007 (NM): Pt-to-Pt HBV transmission in an O.S. practice
✓ 2009 (FL): Possible infection transmission to >3,000 vets from improperly sterilized tubing with endoscopes
✓ 2010 (MO): Possible infection to 1,800 vets from improperly cleaned dental instruments
✓ 2010 (WV): 5 HBV cases following dental tx in free clinic
✓ 2011 (OH): VA dental clinic closed – staff DSS IC practices!!
✓ 375 vets tested: 7 HCV & 2 HBV infections
✓ 2012 (Italy): 1st reported Legionella case from DUWL
AND MORE ……

Basic Infection Control Principles
✓ Immunize against vaccine-preventable diseases
✓ Perform effective hand hygiene
✓ Use personal protective equipment (PPE)
✓ Heat sterilize all reusable patient care instruments/items used intraorally
✓ Use respiratory hygiene/cough etiquette
✓ Prevent cross-contamination with aseptic technique & environmental asepsis
✓ Prevent sharps injuries by using safe work practices & engineering controls

Possible HCW Perceptions
Ineffectiveness of certain recommendations vs. Overkill of infection control vs. Overlap of effective procedures

Lack of Adherence to Basic Infection Control Principles & Practices
Lessens Margin of Effectiveness Overlap
Increases Cross-Infection Risk
ASEPTIC TECHNIQUE

Goal: procedures that break the circle of infection & reduce potential for cross-contamination.

Applications & Examples:
1. Basic cleaning principles.
2. Keep sterilized instruments wrapped until use.
3. Consider single-use disposables.

Hand Hygiene
(Previously termed “hand washing”)

- Single most important infection control precaution.
- Recent technology & procedure advances
- “It’s not what you wash with, but how you wash”
- Cleaning remains basic tenet of hand hygiene
- Basic mechanics require compliance:
  - washing
  - rinsing
  - appropriate time for procedure
  - post-wash asepsis
  - dermatitis considerations

Types of Microflora

- Resident flora – normal body flora
  - located on skin & in deeper skin layers
  - provide immune protection
  - if disrupted, re-establish at same site

- Transient flora – potentially pathogenic
  - Acquired by direct contact
  - Outer skin layers
  - More easily removed

Critical Importance of Hand Hygiene

- 60-70% nosocomial infections related to improper hand washing & care
- Numerous clinical cases/outbreaks confirming patient-to-patient transmission of pathogens from HCW hands
  - MRSA, C. difficile, gram-negatives
- Multiple handwashing & asepsis guidelines since 1975
- CDC 2002 – most recent & comprehensive
- New strategies & product types
- FDA alert & notice (2011)

HAND HYGIENE

Multiple Acceptable Choices

- Non-antimicrobial
- Antiseptic
- Alcohol-based

Guidelines For Hand Hygiene In Health – Care Settings

Indications for Hand Hygiene:
- when hands are visibly dirty, contaminated, or soiled, wash with non-antimicrobial or antimicrobial soap & water.
- if hands are not visibly soiled, use an alcohol–based handrub for routinely decontaminating hands.

(CDC 2002)
III. Hand Hygiene

A. General Considerations

1. Perform hand hygiene with either a non-microbial or antimicrobial soap and water when hands are visibly dirty or contaminated with blood or other potentially infectious material. If hands are not visibly soiled, an alcohol-based hand rub can also be used. Follow the manufacturer’s instructions.

