

Chemical Agent Comparison During a Mock Decontamination Event

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MABSA Symposium
June 11, 2015

Utilizing two (2) rooms (8,576.8 cubic feet) in the Education and Research Building (Legacy UMDNJ; Camden, NJ), three (3) different chemical agent and/or delivery methods were compared: Ionized Hydrogen Peroxide (Six Log, Costa Mesa, CA); Hydrogen Peroxide (Astra Pak [Devea], France); and Chlorine Dioxide (ClorDiSys Solutions, Lebanon, NJ).

The rooms are masonry block wall, concrete slab ceiling and troweled on flooring. The rooms were previously used for large animal research with an ante room. Any penetrations were sealed with caulk or duct tape (floor drains, hose bib, etc.).

The exhaust and supply units were deactivated for all runs.

The exhaust and supply vents were sealed during the chlorine dioxide experiments.





Hydrogen Peroxide

(Phileas D100, Astra Pak [Devea], France)

The method is an innovative technique, based on the nebulization of an active agent. The disinfectant agent is atomized or reduced to a micro-droplet size range is between 5 μ and 10 μ) using a spinning disk technology and diffused in the room without the use of a nozzle or compressed air.



phileas 100



Spinning disc technology
by **Phileas**



One (1) generator was in the room at the time of the experiment. The disinfectant agent was distributed for fifteen (15) minutes followed by the fan running – distributing the disinfectant agent

for ten (10) minutes to move the product throughout the room.

This cycle was replicated five (5) times. The engineers allowed 20 minutes contact time after the last cycle prior to aeration.

The disinfectant agent used was Minncare cold sterilant (Medivators, Minneapolis, MN): Hydrogen peroxide 22.0%; Peroxyacetic acid 4.5%; and Inert ingredients 73.5% (EPA Reg. 52252-4; EPA Est. No. 52252-MN-01); (Lot # 753263, MFD 9/2014, Expiration date 9/2015). The percent hydrogen peroxide was diluted to 10% by adding tap water.

MINNCARE®

COLD S

For use in sanitizing of Reverse Osmosis Membranes and their associated distribution systems, sterilization and disinfection of hard surfaces and non-porous food contact surfaces.

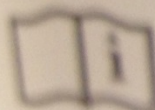
ACTIVE INGREDIENTS

Hydrogen Peroxide.....	22.0%
Peroxyacetic Acid.....	4.5%
Inert Ingredients.....	73.5%
Total	100.0%

EPA Reg. NO. 52252-4

EPA Est. NO. 52252-MN-01

KEEP OUT OF REACH OF CHILDREN
DANGER -



Read the MINNCARE Cold Sterilant label and application notes before using this product.

See Directions for Use for additional precautionary statements.

Failure to follow directions for use per package insert may result in user injury.

The product must be diluted with Purified Water prior to use.

LOT: 753263

MA
MED

Personal Protective Equipment (PPE)

Handlers must wear: Goggles or face shield, and protective clothing.

Environmental Hazards

This pesticide is toxic to birds, fish and aquatic invertebrates.

Do not discharge effluent containing this product into lakes, streams, rivers, or other surface waters unless this product is specifically identified and approved for such use.

Do not discharge effluent containing this product to sewer systems without the approval of the local sewerage authority.

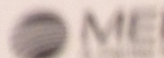
For guidance contact your State Water Board or Regional Water Quality Control Agency.

For more information on this product, contact your distributor.

For more information on this product, contact your distributor.

Physical and Chemical Hazards

This product contains an oxidizing agent.



