

Exposure Assessment for the Use of Spor-Klenz®

Health Hazards, Exposure Limits and Controls



Agenda

Overview of Cold Sterilants

Hazardous Components

Evaluating Worker Exposure

Summary/Q&A

Cold Sterilants

- Non-bleach liquid class of sporicidal disinfectants
- Produced by reacting acetic acid and hydrogen peroxide with an acid catalyst, peracetic acid is found in stabilized solutions containing acetic acid, hydrogen peroxide, and water
- Used throughout biological research and pharmaceutical production
- Controls microbial contamination on stainless steel, glass and plastic surfaces
- Several manufacturers



Cold Sterilants

Stabilized mixture of Peracetic acid, hydrogen peroxide and acetic acid

Commercially available Peracetic Acid:



Cold Sterilants

Pre-Mixed Solution
Spray Bottle
Concentration

Active Ingredients:	Concentration
Hydrogen Peroxide	1.00%
Peracetic Acid	0.08%
Water	98.92%
TOTAL	100.00%

KEEP OUT OF REACH OF CHILDREN
DANGER DELIGRO

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Hazardous Components

Peracetic acid (PAA)

- Clear, colorless liquid, completely soluble in water
- Pungent acetic acid odor (i.e. vinegar)
- pH <2
- Oxidizer
- Corrosive and irritating to the eyes, skin, and mucous membranes
- Inhaling PAA can cause coughing, shortness of breath and pulmonary edema

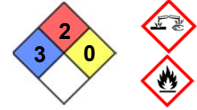


OSHA PEL - NONE
NIOSH REL - NONE
ACGIH TLV - 0.4 ppm 15 min STEL

Hazardous Components

Acetic acid

- Colorless liquid
- Pungent acetic acid odor (i.e. vinegar)
- Odor Threshold 0.48 – 1 ppm
- Corrosive and irritating to the eyes, skin, and mucous membranes
- Inhalation can cause coughing, shortness of breath and pulmonary edema

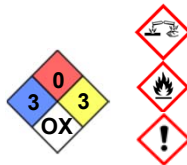


OSHA PEL - 10 ppm
NIOSH REL - 10 ppm, 15 min STEL
ACGIH TLV - 10 ppm, 15 min STEL
NIOSH IDLH - 50 ppm

Hazardous Components

Hydrogen Peroxide

- Colorless odorless liquid
- Reactive and a strong oxidizer
- Commonly used as a bleaching agent, in rocket fuels and in making other chemicals
- Mutagen and possible carcinogen
- Severely irritating to the skin and eyes
- Health effects are unlikely to occur with commercial solutions at low concentrations used as a disinfectant



OSHA PEL - 1 ppm
NIOSH REL - 1 ppm
ACGIH TLV - 1 ppm

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It is important to sample for all three components (this can be a challenge).

- Methods exist for Acetic Acid and Hydrogen Peroxide:
 - OSHA 1019 for Hydrogen Peroxide (treated quartz filter)
 - OSHA PV 2119 for Acetic Acid (coconut shell charcoal tube)



Evaluating Worker Exposure

- Sampling and analysis of PAA is difficult because it coexists with acetic acid and hydrogen peroxide, and neither NIOSH nor OSHA have published a sampling or analytical method for PAA.
- OSHA is currently working on a method for sampling PAA. Additionally, PAA and acetic acid have STELs which require short-term monitoring.

Evaluating Worker Exposure – INRS Method

A method currently used for sampling peracetic acid was published in 2004 by the *Institut National de Recherche et de Sécurité (INRS)*, the French research organization that is similar to our NIOSH.



The INRS method uses a sampling train that consists of a treated pre-filter for hydrogen peroxide, followed by a sorbent tube to collect peracetic acid and hydrogen peroxide simultaneously.

Hydrogen Peroxide and PAA Sampling Train



Dosimeters and Monitors



Sampling Considerations

- PAA sorbent tube requires a pump that can handle high back pressures
- Treated filters must be refrigerated while stored and shipped and have a short half-life
 - Check with your laboratory!



Respiratory Protection

3M had previously recommended supplied air as the appropriate respirator system for hydrogen peroxide (H₂O₂).

3M Technical Data Bulletin #185 (2009) — *Respiratory Protection for Hydrogen Peroxide & Peracetic Acid*, the 3M 6003 Organic Vapor/Acid Gas Cartridge and the 3M 6006 Multi-Gas/Vapor Cartridge effective for 8 hours against H₂O₂ vapor concentrations up to approximately 90 ppm.



The Bulletin also reports that both acetic acid and peracetic acid vapors are removed effectively by 3M acid gas, organic vapor/acid gas, or multigas cartridges.

Mixtures of Contaminants

When two or more hazardous substances that act on the same organ system are present, their combined effect, not the individual effect of either component, should be given primary consideration. In the absence of information to the contrary, the effects of the different hazards should be considered additive.

$$\frac{C_1}{TLV_1} + \frac{C_2}{TLV_2} \cdots \frac{C_n}{TLV_n} = ?$$

If the sum of the fractions is less than one, then the TLV has not been exceeded.
If the sum of the fractions is greater than one, then the TLV has been exceeded.

Inferring PAA Concentration

Lacking a standard method for PAA, some have relied on measuring only acetic acid and hydrogen peroxide and conclude that if the latter two are below their respective OSHA PELs/ACGIH TLVs, then the PAA concentration must also be within safe limits.

- ChemDAQ believes this assumption flawed
 - Complex Equilibrium
 - Does not take into account make up of blend mixtures
 - Non-equilibrium conditions
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Our Experience

We see use of these materials in a variety of work settings.

With small scale use (treating a biosafety cabinet for example), worker exposures are generally well within recommended limits.

With heavy application, such as in a manufacturing suite or clean room, or in poorly ventilated locations, we have seen transient airborne levels that are above recommended limits for all components.

Our Experience

Other sporicides like sodium hypochlorite, chlorine dioxide, etc. also have similar hazards.

Perfumes or smell masking agents do not eliminate the hazards from chemicals.

End users should always check the Safety Data Sheets and consider testing to keep the actual chemical exposure within safe levels.

In Summary...

- These products should be used according to manufacturer's instructions, and in a well-ventilated environment.
 - In some situations, heavy usage can result in airborne levels above recommended limits, and appropriate PPE, including respiratory protection may be required.
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Thank You For Attending!



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