2. For oral surgical procedures, perform surgical hand antisepsis before donning sterile surgeon’s gloves.


Antimicrobial Spectrum / Characteristics of Hand Hygiene Antiseptic Agents

<table>
<thead>
<tr>
<th>Group</th>
<th>Gram-positive bacteria</th>
<th>Gram-negative bacteria</th>
<th>Yeast/droplets</th>
<th>Protozoa</th>
<th>Viruses</th>
<th>Speed of action</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Fast</td>
<td>Optimum contact kill, 99% reduction in 1 minute.</td>
</tr>
<tr>
<td>Chlorhexidine (4% and 5%)</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Persists after skin application.</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Causes skin burns; usually too irritating for routine use.</td>
</tr>
<tr>
<td>Iodine</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Less irritating than other antiseptics.</td>
</tr>
<tr>
<td>Phenol derivative</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Activity catalyzed by triclosan to increase.</td>
</tr>
<tr>
<td>Triton</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>Intermediate</td>
<td>Acceptability on hand varies.</td>
</tr>
</tbody>
</table>

Hand Washing vs. Alcohol-Based Antiseptics

1. Hand Washing

Pros (+)
- Plain soap or antimicrobial soaps
- Antimicrobial soaps effective
- Sinks usually readily available
- Familiar technique
- Rare allergic rx's to active antimicrobial agents
- Irritation dermatitis resolved by relatively simple techniques or behavior changes

Cons (-)
- Frequent washing can cause dryness, chapping, irritation
- Takes more time than antiseptic hand rubs or sprays
- Requires sink, water, paper towels
- Personal habits & preferred products may compromise professional training
- Strong fragrances may adversely affect sensitive people
- Water may be irritating
- Time & technique critical

2. Alcohol-Based Antiseptics

Pros (+)
- Provides more effective antiseptic action on visibly clean hands than washing with soaps or antimicrobial soaps
- Faster protocol than hand washing
- Reduced skin irritation & drying than hand washing
- May be used in absence of sinks & during boil water notices
- Rare allergic rx's to alcohol
- Reduces paper towel use & waste

Cons (-)
- Not indicated for use when hands are dirty or contaminated
- Critical to dispense proper amt
- Hands must be dry before applied
- Frequent use may cause irritation if product lack emollients
- Agent can sting compromised skin
- Strong fragrances may adversely affect sensitive people
- Alcohol flammability
- Glove powder can affect effectiveness

FDA Hand Hygiene Products Alert

- Don’t buy over-the-counter sanitizers or other products that claim to prevent infection from MRSA, E. coli, Salmonella, flu, others
- Examples of unproven claims:
  - kills over 99.9% of MRSA
  - helps prevent skin infections caused by MRSA and other germs
  - is effective against a broad spectrum of pathogens, including MRSA

- Some hand sanitizers & antiseptic products come with “prevent MRSA infection” claims
- FDA: “Don’t believe them. These statements are unproven”
- Products require FDA review & approval
Hand Hygiene Considerations

- Professional vs. personal hand products
- Concentration of emollients in waterless products: lubricates & reduces drying action of alcohol on skin
- Emollient accumulation on skin: seen with product repeated use - soap & water removal
- Supplemental hand lotions/creams: important factor contributing to dermatitis associated with frequent handwashing
- Water-based vs. petroleum-based lotions
- Epithelial integrity: prevent / minimize dermatitis & skin infections

What Do You Think?
A co-worker develops symptoms of dry, itchy, irritated skin on portions of her hands

1. What are the possible causes of the dermatitis?
2. Could it be caused from a product used outside of the dental office/clinic?

Standard Precautions

- Apply to all patients
- Integrate & expand universal precautions
- Standard precautions for preventing disease transmission include:
  - Hand hygiene
  - Use of personal protective equipment (PPE)
  - Cleaning and decontamination of instruments
  - Cleaning & disinfection of environment surfaces
  - Injury prevention

Hepatitis B Virus (HBV)

<table>
<thead>
<tr>
<th>Year</th>
<th>Hepatitis B Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>4,033</td>
</tr>
<tr>
<td>2001</td>
<td>5,319</td>
</tr>
<tr>
<td>2002</td>
<td>7,756</td>
</tr>
<tr>
<td>2003</td>
<td>5,540</td>
</tr>
<tr>
<td>2004</td>
<td>6,212</td>
</tr>
<tr>
<td>2005</td>
<td>7,526</td>
</tr>
</tbody>
</table>

