

## Original Research Article

# Comparative study on efficacy of traditional lysol based floor cleaners versus newer biological and sodium hypochlorite based floor cleaner in our institution

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### ABSTRACT

**Background:** Floor disinfection plays a major role in patient to patient transmission of infections in hospital environment. In our hospital, lysol based floor cleaner was routinely used for floor cleaning. In our study we compare alternative methods of disinfection using sodium hypochlorite (NaOCl) based floor cleaner and biological (cows urine based) floor cleaner with traditional Lysol based floor cleaner.

**Methods:** Three floor cleaners were used in the study (Lysol, NaOCl, biological cleaner). Study was conducted in our institution between August 2018 to October 2018. These floor cleaners were used in different floors and swab was taken every month to determine their efficacy of disinfection.

**Results:** After initial culture of all three floor cleaner samples, the Lysol solution was culture positive for clostridium tetani spore. In first month, Lysol was used in both floor 1 and floor 2. In second month, NaOCl floor cleaner in floor 2 and biological cleaner in floor 1 was used. In third month, NaOCl floor cleaner for floor 1 and biological cleaner for floor 2 was used. Swabs taken at the end of each month was negative for culture except clostridium tetani spores were grown in floor 2 in corridor floor in which biological cleaner was used in third month.

**Conclusions:** Floor cleaning with alternative reagents like NaOCl and biological cleaners are non inferior in disinfection of hospital environment in comparison with traditional lysol floor cleaner.

**Keywords:** Lysol, Sodium hypochlorite, *Clostridium tetani*

### INTRODUCTION

Floor disinfection plays a major role in patient to patient transmission of infections. Colonization with health care-associated pathogens such as *Staphylococcus aureus*, *Enterococci*, and *Clostridium difficile* in hospital environment is associated with increased risk of infection.<sup>1</sup> Microorganisms are ubiquitous, they cause contamination, infection and decay. According to Spaulding's classification, the critical items are those which comes in direct contact with sterile tissues as well as other items that are connected to them.<sup>2</sup> Therefore

these items need sterilization. The semi-critical items come into contact with mucous membranes or non-intact skin. In these cases, disinfection is recommended. And non-critical items come in contact with intact skin, but not mucous membranes, so the only recommendation is cleaning. Virtually, the risk of transmission of infection by non-critical items has not been documented.<sup>3</sup>

But systemic reviews have shown that disinfection of non critical items is required to reduced transmission of infections in hospital environment.<sup>4</sup> In 1991, the Centers for Disease Control and Prevention (CDC) proposed an

additional category for non-critical items called environmental surfaces which, in turn, can be divided into equipment surfaces (X-ray apparatus, hemodialysis machine etc.) and housekeeping surfaces (furniture, floor, wall, table top etc.). The pathogens are capable of surviving on room surfaces and medical equipment for a prolonged period of time. In our hospital, lysol based floor cleaning agent is routinely used for floor cleaning. The main objective of our study is to compare alternative methods of disinfection using sodium hypochlorite (NaOCl) based floor cleaner and biological (cow's urine based) floor cleaner with traditional lysol based floor cleaner in hospital environment.

## METHODS

Three reagent were used in study:

- Lysol based floor cleaner,
- Sodium hypochlorite based floor cleaner,
- Cows urine based biological floor cleaner.

The study was conducted between August 2018 to October 2018 in our hospital. The test was conducted in two floors (floor 1 and floor 2). At first, culture of the all three floor cleaning solutions was done. During the first month all floors were cleaned with Lysol based traditional floor cleaner (floor 1 and 2).

Swab were taken from multiple place like ward floors, ward side walls, corridor walls, corridor side walls, ICU doors, toilet doors and flooring. Next month for one floor sodium hypochlorite solution and for another floor biological floor cleaner was used. (Floor 2 - sodium hypochlorite solution, floor 1- biological floor cleaner). At the end of the month swabs were taken as previously described.

Next month exchange of the two solutions between floors was done. (Floor 1 - sodium hypochlorite solution, floor 2- biological floor cleaner). Again swabs were taken at end of the month

Culture report were analysed and presented.

## Methods of preparation of reagents

### Sodium hypochlorite based solution

1.5 kilogram of common salt, with 50 litres of water with additional electrolytes and 4 units of electricity (4 kilowatt power) is used to prepare sodium hypochlorite solution. This comes to 5000 ppm in concentration. (ppm = (mass of solute ÷ mass of solution) x 1,000,000). It is diluted 100 times with water to make the concentration to 50 ppm and used for floor cleaning.<sup>5</sup>

### Cows urine based floor cleaner

Cows urine is heated to 120 degree Celsius by steam distillation method and the extract which contains carbolic acid is mixed with pine oil and mixed at 3000 rpm (rotation per minute). The reagent is stored in a bottle and mixed with water during floor cleaning. Carbolic acid content of cows urine is the reason for its disinfection properties.<sup>6</sup>

### Culturing technique

Swabs were cultured in agar plates for bacterial growth (*Staphylococcus aureus*, *Enterococci*, *Clostridium difficile*, *Escherichia coli*, *Pseudomonas*, *Klebsiella* etc) and tetanus spore growth.

