

---

# Safer Sanitizers and Disinfectants: A Look at San Francisco's Latest Alternatives Analysis



---

BizNGO Webinar, May 7, 2014

Chris Geiger, Ph.D.

Toxics Reduction Program

San Francisco Department of the Environment



**SF**Environment

**Our home. Our city. Our planet.**

A Department of the City and County of San Francisco

# Topics

- The problem
- Definitions
- Methodology
- Recommendations
- Regulatory challenges



# Problems with disinfectants



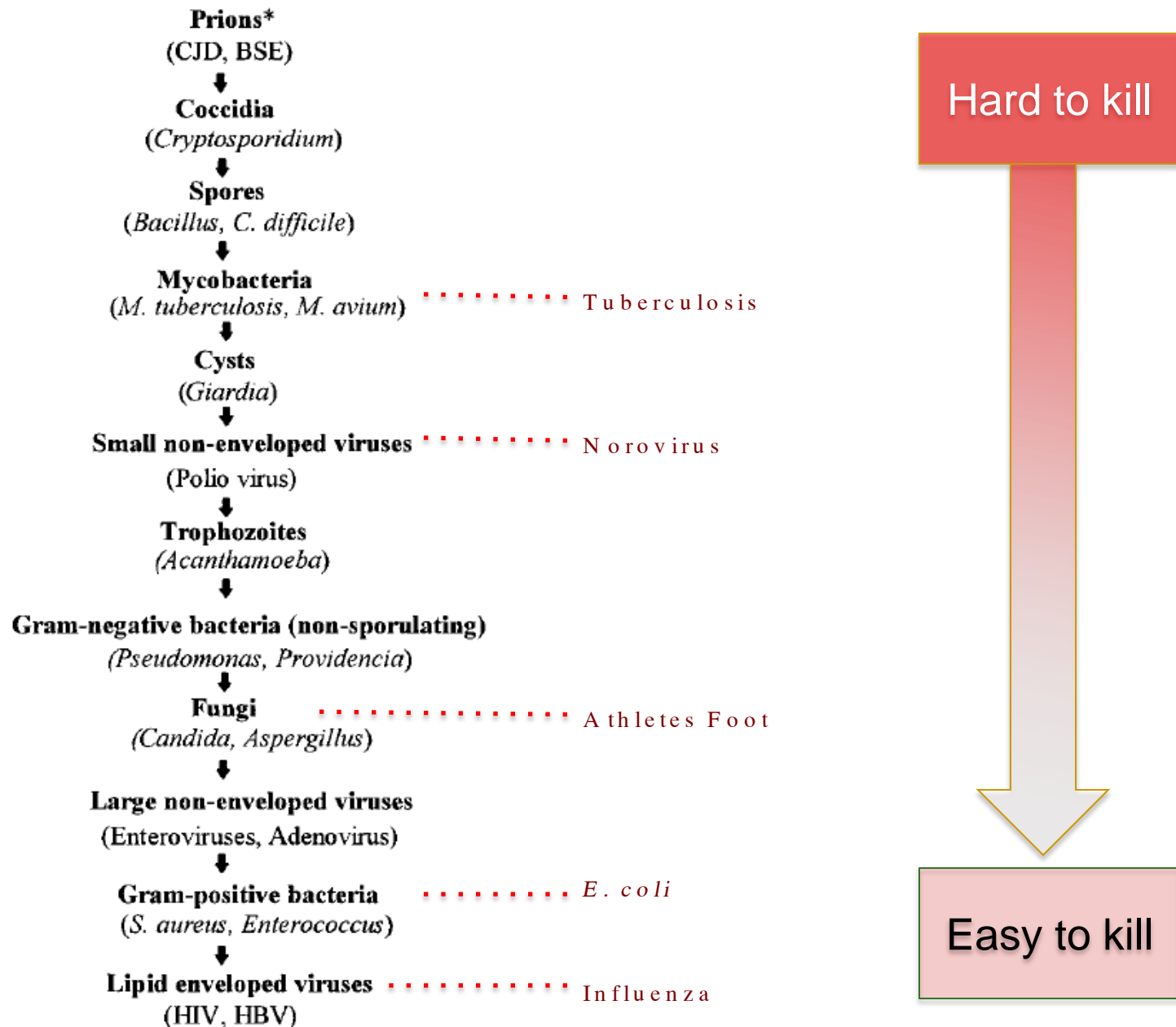


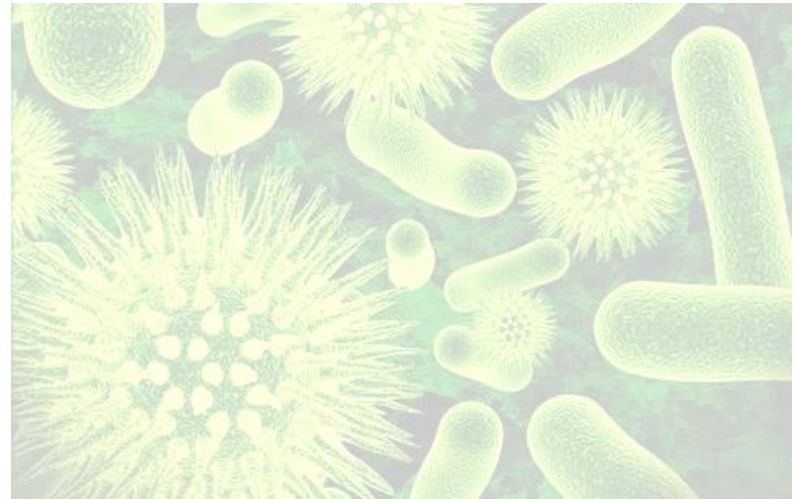
FIG. 1. Descending order of resistance to antiseptics and disinfectants. The asterisk indicates that the conclusions are not yet universally agreed upon.

# Definitions

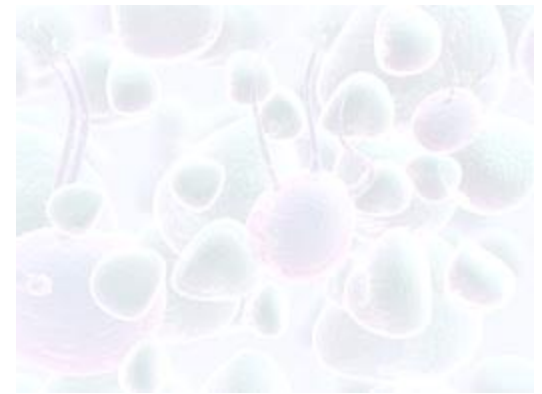
- Non food contact sanitizers

- *Staph*  
*AND*

- Klebsiella pneumoniae* OR *Enterobacter aerogenes*  
99.9% in 5 minutes



# Definitions



## ■ Disinfectants

- High-Grade, or Hospital-Grade
    - *Staph*, *Salmonella*, and *Pseudomonas*  
99.9999% in 10 minutes
  - General
    - *Staph* AND *Salmonella*  
99.999% kill in 10 minutes
  - Limited
    - *Salmonella* OR *Staph*  
99.999% kill in 10 minutes.
-

# Attributes assessed in this AA

- ✓ Hazard\*
- ✓ Fate
- Physical-chemical properties
- ✓ Functional use
- ✓ Product performance\*
- Technical feasibility
- ✓ Exposure potential\*
- ✓ Cost and availability\*
- Life-cycle impacts
- Social impacts
- Stakeholder input
- ✓ Comparison of materials and/or processes.

---

# Assessment factors:

## Active ingredients

- Cancer
- Reproductive toxicity
- Respiratory sensitization
- Skin sensitization
- Aquatic toxicity
- Persistence





# Assessment factors: Products

All of the above, and...