- Remains major, most infectious target of Standard IC Precautions
- Infection risk from needlestick or cut is 6% – 30%
- Vaccination response lowers risk to near zero
- HBV can remain viable on surfaces ~1 week
- HBeAg-positive individuals much more infectious (higher concentration of virus in blood)

Hepatitis C Disease Burden

- Primarily bloodborne transmission
- Sexual & perinatal transmission – not as efficient
- Concern for needlestick & other occupational sharps injuries

<table>
<thead>
<tr>
<th>Year</th>
<th>Hepatitis C</th>
</tr>
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<tbody>
<tr>
<td>2000</td>
<td>878</td>
</tr>
<tr>
<td>2001</td>
<td>849</td>
</tr>
<tr>
<td>2002</td>
<td>802</td>
</tr>
<tr>
<td>2003</td>
<td>694</td>
</tr>
<tr>
<td>2004</td>
<td>756</td>
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<td>891</td>
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Potential Transmission Risks To HCWs

<table>
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<tr>
<th>Pathogen</th>
<th>Conc / ml Serum/Plasma</th>
<th>Transmission Rate (Post-Needlestick)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV</td>
<td>1,000,000 - 100,000,000</td>
<td>6.0 - 30.0 %</td>
</tr>
<tr>
<td>HCV</td>
<td>10 - 1,000,000</td>
<td>2.7 - 6.0 % (1.8% current)</td>
</tr>
<tr>
<td>HIV</td>
<td>10 - 1,000</td>
<td>0.3 %</td>
</tr>
</tbody>
</table>

(Blood splash to eye, nose, mouth is 0.1%)

Lamphear. Epid Rev (1994); CDC 2011

Occupational Exposures to Bloodborne Pathogens & Management

- Percutaneous injury
- Mucous membrane exposure
- Non-intact (broken) skin exposure
- Bites

Exposure Management Policies
✓✓ ✓✓ Include hepatitis B vaccination
✓✓ ✓✓ Consistent with
- OSHA worker protection requirements
- PHS exposure management recommendations
- CDC exposure management recommendations

Characteristics of Percutaneous Injuries Among DHCP
- Reported frequency among general dentists has declined
- Most incidents caused by burs, other solid sharps, & NOT hollow-bore needles
- Occur outside the patient’s mouth
- Involve small amounts of blood
- Among oral surgeons, most occur during fracture reductions and procedures involving wires
- Needles
**Exposure Management**

- Policies for prompt reporting, evaluation, counseling, treatment, and medical follow-up of occupational exposures
- Establish referral mechanisms to qualified health-care professional

**Factors To Consider When Assessing The Need for Follow-up**

1. Type of exposure: percutaneous, mucus membrane, non-intact skin exposure, etc.
2. Type & amount of fluid/tissue: blood, OPIM.
3. Infectious status of source: presence of HBV, HCV, HIV.
4. Susceptibility of exposed person: HBV vaccine & response status; HBV, HCV, or HIV immune status.

**HEPATITIS B VACCINATION SCHEDULE**

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<td>Give 2 doses at 1 year interval.</td>
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**HEPATITIS B VACCINES: 2 GENERATIONS**

- **Heptavax B (Merck) -- 1982**
  - Natural component vaccine from plasma of HBV carriers
- **RecombiVax HB (Merck) -- 1986/1987**
  - In vitro recombinant DNA technology in yeast cultures
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**For People Who Do Not Respond to HBV Vaccination**

Results of Additional Injections:

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IF recipient negative after 6 injections:

- Genetic hepatitis B vaccine non-responder.
- Active hepatitis B virus infection: prodromal or icteric disease phase
- Hepatitis B carrier (HBsAg +): vaccine ineffective

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Hepatitis B Vaccine Long-term Efficacy

- Immunologic memory established following vaccination (90–95% adults respond)
- Demonstrated efficacy for > 25 years
- HBV exposure results in anamnestic response
- Booster doses recommended only for hemodialysis pts, & can be considered for others with a weakened immune system.

