Infection Control and OSHA Update

John A. Molinari
Welcome to the Greater New York Dental Meeting

Greater New York Dental Meeting™
Executive Headquarters
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Sponsored by New York County & Second District Dental Societies

All programs and exhibits are held at the Jacob K. Javits Convention Center
(unless otherwise indicated)
11th Avenue between 34th and 39th Street, New York City

General Registration Hours
Friday, November 29 12:00 Noon - 4:30 P.M.
Saturday, November 30 8:00 A.M. - 4:30 P.M.
Sunday, December 1 - Tuesday, December 3 8:00 A.M. - 5:30 P.M.
Wednesday, December 4 8:00 A.M. - 4:30 P.M.

Exhibit Hall Hours
Sunday, December 1 - Tuesday, December 3 9:30 A.M. - 5:30 P.M.
Wednesday, December 4 9:30 A.M. - 4:30 P.M.

6 Days of Education Seminars, Hands-on Workshops & Essays
Friday - Wednesday

4 Days of Exhibits
Sunday - Wednesday

COURSE REGISTRATION
Pre-registration is required for all continuing education courses with the exception of the “Live” Dentistry and Affiliated Groups. Your seat will be held for 15 minutes after the start of the course; after that, those without tickets will be seated according to space availability. When the room is filled, no additional people will be admitted due to fire department regulations. If you have not pre-registered, please be prepared to select an alternate session to attend.

Tickets
Tickets are required for all courses excluding Live Dentistry. Tickets for all functions can be purchased at all general registration booths located in the Registration Area on the Upper Level in the Crystal Palace and online.

6 Days of Education Seminars, Hands-on Workshops & Essays
Friday - Wednesday

FREE “Live” Dentistry
Hi-Tech 450 Seat Arena

SUNDAY
9:45 - 11:45
VOCO America, Inc.
Drs. Ron Kaminer & Marc Geissberger
Restorative

1:30 - 2:45
Philips Sonicare
Dr. Gerard Kugel
Whitening

3:30 - 5:15
Shofu
Dr. Ron Kaminer
Restorative

MONDAY
1:30 - 2:45
First Fit
Drs. Frederick E. Solomon
Cyrus Tahmasebi
Digital

3:30 - 5:15
Align I Invisalign I Itero
Drs. Karla Soto & Christian Coachman
Restorative

TUESDAY
9:45 - 12:00
Millennium
Dr. Sundil D. Thanik
Laser

2:00 - 4:15
Glidewell
Dr. Justin Chi
Digital

WEDNESDAY
9:45 - 12:00
Apa / CareCredit
Drs. Michael Apa
Aesthetic

2:00 - 4:15
Benco / Vatech
Dr. Aeklaya Panjali
Implant

Celebrity Luncheon Speaker
John Quiñones
Monday, December 2nd
12:00 - 2:00 - Ticket 4010
$125.00

3D Printing & Digital Dentistry Conference
Dental Laboratory Technicians Programs
Sleep Apnea Symposium
Oral Cancer Symposium

5th Annual Global Orthodontic Conference

3rd Annual Pediatric Dentistry Summit

12th Annual INVISALIGN® - GNYDM EXPO
4 Days of Programming:
Sunday - Wednesday

Botox and Facial Fillers Seminar & Workshop

Over 1,700 Exhibit Booths
Infection Control & OSHA Update: That Thing You Do

John A. Molinari, Ph.D.
Professor Emeritus
University of Detroit Mercy
School of Dentistry

December 2, 2019

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

Representative IC Contamination Events
✓ 1989: HPV infections in surgeons from laser plume
✓ 2007 ((NV): HCV with re-use of multi-dose anesthetic vials
✓ 2013 (OK): OS office c multiple violations; pt-to-pt HCV
✓ 2014-- Measles outbreaks (unvaccinated persons & imported)
✓ 2014-2017: Inst reprocessing problems reported in hospitals
  debris on “sterilized” OR insts
  - mechanical vs. manual cleaning
✓ 2011-16: 3 outbreaks in dental pts from DUWL
✓ 2016: E. coli infections resistant to all antibiotics
  more HC inspections, audits, evaluations

