Dental Work Surface Disinfectants

A Pollution Prevention Perspective

In Brief

We conducted a survey of intermediate level work surface infection control techniques used by dental practices in the San Francisco area. This survey was part of a cooperative project sponsored by CDA, local dental societies, city agencies, and the US Environmental Protection Agency.

Our dental co-researchers who responded to the survey told us:

- Phenols and alcohols are the most common active ingredients in the intermediate level work surface disinfectants used by these offices.

- Dental assistants typically disinfect intermediate level surfaces in active operatories between patients, and in other work areas daily or weekly.

- On average the survey respondents use 85 grams per day of work surface disinfectant products for each active operatory (150 grams per dentist per day). This weight excludes water that the dental assistant adds when mixing the product.

- These disinfectants contain 20 grams of ingredients that, while they accomplish the medically needed disinfection, also pose a potential hazard to the user, building occupants, or the environment in general.

These survey responses give us clues on how dental practices can reduce their infection control chemical use. Three primary strategies are:

- Avoid products in aerosol cans. Aerosol mists are easier for the worker to inhale, propellants are usually flammable, and the nozzle can fail before all of the product is dispensed.

- Mix disinfectant products according to manufacturer instructions. Adding too little water does produce a stronger solution, but that strength is usually not needed.

- Evaluate the active ingredients and other chemicals in your disinfectants. Choose products that have the least toxic ingredients needed to accomplish the intended purpose. For example, it is inappropriate to use glutaraldehyde based products for intermediate level work surface disinfection, much less for restrooms and other housekeeping tasks.

These alternative approaches have the important benefits of decreasing patient and staff exposure to chemical hazards, and also decreasing the environmental impact of dentistry.

The Details

1 What are the most common active ingredients in intermediate level dental work surface disinfectants?

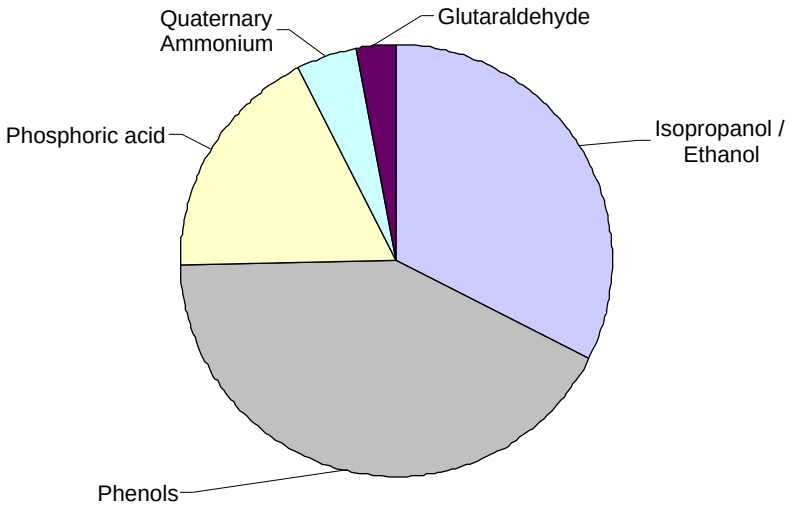
Alcohols and phenols are used in about 75% of the products reported by our survey sites. Some products are formulated with more than one of these ingredients.

2 What are the potential hazards that these active ingredients pose to the user, the building and its occupants, and to the environment in general?

The following table shows that there are a number of potential health hazards associated with active ingredients found in intermediate level surface disinfectants. These agents perform a necessary function in the health care setting. However, the user must be aware of the hazards involved and take appropriate protective measures, such as:

- wear chemical resistant gloves;
- wear eye protection; and
- assure that the work area has plenty of fresh air.