HBV Vaccine Recommendations for Diabetes

- continuing hepatitis B outbreaks in LTC suggests risks for adults living with diabetes may be substantial.
- based on available information (i.e. HBV risk, morbidity, mortality, available vaccines, age at diagnosis of diabetes, cost-effectiveness), ACIP recommends the following:
  - HBV vaccination should be administered to unvaccinated adults with diabetes mellitus who are aged 19 - 59 years (recommendation category A; evidence type 2).
  - HBV vaccination may be administered at discretion of treating MD to unvaccinated adults with diabetes mellitus who are aged ≥60 years (recommendation category B; evidence type 2).

CDC. MMWR (12/23/2011)

Influenza Clinical Features & Viral Shedding

- Incubation period 2 days (range 1 - 4 days)
- Adults infectious 1 day before symptoms thru 5 days after onset of illness (children up to 10 days).
  - severely compromised pts can shed virus wks months.
- Illness severity depends on prior experience & related virus variants (possible cross-reacting Ab).
- Abrupt onset of constitutional & respiratory symptoms: fever, myalgia, sore throat, malaise, nonproductive cough, headache.
- Usually resolves in few days – confused with bad cold (?)

Influenza & Vaccines

- ~24,000 excess deaths per year (1976-2007)
- >90% of deaths → persons ≥65 years of age
- vaccine targets 3 projected predominant strains for season
- 70–90% effective in vaccinated persons
- do not contract the flu from vaccine
  - Inactivated subunit (TIV)
    - intramuscular
    - Trivalent (3 current year strains)
    - duration of immunity 1 year or less
  - Live attenuated vaccine (LAIV)
    - intranasal
    - Trivalent (3 current year strains)
    - duration of immunity at least 1 year

Inactivated Influenza Vaccine Efficacy

- 70% - 90% effective among healthy persons <65 years of age
- 30%-40% effective among frail elderly persons
- 50%-60% effective in preventing hospitalization
- 80% effective in preventing death
- Common vaccination adverse reactions:
  - soreness - redness - swelling
  - muscle aches - fever - neuralgia

Influenza Vaccine

- Preparations are strain specific—use of current year strain for vaccine
- Goal: reduce influenza complications and mortality
- Contraindications:
  - Pregnancy (1st trimester)
  - Allergy to eggs or thimersol (no longer used)
- Note: Do not get flu from vaccine!
### Pertussis Epidemiology

- **Reservoir**: Human
  - Adolescents and adults
- **Transmission**: Respiratory droplets
- **Communicability**: Maximum in catarrhal stage
  - Secondary attack rate up to 80%
- Incubation period usually 7-10 days (range 4-21 days)
- Insidious onset, similar to minor upper respiratory infection with nonspecific cough
- Fever usually minimal throughout course of illness

### Pertussis-containing Vaccines

- **DTaP (pediatric)**
  - approved for children 6 weeks thru 6 years (to age 7 years)
  - contains same amount of diphtheria & tetanus toxoid as pediatric DT
- **Tdap (adolescent and adult)**
  - approved for persons 10 through 18 years (Boostrix) and 11 through 64 years (Adacel)
  - contains lesser amount of diphtheria toxoid & acellular pertussis antigen than DTaP

### Personal Protective Equipment

- A major component of Standard Precautions
- Protects skin & mucous membranes from exposure to infectious materials in spray or spatter
- Proven effectiveness against microbial pathogens
- Should be removed when leaving treatment areas

### Gloves: Types

- Patient exam: non-sterile
- Sterile surgeon’s: tactility, comfort, dexterity
- Non-medical (utility): thick, reusable
- Latex: “Gold” standard
- Vinyl: early high failure rates -- improving
- Nitrile, chloroprene, polyurethane, etc.
- Ambidextrous vs. right/left fitted
- Public Citizen petition to FDA (4/2011):
  - call to ban latex gloves
  - allergic rx risks cited (latex, powder)

### Protective Eyewear

- Meets/exceeds ANSI standards
- High impact resistance
- Side shields
- Sufficient size to cover and protect eyes
- Desirable: no fogging, scratch resistant, anti-static
- Face shields effective – must still use mask
- Disposable eyewear available

