Let’s Talk about Infection Control

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THE DENTAL ADVISOR

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

HIV Outbreak in Rural Indiana

MERS may be airborne

Calif. whooping cough outbreak now full-blown epidemic

1 confirmed Ebola case in U.S.

Measles Transmission at Airport International Gate

The Chain of Transmission

How to Break the Chain
**Basic Infection Control Principles**

1. Routine Practices for all patients
2. Immunize against vaccine-preventable diseases
3. Perform effective hand hygiene
4. Use personal protective equipment (PPE)
5. Heat sterilize all reusable patient care instruments/items used intraorally
6. Use respiratory hygiene/cough etiquette
7. Prevent cross-contamination with aseptic technique & environmental asepsis
8. Prevent sharps injuries by using safe work practices & engineering controls

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**Infection Control Practices Timeline for Canada**

- 2001 CDA publishes updated workbook on Infection Control
- 2003 CDC publishes updated dental IC guidelines
- 2010 CDA no longer provides IPC guidelines, leaving this to Provincial bodies
- 2010 First ever meeting in Canada for IPC educations from all ten Faculties of Dentistry
- 2010 – 2013: CDA and Provincial Infection Prevention and Control Guidelines
- 2015 Anticipated date for updated CDC Guidelines for Dentistry

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**Does your office routinely evaluate the office infection-control program?**

- Periodic assessments
- Review and document procedures (SOP)
- Review occupational exposures and prevention strategies
- Purpose:
  1. Improve IC program effectiveness & dental practice protocols
  2. Dental team understanding
  3. Communicate practice IC to patients
Critical Importance of Hand Hygiene

- Most important infection control precaution
- 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
- New strategies & product types
- CDC 2002 guidelines – most recent & comprehensive
- CDC 2003 IC recommendations for dentistry
- Canadian Provincial Recommendations (2009-2013)

HAND HYGIENE

Multiple Acceptable Choices
- Non-antimicrobial
- Antiseptic
- Alcohol-based

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

Hand Hygiene Considerations
III. Hand Hygiene

1. Hands should be washed with plain or antimicrobial soap & running water:
   -- when hands are visibly soiled (including with powder from gloves) or contaminated with body fluids;
   -- following body functions
2. If hands are not visibly soiled, the use of a 70-90% alcohol-based hand rub is the preferred method of hand hygiene
3. Bar soap should not be used

Are available hand hygiene products manufactured for HCP?

Personal & Product Considerations
- Skin sensitivities & allergies
- Minimal-to-no fragrance
- Water-based vs. alcohol-based
- Hypoallergenic
- Consistency (i.e. liquid, gel)
- Accessibility
- Dispensing

Are HCP hands exhibiting skin irritation problems?

Factors Associated with Dermatitis in Health Care Settings
- Frequent hand hygiene procedures
- Improper wash technique
- Incorrect mixing skin antiseptics
- Excessive perspiration while wearing gloves
- Glove powder
- Failure to dry hands completely

Ability of Hand Hygiene Agents to Reduce Bacteria on Hands

Are appropriate hand lotions or gels available to prevent skin disorders?

Normal, healthy skin

Cracked, scaly skin

Are Routine Practices followed for all patients?

- Integrate & expand universal precautions for BBP
- Apply to all HCP for all patients
- Precautions include, among others:
  - Hand hygiene
  - Vaccinations
  - Use of personal protective equipment (PPE)
  - Injury prevention
  - Cleaning and decontamination of instruments
  - Cleaning & disinfection of environmental surfaces
  - Waterline maintenance

Potential Transmission Risks To HCWs

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Concentration</th>
<th>Transmission Rate</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 % (Blood splash to eye, nose, mouth is 0.1%)</td>
</tr>
</tbody>
</table>

