

Hospital Infection Control

## **Mycobacterium tuberculosis Effect of Disinfectant Medilox®**

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August, 1999

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# Bactericidal effect of Medilox<sup>®</sup> against *Mycobacterium tuberculosis*

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## Introduction

The incidence of mycobacterial infection have increased in the immunocompromised patients. Many sterilization methods are being introduced in order to prevent the propagation of tuberculosis in hospital. The most effective method to prevent nosocomial infection by *Mycobacterium tuberculosis* includes proper disinfection of assured sterilization of endoscopes and other medical instruments, maintenance of clean hands of doctors and nurses that are in contact with patients and hospital surroundings. Disinfectants currently in use are inadequate in many respects being unreliable for rapid use, toxic, corrosive, unstable or expensive depending on the choice of disinfectant used.

This study has examined the bactericidal activity of a new disinfectant, Medilox solution (Soo San ENC Co., Yongin, Korea) against *Mycobacterium tuberculosis*.

## Materials and methods

### 1. Super-oxidized water (Medilox solution)

Medilox solution was prepared by electrolysis of sodium chloride solution using the Medilox system (Soo San ENC Co., Yongin, Korea). Electrolysis yields Super-oxidized water with pH of 5.0-6.5 and an oxidation-reduction potential of >950 mV containing about 30 ppm of HOCl. Freshly prepared Medilox solutions with the HOCl concentration of 30 ppm were used as disinfectants.

### 2. Microorganisms

Test microorganisms were 10 strains of *Mycobacterium tuberculosis* isolated from patients admitted in Soonchunhyang University Hospital in Korea.

### 3. Determination of bactericidal activity

Test strains were cultured in Ogawa medium for 5 weeks at 35°C. Each cultured organisms was washed three times with phosphate buffered solution (pH 7.2) by centrifugation and the final suspension in PBS used for inactivation studies. Disinfection testing was carried out by adding 0.1 mL of microorganism suspension to 5 mL of freshly prepared Medilox with the HOCl concentration of 30 ppm and mixing thoroughly ( $10^6 \sim 10^7$  CFU/mL). Each organism was exposed to disinfectant for various periods (0.5 min, 1 min, 2 min, 5 min, 10 min, 30 min, 1 hr, 2 hr, 5 hr, 12 hr and 24 hr). After the exposure of Medilox disinfectant, 0.01 mL of the mixture of microorganism and Medilox was inoculated in Ogawa medium. The growth of microorganism was examined every week after incubation at 37°C for 8 weeks. All tests were run in duplicate.

## Results

All of ten strains of *Mycobacterium tuberculosis* were killed within 30 seconds after the exposure to Medilox with 30 ppm of HOCl concentration.

Table 1. Bactericidal activity of Medilox (HOCl 30 ppm) according to the exposure time

Exposure time (min)	control	0.5	1	2	5	10	30	60	120
<i>Mycobacterium tuberculosis, strain 1</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 2</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 3</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 4</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 5</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 6</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 7</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 8</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 9</i>	+	-	-	-	-	-	-	-	-
<i>Mycobacterium tuberculosis, strain 10</i>	+	-	-	-	-	-	-	-	-

## Discussion

Thorough cleaning and rapid disinfection of endoscopes and other heat sensitive equipment for between patient use is essential to prevention of hospital infection in a busy endoscopy unit. Thorough, manual cleaning followed by immersion in 2% glutaraldehyde or the use of automatic washer/disinfectors is widely practised in many hospitals. Exposure to glutaraldehyde fumes is known to cause asthma and dermatitis in healthcare staff. Contact times of 10 min for routine disinfection and 20 min for high level disinfection have been recommended for 2% glutaraldehyde by the British Thoracic Society and the British Society for Gastroenterology. Longer exposure times of 60-95 min have been proposed for elimination of *Mycobacterium avium-intracellulare*.

Medilox solution, a Super-oxidized water recently developed by Soo San ENC Company in Korea was improved such inadequacies and enhanced the sterilizing effect. The manufacturer claims Medilox solution is non-toxic and non-corrosive to biologic tissues, endoscopes and washer/disinfectors. It is not costly and does not cause any clinical problems and environmental pollution.

The experimental result of the disinfective activity of Medilox solution showed that general bacteria and fungi isolated in hospital had all been sterilized within 30 seconds to the HOCl concentration of 30 ppm. All of three strains of spore-forming *Bacillus subtilis* were killed within 4 minutes to Medilox with the HOCl concentration of 30 ppm, but all of three strains were killed within 30 seconds to the HOCl concentration of 50 ppm. All of ten strains of *Mycobacterium tuberculosis* were killed within 30 seconds to Medilox with the HOCl concentration of 30 ppm.

The potent biocidal activity of Medilox in the absence of organic matter, after a 30 seconds exposure time, was demonstrated across a range of microorganisms including *Mycobacterium tuberculosis* and spore-forming bacteria. Disinfectant activity is substantially reduced in the presence of heavy organic contamination. In clinical areas where it is recommended that instruments be thoroughly cleaned to remove blood and body fluids before disinfection, Medilox acts as a highly effective disinfecting agent. It is rapidly active against a range of microorganisms including spore-forming bacteria and *Mycobacterium* species, making it suitable as a disinfectant of choice for the rapid turnaround of endoscopes between patients. It is particularly amenable for use in endoscope washer disinfectors, where endoscope washing to remove organic matter is a preparatory step before disinfection.

Medilox may merit consideration as an alternative to glutaraldehyde in endoscopy units.