- Dwell time
- Efficacy for various microorganisms
- Acute toxicity
  - Skin
  - Eye
  - Respiratory
- Eutrophication potential
- Surface compatibilities
- Availability as a concentrate (carbon impacts)
- Potential for exposure reduction (dispensing systems)



---

# Active ingredients considered

- Chlorine “bleach”  
(sodium hypochlorite)
- Hydrogen peroxide  
(regular and AHP)
- Organic acids  
(citric/lactic/caprylic)
- Ortho-phenylphenol
- Pine oil
- “Quats”
- Silver + citric acid
- Thymol

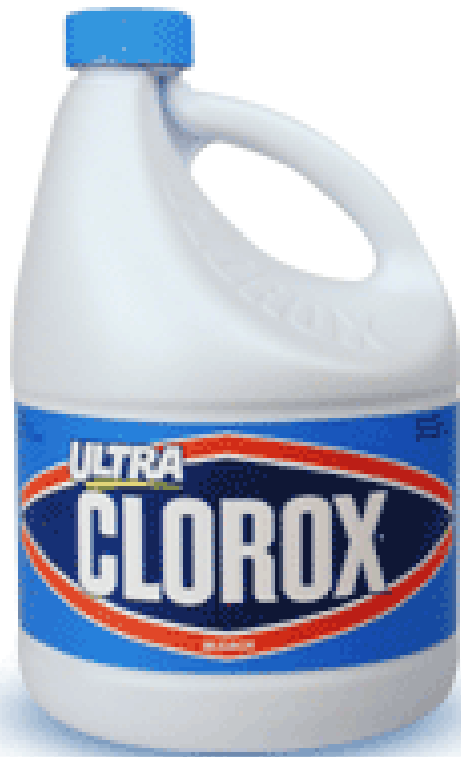
## Other alternatives

- Electrolyzed water
  - Microfiber cloth
  - Soap and water
  - Steam
-

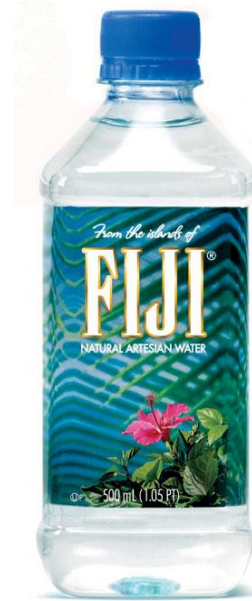
# Sodium hypochlorite (bleach)



| PROS  | CONS  |
|---|---|
| CHEAP, widely available   | pH 11.5 = severe eye damage                                       |
| Kills wide variety of microbes, versatile; some products kill Tb and/or NoroVirus | Respiratory irritant; $\text{Cl}_2$ and HCl are Asthmagens (AOEC) |
| Leaves no residue   | Reacts with organic molecules – environmental hazards             |
|   | Corrodes metals and floor polish                                  |
|   | Not stable – loses potency  |
|   | Reacts with other chemicals to form toxic gas                     |



\$1.79 (60 oz)



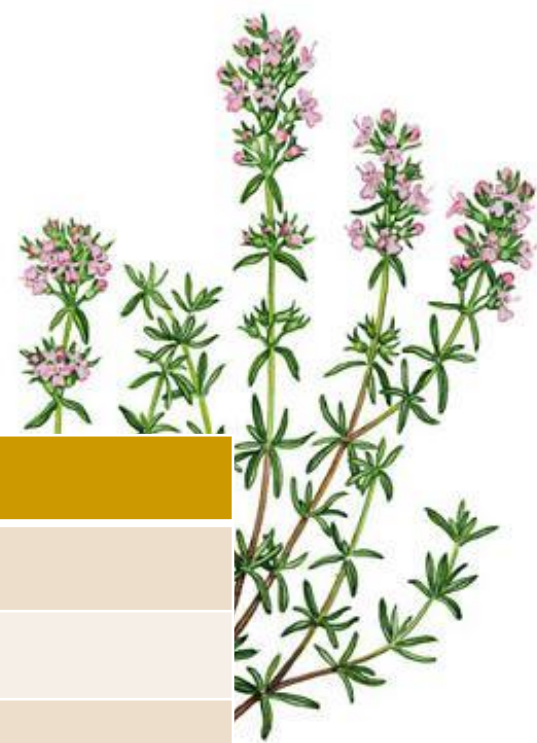
\$2.00 (10.1 oz)

