Indian Journal of Microbiology Research 2019;6(4):299–302

Content available at: iponlinejournal.com

Indian Journal of Microbiology Research

Journal homepage: www.innovativepublication.com

Original Research Article

A comparative study of disinfectants for cleaning intensive care unit surface

R Mizbah[1,*], M N Sumana[2], Vidyavathi Chittaragi[2]

[1]*Dept. of Microbiology, Kodagu Institute of Medical Sciences*
[2]*Dept. of Microbiology, JSS Academy of Higher Education and Research C, Mysore, Karnataka, India*

ARTICLE INFO

Article history:
Received 10-04-2019
Accepted 07-11-2019
Available online 21-11-2019

Keywords:
Glutaraldehyde
Isopropyl Alcohol
ICU

ABSTRACT

Introduction: Two million people per year are affected by hospital acquired infections. Treating nosocomial infections is challenging as most of the causative agents are multi drug resistant. Disinfection plays a major role in preventing these infections. In this context an attempt was made to compare the efficacy of (1%) glutaraldehyde disinfectant and (70%) isopropyl alcohol as surface disinfectants in Intensive Care Unit (ICU).

Materials and Methods: Samples were collected from bed railings, surface of monitor and side table of the all ICU's of JSS Hospital Mysore. Samples were collected before and after disinfection using appropriate disinfectants. After cleaning samples were collected after contact time of 20 minutes. Samples were inoculated on to two sets of blood agar plate and one set of MacConkey agar plate incubated at 37°C under both aerobic and anaerobic conditions. After incubation colony count was done manually to compare the results.

Results: Under aerobic conditions the glutaraldehyde was found 11% more efficient than isopropyl alcohol and when plates were incubated anaerobically glutaraldehyde was found 4% more efficient than isopropyl alcohol. This difference is not significant statistically as the p value is 0.059 which is more than critical significant value 0.05. Null hypothesis is accepted.

Conclusion: Thus, our study showed that there were no statistically significant differences between the efficacies of disinfectants. We concluded that isopropyl alcohol is a better surface disinfectant to be used in intensive care units as it is safe to use and cost effective on the other hand glutaraldehyde is toxic, carcinogenic and also it is expensive.

1. Introduction

Nosocomial infections represent a major health problem because of the excess morbidity and mortality. Two million people per year are affected by hospital acquired infections (5-10% of hospitalized patients). In the United States it is 8^{th} leading cause of death directly or indirectly causing 80,000 deaths.[1] Treating nosocomial infections is challenging as most of the causative agents are multi drug resistant.[2] Major reservoir of multi drug resistant organisms (MDRO) is environmental surface and they remain viable for days to months on various inanimate surfaces. From the environment to patients pathogens can be transferred either directly by contact between patient and contaminated environment or indirectly through hands of health care workers (HCW). There are so many reasons for hygiene failure which includes HCW understaffing, ineffectiveness of common disinfectants against bacteria on the ICU surface.[3] Therefore, we have to give more importance in preventing these infections. Preventative strategies against both development of specific infections and spread of antibiotic resistant pathogens play an important role in preventing nosocomial infections. Disinfection plays a major role in preventing these infections. Now a day's several disinfectants are available in market but still we need to search for better one which is more efficient

* *Corresponding author*.
E-mail address: mizbarizwan10@gmail.com (R. Mizbah).

https://doi.org/10.18231/j.ijmr.2019.064

and also cost effective.[2] In this context an attempt made to compare the efficacy of (1%) glutaraldehyde which is a high level disinfectant and (70%) isopropyl alcohol which is an intermediate level disinfectant as a surface disinfectants in ICU. Both are having their own advantages and disadvantages.

2. Aims and Objectives

The present study was carried out in the Department of Microbiology, JSS Hospital, Mysore for a period of 1 year from January 2017 to December 2017.

2.1. Aim

In view of increasing incidence of HAI's, with MDR nature of pathogens in our Hospital, this study was taken up to reduce HAI's by selecting efficient disinfectant which are capable of destroying pathogenic micro-organism present in surfaces of ICU's.

2.2. Objective

To compare the efficacy of glutaraldehyde (bacillocid) and isopropyl alcohol as a surface disinfectant in intensive care units.