OSHA, DPH, Accreditation Agencies, State Med & Dent Boards

The Chain of Transmission

How to Break the Chain

Exposure Contamination Infection Infectious Disease

Current Status of CDC Dental Infection Control Guidelines
• No evidence to support changes to 2003 guidelines
  – Principles of infection prevention have not changed
  – COMPLIANCE issues, not the ineffectiveness of current recommendations

Summary of basic infection prevention expectations for safe care in all dental settings
• Based on Standard Precautions
• Supplements existing CDC recommendations (not a replacement)
• Provides links to references & additional resources + checklists
2916 CDC Dental Infection Control Guidelines

checklist example

Does Practice Routinely Review & Evaluate Office IC Program?
- Periodic assessments
- Required OSHA and IC updates documented
- Review and document procedures (SOP)
- Training records maintained (federal / state regulations)
- Review occupational exposures and prevention strategies

Purpose:
1. improve IC program effectiveness & dental practice protocols
2. dental team understanding
3. communicate IC practices to patients

Hand Hygiene

- Non-antimicrobial soap
- Antimicrobial (antiseptic) soap
- Alcohol-based antiseptic

3 Hand Hygiene Areas
- Washing (cleaning)
- Antiseptic
- Skin care

Emerging HH issue Increasing tolerance of E. faecium to handwash alcohol antiseptics


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


Antimicrobial Spectrum / Characteristics of Hand Hygiene Antiseptic Agents

Note: +++ = excellent, ++ = good, but does not include the entire bacterial spectrum, + = fair, -- = no activity or not sufficient.

- E. faecium is not included because it is no longer an accepted endpoint for hand disinfectants.

HAND HYGIENE

- Non-antimicrobial soap
- Antimicrobial (antiseptic) soap
- Alcohol-based antiseptic

3 Hand Hygiene Areas
- Washing (cleaning)
- Antiseptic
- Skin care

Resident flora – normal microbial flora
- acquired by direct contact
- more easily removed

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 antiseptic before donning sterile surgeon’s
gloves

Alcohol-free, Waterless Hand Hygiene Antiseptics?

**Alcohol-based**
- Evaporate quickly on skin
- Can dry skin c prolonged use: irritation; decreased use?
- 60-85% ethyl- or isopropyl alcohol

**Non-alcohol-based**
- Remain on skin longer
- Do not dry epithelium c repeated use
- Benzalkonium chloride often active agent

Ability of Hand Hygiene Agents to Reduce Bacteria on Hands

- Alcohol-based handrub (70% Isopropanol)
- Antimicrobial soap (4% Chlorhexidine)
- Plain soap


Available Hand Hygiene Products for HCP: Considerations

**Improved:**
- Skin integrity after repeated use
- Tissue compatibility with soaps, waterless hand rubs, etc.

**Fewer:**
- Scents
- Allergenic components – (HCW c sensitive skin)

**Also consider:**
- Consistency (i.e., “feel”)
- Accessibility
- Acceptance by HCP
- Dispenser systems
- Cost per use

Hand Hygiene Considerations Summary

- 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: frequent handwashing can cause dermatitis
- Water-based vs. petroleum-based lotions
- Epithelial integrity: prevent / minimize dermatitis & skin infections
Bloodborne Pathogens & Infectious Disease Updates

Hepatitis A (HAV) – vaccine since 1995
- # reported hepatitis A cases declined by 90.8%; 13,397 (2000) to 1,239 (2014);
- more unreported U.S. cases each year
- 10,000,000 new cases reported globally every year
- recent outbreaks and deaths reported

Hepatitis B (HBV) -- vaccine since 1982
- est. 19,200 new US infections; 2,953 reported cases (2014)
- ~850,000 – 2.2 million people c chronic HBV infection in U.S.
- 1,000 deaths a year in U. S. from HBV-related liver cancer

Hepatitis C (HCV) – no vaccine
- est. > 30,000 new U.S. cases each year
- 2.7 - 3.9 million people in the US chronically infected
- 9,000 deaths a year in U. S. from HCV-related liver disease