# Quaternary ammonium compounds



| PROS   | CONS   |
|--|--|
| Widely available, inexpensive                    | Found in sewage outfalls                                   |
| More stable than bleach                          | High aquatic toxicity, “persistent”                        |
| Broader efficacy claims than most other products | Asthmagens; concentrates corrosive                         |
| Not as sensitive to organics as bleach           | Forms toxic chloramine gas when mixed with bleach          |
| Surfactant – cleans also                         | Dev & repro toxicity observed (but not weight of evidence) |
| Available in neutral pH formulations             | Requires rinsing – leaves residues                         |

# Thymol



| PROS                     | CONS                                       |
|--------------------------|--|
| Low environmental hazard | Strong smell                               |
| Rapidly breaks down      | Skin sensitizer                            |
| Long shelf life          | Possible repro effects<br>(‘weak’ studies) |
| Not an asthmagen         |  |

# Peroxide compounds



| PROS                                    | CONS                                     |
|---|--|
| Low human toxicity                      | Eye hazard from concentrates - corrosive |
| Low environmental hazard                | Irritating vapors from concentrates      |
| Rapidly decomposes to $O_2 + H_2O$      | Animal carcinogen & mutagen?             |
| No residues                             |  |
| Effective on full range of microbes     |  |
| Shorter dwell time than quats, pine oil |  |
| Whitens grout; removes stains           |  |

# Active ingredient review

| ACTIVE INGREDIENT   | CANCER          | REPRO TOX       | ASTHMA          | SKIN SENS                 | AQUATIC TOX             | PERSIST   |
|---------------------|-----------------|-----------------|-----------------|---------------------------|-------------------------|-----------|
| Caprylic Acid       | No              | No              | No              | No                        | Med acute               | Low       |
| Citric Acid         | No              | No              | No              | No                        | None                    | Low       |
| Hydrogen Peroxide   | No <sup>1</sup> | No              | No              | No                        | High acute              | Low       |
| Lactic Acid         | No              | No              | No              | No                        | None                    | Low       |
| Ortho-Phenylphenoll | Known           | Suspected       | No              | No                        | Very high acute         | Low       |
| Peroxyacetic Acid   | No              | No              | Yes             | No                        | Very high acute         | Low       |
| Pine Oil            | No <sup>2</sup> | No              | No <sup>3</sup> | Yes                       | None                    | Low       |
| Quats               | No              | Suspected       | Yes             | One compound <sup>4</sup> | High acute, med chronic | Very High |
| Silver              | No              | No              | No              | No                        | High acute              | Very High |
| Chlorine Bleach     | No              | No              | Yes             | No                        | Very high acute         | Low       |
| Thymol              | No              | No <sup>5</sup> | No              | Yes                       | High acute              | Low       |



---

# Recommendations-ingredients

- Hydrogen peroxide
  - Citric acid
  - Lactic acid
  - Caprylic acid
  - (Silver/citric acid)
-

# Sample product review

| Active Ing.        | Dwell | Efficacy | (Bact, Virus, Fungi) | Health | Env |   |
|--------------------|-------|----------|----------------------|--------|-----|---|
| H2O2 -----         | 1     | BB       | VVV                  | FF     | L   | L |
| CAPRYLIC ACID ---  | 10    | BBB      | VVV                  | F      | L   | L |
| CITRIC ACID -----  | 10    | BB       | V                    | 0      | L   | L |
| SILVER/CITRIC --   | 1     | BBB      | VVV                  | F      | L   | H |
| LACTIC ACID -----  | 10    | BB       | V                    | 0      | L   | L |
| THYMOL -----       | 10    | BB       | V V                  | F      | H   | L |
| QUATS -----        | 10    | BBB      | VVV                  | FFF    | H   | M |
| CHLORINE -----     | 1-10  | BBB      | VVV                  | FFF    | H   | L |
| PINE OIL -----     | 10    | BB       | 0                    | F      | M   | H |
| H2O2 + PAA [ ] --- | 10    | BBB      | V                    | FF     | H   | L |
| OPP -----          | 10    | BBB      | VVV                  | F      | H   | H |