### American Society for Testing and Materials (ASTM)

- **Low**
- **Moderate**
- **High**
Masks, Protective Eyewear, Face Shields

- Wear surgical mask & either eye protection with solid side shields or face shield to protect mucous membranes of eyes, nose, & mouth
- Protection between patients; if visibly soiled, clean and disinfect
- Be certain of proper fit for masks & eyewear
- Change masks between patients
- Clean reusable face

Fluid Resistance
- Remember: masks saturated from both sides
- “Wicking” of fluids through wet mask
- 20 min. routine use-life
- Face shield may lengthen use-life
- Position mask to “stand out” from face

Latex Hypersensitivity Symptoms

- **Type I localized:**
  - Immediate IgE allergic reaction
  - Develops within minutes to latex protein challenge
  - Urticaria, hives, pruritus, rhinitis
- **Type I systemic:**
  - More generalized, severe manifestations
  - Conjunctivitis, laryngeal/respiratory distress
- **Type IV:**
  - Delayed, contact dermatitis
  - Slow-forming, localized rash, necrosis, sloughing
  - Develops within 12-24 hrs to chemical challenge

Latex Allergy Risk Factors

- Persons with multiple surgery hx.
- Persons with spina bifida (18-68%).
- Health care workers (3-17%).
- Rubber industry workers (11%).
- Atopy - presence of multiple allergies
  - Note: increasing % of population atopic.
- Hx certain food allergies: banana, kiwi, avocado, papaya, melon, peach, chestnut, hazelnut, etc.
  - Cross-reacting protein allergens in latex sap.

Available Sterilization Methods

- Steam under pressure
- Prolonged dry heat
- Rapid heat transfer
- Unsatuated chemical vapor
  - Heat-stable items

- Ethylene oxide
- Chemical (cold) sterilization
  - Heat-labile items

Liquid Chemical Sterilization

**Advantages**
- Can sterilize items that would be damaged by heat

**Disadvantages**
- Less reliable than heat methods
- Very time-consuming & limited use-life
- Expensive
- Cannot be spore tested
- Toxic fumes may require special ventilation
- Potential for allergic reactions
- PPE required during use
- Cannot package items
- Sterilized items must be rinsed off with STERILE water
- Inst corrosion or rusting
Gravity Steam Sterilizers

- 10 to 25 minutes exposure time at 132°C – 135°C (270°F to 275°F)
- 15 to 30 minutes exposure time at 121°C – 123°C (250°F to 254°F)
- Drying times vary according to load configuration, materials, contents

Pre- & Post-vacuum Steam Sterilizers

- 3 to 4 min at 132 – 135°C (270 – 275°F)
- Evacuate chamber to enhance steam penetration
- More effective sterilization of handpieces & wrapped items
- Post-vacuum cycle
- Evacuate chamber to enhance drying
- Decreased corrosion of high-carbon steel

Steam Injection & Positive Pressure Pulse Displacement Autoclave

STERILIZATION CYCLE COMPONENTS

- Heat – up period:
  - must reach sterilizing temperature
- Exposure interval:
  - time required for sterilization of load
- Cool down period:
  - allow sufficient cooling for handling
  - removal of excess moisture
  - important for handpiece sterilization & function

Sterilization Monitoring

Chemical Monitoring
- In Office
- Mail Service
  - company
  - dental school

Biological Monitoring:

- Packaging material
- Packaging procedures
- Sterilizer loading
- Sterilizer use
- Sterilizer functioning
- Sterilizer maintenance

Value of Biological Monitoring Systems

They Test:

- Person In Charge

JAM
Common Errors (All Sterilizer Types)

- Improper pre-cleaning, organic debris
- Incorrect or excessive packaging
- Overloading the sterilizer
- Improper time, temperature & pressure parameters
- Inadequate sterilizer maintenance
- Use of inappropriate equipment (e.g. household ovens, toaster ovens)

