ENVIRONMENTAL ISSUES IN DENTAL PRACTICES

- Housekeeping/Clinical Contact Surfaces
- Medical Waste
- Dental Unit Waterlines
- Laser plumes/surgical smoke
DEFINITIONS

Spaulding Classification of Surfaces:

1. **Critical** – Objects which enter normally sterile tissue or the vascular system and require sterilization

2. **Semi-Critical** – Objects that contact mucous membranes or non-intact skin and require high-level disinfection

3. **Non-Critical** – Objects that contact intact skin but not mucous membranes, and require low or intermediate-level disinfection
DISINFECTION LEVELS

**High** – inactivates vegetative bacteria, mycobacteria, fungi, and viruses but not necessarily high numbers of bacterial spores

**Intermediate** – destroys vegetative bacteria, most fungi, and most viruses; inactivates *Mycobacterium tuberculosis*

**Low** - destroys most vegetative bacteria, some fungi, and some viruses. Does not inactivate *Mycobacterium tuberculosis*

CATEGORIES OF ENVIRONMENTAL SURFACES
HOUSEKEEPING SURFACES

MANAGEMENT OF HOUSEKEEPING SURFACES

No blood/body fluids present (non-clinical areas):

- Water and detergent and mop/cloth
- Clean mop/cloth and allow mop/cloths to dry OR use disposable mop

Presence of blood/body fluids (patient care areas):

- Wipe/mop surface with an EPA-registered disinfectant
- Do not re-dip contaminated wipes into disinfectant solution
- Cloth mops and disinfectant solution should be changed every 3 rooms or 60 minutes
- Micorfiber mops should be changed every room

Walls, blinds, drapes cleaned when dusty
## MICROBIAL SURVIVAL ON ENVIRONMENTAL SURFACES

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Duration of persistence (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Candida albicans</em></td>
<td>1-120 days</td>
</tr>
<tr>
<td><em>Heamophilus influenzae</em></td>
<td>12 days</td>
</tr>
<tr>
<td><em>Mycobacterium tuberculosis</em></td>
<td>1 day – 4 months</td>
</tr>
<tr>
<td><em>Streptococcus pyogenes</em></td>
<td>3 days – 6.5 months</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>7 days – 7 months</td>
</tr>
<tr>
<td><em>Herpes simplex virus</em></td>
<td>Hours – 18 weeks</td>
</tr>
<tr>
<td><em>Coxsackievirus</em></td>
<td>2 weeks</td>
</tr>
</tbody>
</table>

Kramer et al. *BMC Infectious Diseases* 2006 6:130
SOURCES OF CONTAMINATION

• Contaminated gloves and hands of dental healthcare personnel
• Contaminated instruments or other inanimate objects
• Aerosol/splatter

MANAGEMENT OF CLINICAL CONTACT SURFACES

• Surface protection
• Disinfection
SURFACE PROTECTION OF CLINICAL CONTACT SURFACES

SURFACE CLEANING/DISINFECTION OF CLINICAL CONTACT SURFACES

- Use an EPA-registered disinfectant with a HIV/HBV or TB claim.
- Required for exposed clinical surfaces after treating an individual patient.
- Required at the end of the day.
- Pre-clean and disinfect the surface after contamination and before each use.
  - Spray-wipe-spray: using a liquid disinfectant/cleaner
  - Wipe-discard-wipe: using a disinfectant towelette
CLEANING RECOMMENDATIONS

**Clean and disinfect surfaces using correct technique**
- Clean to dirty
- Prevent contamination of solutions
  - Don’t use dried out wipes
- Physical removal of soil (elbow grease)
- Contact time
- Correct type of cleaning materials
- Wear appropriate PPE (gloves, gown, mask, eye protection)

LIQUID DISINFECTANTS

<table>
<thead>
<tr>
<th>Disinfectant Agent</th>
<th>Use Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl or isopropyl alcohol</td>
<td>70% - 90%</td>
</tr>
<tr>
<td>Chlorine (bleach)</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Phenolic</td>
<td>UD</td>
</tr>
<tr>
<td>Iodophor</td>
<td>UD</td>
</tr>
<tr>
<td>Quaternary ammonium compound (QUAT)</td>
<td>UD</td>
</tr>
<tr>
<td>Improved/Accelerated hydrogen peroxide</td>
<td>0.5%, 1.4%</td>
</tr>
</tbody>
</table>

UD = Manufacturer’s recommended use dilution
OTHER ENVIRONMENTAL ISSUES

Blood and Body Fluid Spills

• Promptly clean and decontaminate
• Use appropriate PPE
• Decontaminate spills with dilute bleach solution (1:10 or 1:100) or an EPA-registered hospital disinfectant with a TB or HIV/HBV kill claim.