# Recommendations-disinfectants

(for complete list, see report)



## *Hydrogen Peroxide*

- **Accel** (Concentrate: 1:128, 3-minute dwell time)
- **Alpha HP** (Concentrate, 1:128 dilution, 3-minute dwell time)
- **Alpha-HP Multi-Surface Disinfectant Cleaner** (Concentrate, 1:128 dilution, 3-minute dwell time)
- **Carpe Diem Concentrate Five 16** (Concentrate: 1:128, 3-minute dwell time)
- **Envirox Concentrate 118/H2Orange2 117\*** (Concentrate, 5-minute dwell time)
- **Envirox H2Orange2 Superconcentrate 112** (Concentrate: 5:23 dilution, 5-minute dwell time)
- **G-Force H2O2 Bathroom Cleaner Disinfectant** (Concentrate, 1:128 dilution, 3-minute dwell time)
- **Oxivir Five 16** (Concentrate, 1:128 dilution, 3-minute dwell time)
- **Ramsey Bathroom Cleaner Disinfectant** (Concentrate, 1:128 dilution, 3-minute dwell time).

---

# Recommendations-disinfectants

(for complete list, see report)

## *Citric Acid*

- **Comet Disinfecting Bathroom Cleaner** (Concentrate, 1:4 dilution, 5-minute dwell time)

## *Caprylic/Octanoic Acid*

- **Ecolab 65 Disinfecting Heavy-Duty Acid Bathroom Cleaner** (Concentrate, 1:40 dilution, 5-minute dwell time)



# Recommendations-specialized

## ■ Bloodborne pathogens HIV + HBV

### □ RTU

- 30 sec: Clorox Healthcare Peroxide Cleaner (1.4% H<sub>2</sub>O<sub>2</sub>)
- 1 min: Oxivir Tb (0.5% AHP)
- 1 min: Pure Hard Surface (Silver + Citric Acid)

### □ Concentrate

- 5 min: Oxivir Five 16 (4.25% AHP; 1:16)



# Recommendations-specialized

## Locker Rooms (Athletes Foot Fungus)

### RTU

- 5 min: H2Orange 120 One (1% H<sub>2</sub>O<sub>2</sub>)
- 3 min: Clorox Healthcare Peroxide Cleaner (1.4% H<sub>2</sub>O<sub>2</sub>)
- 10 min: Oxivir Tb (0.5% AHP)
- 10 min: Clean-Cide (0.6% Citric acid)
- 10 min: Quantum Tb (0.138% Caprylic acid)
- 5 min: Limited: Pure Hard Surface (Silver + CitAcid)

### Concentrate

- 5 min: Oxivir Five 16 (4.25% AHP; 1:16) 5 min.



# Recommendations-specialized

## ■ Norovirus

### □ RTU

- 1 min: Oxivir Tb (0.5% AHP)
- 1 min: Clorox Healthcare Peroxide Cleaner (1.4% H<sub>2</sub>O<sub>2</sub>)
- 5 min: Clean-Cide (0.6% Citric acid)
- 1 min: Pure Hard Surface (Silver + Citric Acid)  
24-hr residual efficacy

### □ Concentrate

- 5 min: Oxivir Five 16 (4.25% AHP @1:16)



# Electrolyzed water devices





# Microfiber

(an important part of an effective disinfection program)



Bacteria culture taken after a traditional wet mop cleaning — only a 30% reduction from precleaning.



Bacteria culture taken after microfiber mop cleaning — a 99% reduction!



**CLEAN, GREEN, EFFICIENT**

Green cleaning is a comprehensive approach to cleaning that combines chemicals, equipment, tools, disposable and communication to produce an effective and safe cleaning program.

A green cleaning program is one that combines environmentally preferred products with good sound cleaning procedures, training and expertise.