Active Ingredients in Work Surface Disinfectants



Source: Survey responses

Disinfectant Active Ingredients And Their Hazards

Active Ingredient	Practices Using Ingredient	Potential Impact of Each Ingredient			
		User	Surfaces	Patients	Environment
Phenols	42%	Eye & skin burns; Absorbs thru skin Some forms are possible carcinogens & teratogens	Corrodes plastic surfaces	Affects indoor air quality	Medium to High
Isopropanol / Ethanol	33%	Absorb thru skin, Vapors harmful - CNS effects	Low to Medium	Affects indoor air quality	Low to Medium
Phosphoric acid	18%	Eye & skin burns	Corrodes metal surfaces	- - -	Low to Medium
Quaternary Ammonium	4%	Eye & skin burns; Asthma	Low to Medium	Affects indoor air quality; Asthma	Low to Medium
Glutaraldehyde	3%	Eye & skin burns; Asthma	Corrodes metal surfaces	Affects indoor air quality; Asthma	Medium to High
Formaldehyde	<1%	Carcinogen; Asthmagen; eye & skin burns		Carcinogen; Asthmagen; eye & skin burns	Medium to High

Source: Product and ingredient MSDSs; Dental Office Surveys; CA Dept. Pesticide Reg.

3 What are appropriate active ingredients to use for intermediate level work surface infection control?

In 2003, the Center for Disease Control (CDC) published its Guideline For Infection Control In The Dental Health Care Setting. Appendix C of this Guideline recommends that a dental practice use products that deliver a level of infection control that corresponds to the need.

- Sterilization - High temperature heat, low temperature heat, or chemical sterilization with glutaraldehyde or another agent with similar capability for destroying all microorganisms. Applicable to instruments and devices that contact a patient's blood vessels or bone tissue.

- High Level Disinfection - Heated washer-disinfector or chemical disinfection with glutaraldehyde or another agent with similar capability for destroying all microorganisms. Applicable to "semi-critical" items that contact a patient's non-intact skin.

- Intermediate Disinfection - Chemical disinfection with an active ingredient registered by EPA for tuberculocidal activity (e.g., quaternary ammonium chloride, alcohols, phenols, or halogens such as chlorine or iodine). Applicable to clinical items or surfaces that contact intact skin and where blood is visible.

- Low-level Disinfection - Chemical disinfection with an active ingredient registered by EPA for HIV and hepatitis B potency (e.g., quaternary ammonium chloride, alcohols, phenols, or iodphors). Applicable to items and housekeeping surfaces where blood is not present.

Three key observations are made from the above CDC Guideline, taken together with the ingredient hazards listed in the prior table.

1 Do not use formaldehyde or glutaraldehyde for intermediate disinfection dental work surface infection control. This disinfection should be done with phenol, alcohol, quaternary ammonium chloride, or similar products.

2 Do not use formaldehyde, glutaraldehyde, or phenol disinfectants on housekeeping surfaces. For these surfaces, disinfect with products that contain alcohols, phosphoric acid. or quaternary ammonium chloride.

3 Where cleaning alone is judged sufficient, use a product containing enzymes or detergents on housekeeping surfaces.

4 What other ingredients besides the "active" ones are commonly found in work surface disinfectants?

Disinfectants may contain one or more of the following:

Butoxyethanol or another glycol ether. This family of chemicals tends to absorb through skin, and can affect the worker's blood, liver, and kidneys.

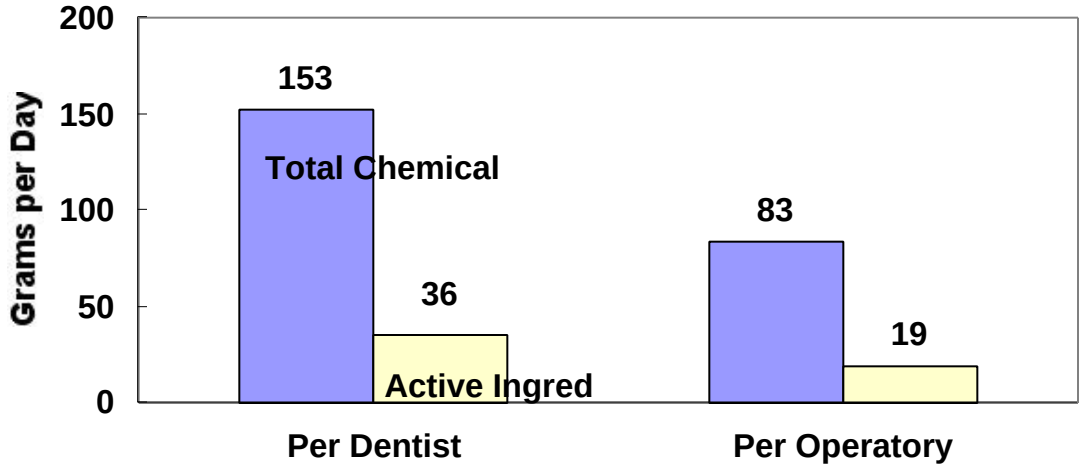
Nonyl phenol ethoxylate. This chemical and its relatives have the potential to adversely affect human and animal hormone systems.