## RESULTS

After initial culture of reagent samples (lysol based floor cleaner, sodium hypochlorite based floor cleaner, Cows urine based biological floor cleaner). The Lysol solution which was routinely used for floor cleaning was culture positive for *Clostridium tetani* spore, other two samples had no growth. First month swab culture following Lysol application in both floor 1 and floor 2 showed no growth in any of the swabs taken. Second month following application of sodium hypochlorite based floor cleaner in floor 2 and biological floor cleaner for floor 1. No growth was found in any of the swab taken. Third month sodium hypochlorite base floor cleaner for floor 1 and biological floor cleaner for floor 2 was used. *Clostridium tetani* spores were grown in floor 2 in corridor floor in which biological floor cleaner was used (Table 1).

**Table 1: Swab culture reports.**

	Floor 1		Floor 2	
	Reagent	Culture	Reagent	Culture
<b>1<sup>st</sup> month</b>	Lysol	No growth	Lysol	No growth
<b>2<sup>nd</sup> month</b>	Biological	No growth	Sodium hypochlorite	No growth
<b>3<sup>rd</sup> month</b>	Sodium hypochlorite	No growth	biological	<i>Clostridium tetani</i> spores grown in corridor floor

## DISCUSSION

Disinfection is the use of chemical or physical methods to reduce the number of pathogenic microorganisms on

surfaces. It is the destruction or removal of all pathogenic organisms or organism capable of giving rise to infection. Cleaning plays a preparatory role before disinfection, by removing soil and other dirt and reducing microbial

burden and making disinfection more effective. These methods need to be used in combination with cleaning as they have limited ability to penetrate organic material.

Healthcare-associated infections (HAIs) represent a substantial risk to patient safety. Several transmitter pathogens of HAIs are on surfaces and equipment more often handled by professionals and patients. Microorganisms are transferred from an infected patient to a susceptible patient commonly via the hands of healthcare personnel, contaminated hospital surfaces and medical equipment. These factors are directly or indirectly involved in the transmission pathways.

Environmental contamination has been demonstrated to play an important role in the transmission of certain hospital acquired pathogens, including vancomycin resistant *Enterococcus* species, methicillin-resistant *Staphylococcus*, and *Clostridium difficile*, *Pseudomonas aeruginosa*, *Enteric bacterias*. Bacterial spores are more difficult to kill than other micro-organisms by disinfectants.<sup>7</sup> In our study both biological cleaner and sodium hypochlorite based floor cleaner was able to kill spore of *Clostridium tetani* though one swab from floor 2 corridor in third month showed tetanus culture positive.

Sodium hypochlorite showed superior action or equivalence to most other products with broad microbicidal action, including spores, and progressive action as longer exposure time and concentration, especially those related to HAIs transmission. Even in our study it has better result as floor cleaning agent. The exact mechanism by which free chlorine destroys microorganisms has not been discovered. Inactivation by chlorine may result from a number of factors: oxidation of sulfhydryl enzymes; ring chlorination of amino acids; loss of intracellular contents; decreased uptake of nutrients; inhibition of protein synthesis; decreased oxygen uptake; oxidation of respiratory components; decreased adenosine triphosphate production; breaks in DNA; and decreased DNA synthesis.<sup>8</sup> Main advantages of sodium hypochlorite are no activation required and may enhance removal of organic material and organism. No odour or irritation issues. Does not coagulate blood or fix tissues to surfaces. Freshly prepared hypochlorite solutions, buffered to about pH 7.6, have a very rapid sporicidal activity for this reason *Clostridium tetani* spores were used to evaluate the efficacy of disinfectants.<sup>9</sup> In our study, none of the swab culture from floors treated with sodium hypochlorite showed tetanus spore growth.

Gomutra (Sanskrit: "cow urine") refers to the usage of cow urine for therapeutic purposes in traditional Indian medicine, Ayurveda. The cow urine was claimed to be serving as a bio enhancer, enhancing antimicrobial activity of antibiotic and antifungal agents. Stored cows urine is sent in filter and added to pine oil to prepare the floor cleaning solution.<sup>10</sup> The main constituent of cows urine is carbolic acid acts as a disinfectant. In our study

biological floor cleaner is effective as traditional floor cleaners though one swab from floor 2 corridor in third month showed tetanus culture positive, traditional Lysol based floor cleaner had tetanus spore grown in the reagent itself. Suggesting biological agent is non inferior to traditional floor cleaners in disinfection of hospital environment.

## CONCLUSION

Floor cleaning with alternative and latest reagents like sodium hypochlorite and cows urine based biological reagent is non-inferior in disinfection of hospital environment in comparison with traditional lysol based floor cleaner.

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