**GREEN PARTNER SUPPORT™ (GPS™)**

WAXIE's GPS program consists of the environmental impact clean green products, equipment and training for your own "green" cleaning program. We help you to safely and effectively clean buildings to protect health without harming the environment.

**EXPERIENCE THE BENEFITS OF MICROFIBER**

- Squeegee and trap dirt
- Can be laundered hundreds of times
- Spreads product smoothly on a variety of surfaces
- Color-coding options available
  - Light Blue
  - Pink
  - Green
  - Yellow
  - Orange
  - Red
- Flexible and durable
- Highly absorbent
- Highly durable
- Highly resistant to wear and tear
- Highly resistant to staining
- Highly resistant to odors
- Highly resistant to mold and mildew
- Highly resistant to bacteria
- Highly resistant to viruses
- Highly resistant to fungi
- Highly resistant to parasites
- Highly resistant to insects
- Highly resistant to animals
- Highly resistant to plants
- Highly resistant to humans
- Highly resistant to all life forms

**COLOR-CODING:**

Reduce the risk of cross contamination by identifying use in different departments and surface types. Choose the right color for your cleaning procedure.

**WAXIE green**

**Microfiber**

Cleaning, Dusting, Wet & Dry Mopping Products

**cleaner  
quicker  
smarter**

**GPS**

**WAXIE**









**Twist 'n Fill Application Chart**  
Cuadro de Aplicación Twist 'n Fill

|  |  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

**Administrative Services**  
Capitalist Department

**Do you Have the Right Gear For the Job?**

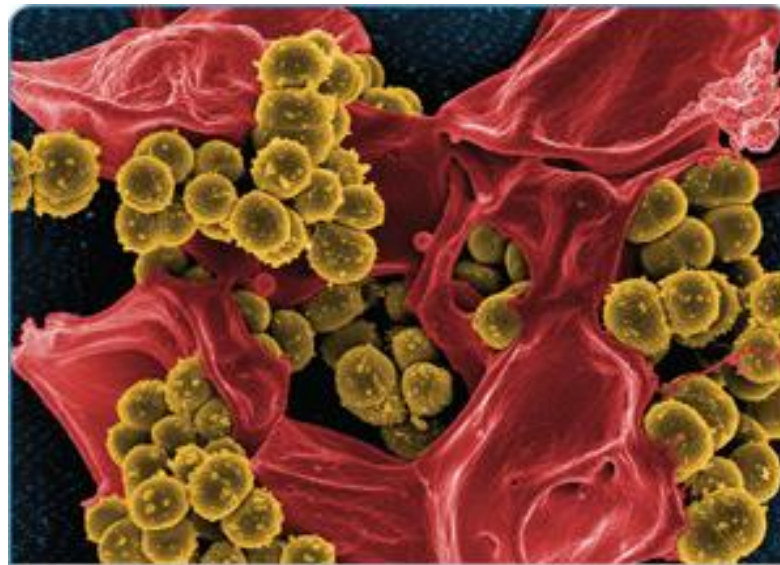
**Safety, Remember Starts with You**

**Twist 'n Fill System**

# Regulatory challenges

- Meaningful registration of devices
- Full ingredient disclosure
- Verifying manufacturers' claims
- Confusion over market claims vs. label claims





## Safer Products and Practices for Disinfecting and Sanitizing Surfaces



**SF Environment**  
Our homes. Our city. Our planet.  
A Department of the City and County of San Francisco

1455 Market Street, Suite 1200  
San Francisco, CA 94103  
SFEnvironment.org • (415) 355-3700

<http://www.sfapproved.org/>

---

# Acknowledgements

- Susan Kegley – Pesticide Research Institute
  - Kelly Moran – TDI Consulting
  - Ann Blake – Ann Blake Consulting
  - Justine Weinberg – Calif Dept. of Public Health
  - Luz Agana – SF Dept. of Public Health
  - Karen Cohn – SF Dept. of Public Health
  - Bridget Williams - USEPA DfE
  - Cal Baier-Anderson - USEPA DfE
-