Single-Use Disposable Devices

- Introduced in 1960’s -- promoted as convenient & easy to use
- Designed for use on 1 patient only
- Not intended to be cleaned & sterilized for reuse on another patient
- Not heat tolerant & cannot be reliably cleaned
- Numerous single-use & disposable examples
- More recyclables & biodegradables available

Harte/Molinari

Spaulding Classification

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
<th>Examples in Dentistry</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Penetrate soft tissue, contact bone, enter into or contact the bloodstream or other normally sterile tissue.</td>
<td>Surgical instruments, periapical, flared burs, dental burs</td>
<td>Have the greatest risk of transmitting infection-clean and heat sterilize.</td>
</tr>
<tr>
<td>Semicritical</td>
<td>Contact mucous membranes or nonsterile skin, but will not penetrate soft tissue, contact bone, or enter into or contact the bloodstream or other normally sterile tissue.</td>
<td>Dental mouth mirror, amalgam condensers, removable partial dentures, orthodontic brackets.</td>
<td>Have a lower risk of transmitting disease-clean and heat sterilize. A semicritical item is heat sensitive. It should, at a minimum, be processed with high-level disinfectant.</td>
</tr>
<tr>
<td>Noncritical</td>
<td>Contact with intact skin.</td>
<td>Rubber headrest, blood pressure cuff, fundus, pulse oximeter.</td>
<td>From the least risk of transmitting a disease-clean and disinfected or use disposable barrier protection.</td>
</tr>
</tbody>
</table>

GOAL OF STERILITY ASSURANCE

- Goal: deliver sterile instruments to patients
- Steps for infection control assurance:
  1. select appropriate cleaning, packaging, sterilization, & storage procedures.
  2. written step - by - step training protocols.
  3. perform procedures correctly.
  4. monitor performance

- Human error most common problem!

Holding Solutions or Foam Sprays (optional step)

- Goal: avoid drying of debris prior to cleaning & sterilization
  - loosen debris
  - helps to decrease contaminant MO’s
  - minimize instrument handling
  - soap & water -- ultrasonic cleaning soln
  - foam sprays e enzymes available
- NEVER, EVER use glutaraldehydes!
Cleaning Instruments: Options

“Cleaning is the first step in every decontamination process” (CDC)

- **Mechanical** (Hand Scrubbing)
- Ultrasonics
- Inst Washer / Disinfectors

**Manual Instrument Cleaning**
- Effective at removing debris
- Not as efficient as mechanical cleaners
- Dangerous – increased potential for sharps exposure when scrubbing instruments
- When need to scrub contaminated insts, use long-handle brush
- Wear utility gloves & other PPE
- Use engineering controls

**Ultrasonic Cleaners**
- Wear PPE – Utility gloves, mask, glasses, gown
- Sound waves cause bubbles to implode, loosening debris
- Use only correct solution, change daily
- Never overload
- Rinse instruments after cycle
- Dry before placing in pouches / wraps
- Keep lid on during use
- Periodic foil test for unit efficacy

**Automated Instrument Cleaning**
- effective
- efficiency
- ↓ exposure to blood & body fluids
- ↓ exposure to sharps
- instrument washers NOT dish washers!

**Advantages of Cassettes**
- Safe transport
- Safe instrument cleaning
- Ease of instrument set-up
- Cannot overload sterilizer
- Ease of storage
- And…

**Storage & Use of Reprocessed Instruments**
- sterile insts dated & maintained as sterile until use
- Event – Related vs. Date-Related Shelf Life
- reprocessed insts stored in clean, dry location in manner to prevent contamination during storage
- inspect instrument package for integrity & dryness before opening
- if compromised -- insts cleaned, packaged, re-sterilized
Evolution of Dental Handpiece Infection Control

1978: 1st ADA recommendations:
“until handpieces can be replaced with models that can be routinely sterilized, scrubbing them in detergent solutions and wiping with alcohol is an alternative”

