



# Dental Vacuum Line Cleaners

## *A Pollution Prevention Perspective*

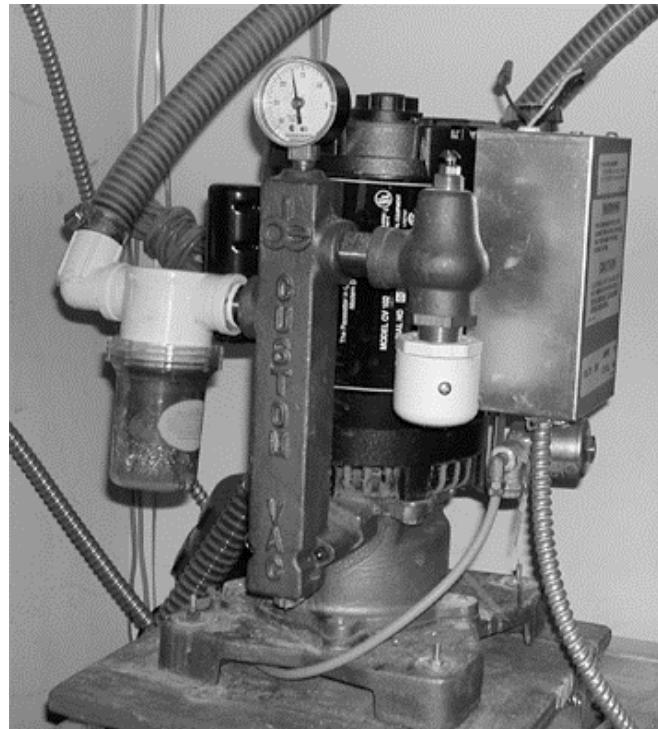
### In Brief

---

We conducted a survey of vacuum line 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:

- Alcohols, phosphoric acid, and enzymes are the most common active ingredients in the vacuum line cleaners and disinfectants used.
- Dental assistants typically clean or disinfect vacuum lines either daily or weekly depending more upon office protocols than patients seen.
- On average the survey respondents use 40 grams per day of vacuum line cleaner or disinfectant products per dentist. This weight excludes water that a dental assistant may add when mixing the product.
- Line cleaners contain from zero to 45 grams per day per dentist of ingredients that pose a potential hazard to the user, building occupants, or the environment in general. Disinfectants used for vacuum lines contain an average of 5 grams per dentist per day of hazardous ingredients.



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

- Consider enzyme based cleaners for this task. About 15% of the survey respondents use this approach.
- 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 formaldehyde or glutaraldehyde products for vacuum line disinfection.
- If a disinfectant must be used, then mix it according to manufacturer instructions. Adding too little water does produce a stronger solution, but that strength is usually not needed.

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 dental vacuum line cleaners?**

Isopropanol, ethanol, phosphoric acid, and enzymes are used in about 80% of the products reported by our survey sites. A product may contain more than one of these active ingredients. For example, one popular disinfectant has both isopropanol and phosphoric acid.