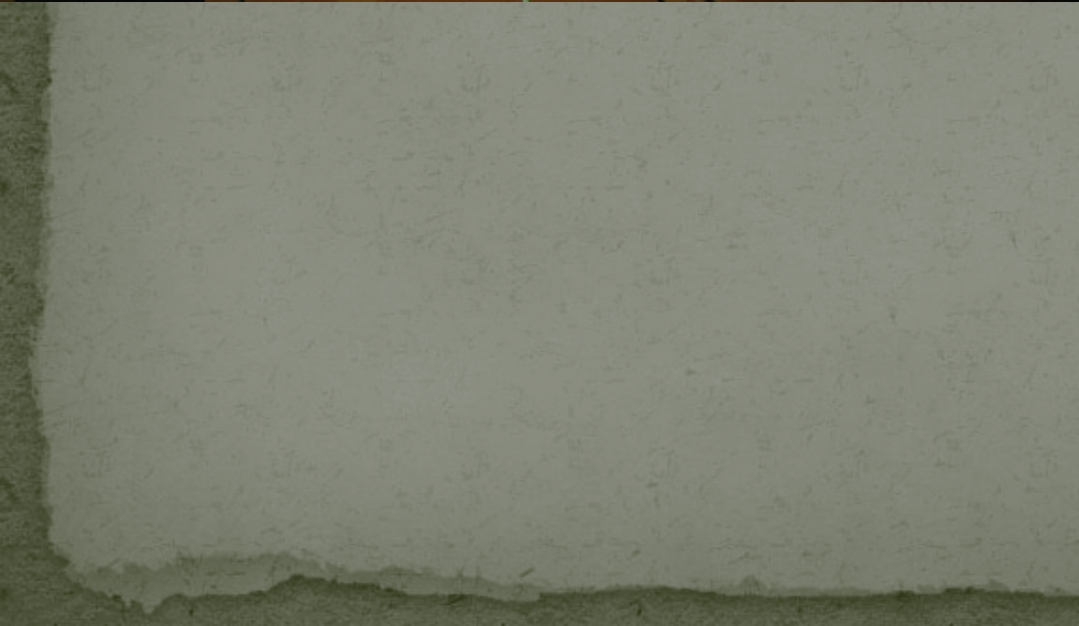
MEMPHIS MEDICAL EQUIPMENT

Ionized Hydrogen Peroxide ~ iHP (Six Log, Costa Mesa, CA)

This method aerosolizes a low concentration of hydrogen peroxide that is passed through a 17,000 volt electric arc (cold plasma field). This technology allows for a net positive charge on all particles so they distribute more like a gas than a vapor.

The positive charged particles both repel each other and attract to all surfaces. Additionally, this technology is not affected by temperature or humidity.





One (1) unit with three (3) spray nozzles on separate stands were placed and aimed in different directions (by the engineers) within the space.

The generator was in the room at the time of the experiment.

The disinfectant agent used was BiT (TOMI Env. Solutions, Inc. Rockville, MD): Hydrogen peroxide 7.5%; and Inert ingredients 92.5% (EPA Reg. 90150-1; EPA Est. No. 72038-DE-001); (Lot # 0102A1, Expiration date 9/2015).

This product is registered as a Pesticide.



BIT
binary ionization technology®

For use in mold control and remediation

Active Ingredient:	
Hydrogen peroxide	7.5%
Inert Ingredients	92.5%
Total	100%

EPA Reg. No. 90150-1 EPA Est. No. 72038-DE-001

KEEP OUT OF REACH OF CHILDREN
DANGER PELIGRO

OXIDIZER CORROSIVE

PRECAUTIONARY STATEMENTS

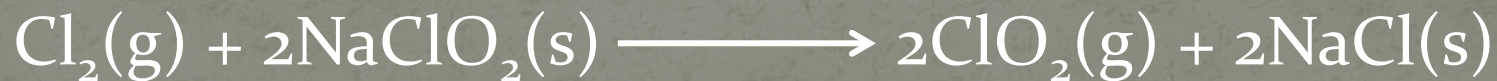
Hazards to Humans and Domestic Animals

FIRST AID	
If in eyes	<ul style="list-style-type: none">• Hold eye open and rinse slowly and gently with water for 15-20 minutes.• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.• Call a poison control center or doctor for treatment advice.
If swallowed	<ul style="list-style-type: none">• Call a poison control center or doctor immediately for treatment advice.• Have person sip a glass of water if able to swallow.• Do not induce vomiting unless instructed by a poison control center or doctor.