DISINFECTION OF COMPUTER KEYBOARDS

• All tested products were effective (>95%) in removing and/or inactivating the test pathogens (MRSA, *P. aeruginosa*). No functional/cosmetic damage after 300 wipes.
• Disinfectants included: 3 quaternary ammonium compounds, 70% isopropyl alcohol, phenolic, chlorine (80ppm)
• At present, recommend that keyboards be disinfected daily and when visibly soiled
• Use disinfectant wipes for one surface cleaning area one time
ENVIRONMENTAL ISSUES

• Housekeeping/Surfaces
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PUBLIC HEALTH IMPLICATIONS OF MEDICAL WASTE

Epidemiologic Evidence

• Only medical waste associated with infectious disease transmission is contaminated sharps.
• Reports of transmission of infectious agents by sharps occurred in health care setting.
• No evidence that a member of the public has ever acquired infection from medical waste.
• No infectious risks associated with any type of medical waste treatment method to include sanitary landfill disposal.
MEDICAL WASTE
PLAUSIBLE TRANSMISSION ROUTES

• Virtually nonexistent - respiratory, urinary or gastrointestinal tract or mucous membrane of the mouth, eyes, nose.
• Why? Chain of infection is incomplete
• Rare - "Sharps" have an intrinsic capability to disrupt the skin's integrity and introduce infectious agents.

THERE ARE TWO TYPES OF MEDICAL WASTE!

**Medical Waste**
• Any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals
• Cost $0.55/lb to dispose

**Regulated Medical Waste**
• Any blood or body fluids in individual containers >20ml (about size of test tube)
• Microbiological waste
• Pathological waste
• Must be treated prior to disposal
• Cost $1.75/lb to dispose of

Adapted from Medical Waste Presentation by Bill Patrakis, NC DENR, Division of Solid Waste Management. http://portal.ncdenr.org/web/wm/sw/medicalwaste
BLOOD AND BODY FLUIDS

- Liquid blood, serum, plasma, other blood products, emulsified human tissue, spinal fluids, and pleural and peritoneal fluids
- Dialysates, urine, and feces are NOT blood or body fluids under this definition
- Possible methods of treatment – dispose of in commode, incineration, steam sterilization.

MICROBIOLOGICAL WASTE

- Cultures and stocks of infectious agents (e.g. Microbiology laboratory)
- Possible methods of treatment – incineration, autoclaved, or chemical disinfectants (bleach 1:5)
PATHOLOGICAL WASTE

• Human tissues, organs, and body parts removed during surgery or autopsy.
• Only method of treatment – incineration.

DISPOSAL OF SHARPS*

• Rules do not require treatment before disposal
• Must be packaged in a container that is rigid, leak-proof when upright, and puncture resistant
• Can be disposed of with general solid waste
  • Some landfills do not accept sharps

* Sharps: Needles, Needles with syringes, Needles with vaccinationers, blades (scalpels), contaminated broken glassware
NOT DEFINED AS REGULATED MEDICAL WASTE

- Dressings and bandages (even blood soaked), sponges, disposable instruments, used gloves, and tubing
  - Disposed of as general solid waste
- Household waste including injections administered at home is not included in medical waste rules.

OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION

- OSHA specifies certain features of the regulated waste containers, including appropriate tagging meant to protect waste industry workers.
- OSHA rules are intended to minimize employee exposure to bloodborne pathogens. OSHA does not address disposal.
- OSHA definition of regulated waste may include waste such as bloody gauze, blood saturated dressings, used gloves, or tubing.
**EXTRACTED TEETH**

- Do not incinerate extracted teeth containing amalgam; must be recycled.
- Clean and disinfect before sending to lab for shade comparison.
- Can be given back to patient.
HANDLING EXTRACTED TEETH IN EDUCATIONAL SETTINGS

• Remove visible blood and debris.
• Maintain hydration.
• Autoclave (teeth with no amalgam).
• Use Standard Precautions.