1986: 1st CDC recommendations:
“routine sterilization of handpieces is desirable, however not all handpieces can be sterilized”

1980: HIV transmission to a dental patient (Acer-Bergalis case)

1992: Published study re: microbial contamination of internal surfaces

1992: FDA letter to dentists “recommends... reusable dental handpieces & related instruments... be sterilized between each patient use”

1993 & 2003: CDC recommendations

2008: CDC reaffirmed sterilization between uses & “handpieces that cannot be sterilized should NOT be used.” JAM (2012)

Clean – Lubricate - Sterilize

✓ Follow manufacturer’s instructions !!!
✓ Careful attn to fiber optics:
  - beware lubricant or dirt collecting between fiber bundles
  - heat sterilization can cause darkened/dimmed light
✓ Maximize use – life
✓ Minimize repair/replacement costs
✓ Do not use surface disinfectants or chemical sterilants
✓ Consider automatic handpiece maintenance system

Principle 3
Limit the Spread of Contamination

- Cover surfaces that may become contaminated
- Disinfect surfaces
- Minimize sprays and splashes
- Properly dispose of medical waste

Beware of the dangers of
- overspraying
- aerosols

Categories of Patient items
-- Critical
-- Semi-Critical
-- Noncritical

Categories of Environmental Surfaces
-- Clinic Contact Surfaces: (light handles, switches, tray) may be touched frequently with gloved hand during pt care, or may become contaminated with blood / OPIM
-- Housekeeping Surfaces: (floors, walls, sinks) do not come into contact with devices used in dental procedures

Surface Covers:

Advantages
1. Prevents contamination
2. Protects difficult-to-clean surfaces
3. Less time consuming
4. Reduces chemical use
5. More eco-friendly choices

Disadvantages
1. Need varied sizes / types
2. Non-biogradable plastics
3. Esthetically undesirable?
4. Additional costs over chemical sprays?

Efficacy of Chemical Germicides

CDC (2003)
Surface Sprays: Pros and Cons

**Pros:**
1. May be less expensive than covers
2. Does not change esthetic appearance of office
3. Does not add plastic to environment
4. Eco-friendly choices becoming available

**Cons:**
1. More time-consuming than replacing covers (?)
2. Cannot pre-clean some surfaces
3. Chemical & equipment compatibility issues
4. Need to label chemical containers
5. May need to periodically prepare use dilutions
6. Must dispose chemical according to environmental laws

Disinfectant Wipes: Pros and Cons

**Advantages:**
- Tuberculocidal (most)
- Less chemical sprays in environment
- Less HCW toxicity reactions due to aerosolized disinfectants
- More “equipment friendly”
- Other classes available (phenolic wipes; H2O2 sodium hypochlorite; quaternary ammoniums (low-level disinfectants)

**Disadvantages:**
- 2 wipes needed for cleaning and disinfection
- May need more due to large clinical contact area
- May evaporate quickly (alcohols)
- Potential for misuse by HCW
- More expensive than liquid

General Cleaning Recommendations

- Use PPE precautions (e.g., heavy-duty utility gloves, masks, protective eyewear) when cleaning and disinfecting environmental surfaces
- Physical removal of microorganisms by cleaning is as important as the disinfection process
- Follow manufacturer’s instructions for disinfectant use – Do Not Make Your Own Wipes From Disinfectants Approved As Sprays Only !!
- Do not use sterilants/high-level disinfectants on environmental surfaces

Use of Green Cleaning

- Use of cleaning products claiming to be gentle on environment (i.e., glass cleaners, carpet spot cleaners, odor eliminators, toilet cleaners)
- Some “green” products are “green” because they have a reduced active agent concentration -- may reduce product effectiveness
- Evaluate product effectiveness & “green” features

Environmental Surface Asepsis

- **Important Terms:**
  - cleaning
  - disinfection
  - clinical contact surfaces
  - housekeeping surfaces
  - high - level disinfectant
  - intermediate - level disinfectant
  - low - level disinfectant
  - tuberculocidal
  - disinfectant use life & shelf life

Representative DUWL Microbes

- Pseudomonas sp.
- Salmonella
- Pasteurella sp.
- Streptococcus
- Micrococcus sp.
- Staphyloccus
- Klebsiella pn.
- Bacteroides
- Legionella sp.
- Escherichia coli
- Mycobacterium sp.
- Nematodes
- Enteroccocys sp.
- Protozoa, amoebas
- Actinomyces
- Fungi (Candida, Aspergillus sp.)