Chlorine Dioxide

(ClorDiSys Solutions, Lebanon, NJ)

This method distributes the gas contacting all surfaces evenly. One (1) Minidox M generator with two (2) Cl compressed gas cylinders were used for the generation of chlorine dioxide gas. The generator and compressed gas cylinders were in a common corridor at the time of the experiment. The Minidox M generator Chlorine Dioxide was generated from chlorine gas and sodium chlorite by the reaction:





2% chlorine gas in nitrogen was passed through a column packed with solid sodium chlorite and other stabilizing compounds. Tubing from the Minidox M was run into the room for distribution of ClO₂ gas.

Temperature and relative humidity were established (25.4 C and 64.9 %RH) prior to the ClO₂ experiments. The efficacy of ClO₂ as a decontaminant is greatly enhanced at a relative humidity greater than 60%.

SAFETY

Interior concentrations of hydrogen peroxide were obtained every three (3) minutes using a Porta Sens II detector (Hydrogen Peroxide Sensor #00-1042). The Minidox-M records continuous interior concentrations using an internal dual data storage drive.

Exterior concentrations of hydrogen peroxide were obtained with a Drager Pac III (P/N: 4530010) with a H₂O₂ sensor (S/N: ERCK0027). Exterior concentrations of chlorine dioxide were obtained with a Porta Sens II (Chlorine Dioxide Sensor #00-1004).

Iodine Test Strips (Code: 2948-BJ; expiration date: 3/16) (LaMotte, Chestertown, MD) were placed both inside the test rooms as well as outside in the common corridor to show exposure or non-exposure.