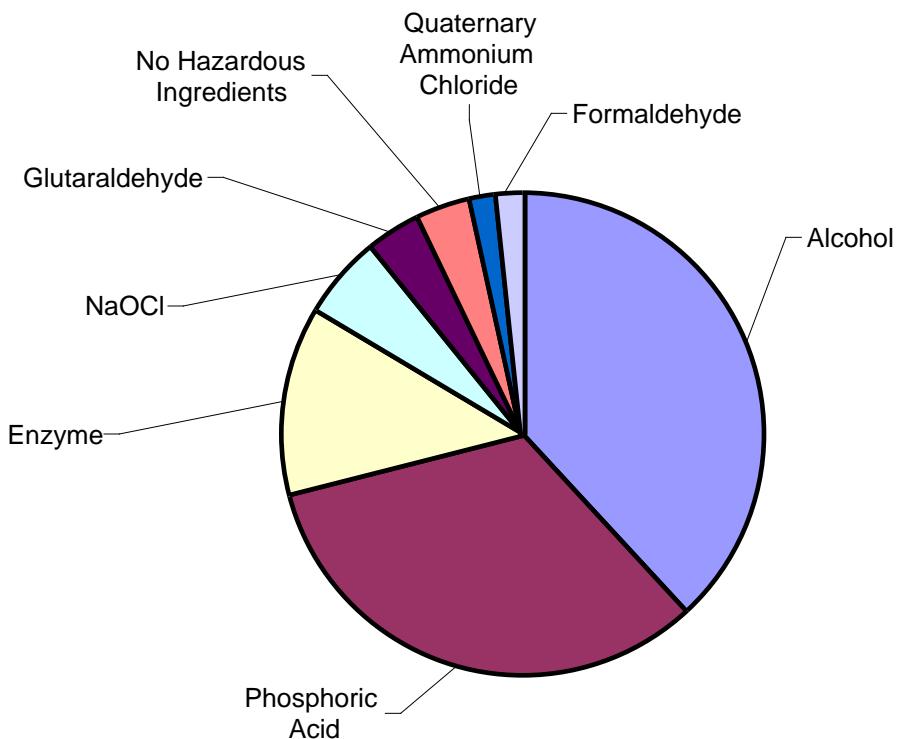
**2     What are the potential hazards that these active ingredients pose to the user, the building and its occupants, and to the environment in general?**

The following table shows potential health hazards associated with active ingredients found in some line cleaners. 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:

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

---

### Active Ingredients in Vacuum Line Cleaners & Disinfectants




---

Source: Survey responses

### 3 What are appropriate chemical ingredients to use for dental vacuum line cleaning?

In 2003, the Center for Disease Control (CDC) published its Guideline For Infection Control In The Dental Health Care Setting. Although CDC does not specifically address vacuum lines, Appendix C of this Guideline does recommend that a dental practice generally use products that deliver a level of infection control that corresponds to the need.

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

- 1 Do not use formaldehyde, glutaraldehyde, or orthoaldehyde as vacuum line disinfectants.
- 2 Where cleaning alone is judged sufficient, use a product containing enzymes or detergents.
- 3 If disinfection is necessary, use a product with alcohols, phosphoric acid, or quaternary ammonium chloride.

---

### Vacuum Line Cleaner / Disinfectant Active Ingredients

| Active Ingredient            | Practices Using Ingredient | Potential Hazards of Each Ingredient           |                         |                                    |                |
|------------------------------|----------------------------|--|-------------------------|------------------------------------|----------------|
|                              |                            | User   | Surfaces                | Patients                           | Environment    |
| Isopropanol / Ethanol        | 38%                        | Absorb thru skin, Vapors harmful - CNS effects | Low                     | Affects indoor air quality         | Low to Medium  |
| Phosphoric acid              | 33%                        | Eye & skin burns                               | Corrodes metal surfaces | ---                                | Low to Medium  |
| Enzymes                      | 18%                        | Eye irritant                                   | Low                     | Low                                | Low            |
| NaOCl (Bleach)               | 5%                         | Eye & skin burns                               | Corrodes metal surfaces | Affects indoor air quality         | Medium to High |
| Glutaraldehyde               | 4%                         | Eye & skin burns; Asthma                       | Corrodes surfaces       | Affects indoor air quality; Asthma | Medium to High |
| Quaternary Ammonium Chloride | 4%                         | Eye & skin burns; Asthma                       | Low                     | Affects indoor air quality; Asthma | Low to Medium  |
| "Non Hazardous Ingredients"  | 2%                         | Unknown  | Unknown                 | Unknown                            | Unknown        |
| Formaldehyde                 | 2%                         | Carcinogen; Asthmagen; eye & skin burns        | Corrodes surfaces       | Affects indoor air quality; Asthma | Medium to High |

Source: Product and ingredient MSDSs; Dental Office Surveys; CA Dept. Pesticide Reg.; State of NJ Worker Right-To-Know Factsheets

---

#### 4    **What other ingredients are commonly found in vacuum line cleaners and disinfectants?**

If the product is also meant to be used as a cleaner, it 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.

