

## A Comparative Study on the Efficacy of TOTASEP Disinfectant in a Newly Built Operation Theatre Versus to an Already Existing Well-Functioning Operation Theatre: A Prospective Cross Sectional Analytical Study

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### Abstract:

**Introduction:** Disinfection and infection control protocol implementation is a continuous process in healthcare setups. Strict and stringent disinfectant protocol must be followed in high risk areas like ICU and in OT theaters. Hospital set ups can face many hurdles in implementing the protocol and maintaining its quality throughout the healthcare setups. In our study we throw light upon differences and difficulties faced while fumigating, an already existing OT theater compared to the newly built OT theater, along with the disinfectant potency.

### Materials and Methods:

**Study design:** Analytical study

**Study place:** ACS medical college and hospital and Sri Lalithambigai Medical College and Hospital, Chennai

**Period of Study:** January 2022 to December 2022

As per the Hospital infection guidelines and disinfectant policy designed based on our hospital setup, the protocol was followed. Pre fogging OT theater environment samples, post fogging environment samples, and post deep cleaning environment samples were analyzed

**Results:** the results were interpreted and comparative analysis was done by using SPSS software 2023 version. The results showed that disinfectants used in an established OT set up showed more sensitivity than the newly built OT. The disinfectant analysed was TOTASEP. There was not much difference with the specificity between the two OT setups. There was a need for usage of additional disinfectant in case of newly built OT theater due to the micro debris and dust deposits from the construction works.

**Conclusion:** We came to know that Totasep was more efficient in a well-established OT set up compared to the newly built. The major factor included were as newly built theater cleaning must be done frequently due to the deposition of the debris, cement dust, AC vent deposits. The other factor that we noticed was insect's infestations and pest control must be followed more vigorously. Frequent visitors for plumbing works, leaks, bolt or screw tightening will happen in a newly built setup. After each and every visit required through cleaning of the setup. Totasep alone cannot be used as a single disinfectant, additional disinfectant must also be used in a newly built hospital OT, to avoid the above mentioned factors and frequent exposure of the same disinfectants may also lead to resistant in the insects and pest which was in the area.

**Keywords:** Totasep, Disinfection, Operation Theater, Newly built OT.

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### Introduction

Disinfection and infection control protocol implementation is a continuous process in healthcare setups. Strict and stringent disinfectant protocol must be followed in high risk areas like ICU and in

OT theaters. There can be many hurdles in implementing it and maintaining its quality throughout the healthcare setups. The hospital acquired infections are to be concerned about, when

it comes to Disinfecting. [1] Its not only going to affect the patients but also the healthcare workers appointed in that area. As far as Operation theaters are concerned, disinfecting the environment is a main key factor in preventing and spreading of the infective pathogen. The disinfection protocol for Operation Theater may vary from place to place. As health care workers, we noticed implementing the disinfection policy was different for a newly built hospital compared to the already established hospital. [2,3]

The disinfecting chemicals were also analyzed. In an existing operating theater, the fumigation process must be carefully planned to minimize disruption to the facility's workflow. This may include scheduling the fumigation during periods of low activity and ensuring that all equipment and surfaces in the operating theater are properly protected from the disinfectant used. Additionally, any existing pests or infestations must be identified and treated prior to fumigation.

In a newly built operating theater, the fumigation process can be incorporated into the construction process, allowing for greater control over the environment. [4,11] This may include incorporating pest-proofing measures into the design of the operating theater and ensuring that the building materials used are resistant to pests. Additionally, a fumigation process can be done before any equipment or people enter the building to prevent any pests from entering. In both cases, the fumigation process must be carried out by trained professionals and in accordance with all safety guidelines provided by the manufacturer.[5]

In our study we throw light upon differences and difficulties faced while fumigating, an already existing OT theater compared to the newly built OT theater, along with the disinfectant potency. As, fumigation of theaters with formaldehyde have not been accepted due to its adverse effects, hence alternative substances were analyzed.