HBV Infections among HCP:
- 1983: 17,000 est. cases
- 2012: 139 est. cases
Bellrumi (2000)/CDC (2014)

Dramatic decline since mid-1990’s
BUT diagnoses increasing
New cases tripled since 2010 (major problem in non-urban areas)
HCV – high genetic diversity (55-85% carrier rate)
Est. 2.7 -3.9 million c chronic HCV (mean death age = 59 yrs)
Effective antiviral tx (2014)
Baby boomers & HCV risks -- 13.9% screened as of 2016 (AJIC, 2018)
more screening efforts needed for certain groups

Hepatitis C in U.S.
2016: est. 35,000 new cases

Viral Hepatitis Overview + CDC Hepatitis Table

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Hepatitis C in U.S.
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Global HIV Infection (2017)

Number of people living with HIV in 2017

East and Southern Asia: 10.6 million
Western and Central Africa: 6.5 million
North and South America: 3.2 million
Middle East and North Africa: 2.2 million
Latin America: 1.8 million
Europe: 1.4 million
Caribbean: 350,000

38,739 NEW HIV DIAGNOSES

Potential Transmission Risks To HCWs

Pathogen | Conc / ml | Transmission Rate (Post-Needlestick)
--- | --- | ---
HBV | 1,000,000 - 100,000,000 | 6.0 - 30.0 %
HCV | 10 - 1,000,000 | 2.7 - 6.0 %
HIV | 10 - 1,000 | 0.3 %

Occupational Exposures to Bloodborne Pathogens

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

CDC estimates ~385,000 sharps injuries annually among hospital-based healthcare personnel (>1,000 injuries/day)
- many more in other healthcare settings (e.g., emergency services, home care, nursing homes)
- Increased risk for bloodborne virus transmission
- Costly to personnel and healthcare system


Federal OSHA standard requires:
- Use of engineering & work practice controls
- Recordkeeping on a Sharps Injury Log
- Written Exposure Control Plan
- Must reflect changes in technology use for prevention
- Document annual evaluation of safer sharps devices
- Employers required to solicit input from direct patient care personnel regarding identification & selection of engineering & work practice controls.
Characteristics of Percutaneous Injuries Among DHCP

- Declining frequency
  - improved awareness & precautions
  - increased cassette use
- 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

Does Practice Have A Post-Exposure Management Plan?

- Clear written policies and procedures
- Who will manage post-exposure process
  - Employee Health
  - Occupational Medicine
  - Emergency depts. / Urgent Care
  - Education of dental health care personnel (DHCP)
- Rapid access to:
  - Clinical care
  - Referral mechanisms to qualified HCP
  - Testing of source patients/HCP
  - Payment of services
  - Wait times to be evaluated
  - Availability of HBIG, HBV vaccine, & HIV PEP
  - Confidentiality!!!

Hepatitis Vaccines (1982-2017)

- Heptavax B: licensed in 1981; available in 1982
- Recombivax HB; Engerix B: recombinant vaccines available in 1986
- Safe: possible allergic rxs in yeast-sensitive persons
- Immunogenic & Effective: decline of HBV infections among HCP:
  - 1983: 17,000 cases estimated
  - 2012: 139 cases estimated
- Generally administered as 3-dose series
- Protection lasts >30 years
  - no current recommendation for booster doses
  - people with declining anti-HBs titers still protected against infection & chronic disease
  - Beltrami (2000)/CDC (2014); Bryce. JID (2016); Schillie. CDC (2/2018)

ORIGINAL HBV VACCINATION SCHEDULE

HBsAg + Alum Adjuvant

Adolescents & Adults IM injection

0, 1, 6 mos.