Sodium hydroxide or potassium hydroxide. These ingredients raise the pH of the cleaner to 10 or higher, and also make the product corrosive to eyes and skin.

5 What amounts of intermediate level work surface disinfectant products do dental practices typically use?

The following chart shows the amounts of product and hazardous ingredients per dentist and per operatory.

Estimated Daily Use Of Dental Work Surface Disinfectants



Source: Survey Responses

The survey participants indicate that they use an average of about 150 grams of intermediate level disinfectant per dentist, or 85 grams per operatory each day. Water added to mix the products is not included in this estimate.

Hazardous ingredients include both the "active" ingredient cited when the disinfectant was registered with US EPA, and other chemicals in the product that pose a health or environmental risk. These ingredients average about 35 grams per dentist per day, or 20 grams per operatory.

What You Can Do

Take a quick inventory of your intermediate level surface disinfection chemicals, and estimate the amounts of each product that you use each week.

You may discover old, outdated products in your storage area. Dispose of these properly (e.g., unused disinfectant with phenol is a hazardous waste). In the future buy just the amount that matches your consumption.

Results to expect: You can reduce your chemical use by up to perhaps 2% to 5%, depending upon the details of how your practice has been ordering supplies.

If you use significantly more than the amounts of surface disinfectant that we found to be typical (i.e., 150 grams per dentist each day), then audit your disinfection protocols.

- First check that you are following the mixing and use directions from the manufacturer.
- If you are consuming more than these guidelines, then change how you mix the product. Of course, take care not to go so far that worker and patient protection is compromised.

Do not use products packaged as aerosols. There are health issues and other considerations that outweigh the convenience of aerosol packaging.

- Aerosols tend to mist the product, making it more easily inhaled.
- Propane and butane are often used as propellants. These chemicals are extremely flammable.

- Depending upon how you use the aerosol product, you may end up with a residual in the can after the propellant is gone or the nozzle fails. Used aerosols that are not absolutely empty must be disposed of as hazardous waste.

Results to expect: The outcome of adopting these changes will vary with the specifics of your situation, but you may see an overall reduction of up to perhaps 20% in surface disinfectant use.

You may also wish to evaluate alternative disinfectant products, and select the one that has the active ingredient and other chemicals that pose the least overall hazard to the worker and patients.

The Center for Disease Control and the American Dental Association have published guidelines for dental office infection control that will assist you in researching active ingredients. For details, refer to the websites cited below.

Where To Get More Information

Dental supply vendors and manufacturers usually have MSDSs and other product literature available for downloading on their websites.

Health, safety, and environmental issues related to specific ingredients of dental disinfectants may be researched via the following websites:

http://www.cdc.gov/mmwr/PDF/rr/rr5217.pdf

http://www.cdc.gov/mmwr/PDF/rr/rr5210.pdf

http://www.apic.org/pdf/gddisinf.pdf

http://www.osap.org/

http://atsdr1.atsdr.cdc.gov/toxfaq.html

http://toxnet.nlm.nih.gov/

http://ehp.niehs.nih.gov/docs/montharch.html

http://www.state.nj.us/health/eoh/rtkweb/rtkhsfs.htm

http://www.osha-slc.gov/SLTC/dentistry/index.html

About The Project

The Dental P2 Project team worked under a grant from Region IX of the US Environmental Protection Agency. Co-researchers included staff from the California Dental Association; Cities of San Francisco, Palo Alto, and Richmond; Mid-Peninsula Dental Society; San Francisco Dental Society; Union Sanitary District; and the University of Nevada - Reno.

The project goals are to identify, characterize, and quantify chemicals used by dental professionals for radiography, infection control, and restorative work.

In 2004 and 2005 the project team mailed, FAXed, and hand-delivered a 2-page survey about dental infection control to 450 dental offices in the San Francisco Bay Area. Over 50 dental practices chose to participate in this part of the project, for a response rate of about 12%.

We invite your comments. http://www.westp2net.org/studies.cfm

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