Potential Transmission Risks To HCWs

- Dramatic decline since mid-1990’s
- Est. 4.2 – 5.1 million inf. (anti-HCV+)
- Est. 2.7–3.9 million living c chronic HCV
- Mean death age = 59yrs
- HCV prevalence highest in persons born 1945-1965
Hepatitis C in Canada
- est. 280,000 chronically infected persons (2014)
- Canadian prevalence est. 0.8% - 1%; increasing incidence
- > 21% do not know of infection - remain undiagnosed
- new drugs becoming available
- no vaccine for HCV

Year Cases # Ontario # BC
2005 13,057 4,494 2,882
2006 12,122 3,947 2,937
2007 12,105 4,479 2,901
2008 12,039 4,715 2,491
2009 11,357 4,399 2,444

Natural History of HCV Infection
In 20 years, 15-30% progress to cirrhosis
Progression accelerated by HIV, HBV, alcohol use, and fatty liver

Therapeutic Milestones for HCV
U.S. FDA Approval of HCV Treatments:
- 1991: Interferon (IFN)
- IFN & ribavirin
- Pegylated IFN
- Boceprevir & Telaprevir
- Sofosbuvir & Ledipasvir
- highly effective against untreated HCV genotype 1 inf.

Recent U.S. Recommendation
MMWR (8/17/2012)
Infected DHCP

- Are there any suggested work restrictions?
- Hepatitis C:
  
  "No restrictions on professional activity," (unless epidemiologically linked to transmission of infection)

  "HCV-positive health care personnel should follow aseptic technique and standard precautions"

  CDC. Guidelines for Infection Control in Dental Health Care Settings. MMWR (2003)

  "DHCPs who might perform exposure-prone procedures… ethical obligation to know serological status. If infected, … must seek guidance from their regulatory body with respect to the potential for transmission of their infection to their patients."

  NS Guidelines (2013)

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HIV epidemiology in Canada (1996-2013)

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NS Guidelines (2013)

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U.S. HIV Infection: Current Status

HIV remains a global disease, with the majority of individuals diagnosed with HIV in 2013 residing in areas with 500,000 or more people. Areas ranked by ranking of HIV cases per 100,000 people include Atlanta, GA Miami, FL Washington DC Dallas, TX and New Orleans, LA. Memphis, TN and Baltimore, MD.

Out of the more than 3.5 million Americans with HIV:

- 1,000,000 know they are infected
- 475,000 are unaware they are infected
- 330,000 are receiving treatment
- 120,000 are not receiving treatment

2011: 382,000

2013: 475,000

2015: 530,000

Rural Indiana County's HIV Outbreak Tops 140 Cases (5/2015)

- Currently >140 confirmed & 11 preliminary positive cases
- Outbreak linked to needle-sharing among IV drug users

All-age HIV diagnosis rate/100,000 pop. by province/territory (2013)

<table>
<thead>
<tr>
<th>Province/Territory</th>
<th>Rate/100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>13.6</td>
</tr>
<tr>
<td>British Columbia</td>
<td>12.4</td>
</tr>
<tr>
<td>Manitoba</td>
<td>13.1</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>12.7</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>22.4</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>1.7</td>
</tr>
<tr>
<td>Nunavut</td>
<td>16.4</td>
</tr>
<tr>
<td>Ontario</td>
<td>12.3</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>2.5</td>
</tr>
<tr>
<td>Yukon</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Nat'l rate = 5.9/100,000
Types of Occupational Exposures to Bloodborne Pathogens

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

CDC Surveillance as of Dec. 2010   Updated May 23, 2011

Healthcare Personnel with Documented and Possible Occupationally Acquired HIV Infection, by Occupation, 1984-2010

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Documented</th>
<th>Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Laboratory worker, clinical</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Physician, nonsurgical</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Laboratory technician, nonclinical</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Housekeeper/maintenance worker</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Technologist, surgical</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Embalmer/morgue technician</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Health aide/attendant</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Technician, dialysis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Dental worker, including dentist</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Emergency medical technician/paramedic</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Physician, surgical</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Other technician/therapist</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Other healthcare occupation</td>
<td>-</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>57</td>
<td>143</td>
</tr>
</tbody>
</table>

Health Care Workers with Documented Occupationally - Acquired HIV/AIDS as of 12/2006 (Yr of Occupational Exposure / Injury)

- Deep injury
- Visible blood on device
- Needle placed in artery or vein
- Terminal illness in source patient

Risk Factors:

Is there a post-exposure protocol in event of accidental occupational exposures?