3. Materials and Methods

This prospective cross-over study was performed in the department of Microbiology, JSS Hospital, Mysore from January 2017 to December 2017. Surface swabs from all the ICU's (both medical and surgical) constitute the source of data for this study.

Samples were collected from bed railings, surface of monitor and side table of the all ICU's (medical intensive care unit, respiratory intensive care unit, pediatric intensive care unit, neonatal intensive care unit, neurosurgery intensive care unit, transplant intensive care unit, stepdown intensive care unit, surgical stepdown intensive care unit, coronary care unit and intensive coronary care unit) of JSS Hospital Mysore, using sterile cotton swabs dipped in saline. Samples were collected before and after disinfection using appropriate disinfectants (1% glutaraldehyde and 70% isopropyl alcohol). After cleaning samples were collected from the same place after contact time of 20 minutes. Samples were first inoculated in to liquid media like peptone water. After incubating for 24 hours at 37°C the sample from the broth was inoculated on to two sets of blood agar plate and one set of MacConkey agar plate. One set of blood agar plate and MacConkey agar plates were incubated aerobically at 37°C for 48 hours. Another set of blood agar plates were incubated anaerobically at 37°C for 48 hours. Anaerobic environment was provided by using gas pak in anaerobic jar. After incubation colony count was done manually to compare the results. The plated microbes grow from a colony forming unit (cfu) consisting of one or more cells into a visible colony that was seen and counted.

4. Results

Under aerobic conditions the glutaraldehyde (bacillocid extra) was found 11% more efficient than isopropyl alcohol. This difference is not significant statistically as the p value is 0.059 which is more than critical significant value 0.05. Therefore, we cannot reject the null hypothesis. There is no significant difference in efficacy of glutaraldehyde to that of isopropyl alcohol.

Under anaerobic conditions the glutaraldehyde (bacillocid extra) was found 4% more efficient than isopropyl alcohol. This difference is not significant statistically as the p value is 0.059 which is more than critical significant value which is 0.05. Therefore the null hypothesis is accepted and the alternative hypothesis is rejected.

4.1. Statistical analysis

SPSS software version 20 was used for data analysis. Colony count was considered to know the efficacy of disinfectants. Glutaraldehyde was found 11% more effective than isopropyl alcohol when plates were incubated aerobically at 37°C and difference between the efficacies of disinfectants reduced to 4% when plates were incubated anaerobically. To know whether the difference in the efficacy of disinfectants was statistically significant or not we performed chi-square test. P value obtained is 0.059 which is more than critical significance level that is 0.05. Therefore, we cannot reject null hypothesis. This indicates there is no significant difference between the efficacies of two disinfectants compared.

5. Discussion

Disinfection plays a major role in preventing HAI's. Now a day's several disinfectants are available in market but still we need to search for better one which is more efficient and also cost effective. In the study from tuhina banerji et al[2] it was found that superoxidised water can contain hypochlorous acid which is safe to be used as a surface disinfectant in ICU. A study done by Caroline Blazejewski et al[3] used hydrogen peroxide for surface disinfection and found that it is more efficient than routine terminal cleaning alone in ICU contaminated with multi drug resistant organisms. This study was conducted in JSS Hospital Mysore including medical intensive care unit, respiratory intensive care unit, pediatric intensive care unit, neonatal intensive care unit, neurosurgery intensive care unit, transplant intensive care unit, stepdown intensive care unit, surgical stepdown intensive care unit, coronary care unit and intensive coronary care unit (MICU, RICU,

Table 1: Comparision of efficacy of glutaraldehyde (1%) to isopropyl alcohol (70%) when plates were incubated aerobically

	Number of colinies before cleaning with isopropyl alcohol	Number of colonies after cleaning with isopropyl alcohol	Number of colonies before cleaning with glutaraldehyde	Number of colinies after cleaning with glutaraldehyde
NICU	7	5	2	0
RICU	3	0	3	0
MICU	2	0	7	0
CCU	13	5	19	4
PICU	18	1	8	0
TICU	6	1	11	0
NSICU	130	33	51	4
SDICU	63	2	30	0
SSICU	2	0	2	0
ICCU	1	0	22	5

Table 2: Comparision of efficacy of glutaraldehyde to isopropyl alcohol when plates were incubated anaerobicall

