

## Effectiveness of 3% Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) as a disinfectant as per CDC 2008 Report and Guidelines

The literature contains several accounts of the properties, germicidal effectiveness, and potential uses for stabilized hydrogen peroxide in the health-care setting. Published reports ascribe good germicidal activity to hydrogen peroxide and attest to its bactericidal, virucidal, sporicidal, and fungicidal properties<sup>653-655</sup>. (Tables 4 and 5) The FDA website lists cleared liquid chemical sterilants and high-level disinfectants containing hydrogen peroxide.

### Mode of Action.

Hydrogen peroxide works by producing destructive hydroxyl free radicals (oxygen) that can attack membrane lipids, DNA, and other essential cell components. Catalase, produced by aerobic organisms and facultative anaerobes that possess cytochrome systems, can protect cells from metabolically produced hydrogen peroxide by degrading hydrogen peroxide to water and oxygen. This defense is overwhelmed by the concentrations used for disinfection<sup>653, 654</sup>

### Microbicidal Activity.

Hydrogen peroxide is active against a wide range of microorganisms, including bacteria, yeasts, fungi, viruses, and spores<sup>78, 654</sup>. A 0.5% hydrogen peroxide demonstrated bactericidal and virucidal activity in 1 minute and mycobactericidal and fungicidal activity in 5 minutes<sup>656</sup>. Effectiveness of hydrogen peroxide has been demonstrated against a variety of health-care-associated pathogens; organisms with high cellular catalase activity (e.g., *S. aureus*, *S. marcescens*, and *Proteus mirabilis*) required 30–60 minutes of exposure to 0.6% hydrogen peroxide for a 10<sup>8</sup> reduction in cell counts, whereas organisms with lower catalase activity (e.g., *E. coli*, *Streptococcus* species, and *Pseudomonas* species) required only 15 minutes' exposure<sup>657</sup>. In an investigation of 3% hydrogen peroxide for reducing spacecraft bacterial populations, a complete kill of 10<sup>6</sup> spores (i.e., *Bacillus* species) occurred with a 3% concentration for 150 minutes showed kill rate of 10<sup>6</sup> spores in six of seven exposure trials<sup>658</sup>. A 3.0% hydrogen peroxide solution topically was ineffective against VRE after 3 and 10 minutes exposure times<sup>661</sup> and caused only a 2-log<sub>10</sub> reduction in the number of *Acanthamoeba* cysts in approximately 2 hours<sup>662</sup>.

### VRE - vancomycin-resistant enterococci

Vancomycin-resistant enterococci (VRE) are a type of bacteria called enterococci that have developed resistance to many antibiotics, especially vancomycin. Enterococci bacteria live in our intestines and on our skin, usually without causing problems. But if they become resistant to antibiotics, they can cause serious infections, especially in people who are ill or weak. These infections can occur anywhere in the body. Some common sites include the intestines, the urinary tract, and wounds. Vancomycin-resistant enterococci infections are treated with antibiotics, which are the types of medicines normally used to kill bacteria. VRE infections are more difficult to treat than other infections with enterococci, because fewer antibiotics can kill

the bacteria. (**Special note – Inhalation treatments of 3 cc of 3% H<sub>2</sub>O<sub>2</sub> up to six times daily have been shown to be very effective against VRE**)

<sup>664</sup>. Other studies demonstrated the antiviral activity of hydrogen peroxide against rhinovirus <sup>665</sup>. The time required for inactivating three serotypes of rhinovirus using a 3% hydrogen peroxide solution was 6–8 minutes; this time increased with decreasing concentrations (18-20 minutes at 1.5%, 50–60 minutes at 0.75%)

**. 3% and 6% H<sub>2</sub>O<sub>2</sub> were unable to inactivate HAV (Hepatitis A Virus) in 1 minute in a carrier test <sup>58</sup>.**

#### Key facts:

- **Hepatitis A is a viral liver disease.**
- **The hepatitis A virus (HAV) is transmitted through that ingestion of contaminated food and water or through direct contact with an infected person. (Note of interest – If everyone ate food and drank water disinfected with H<sub>2</sub>O<sub>2</sub>, HAV would be eradicated.)**
- **Almost everyone recovers fully from hepatitis A with a lifelong immunity.**
- **HAV causes generally a mild, but in some cases, severe illness.**
- Under normal conditions, hydrogen peroxide is extremely stable when properly stored (e.g., in dark containers). The decomposition or loss of potency in the 16 oz and 30 oz containers purchased in local grocery and drug stores is less than 2% per year at ambient temperatures <sup>670</sup>

#### Uses:

Commercially available 3% hydrogen peroxide is a stable and effective disinfectant when used on inanimate surfaces. It has been used in concentrations of 3% for disinfecting soft contact lenses (e.g., 3% for 2–3 hrs) <sup>653, 671, 672</sup>, tonometer biphisms <sup>513</sup>, ventilators <sup>673</sup>, fabrics <sup>397</sup>, and endoscopes <sup>456</sup>. Hydrogen peroxide was effective in spot-disinfecting fabrics in patients' rooms <sup>397</sup>. Hydrogen peroxide also has been instilled into urinary drainage bags in an attempt to eliminate the bag as a source of bladder bacteriuria and environmental contamination.

In summary, **Hydrogen peroxide** does kill germs, including most viruses and bacteria. A concentration of 3% **hydrogen peroxide** is an **effective disinfectant**. It is also effective in concentrations as low as 0.5%

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