- Required for every dental clinic
- Contracted health service to provide support after accidents or emergencies
- Risky biological materials
- Medical consultation
- Source person - confidentiality
- Exposed person
- Dental clinic accident report
- CONFIDENTIALITY !!!
Characteristics of Percutaneous Injuries Among DHCP

- Declining frequency
  - improved awareness & precautions
- Most incidents: burs, other solid sharps, & *NOT* hollow-bore needles
- Most occur outside patient’s mouth
- Small amounts of blood
- Needles – 25, 26, 27, 30 gauge vs. larger medical needles

Exposure Prevention Tips

Percutaneous injuries = greatest risk of blood-borne pathogen transmission to HCP

- extreme caution when passing sharps
- needles remain capped prior to use
- needles not bent, recapped or otherwise manipulated by using both hands
- one-hand scoop recapping or recapping device
- burs removed immediately from handpiece
- contaminated-used sharps, clearly labeled, puncture-resistant sharp containers, utility glove use

Exposure Prevention Tips

- extreme caution when passing sharps
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Personal Protective Equipment (PPE)

- A major component of standard precautions (routine practices)
- Extensive scientific & clinical literature showing effectiveness of PPE in patient-care settings
- HCP wear PPE to shield own tissues from exposure to PIM
- Also protects patients, by preventing HCP from becoming microbial vector to patients

Are Appropriate Gloves Available?

<table>
<thead>
<tr>
<th>Considerations</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>- latex, vinyl, nitrile, chloroprene</td>
</tr>
<tr>
<td>Skin sensitivity</td>
<td>- allergies to latex or nitrile</td>
</tr>
<tr>
<td>- hand perspiration</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>- proper size, lightweight &amp; pliable</td>
</tr>
<tr>
<td>- snug fit without hand constriction</td>
<td></td>
</tr>
<tr>
<td>- appropriate finger length</td>
<td></td>
</tr>
<tr>
<td>- fits palm without compression</td>
<td></td>
</tr>
<tr>
<td>- ambidextrous vs. right- &amp; left-fitted</td>
<td></td>
</tr>
<tr>
<td>Tactile sensation</td>
<td>- grip</td>
</tr>
<tr>
<td>- glove thickness</td>
<td></td>
</tr>
<tr>
<td>- slipperiness of material when wet</td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td>- non-sterile gloves for most procedures</td>
</tr>
<tr>
<td>- sterile gloves for surgical procedures</td>
<td></td>
</tr>
<tr>
<td>- utility gloves reprocessing &amp; clean-up</td>
<td></td>
</tr>
</tbody>
</table>

Molinari & Nelson, TDA (2/2015)
Are Hands Hurting When Wearing Gloves?

Hand & Wrist Risk Factors Associated with Dentistry
✓ Repetitive hand movements
✓ Awkward wrist positions
✓ Mechanical stresses to digital nerves (i.e. sustained grasping on instrument handles)
✓ Forceful treatment procedures in confined, small space
✓ Extended vibratory instrument use (i.e. handpieces, ultrasonic scalers)

Are Gloves Infallible?

Cardiovascular surgeon with inflammation on hands transmitted *Staphylococcus epidermidis* infection to 5 pts
✓ Hospl surgeries involved heart valve replacements
✓ Long procedures same pair gloves – “microscopic tears” allowed bacteria to pass into pts
  - valve surgery requires use of thick sutures and >100 knots tied -- can cause extra stress on the gloves
✓ Same *S. epidermidis* strains traced to surgeon’s hands (12/2012)

Protective Eyewear with Side Shields

When it comes to personal protection “Size Does Matter”

Do clinic personnel wear appropriate eye protection?
Are face masks being used properly?