#### Materials and Methods:

**Study design:** Analytical study

**Study place:** ACS Medical College and Hospital (ACSMCH) and Sri Lalithambigai Medical College and Hospital, Chennai(SLMCH)

**Period of Study:** January 2022 to December 2022

**Sample size:** convenient sampling method.

**Inclusive criteria:** Operation theaters – inclusive of Minor OT, Major OT, Surgical OT, Ophthalmology OT,OBG OT

**Exclusive Criteria:** samples collected from wards and other areas of the hospital.

As per the Hospital infection guidelines and disinfectant policy designed based on our hospital

setup, the protocol was followed. The concentration and the quantity of the TOTASEP used was increased for fogging procedure compared to the concentration used for surface disinfectant and deep cleaning as per the manufacture instructions.

**Pre fogging:** Deep cleaning and surface cleaning of the operation theaters were done with the chemical disinfectant available.5%sheep blood agar was used to take the settle plate method sample. The plate was labeled with OT name, date and site of the sample collected. Blood agar was exposed to OT environment for 1 hour at 1 meter above the floor and 1 meter away from the wall before disinfection by fogging. The sample was sent to Microbiology lab for processing and analyzing the colony count [6]

**Post fogging:** After 6 -8 hours of post fogging, the theater was opened and air samples are taken, 6 blood agar plates – 2 for right corner, 2 for left corner and 2 for the center is used per theatre. The plates are exposed for 1 hour at 1 meter above the floor and 1 meter away from the wall. The plates are labeled and sent to microbiology lab and incubated at 37deg Celsius for up to 48 hrs. plates are examined after 24 hours of incubation and 48 hours of incubation. The number of colony forming units/plate is counted and colony counts derived. Presumptive bacterial identification is done by grams staining and specific bacteria are identified using biochemical tests.

**Fogging procedure:** Composition of Totasep includes 3% polyhexamethylene biguanide, hydrochloride and 10% didecyl dimethyl ammonium chloride. 10ml of Totasep disinfectant solution is added in 990ml of water and added to the fogger and left inside the operation theatre after switching on the theatre is sealed for 6- 8 hrs before taking air samples.[6,7]

**Deep cleaning:** Deep cleaning was done with Microgen D- 125, a third generation twin chain quaternary ammonium compound. The post cleaning settle plate method results was also studied.

**Results:** The results were interpreted and comparative analysis was done by using SPSS software 2023 version. The results exposed that disinfectants used in an established OT set up showed more sensitivity than the newly built OT. The disinfectant analysed was TOTASEP. There was not much difference with the specificity between the two OT setups. There was a need for usage of additional disinfectant in case of newly built OT due to the micro debris and dust deposits from the construction works. The Major five OT theaters culture results were compared, and the 2x2 table was formed and the positive predictive value results were analyzed.

**Table 1: The Positive Predictive Value Results of Pre Fumigation and Post Fumigation Settle Plate Methods from – A.C.S and SLMCH Ophthalmology OT**

Disinfectant used: Totasep

ACS

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	55	183	238
No growth	0	0	0
Total	55	183	238

Sensitivity = 100%, Specificity = 0% Positive Predictive Value = 23.11%

SLMCH

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	17	220	237
No growth	0	0	0
Total	17	220	237

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 7.17%

**Table 2: The Positive Predictive Value Results of Pre Fumigation and Post Fumigation Settle Plate Methods from – A.C.S and SLMCH OBG OT**

SLMCH

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	9	160	169
No growth	0	0	0
Total	9	160	169

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 5.33%

ACS

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	34	109	143
No growth	0	0	0
Total	34	109	143

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 23.78%

**Table 3: The Positive Predictive Value Results of Pre Fumigation and Post Fumigation Settle Plate Methods from – A.C.S and SLMCH Orthopaedics OT**

SLMCH

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	17	182	199
No growth	0	0	0
Total	17	182	199

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 8.54%

ACS

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	31	105	136
No growth	0	0	0
Total	31	105	136

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 22.79%

**Table 4: The Positive Predictive Value Results of Pre Fumigation and Post Fumigation Settle Plate Methods from – A.C.S and SLMCH General OT Culture General OT**