Anti-HBs

Responses: after 1 dose: 30%-55%
  - after 2 doses: 75%
  - after 3 doses: ≥90%
Lower 3-dose seroprotection: advanced age, diabetes, renal disease/dialysis, obesity, chronic illness, smoking, hepatitis B carrier (HBsAg +): vaccine ineffective

For People Who Do Not Respond to HBV Vaccination

Results of Additional Injections:

<table>
<thead>
<tr>
<th>Injection</th>
<th>% Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th</td>
<td>25 %</td>
</tr>
<tr>
<td>5th</td>
<td>40 %</td>
</tr>
<tr>
<td>6th</td>
<td>50 %</td>
</tr>
</tbody>
</table>

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

HEPLISAV-B

- FDA licensed 11/9/2017
- Protection against all HBV subtypes in persons ≥ 18 yrs old
- Vaccine series: 2 doses, separated by 1 month
- Uses 018 adjuvant to stimulate directed response to HBsAg
- Clinical studies demonstrated high rates of seroprotection:
  - 90.0%-100.0% HEPLISAV-B recipients vs. 70.5%-90.2%
  - recipients comparison group
  - Type 2 diabetes mellitus: 90.0% (HEPLISAV-B) vs. 65.1%
    - (comparator)
  - Chronic kidney disease: 89.9% (HEPLISAV-B, 3 doses)
    vs. 81.1% (comparator, 4 double doses)

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

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></td>
<td>hand perspiration</td>
</tr>
<tr>
<td>Size</td>
<td>proper size, lightweight &amp; pliable</td>
</tr>
<tr>
<td></td>
<td>snug fit without hand constriction</td>
</tr>
<tr>
<td></td>
<td>appropriate finger length</td>
</tr>
<tr>
<td></td>
<td>fits palm without compression</td>
</tr>
<tr>
<td></td>
<td>ambidextrous vs. right- &amp; left-fitted</td>
</tr>
<tr>
<td>Tactile sensation</td>
<td>grip</td>
</tr>
<tr>
<td></td>
<td>glove thickness</td>
</tr>
<tr>
<td></td>
<td>slipperiness of material when wet</td>
</tr>
<tr>
<td>Function</td>
<td>non-sterile gloves for most procedures</td>
</tr>
<tr>
<td></td>
<td>sterile gloves for surgical procedures</td>
</tr>
<tr>
<td></td>
<td>utility gloves reprocessing &amp; clean-up</td>
</tr>
<tr>
<td>Molinari &amp; Nelson, TDA (2/2015)</td>
<td>FDA bans powdered medical gloves beginning on 1/19/2017</td>
</tr>
</tbody>
</table>

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)

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

Aerosols and Spatter: Rationale for Occupational Eye Protection

Do clinic personnel wear appropriate eye protection appropriately?
**Representative Occupational Respiratory Infections**

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>CAUSATIVE AGENT</th>
<th>TRANSMISSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tubercolosis</td>
<td>Mycobacterium tuberculosis</td>
<td>Sputa and aerosols expelled by coughing</td>
</tr>
<tr>
<td>Common cold</td>
<td>Rhinovirus, Influenza (most frequently)</td>
<td>Coughing and sneezing, contaminated environmental surfaces</td>
</tr>
<tr>
<td>Influenza</td>
<td>Influenza virus</td>
<td>Sputa and aerosols associated with coughing, contaminated environmental surfaces</td>
</tr>
<tr>
<td>Sudden Acute Respiratory Syndrome</td>
<td>SARS Coronavirus</td>
<td>Direct person-to-person contact or via aerosolized droplets and indirect contact from contaminated surfaces</td>
</tr>
<tr>
<td>Pertussis (whooping cough)</td>
<td>Bordetella pertussis</td>
<td>Coupling and sneezing</td>
</tr>
<tr>
<td>Legionnaires’ Disease</td>
<td>Legionella pneumophila</td>
<td>Breathing in mists or vapor (small droplets of water in the air) containing the bacteria, and spread from person to person</td>
</tr>
<tr>
<td>Rabies</td>
<td>Rabies virus</td>
<td>Saliva from animals infected with rabies</td>
</tr>
</tbody>
</table>

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**ASTM F2100 Medical Face Mask Material Requirements by Performance Level**