HANDLING BIOPSY SPECIMENS

• Place biopsy in sturdy, leak proof container
• Avoid contaminating the outside of the container
• Label with a biohazard symbol
MEDICAL WASTE CONCLUSIONS

• Medical Waste: Not considered infectious, thus can be discarded in regular trash

• Regulated Medical Waste: Poses a potential risk of infection during handling and disposal

REGULATED MEDICAL WASTE MANAGEMENT CONCLUSIONS

• Properly labeled containment to prevent injuries and leakage

• Medical wastes are “treated” in accordance with state and local EPA regulations

• Processes for regulated waste include autoclaving and incineration
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DENTAL WATERLINE QUALITY

• Colony counts in water from untreated systems can exceed 1,000,000 CFU/mL
  CFU=colony forming unit
• Untreated dental units cannot reliably produce water that meets drinking water standards
• Limited pathogen potential
• Few reports of waterborne infections
• Exposing patients to water of uncertain microbiological quality is inconsistent with the infection control principles
DENTAL UNIT WATERLINES AND BIOFILM

- Microbial biofilms form in small bore tubing of dental units
- Biofilms serve as a microbial reservoir

DENTAL WATER QUALITY

For routine dental treatment, meet regulatory standards for drinking water.*

* <500 CFU/mL of heterotrophic water bacteria
AVAILABLE DUWL TECHNOLOGY

• Independent reservoirs
• Chemical treatment
• Filtration
• Combination

MONITORING OPTIONS

• Water testing laboratory  (UNC School of Dentistry)
• In-office testing with self-contained kits
• Follow recommendations provided by the manufacturer of the dental unit or waterline treatment product for monitoring water quality (weekly or monthly)

Reference:  www.ada.org
STERILE IRRIGATING SOLUTIONS

- Use sterile saline or sterile water as a coolant/irrigator when performing surgical procedures

- Use devices designed for the delivery of sterile irrigating fluids

SPECIAL CONSIDERATIONS

- Dental handpieces and other devices attached to air and waterlines
- Saliva ejectors
- Single-use (disposable) Devices
- Pre-procedural mouth rinses
DENTAL HANDPIECES AND OTHER DEVICES ATTACHED TO AIR AND WATERLINES

• Clean and heat sterilize intraoral devices that can be removed from air and waterlines
• Follow manufacturer’s instructions for cleaning, lubrication, and sterilization
• Do not use liquid germicides or ethylene oxide

COMPONENTS OF DEVICES PERMANENTLY ATTACHED TO AIR AND WATERLINES

• Do not enter patient’s mouth but may become contaminated
• Use barriers and change between uses
• Clean and intermediate-level disinfect the surface of devices if visibly contaminated
SALIVA EJECTORS

• Previously suctioned fluids might be retracted into the patient’s mouth when a seal is created
• Do not advise patients to close their lips tightly around the tip of the saliva ejector

SINGLE-USE (DISPOSABLE) DEVICES

• Intended for use on one patient during a single procedure
• Usually not heat-tolerant
• Cannot be reliably cleaned
• Examples: Syringe needles, prophylaxis cups, and plastic orthodontic brackets, sterile irrigation water
• FDA Law prevents reuse or reprocessing of “labeled” single use patient products or devices
PREPROCEDURAL MOUTH RINSES

• Antimicrobial mouth rinses prior to a dental procedure
  • Reduce number of microorganisms in aerosols/spatter
  • Decrease the number of microorganisms introduced into the bloodstream
• Unresolved issue–no evidence that infections are prevented

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LASER/ELECTROSURGERY PLUMES AND SURGICAL SMOKE

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

REFERENCES

• CDC. Jennifer L. Cleveland, DDS, Division of Oral Health
• Rutala WA, Weber DJ, HICPAC. CDC guideline for disinfection and sterilization in healthcare facilities., 2008
• Rutala WA. APIC guideline for selection and use of disinfectants. Am J Infect Control 1996;24:313
Congratulations on completing the modules! Proceed to the course evaluation.