- Be certain of proper fit for masks & eyewear
- Change masks between patients
- Clean reusable face shields

Dental Aerosol & Spatter
(1977 Microbiology Textbook)

Masks: What to Wear & When

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>ASTM Low Barrier: For procedures where fluid, spatter, and/or aerosols are produced in low concentrations.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Procedures:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>ASTM Moderate Barrier: For procedures where generation of fluid, spatter and/or aerosols is moderate.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Procedures:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td></td>
</tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>ASTM High Barrier: For procedures where heavy to moderate levels of fluid, spatter and/or aerosols are produced.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Procedures:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td></td>
</tr>
<tr>
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</tr>
</tbody>
</table>

CLEANING, DISINFECTION, and STERILIZATION of PATIENT CARE ITEMS

Molinari & Nelson, TDA, 2014
**Term and Procedure Distinctions**

-- Cleaning: removal of debris; always the 1st step
-- Disinfection: destruction of pathogenic microorganisms, but not necessarily all microbial forms, such as not spores
-- Sterilization: destruction of all microbial forms; limiting factor destruction of heat-resistant spores

**AVAILABLE STERILIZATION METHODS**

- Steam under pressure
- Prolonged dry heat
- Rapid heat transfer
- Unsaturated chemical vapor
- Ethylene oxide
- Chemical (cold) sterilization

**Gravity Steam Sterilizers**

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

**Liquid Chemical Sterilization**

**Advantages**
- Can sterilize items that would be damaged by heat
- Less reliable than heat methods
- Very time-consuming & limited use-life
- Expensive
- Cannot be spore tested
- Fumes may require 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
- Glut. alternatives

**Disadvantages**
- Can sterilize items that would be damaged by heat
- Very time-consuming & limited use-life
- Expensive
- Cannot be spore tested
- Fumes may require 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
- Glut. alternatives
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

Monitoring Indicators & Integrators

Are chemical indicators and BIs used & correctly interpreted?
Is sterilization equipment properly monitored and records maintained?

- Quebec guidelines: “monitoring at least once/month”
- Independent testing laboratory

  Value of BI monitoring -- they test:
  - Packaging material
  - Packaging procedures
  - Sterilizer loading
  - Sterilizer use
  - Sterilizer functioning
  - Sterilizer maintenance

Single-Use Disposable Devices

- Introduced in 1960’s -- promoted as convenient & easy to use
- Designed for use on 1 patient & then discarded
- Not intended to be cleaned & sterilized
- More recyclables and biodegradables
- “Single-use items must never be sterilized or re-used…. must be discarded”

Sterilization Process Problems

<table>
<thead>
<tr>
<th>Error</th>
<th>Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improper instrument cleaning and potentially compromise the sterilization process</td>
<td>Biological and other debris can shield adherent microbes and potentially compromise the sterilization process</td>
</tr>
<tr>
<td>Improper packaging</td>
<td>Examples: wrong type material for method; too many items in package; excessive amounts of wrap material</td>
</tr>
<tr>
<td>Overloaded sterilizer</td>
<td>Can prevent thorough contact of sterilizing agent with all items in unit</td>
</tr>
<tr>
<td>Inadequate Maintenance</td>
<td>Critical areas: Example issues include worn gaskets and seals</td>
</tr>
<tr>
<td>Improper sterilization equipment</td>
<td>Use of non-FDA approved equipment</td>
</tr>
</tbody>
</table>

Viable bacteria cultured from the lumens of 4/40 (10%) metal tips used 100x’s
Heat - sterilized between uses.
Particulate material also visually observed after sterile TSB aseptically forced thru 5/40 (12.5%) AWS tip lumens

Conclusion: unable to clean lumens -- provides support for routine use of disposable AWS tips.
**Cleaning Instruments: Options**

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

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

**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 c enzymes available

- NEVER, EVER use glutaraldehydes!