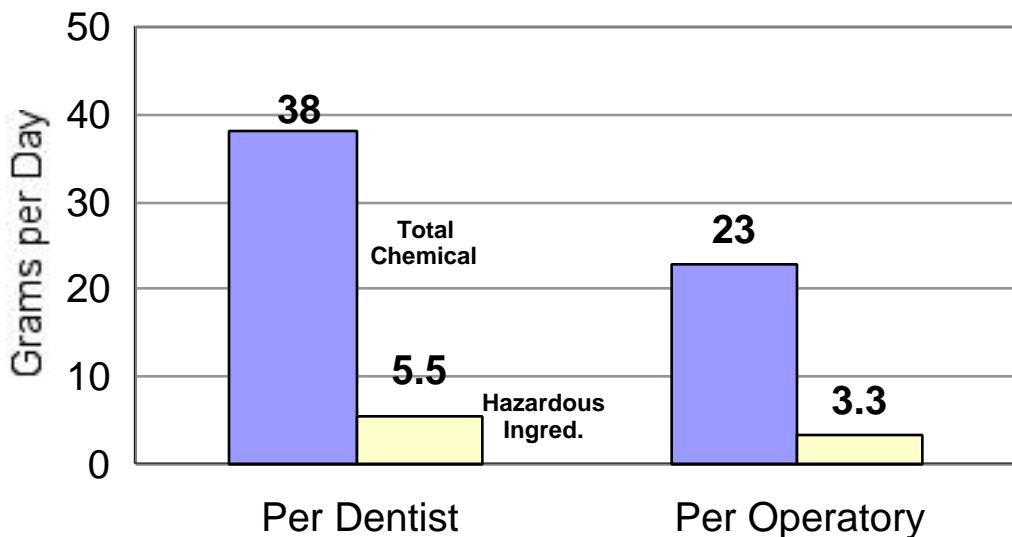
Nonyl phenol ethoxylate. This chemical and its relatives have the potential to adversely affect human and animal hormone systems.

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 vacuum line cleaners and disinfectants do dental practices typically use?**

The following chart shows the daily amounts of product and hazardous ingredients used per dentist and per operatory. The 'per operatory' amounts are influenced by the specific surveys we received, while the 'per dentist' amounts are more widely applicable to other offices.

**Estimated Daily Use Of Dental Vacuum Line Products**



Source: Survey Responses

The survey participants indicate that they use an average of about 40 grams of line cleaner or disinfectant per dentist, which for these offices is equivalent to 23 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 risks. These ingredients average about 5.5 grams per dentist per day, or 3.3 grams per operatory.

## What You Can Do

---

**Take a quick inventory of your vacuum line maintenance chemicals, and estimate the average amounts of each product that you use daily.**

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 you can use before the shelf life expires.

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 vacuum line cleaner or disinfectant that we found to be typical (i.e., 38 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.
- You may also find it useful to briefly keep a log of vacuum line maintenance to check that the cleaning interval is appropriate.

Results to expect: The outcome of adopting these changes will vary with the specifics of your situation, but you may see an overall product reduction of perhaps 20% to 40%. This estimate is based upon the fairly wide range in amounts per dentist reported by the survey sites.

**You may also wish to evaluate alternative disinfectant products, and select the one that has the active ingredient and other chemicals that perform the desired task while posing the least overall hazard to your workers and patients.**

Local sewer agencies have limitations on what may be discharged by dental offices and other businesses. Since vacuum lines lead to the sewer, in most locations you may not use formaldehyde or glutaraldehyde as a maintenance product.

Many sewer agencies prohibit the use of bleach because it releases mercury and silver from amalgam particles in the vacuum system.

The Center for Disease Control and the ADA 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>

Last Update: September 2005