Dental Unit Waterline (DUWL) Asepsis

- **Sanitized, Potable, Drinking Water (PH Standards):**
  - 500 CFU/ml of heterotrophic bacteria
- **Most untreated dental unit water samples:**
  - 1,000 to 10,000 CFU/ml
- **Dental DUWL:**
  - >100,000 CFU/ml (documented)
- **CDC Recommendation (2003):**
  - Use water that meets regulatory standards for drinking water (fewer than 500 CFU/ml of heterotrophic water bacteria) for routine dental treatment output water.
Reported Associated Illnesses from Contaminated Water

- Gastroenteritis (E. coli, enterics)
- Nosocomial surgical infections
- Pneumonia, Bronchitis
- Legionellosis
- Abscesses, Septicemia
- Appendicitis
- Viral hepatitis (HAV; HEV)
- Salmonella poisoning
- Cryptosporidiosis & other parasites
- Head & neck infections (?)

Potential Effects on Health

- Documented evidence for waterborne infections & disease in multiple hospital/public health settings.
- Many involve medical devices (nebulizers, endoscopes, hemodialysis units).
- Most MO’s from DUWL from public water supply, & do not pose high disease risk for HEALTHY persons.
- Increasing # of immune compromised dental pts – common waterborne bacteria present increased infection/illness risks.
- Dental evidence:
  - Higher Ab titers against Legionella sp. in dental personnel compared to other control populations (2 studies)
  - No Legionella disease documented in DHCW
  - DUWL implicated as source for localized Pseudomonas infections in 2 immune comp pts, carriage of same strain in 78 other persons

Recent DUWL Developments

- Waterborne infection is a major public health concern
- Unacceptable to use highly colonized water for any kind of dental treatment

1st Reported Case of Legionella From DUWL

- Italian case report published in LANCET (February 18, 2012)
- 82 yr. old woman died from Legionnaires disease after hospitalization
- During Legionella incubation period, only left house for 2 dental visits
- No underlying disease or other obvious Legionella risks
- L. pneumophila serogroup 1 isolated from bronchial aspirate & DUWL
- Dental office tests: 4x10^3 CFU/mL from DUWL; 6.2x10^4 CFU/mL from high speed handpiece turbine
- “Benidorm” L. pneumophila subgroup isolated from aspirate & DUWL: same rare sequence type (ST 593) found in both one of most virulent L. pneumophila subgroups
- No other Legionnaires’ Disease or Pontiac Fever cases found among dental staff or practice pts identified by epidemiological investigation

DUWL, Biofilm, & Water Quality

- A. General Recommendations
  1. Use water that meets EPA regulatory standards for drinking water (i.e. less than/equal to 500 CFU/mL of heterotrophic bacteria for routine dental treatment output water (IB, IC).
  2. Consult with dental unit manufacturer for appropriate methods & equipment to maintain the recommended quality of water (II).
  3. Follow recommendations for monitoring water quality ….
  4. Discharge water & air for a minimum of 20-30 seconds after each patient …. (II).
  5. Consult with manufacturer on need for periodic maintenance of anti-retraction mechanisms (IB) CDC (2003)

Representative DUWL Solutions

- Autoclavable water delivery systems
- Self-contained water units
  - Can use biocides for periodic disinfection
- Physical barriers
  - Point-of-use filters (0.22 u)
  - Water entry filters
  - Improved pinch, check, & anti-retraction valves
- Water treatment strategies
  - UV, ozonization
  - Super heating at entrance to office

JAM