**Appropriate type brush & utility gloves worn if scrubbing contaminated instruments?**

- Effective for debris removal
- Not as efficient as ultrasonic cleaners
- Dangerous – increased potential for sharps exposure when scrubbing instruments
- Wear utility gloves & other PPE
- Cassettes – manual cleaning not necessary
Ultrasonic Cleaning

- More efficient cleaning than hand scrubbing
- Sound waves cause bubbles to implode, loosening debris
- Use only ultrasonic-designated solution; change daily
  - enzymatic cleaners: single vs. dual enzymatics
- Do not overload unit
- Wear PPE
- Lid on during cycle
- Rinse instruments thoroughly
- Dry before packaging
- Periodic foil test for unit efficacy

Automated Instrument Cleaning

- Effective
- Efficiency
- ↓ exposure to blood & body fluids
- ↓ exposure to sharps

instrument washers NOT dish washers!

Ultrasonic Unit Testing

Advantages of Cassettes

- Safe transport
- Safe instrument cleaning
- Ease of instrument set-up
- Cannot overload sterilizer
- Ease of storage
- And….
Evolution of Instrument Cassettes


Is sterilizer loaded such that sterilant vapor can reach all package surfaces?

Sterilized Wrapped Instruments Keeping Instruments Wrapped Until Patient Treatment

The Pay-off: Patients Note Sterile Packages (Perception & Reality)

What Do You Think?

Paper Side Up?

Paper Side Down?
Event- vs. Date-related sterilization:
• Date & maintain as sterile until use
• Stored in clean, dry location in manner to prevent contamination during storage
• “First in, first out”
• Inspect packages for integrity & dryness before opening
• If compromised, clean, package, re-sterilize

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”

1990: HIV transmission to a dental patient (Acer-Bergalis case)

1992: Published study re: microbial contamination of internal surfaces

1993 & 2003: CDC recommendations

2008: reaffirmed sterilization between uses & “handpieces that cannot be sterilized should NOT be used.”

2014: “… must be sterilized after each patient use.” NB Guidelines

Are wrapped instrument packages inspected to insure they are intact?

Are handpieces cleaned, lubricated, and sterilized between patients?

70% of all handpiece failures due to insufficient maintenance

1. Flush air/water lines 20-30 sec. (bur in place)
2. Clean and dry handpiece
3. Lubricate
4. Expel excess lubricants (prevents “gumming”)
5. Clean fiber optics
6. Package and heat sterilize

DISINFECTION of PATIENT CARE ITEMS
Role of Hospital Surfaces in HAI

- Surface contamination plays important role in MO transmission
- Well-established for MRSA & VRE
- New evidence for noroviruses, C. difficile, & Acinetobacter
- Extent of pt-to-pt transmission proportional to level of environmental contamination


Microbial Persistence on Dry Inanimate Surfaces

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Duration of Persistence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus, incl. MRSA</td>
<td>7 days – 7 mos.</td>
</tr>
<tr>
<td>Mycobacterium tuberculosis</td>
<td>2 days – 4 mos.</td>
</tr>
<tr>
<td>Bordetella pertussis</td>
<td>3 – 5 days</td>
</tr>
<tr>
<td>Enterococcus sp. (incl. VRE)</td>
<td>5 days – 4 mos.</td>
</tr>
<tr>
<td>Clostridium difficile spores</td>
<td>up to 2 yrs.</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>1.5 hrs. – 16 months</td>
</tr>
<tr>
<td>Influenza viruses</td>
<td>1 – 2 days</td>
</tr>
<tr>
<td>Rhinoviruses</td>
<td>2 hrs – 7 days</td>
</tr>
<tr>
<td>Herpes simplex viruses (HSV)</td>
<td>4 hrs. – 8 wks.</td>
</tr>
<tr>
<td>Hepatitis B Virus (HBV)</td>
<td>&gt; 1 wk. (in blood)</td>
</tr>
<tr>
<td>Hepatitis C Virus (HCV)</td>
<td>16 hrs. – 6 wks. (in blood)</td>
</tr>
<tr>
<td>Hepatitis A Virus (HAV)</td>
<td>2 hrs. – 2 mos.</td>
</tr>
<tr>
<td>Human Immunodeficiency Virus (HIV)</td>
<td>few min. – 7 days</td>
</tr>
</tbody>
</table>

