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CO_2 incubators

Question: Why is automated heat decontamination a better solution for sterilizing my CO_2 incubator than an automated chemical disinfection, such as *in situ* hydrogen peroxide vapor?

Answer:

A CO_2 incubator automated heat decontamination cycle delivers ease-of-use and proven effectiveness. After removing cells and any heat sensitive items from the incubator, simply push a button to begin the automated heat decontamination cycle. In contrast, *in situ* hydrogen peroxide (H_2O_2) requires manual handling and a continuing investment in reagents, yet the effectiveness is uncertain.

Hydrogen peroxide vapor is often used for biological safety cabinets and room disinfection because heat decontamination is not possible due to the scope and size of these areas. This method uses external equipment to generate a concentrated vapor, and, due to the toxic nature of the H_2O_2, should be performed by trained personnel.

The "automated" in-chamber hydrogen peroxide vapor available on some CO_2 incubators is not the same as external H_2O_2 generation. This *in situ* H_2O_2 disinfection technology requires the user to handle the chemical and set up the H_2O_2 generator manually. This also involves disassembly and careful repositioning of all internal components – as much manual labor as separately autoclaving all of these parts. This additional handling may result in error or insufficient disinfection and can easily reintroduce contamination to the incubator chamber, jeopardizing cultured cells. The chemical is not automatically neutralized so must be manually removed to prevent corrosion over time.

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Automated heat decontamination

Hydrogen peroxide poses dangers for humans and cultured cells

Hydrogen peroxide vapor is toxic to humans and cultured cells as well as to microorganisms. This method for disinfecting laboratory equipment should be performed by a trained technician. The American Cancer Society states, “Direct skin contact with food grade hydrogen peroxide can cause blistering or burns, and breathing its vapors can cause serious breathing problems up to 72 hours later.” (www.cancer.org, “Oxygen Therapy”) The U.S. Occupational Safety and Health Association (OSHA) has set a Permissible Exposure Limit (PEL) of 1 part per million (ppm) per day exposure. Hydrogen peroxide can generate dangerous free radicals, damaging DNA and causing chromosomal aberrations. Based on these effects, any residual hydrogen peroxide must be entirely eliminated to avoid any detriment to cultured cells.

Table 1: Hydrogen peroxide poses dangers to humans and to cultured cells.
Data from the U.S. Occupational Safety and Health Association at osha.gov.

Routes of exposure:	**Reference**
Inhalation of vapor or mist, contact with eyes or skin, or ingestion	Sittig M 1991. Handbook of toxic and hazardous chemicals. 3rd ed. Park Ridge, NJ: Noyes Publications
Health hazard effects:	**Reference**
Eye, skin and mucous membrane irritant	NIOSH 1995. Registry of toxic effects of chemical substances: Hydrogen Peroxide. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control.
Inhalation of 7 ppm causes lung irritation in humans; exposure to vapor or mist for even short periods can cause eye stinging and tearing.	NLM 1995. Hazardous substances data bank: Hydrogen Peroxide. Bethesda, MD: National Library of Medicine. Hathaway GJ et al. 1991. Proctor and Hughes’ chemical hazards of the workplace. 3rd ed. New York, NY: Van Nostrand Reinhold.
Mutagenic; damages DNA and causes chromosomal aberrations in cultured mammalian cells.	IARC 1985. IARC monographs on the evaluation of carcinogenic risk of chemicals to man. Volume 36. Lyon, France: World Health Organization, International Agency for Research on Cancer.
Liquid H_2O_2 in contact with skin can cause whiteness or bleaching. If not washed promptly, irritation, redness and blisters can develop.	Hathaway GJ, Proctor NH, Hughes JP, and Fischman ML [1991]. Proctor and Hughes’ chemical hazards of the workplace. 3rd ed. New York, NY: Van Nostrand Reinhold.

Choose a method with independent test results for proven effectiveness

An automated system for sterilization of a CO_2 incubator should provide consistent, measurable results that prove successful elimination of contamination. The effectiveness of automated hydrogen peroxide disinfection can be questionable because H_2O_2 molecules would have to make contact with every microorganism to be successful. Any microscopic areas missed by the H_2O_2 allow microorganisms to survive and propagate again. In contrast, Thermo Scientific™ CO_2 incubators provide independent proof of their high temperature cycles using accepted test microorganisms including bacterial spores. Application notes documenting these independent test results can be found at **thermoscientific.com/co2**.

Save time and labor with true automation

User operated *in situ* H_2O_2 disinfection systems require complete removal of all internal parts from the CO_2 incubator and repositioning inside the incubator. Disassembly and repositioning of many parts into a specific configuration adds an element of human error which may compromise consistent results. After the cycle, the shelves, brackets, water pan, plenums, etc. must be replaced in their normal working orientation. Any remaining liquid which contains hydrogen peroxide must be removed for the safety of cultured cells and personnel. Finally, the manufacturer recommends venting the remaining fumes. **Instead, choose a Thermo Scientific CO_2 incubator with hands-free heat sterilization that truly is automated, leaving you with more time to focus on your research.**

Summary

Do-it-yourself hydrogen peroxide disinfection requires as much manual handling as autoclaving parts from a basic incubator. Any remaining residues can pose risk to cultured cells and humans and must be removed. This method is not proven to effectively eliminate contamination with the same assurance or ease of use that heat decontamination offers.

Find out more at **thermofisher.com/co2**