**SLMCH**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	7	194	201
No growth	0	0	0
Total	7	194	201

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 3.48%

**ACS**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	55	174	229
No growth	0	0	0
Total	55	174	229

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 24.02%

**Table – 5: The Positive Predictive Value Results Of Pre Fumigation And Post Fumigation Settle Plate Methods From – A.C.S And SLMCH ENT OT.**

**SLMCH**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	10	210	220
No growth	0	0	0
Total	10	210	220

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 4.55%

**ACS**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	96	227	323
No growth	0	0	0
Total	96	227	323

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 29.72%

**Deep Cleaning Analysis in SLMCH OT Theater: Disinfectant used - MICROGEN (D-125)**

**Table 6: The Ophthalmology OT Positive Predictive Value Of Settle Plate Method Results of SLMCH - Pre and Post Deep Cleaning**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	30	200	230
No growth	0	0	0
Total	30	200	230

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 13.04%

**Table 7: The OBG OT Positive Predictive Value Of Settle Plate Methods Results of SLMCH - Pre and Post Deep Cleaning With Microgen**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	28	148	176
No growth	0	0	0
Total	28	148	176

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 15.9%

**Table 8: The Orthopaedic OT Positive Predictive Value Of Settle Plate Method Results of SLMCH - Pre and Post Deep Cleaning**

Pre Fumigation	Post Fumigation		Total
	Growth	No Growth	
Growth	36	188	224
No growth	0	0	0
Total	36	188	224

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 16.07%

**Table 9: The ENT OT Positive Predictive Value Of Settle Plate Method Results of SLMCH - Pre and Post Deep Cleaning**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	32	205	237
No growth	0	0	0
Total	32	205	237

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 13.5%

**Table 10: The General OT Positive Predictive Value of Settle Plate Method Results of SLMCH - Pre and Post Deep Cleaning**

Pre fumigation	Post fumigation		Total
	Growth	No growth	
Growth	29	208	237
No growth	0	0	0
Total	29	208	237

Sensitivity = 100%, Specificity = 0%, Positive Predictive Value = 12.24%

As per the hospital disinfectant policy, any fungal growth detected in the cultures, repeat fogging and deep cleaning was advised.

As per the in house disinfectant policy, OT settle plates showing more than 20 colonies per plate was reported as unsatisfactory and again deep cleaning and fogging was done. Repeat sample was taken after fogging

### Discussion and Conclusion

The sterility check of the Operation theater is a ongoing and continuous process. It plays an important role in every hospital set ups. To maintain the proper clean environment of the operation theater chemical disinfectants usage and standardization of the hospital infection control policy of Operation Theater must be followed deliberately.

As in our study, we analyzed the effect of the chemical disinfectant used in OT of a well-established hospital which has been functioning for more than a decade with the newly built hospital OT. [10] As totasep chemical disinfectant is used in the OT, After doing a pilot study, we started comparing the results of two hospital OT settle plate methods post deep cleaning and fumigation. In our study 5 common frequently used OT rooms were selected. After analyzing the results we came to know that

Totasep was more efficient with increase concentration and quantity in a well-established OT set up compared to the newly built.

The major factor included were as newly built theater cleaning must be done frequently due to the deposition of the debris, cement dust, AC vent deposits. [12] The other factor that we noticed was insect's infestations and pest control must be followed more vigorously. Frequent visitors for plumbing works, leaks, bolt or screw tightening will happen in a newly built setup. After Each and every visit, through cleaning must be done. To conclude Totasep was effective in an already existing set up than the newly built set up.

Totasep alone cannot be used as a single disinfectant, additional disinfectant must also be used in a newly built hospital OT, to avoid the above mentioned factors and frequent exposure of the same disinfectants may also lead to resistant in the insects and pest which was in the area.

**Limitations:** Anaerobic culture results were not analysed in this study. As different methods were followed by the two hospitals mentioned in this study for anaerobic identification, anaerobic results were not included for results analysis. Anaerobic culture was done after any construction work or any maintenance work done inside the OT theater of the newly built hospital. Hence the comparative analysis percentage value was not appropriate. [15,16]

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