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 / ORIM
-- Housekeeping Surfaces: (floors, walls, sinks)
  limited risk of disease transmission
  do not come into contact with devices used in dental procedures

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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?
Are surface barriers changed between patients?

Properties of an IDEAL Surface Disinfectant
-- broad antimicrobial spectrum
-- rapid, lethal action on all vegetative forms
-- not affected by physical factors (i.e. active in presence of organic matter)
-- non-toxic; non-allergenic; easy to use
-- surface compatibility: should not compromise integrity of equipment & metallic surfaces
-- residual effect on treated surfaces (reactivation of agent when moistened)
-- odorless
-- eco-friendly (does not add "damaging" chemicals to environment)

Efficacy of Chemical Germicides

Environmental Surface Asepsis

Important Terms:
-- cleaning
-- disinfection
-- clinical contact surfaces
-- housekeeping surfaces
-- high - level disinfectant
-- intermediate - level disinfectant
-- low - level disinfectant
-- tuberculocidal
-- Do Not Make Your Own Wipes From Disinfectants Approved As Sprays Only!
Potential Surface Disinfectant Problems

1. Surface stains after switching surface disinfectants
   - most common going from sprays to wipes
   - accumulated disinfectant → chemical rxns
   - clean surfaces before new disinfectant use

2. Unpleasant odor when using surface disinfectant
   - sulphur in gloves reacting c chemical
   - not in most gloves; sulphur can be removed

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; some DUWL > 1,000,000 CFU 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.

Does the dental unit water meet regulatory potable standards for drinking water?

How Clean is Your Dental Water?

<50 cfu/mL

>15,000 cfu/mL

“slime worms”

Molinari & Nelson, TDA (2/2015)
DUWL Concerns & Challenges

- Water coming into dental office from city supply contains bacteria and nutrients that support their growth
- Dental unit waterlines contain long lumens, with a high surface area for biofilms to develop
- Biofilms thrive in moist and warm environments, making the dental unit waterlines a perfect environment
- Untreated dental units cannot reliably produce water that meets drinking water standards
- Microbial counts can be >200,000 cfu/mL within 3 days of DUWL installation
- Dental water exiting units can be 100-1000 times more contaminated than incoming tap water
- Waterline contamination consists of slime-producing bacteria, fungi, and pseudomonas
- Immune-compromised patients are at a greater risk of opportunistic infections

In their natural habitat, 99.9% of all bacteria live as a community and attach to surfaces as biofilms

Representative Isolated DUWL Microbes

- Waterborne infections & disease in hospital/public health settings many involve medical devices (nebulizers, endoscopes)
- Most DUWL MO's from public water supply, & do not pose high risk for HEALTHY persons (i.e. opportunistic pathogens)
- Increasing # of immune-compromised dental pts – common waterborne MO’s involved as increased infection/illness risks

Recent DUWL Developments

- No current definable public health problem
- 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

- Case report 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 Legionna 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 in dental staff or practice pts identified by epidemiological investigation

Emerging Infection Control Challenges

Microbes will continue to evolve and adapt in order to survive and thrive -- sometimes at the expense of susceptible human hosts.

We must constantly remain aware of impending infectious disease threats which may challenge our current infection control precautions.