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>ASTM Level 1</th>
<th>ASTM Level 2</th>
<th>ASTM Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILTER RESISTANCE, wetting</td>
<td>&gt;95%</td>
<td>&gt;98%</td>
<td>&gt;99%</td>
</tr>
<tr>
<td>PFE, at 0.1 micron</td>
<td>&gt;95%</td>
<td>&gt;98%</td>
<td>&gt;99%</td>
</tr>
<tr>
<td>EN 186:3 2012 EN 149:2001</td>
<td>&lt; 4.0</td>
<td>&lt; 5.0</td>
<td>&lt; 5.0</td>
</tr>
</tbody>
</table>

**FLAME SPREAD**

| LEVEL | Class 1 | Class 1 | Class 1 |

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**Masks: What to Wear & When**

**LEVEL:**

1. **ASTM Low Barrier:**
   - **Procedures:**
     - **Procedure:**
       - Dental Assistant
       - Procedural
       - Dental Hygiene
       - Orthodontist

2. **ASTM Moderate Barrier:**
   - **Procedures:**
     - **Procedure:**
       - Remote Area
       - Surgical
       - Orthodontist
       - Dental Hygiene
     - **Procedure:**
       - Sedation
       - Oral Surgery
     - **Procedure:**
       - Medical
       - Orthodontist
       - Dental Hygiene
     - **Procedure:**
       - Oral Surgery
       - Endodontics

3. **ASTM High Barrier:**
   - **Procedures:**
     - **Procedure:**
       - Remote Area
     - **Procedure:**
       - Surgical
       - Oral Surgery
     - **Procedure:**
       - Sedation
       - Oral Surgery
     - **Procedure:**
       - Medical
       - Oral Surgery
     - **Procedure:**
       - Medical
       - Oral Surgery
     - **Procedure:**
       - Medical
       - Oral Surgery
     - **Procedure:**
       - Medical
       - Oral Surgery

---

**Are effective masks worn for laser/electro surgery to protect against plumes & surgical smoke?**

- Tissue destruction creates smoke - harmful by-products
- Carcinogens, mutagens, other irritants in laser plumes
- Infectious materials (HSV, HPV, bacteria) may contact nasal mucous membranes
- No evidence of HIV/HBV/HCV transmission
- Suitable eye & respiratory protection required
- Mask Level?
- Further studies needed for occupational dental risks

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**N – 95 Respirators**

- **NIOSH – approved disposable respirators – type of particulate respirator mask (PRM)**
- **For:**
  - HCW working in close contact with pts with respiratory symptoms, influenza, or influenza-like illness
- **More efficient than masks used for routine pt treatment**
- **Work best when fitted properly - employers to ensure**
- **Difficulty breathing for some people - greater perceived discomfort**

---

**Is Face Mask Providing Adequate Respiratory Protection?**

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

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**AVAILABLE STERILIZATION METHODS**

- Steam under pressure (autoclaves)
  - Gravity Displacement
  - Steam Flush Pressure Pulse
  - Fractionated Vacuum
  - Steam Injection Pressure Pulse
- Prolonged dry heat
- Plasma Sterilization
- Unsaturated chemical vapor
- Ethylene oxide
- Chemical (cold) sterilization

**Is sterilization equipment properly monitored and records maintained?**

- CDC recommends weekly biological monitoring
  - In case of a positive spore test
    - Remove the sterilizer from service
    - Do not use the sterilizer until inspected and working properly

**Monitoring Indicators & Integrators**

- Class I (Process Indicators)
- Class II (Bowie-Dick Indicators)
- Class III (Temperature Specific Indicators)
- Class IV (Multi-Parameter Indicators)
- Class V (Integrating Indicators)

**Person in Charge!!**

- Improper instrument cleaning and potentially compromise the sterilization process
- Improper packaging
- Overloaded sterilizer
- Inadequate Maintenance
- Improper sterilization equipment

**Equipment and Integrators**

- Sterilization Process Problems
- Biological and other debris can shield adhesive microbes and potentially compromise the sterilization process
- Examples: wrong type material, too many items, or excessive amounts of wrap material
- Can prevent proper contact of sterilizing agent with all items in unit
- Critical area; example issues include worn gaskets and seals
- Use of non-FDA approved equipment

**Single-Use Disposable Devices**

- Introduced in 1960’s -- convenient & easy to use
- Designed for use on 1 patient & then discarded
- Not intended to be cleaned & sterilized for reuse on another patient
- Not heat tolerant & cannot be reliably cleaned
- More recyclables and biodegradable available
- Manufacturers required to document reprocessing reusable items – no reuse for single use devices!