	Number of colonies before cleaning with isopropyl alcohol	Number of colonies after cleaning with isopropyl alcohol	Number of colonies before cleaning with glutaraldehyde	Number of colinies after cleaning with glutaraldehyde
NICU	10	2	0	0
RICU	0	0	0	0
MICU	0	0	0	0
CCU	0	0	10	0
PICU	0	0	0	0
TICU	0	0	0	0
NSICU	3	0	0	0
SDICU	41	0	0	0
SSICU	1	0	0	0
ICCU	0	0	0	0

CCU, PICU, NICU, NsICU, SICU, ICCU, SsICU, TICU). Glutaraldehyde was found to be 11% more efficient than isopropyl alcohol and under anaerobic condition glutaraldehyde was only 4% efficient than isopropyl alcohol the difference is not significant statistically. Therefore, null hypothesis is accepted and alternative hypothesis is rejected. After disinfecting with 1% glutaraldehyde Colony count got reduced from 14 to 0 in MICU, 7 to 0 in RICU, 3 to 0 in NICU, 19 to 4 in CCU, 10 to 0 in ICCU, 21 to 0 in NsICU, 31 to 0 in SICU, 11 to 0 in TICU under aerobic condition. But when plates are incubated under anaerobic condition growth was seen only in swabs collected from CCU which got reduced from 1 to 0. After disinfecting with 70% isopropyl alcohol colony count got reduced from 7 to 5 in MICU, 2 to 0 in RICU, 3 to 0 in NICU, 13 to 5 in CCU, 11 to 1 in PICU, 6 to 1 in TICU, 50 to 33 in NsICU, 13 to 2 in SICU, 5 to 0 in SsICU, 1 to 0 in ICCU when plates are incubated aerobically. But when plates are incubated anaerobically colony count in MICU got reduced from 10 to 2, NsICU 3 to 0, SICU 1 to 0, and SsICU 1 to 0. A study done by Thereza Christina Vessoni Penna et al[4] concluded that glutaraldehyde exhibit high bactericidal, fungicidal and viricidal activity and can be used as high level disinfectant but it demands safe work environment and a training programme to assure workers safety and standards. On the other hand isopropyl alcohol is not sporicidal but it is effective in inhibiting germination of spores. But a study done by Maria reggiani et al[1] concluded that the difference in efficacy of glutaraldehyde and isopropyl alcohol was not significant statistically in killing *Streptococcus mutan*s, *Staphylococcus aureus* and *Candida albicans*. As Isopropyl alcohol is cheaper, easily available and there are no side effects unlike glutaraldehyde it is considered better to use as surface disinfectant in ICU.

6. Conclusion

Thus our study showed that there were no statistically significant differences between the efficacies of disinfectants. We concluded that isopropyl alcohol is a better surface disinfectant to be used in intensive care units as it is safe to use and cost effective on the other hand glutaraldehyde is toxic, carcinogenic and also it is expensive.

7. Source of funding

None.

8. Conflict of interest

None.

References

1. Hilburn J, Brian SC, Fendler HEJ, Groziak AP, Houston MSB, et al.. "Use of alcohol hand sanitizer as an infection control strategy in an acute care facility" the Assoc Professionals Infect Control Epidemiol, Inc. ; 2003,.
2. Banerji S, Anupurba S. Microbiological activity of superoxidised water for disinfection in ICU environment. *Indian J Prev Soc Med*. 2011;42(4).
3. Blazejewski C, Wallet F, Rouz A, Guern RL, Ponthieux S, et al. Efficiency of hydrogen peroxide in improving disinfection of ICU rooms. vol. 19 ; 2015,. p. 30.
4. Penna TCV, Mazzola PG, Martins AMS. The efficacy of chemical agents in cleaning and disinfection programs. *BMC Infectious Diseases*. 2001;Available from: 10.1186/1471-2334-1-16.

Author biography

R Mizbah Tutor

M N Sumana Professor

Vidyavathi Chittaragi Assistant Professor

Cite this article: Mizbah R, Sumana MN, Chittaragi V. A comparative study of disinfectants for cleaning intensive care unit surface. *Indian J Microbiol Res* 2019;6(4):299-302.