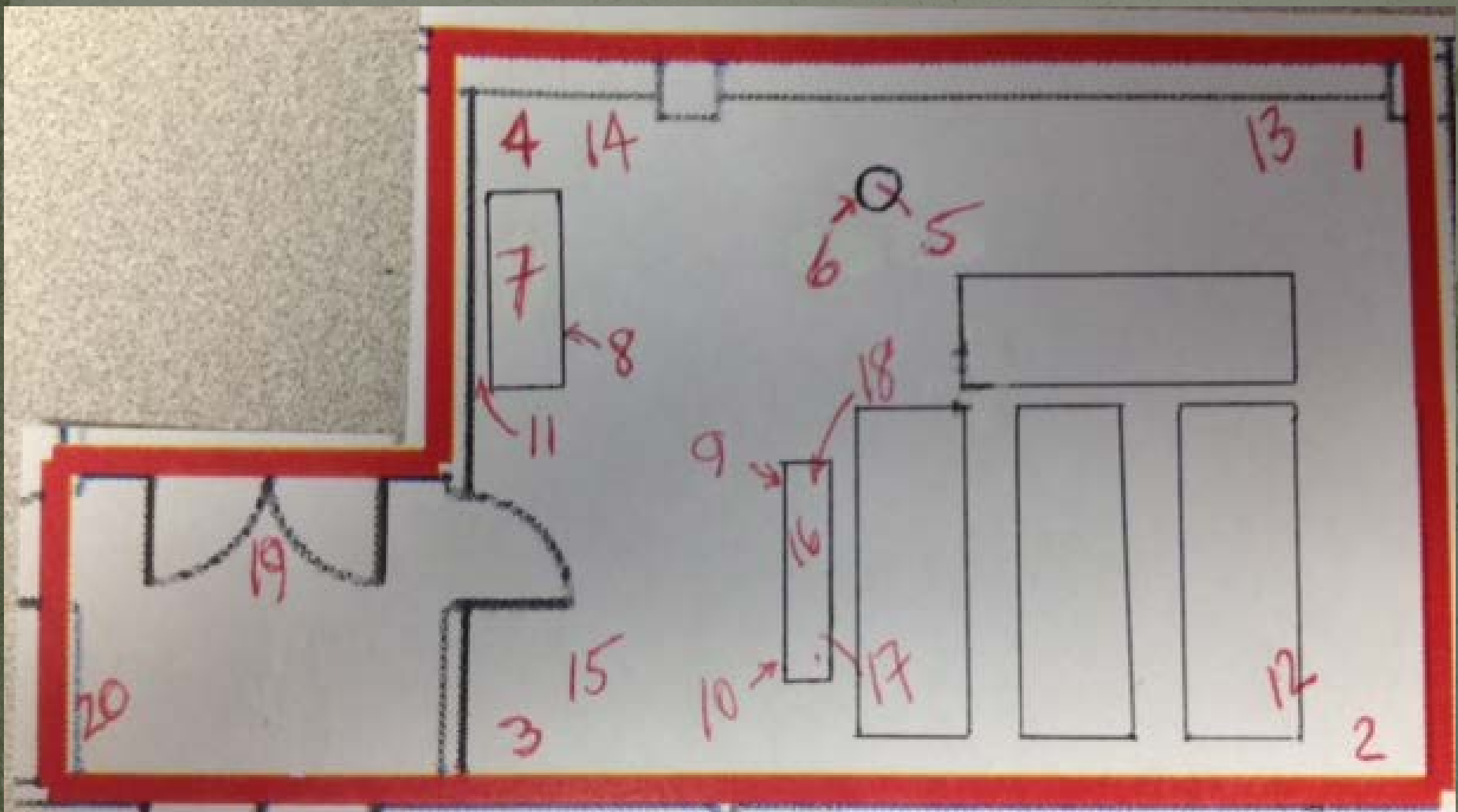
VERIFICATION

20 Mesa Strip Dual Species Biological Indicator (*Geobacillus stercophilus* [1.8×10^5] and *Bacillus Subtilis* [2.3×10^6]) spore strips (Mesa Labs, Bozeman, MT) were placed throughout the test rooms.

Iodine Test Strips (Code: 2948-BJ; expiration date: 3/16) (LaMotte, Chestertown, MD) were placed next to each dual species spore strip within the test rooms.

BI PLACEMENT

Top of ductwork (X3)	Top of light housings (X2)	Under work surface of BSC (X1)
Work surface of BSC (X1)	Between pleats of HEPA filter - BSC (X1)	Behind BSC at waist level (X1)
On top of desk (X1)	Inside partially closed drawer of desk (X1)	Inside a 55 gallon feed drum on wheels (X1)
Under 55 gallon waste drum on wheels (X1)	Inside erlenmeyer flask (X1)	Inside inverted water bottle in tray (X1)
On floor in the corners (X2)	Under grates in drain runs (X2)	Under scale (X1)



FRACTIONATION

Biological Indicator analyses was performed using the “fraction negative”, “fractionation”, or “go/no-go” method. This method involves observing if a Biological Indicator has been sterilized or not sterilized by a decontamination event. The fractionation method is convenient, but is limited in that it does not differentiate between decontaminations that leave only one versus any number of viable spores.

Fractionation method was used since it is suitable and repeatable with *Geobacillus stearothermophilus* and *Bacillus Subtilis* spores on paper.

RESULTS



Biological Indicators placed during the Hydrogen Peroxide experiments show “no growth” in all but one sample. The sample placed inside the erlenmeyer flask had growth.



Biological Indicators placed during the ionized Hydrogen Peroxide experiments show “no growth” in all but two sample. The samples placed inside the erlenmeyer flask and the inverted water bottle had growth.



Biological Indicators placed during the Chlorine Dioxide experiments show “no growth”.

CONCLUSION

This one trial study shows that Chlorine Dioxide acted as a true gas and was able to kill (show no signs of growth) all the biological indicators in the 2 room mock set up. Hydrogen Peroxide was able to be pushed throughout the mock set up and kill (show no signs of growth) all but one of the biological indicators. This process of distributing hydrogen peroxide for 15 minutes then pushing it further into the rooms (for 10 minutes) using the internal fan system assisted with its success. Ionized Hydrogen Peroxide also showed that it was capable killing (show no signs of growth) all but 2 biological indicators.

CONCLUSION

Decontamination of smaller, removable items in the room(s) could take place prior to complete room decontamination, as long as the facility follows its Standard Operating Procedures for this purpose.

SPECIAL THANK YOU TO:

- Steve Feinstein, Six Log, Costa Mesa, CA - Ionized Hydrogen Peroxide [Engineers: Johnny Cato and Johnny Cato];
- Josh Hallman, Astra Pak [Devea], France [Engineers: Johnny Cato and Johnny Cato]; and
- Paul Lorcheim and Mark Czarneski, ClorDiSys Solutions, Lebanon, NJ [Engineers: Paul Lorcheim and Daniel Paznek]