**Spaulding Classification**

- Critical: Penetrates soft tissue, contact bones, spine, vital structures, internal organs, or other normally sterile tissue
  - Surgical instruments, periapical osseous, dental, surgical, sterilized bone

- Non-Critical: Contact non-tissue or non-essential, but will not penetrate soft tissue, contact bone, or vital organs or contact the bloodstream or other normally sterile tissue
  - Dental unit needles, amalgam restorations, composite resin restorations, orthodontics

- Non-Medical: Contact with intact skin
  - Laboratory equipment, heated pressure controlled, food, public areas

- Mix of surgical instruments, surgical instruments, and dental unit needles with water has been associated with high levels of contamination.

![Image of sterilization equipment and monitoring indicators](image-url)
**Instrument Processing Area Flow Process**

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

- Receiving Cleaning
- Preparation packaging
- Heat sterilization
- Monitoring
- Storage

Ships container available

**Cleaning Instruments: Options**

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

**Holding** Solutions or Foam Sprays (optional step)

- Goal: avoid drying of debris prior to cleaning & sterilization
  - when cleaning will be delayed
  - loosen debris
  - helps to decrease contaminant MO’s
  - minimizes instrument handling
  - soap & water - ultrasonic cleaning soln
  - foam sprays w enzymes available

- **NEVER, EVER** use glutaraldehydes!

**If hand scrubbing is performed, is long handled brush utilized and utility gloves worn?**

- Not as efficient as ultrasonic cleaners
- Dangerous – increased potential for sharps exposure when scrubbing instruments
- Wear utility gloves & other PPE
- When using cassettes – manual cleaning not necessary

**Ultrasonic Cleaners**

- Wear PPE – utility gloves, mask, glasses, clinical attire
- Sound waves cause bubbles to implode, loosening debris
- Dual enzymatic & detergent solns
- Remove of gross debris before ultrasonics
- Use only correct solution, change daily, or more frequently
- Never overload; lid on during use
- Rinse/dry insts before placing in pouches / wraps
- Test for cleaning cycle efficacy
  - foil test
  - artificial soil monitors

**Automated Instrument Cleaning**

- effective
- efficiency
- ↓ exposure to blood & body fluids
- ↓ exposure to sharps

**Note:** Dish washers are NOT instrument washers!
COMMON CLEANING PROCESS FAILURES

Washer-Disinfector
- Cycle used (i.e. “Rinse-Hold”)
- Inadequate water spray due to spray impingement
- Clogged spray arms
- Pump/line clog or malfunction
- Overloading
- Instrument shadowing
- Inadequate detergent dosing

Ultrasonic
- Insufficient time
- Detergent concentration
- Ineffective cavitation
- Inappropriate soln temperature
- Overloading

When ultrasonic is utilized, is periodic testing performed?

Cassette Advantages

Is sterilizer loaded such that sterilant may reach all surfaces of the package?

What Do You Think?

Paper Side Down?

Sterilized Wrapped Instruments

Keeping Instruments Wrapped Until Patient Treatment

The Pay – off: Patients Note Sterile Packages
(Perception & Reality)
Package Labeling & Inspection Before Use

Event-related storage

- “contents sterile unless package is opened or damaged, please check before using.”
- Stored in clean, dry location in manner to prevent contamination during storage
- Relies on proper storage and handling of packs
- Inspect packages for integrity & dryness before opening
- If compromised, clean, package, re-sterilize
- Most commonly recommended

Time (Date)-related storage

- Package expiration date
- Establishes time limit for sterile storage
  - Based on manufacturer IFU

CDC IC Recommendations for Handpieces

- Semi-critical devices; internal components can become contaminated with patient materials during use.
- Follow manufacturers’ IFUs for reprocessing!
- “Dental handpieces and associated attachments, including low-speed motors and reusable prophylaxis angles, should always be heat sterilized between patients and not high-level or surface disinfected.”
  (CDC, 2016)

Are Clinical Contact Surfaces Covered or Cleaned & Disinfected Between Patients?

-- Cleaning

-- Sanitization

-- Disinfection

-- Sterilization

Microbial Persistence on Dry Inanimate Surfaces

Microorganism                        Duration of Persistence

- Staphylococcus aureus, incl. MRSA       7 days – 7 months
- Mycobacterium tuberculosis           2 days – 4 months
- Bordetella pertussis                 3 – 5 days
- Enterococcus sp. (incl. VRE)         5 days – 4 months
- Clostridium difficile spores         up to 2 yrs.
- Escherichia coli                     1.5 hrs. – 16 months
- Candida auris                       > 1 month
- Influenza viruses                   1 – 2 days
- Rhinoviruses                        2 hrs. – 7 days
- Herpes simplex viruses (HSV)        4 hrs. – 8 wks.
- Hepatitis B Virus (HBV)              > 1 wk. (in blood)
- Hepatitis C Virus (HCV)             16 hrs. – 6 wks. (in blood)
- Hepatitis A Virus (HAV)              2 hrs. – 2 months
- Human Immunodeficiency Virus (HIV)   few min. – 7 days**

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; cleaned on regular basis
**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-biodegradable plastics
3. Esthetically undesirable?
4. Additional costs over chemical sprays?

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**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)

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**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!

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**Does the dental unit water meet EPA regulatory standards for drinking water?**

- Use water that meets regulatory standards for drinking water (< 500 CFU/ml of heterotrophic water bacteria) for routine dental treatment output water.
- Most untreated dental unit water samples: 1,000 to 10,000 CFU (some DUWL >1,000,000 CFU documented)

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**Health Facility Reservoirs as Potential Sources of Waterborne Infections**

- Potable & hospital water systems
- Showers
- Sinks
- Faucet aerators
- Nebulizers
- Ice and ice machines
- Eyewash stations
- Dialysis water
- Hydrotherapy tubs
- Endoscopes

- Hospitals outbreaks predominantly linked to water sources

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**Eyewash Stations**

- Improper maintenance contain MO’s
- Activated weekly (15 mins)
- Reduce microbial contamination
- Follow manufacturer’s IFUs
Key HC Waterborne Notes

- Many HC-associated infections linked to contaminated potable/tap water & hospital water systems,
- Major risks: immunocompromised & severely ill patients
- Common pathogens: gram-negative bacilli (eg, Pseudomonas, Stenotrophomonas, Legionella) & NTM
- All water, except for sterile water & filtered water, is contaminated c microbes (eg, potable water, tap water, showers, and ice).
- What is “safe” microbial level in HC water supplies/systems?

Source of DUWL Biofilm

Rapid growth of microorganisms is caused by:
- Small diameters of waterlines
- Surface-to-volume ratio: smaller cylinder diameter, the larger the surface area available for colonization by same volume of water
- Slow water flow: very little flow at hydrodynamic boundary
- Low volume of water used
- Water warms to room temp
- Low usage

DUWL Biofilm Formation

Characteristics of Biofilm

- Highly complex microbial structural entity
- Organisms provide nutrients to each other
- Exists in all environments, including water & solids
- Microorganisms grow very well in stagnant water

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; not high risk for healthy persons
- However, increasing # of immune compromised dental pts “opportunistic pathogens” from waterborne MO’s

DUWL Concerns & Challenges

- Water coming into dental office from city supplies contain 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 waterline a perfect environment
- Untreated dental unit cannot reliably produce water that meets drinking water standards
- Microbial counts can be > 200,000 cfu/ml within 5 days of DUWL installation
- Dental water exiting unit can be 100x to 1000x times more contaminated than incoming tap water
- Waterline contamination consists of lime-producing bacteria, fungi, and protists
- Immune compromised patients are at a greater risk of opportunistic infections
- In their natural habitats, 99.9% of all bacteria live as a community and attach to surfaces as biofilms
Recent DUWL Developments

No current definable public health problem

Waterborne infection is a major public health concern and

Unacceptable to use highly colonized water for any kind of dental treatment

Reports of Infectious Agent Spread in Dental Settings (2001-2016)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Year</th>
<th>Pathogen</th>
<th># Inf</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMS Practice</td>
<td>2001</td>
<td>HBV</td>
<td>1</td>
<td>Pt-to-Pt</td>
</tr>
<tr>
<td>Dental clinic in school gym</td>
<td>2009</td>
<td>HBV</td>
<td>5</td>
<td>5 cases: 3 pts/2 volunteers; multiple IC breaches identified</td>
</tr>
<tr>
<td>OMS Practice</td>
<td>2013</td>
<td>HCV</td>
<td>1</td>
<td>Pt-to-Pt; multiple breaches identified</td>
</tr>
<tr>
<td>General Dental</td>
<td>2010</td>
<td>M. tuberculosis</td>
<td>1</td>
<td>M. tuberculosis; DHCP-to-DHCP; Meningitis of TB disease</td>
</tr>
<tr>
<td>General Dental</td>
<td>2011</td>
<td>L. pneumophila</td>
<td>1</td>
<td>82 yr old woman; DUWL; unknown if waterlines were treated</td>
</tr>
<tr>
<td>Pediatric Dental Clinic</td>
<td>2015</td>
<td>M. abscessus</td>
<td>20+</td>
<td>Children; potentially linked to untreated DUWL</td>
</tr>
</tbody>
</table>
| Pediatric Dental Clinic  | 2016 | M. abscessus/chelonae group | 72+  | Children; ongoing investigation; treated water for DUWL kept in holding tank before put in bottles (?)

Cleveland, OSAP (2015); Junger, OSAP (2016); Zahn, OSAP (2017); JAM (2017)

2014 --> Dental practices closed in many states for serious IC violations &/or pt infections

DUWL Infection Control

- Progress in developing reliable methods to control biofilm formation
- FDA-cleared & FDA-registered products available
- When used properly can provide high-quality water for patient care
- Choices include:
  - EPA-registered chemical germicides or antimicrobial surface tx’s
  - independent water reservoirs (isolate units from municipal water)
  - automated germicide metering devices with microfiltration technology (can be used with independent reservoirs or municipal water connections)
  - sterile water delivery systems
- System in place for periodic monitoring of bacterial levels


Treating Dental Unit Waterlines

Complete DUWL systems include use of antimicrobial cleaner + maintenance product

- CLEANING with registered antimicrobial is KEY to remove microbial deposits

- MAINTENANCE product prevents waterborne organisms from attaching, colonizing, proliferating in tubing

IC for Dental Unit Waterlines (DUWL)

- Follow manufacturer’s IFUs for daily and weekly maintenance
- Do not use waterline heaters
- When recommended, shock all waterlines periodically with strong chemical to remove biofilm
- Removal of handpieces, A/W tips, ultrasonic scalers from waterlines before flushing
- Flushing beginning/end of day for at least 2-3 minutes
- Handpieces flushed 20-30 seconds after pt care
- Sterile water/saline when irrigating open surgical sites and when cutting bone during surgical procedures

Waterline management factors necessary for controlling contamination & insuring good test results:

- Insure that source water is clean – common problem?
- Do not confuse “shocking” with “flushing” processes.
- Test waterlines consistently to confirm maintenance protocol effectiveness and determine proper shock frequency.
Monitoring Options

- Recommended by ADA to monitor effectiveness of tx’s
- Water testing laboratory (multiple commercial choices)
- In-office testing with self-contained kits
- Follow recommendations provided by manufacturer of DUWL treatment product for monitoring water quality (i.e. IFU)

Infection Control: Past, Present, & Future

…. not a single event
…. or an occasional decision
…. a commitment
…. a mindset
…. an attitude
…. an ongoing process

Pollack-Simon/ JAM