

## Research Article

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## Antimicrobial Activity of Newer Disinfectant on Multidrug Resistance Organisms in St. Lucia

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### ABSTRACT

This study was done to observe the effect of disinfectant for their antibacterial activities against multi-drug-resistant (MDR) organisms like *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa* & *Klebsiella pneumonia* at St. Lucia. Procedures for infection control in hospital environments have not been successful in preventing the rise in infections by MDR pathogens. Pathogens are steadily developing resistance to chemical disinfectants and has been reported worldwide. So prevention of multidrug-resistant health care associated infections (HAI) has become a priority issue and great challenge to clinicians. This requires appropriate sterilization and disinfection procedures and strict adherence to protocol in infection control policy. There is a need to evaluate the efficacy of newer disinfectants which have come into the market for better control of health care associated infections (HAI) [1-4]. The Chemico - a combination of 60% Ethanol with Crude Coconut oil (dodecanoic acid) disinfectant and their activities were measured by estimating zones of inhibition as produced by antibiotic sensitivity method on Mueller-Hinton agar. The results of this research support for the use of Chemico disinfectant to prevent infectious diseases against Multi drug resistance pathogens in the hospital and research lab facilities. However further analysis is required to find out efficacy of disinfectant against enterococcus by increasing concentration.

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### Introduction

Antimicrobial resistance is a worldwide public health emergency that requires urgent attention. Most of the effort to prevent this coming catastrophe is occurring in high income countries and we do not know the extent of the problem in low and middle-income countries, largely because of low laboratory capacity coupled with lack of effective surveillance systems. Multi-drug resistant infections have been reported to account for mortality of at least 23,000 people in the United states annually while the magnitude of the problem in low and middle-income countries (LMIC) is projected to be three times higher [5-7].

Current procedures for infection control in hospital environments have not been successful in curbing the rise in infections by multi-drug-resistant (MDR) pathogens. Emergence of resistance to chemical disinfectants is increasing steadily and has been reported

worldwide. This occurs due to increasing use of disinfectants and lack of targeted approach for maintenance of a clean environment.

So, prevention of multidrug-resistant health care associated infections (HAI) has become a priority issue and great challenge to clinicians. This requires appropriate sterilization and disinfection procedures and strict adherence to protocol in infection control policy. There is a need to evaluate the efficacy of newer disinfectants which have come into the market for better control of HAI [8].

This study was done to observe the effect of Chemico- a combination of 60% Ethanol with Crude Coconut oil (dodecanoic acid) disinfectant for their antibacterial activities against multi-drug-resistant (MDR) organisms on *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa* & *Klebsiella pneumonia* due to highly Drug Resistance mechanisms were reported by Genetically, formation of biofilm, extended-spectrum  $\beta$ -lactamase (ESBL) production, Horizontal transfer of antibiotic resistance genes and other reasons has been considered for the dissemination of multidrug resistance among bacteria [9-16].

## Materials & Methods

ORGANISM	ANTIBIOTICS USED	ORGANISM & DISINFECTANT
Pseudomonas	Streptomycin (10), Vancomycin (30), Tetracycline (30), Penicillin (10), Disinfectant (dr. Shiva's lab), Bacitracin (10)	St. Jude's Hospital, Saint Lucia
Staphylococcus aureus	Tetracycline (30), Streptomycin (10), Vancomycin (30), Penicillin (10), Disinfectant, Bacitracin (10), Amoxicillin (30), TMP-SMX	St. Jude's Hospital, Saint Lucia
Klebsiella	Trimethoprim/sulfamethoxazole, Tetracycline (30), Vancomycin (30), Amoxicillin (30), Streptomycin (10), Disinfectant	St. Jude's Hospital, Saint Lucia Chemico – Chemico Industry, SLU
Enterococcus	Trimethoprim/sulfamethoxazole, Bacitracin (10), Vancomycin (30), Amoxicillin (30), Streptomycin (10), Disinfectant	St. Jude's Hospital, Saint Lucia

Four microbial species were employed as test organisms which include *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Enterococcus* and *Klebsiella* which is obtained from St. Jude's Hospital, Saint Lucia. The bacteria were grown in Mueller-Hinton Agar (MH). Inoculate were prepared by adding an overnight culture of the organism in MH broth to obtain an OD600 0.1. The cells were incubated to grow until they obtain the McFarland standard 0.5 (approximately 105-108 CFU/ml).

## Antibiotics & Culture

All antibiotics, Culture media and chemicals were obtained from Carolina Biological Ltd. (USA).

## Microscopical Identification of the Isolated Bacteria

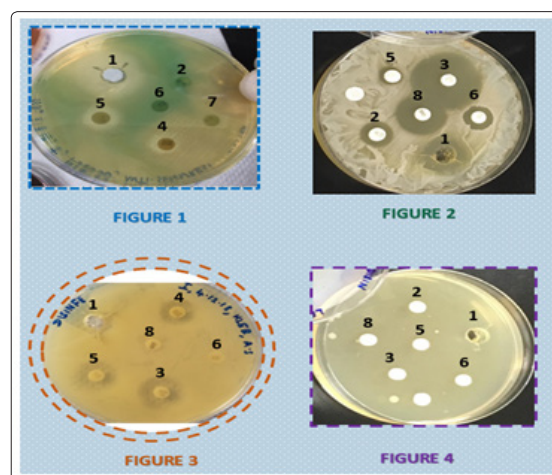
Microbial Isolate were stained by Gram stain. Microbes Identified by the presence of: Color, Shape and their arrangement.

## Antibacterial Assay

Antibacterial activity of the Newer Disinfectant and antibiotics were tested using the agar diffusion Kirby bauer method on Muller Hinton agar with negative control. The plates were incubated at 37°C for 24 hours and the zones of inhibition measured.

## Results

The combination of Disinfectant, antibiotics and bacterial samples was assessed by Disc diffusion method in department of microbiology using Muller Hinton agar media to see the antibacterial activity. The results obtained are presented in Table 1 for qualitative analysis of Anti-bacterial activity. Given is antibacterial activity in Figure 1,2,3,4 illustrates a representative plate showing the antibacterial activity of Newer Disinfectant that produced zones of inhibition against *staphylococcus aureus* and *Pseudomonas* and no inhibitory zone for *Enterococcus* and *Klebsiella*.



**Table 1**

ORGANISMS	1 DISINFECTANT	2 BACI-TRACIN	3 AMOXACILLIN (+CLAVULANIC ACID)	4 TETRA- CYCLIN	5 STREPTO- MYCIN	6 VANCO- MYCIN	7 PENI-CILLIN	8 TMP-SMX
PSEUDOMONAS (FIG;1)	SENSITIVE	RESISTANT	—	RESISTANT	RESISTANT	RESISTANT	RESISTANT	—
STAPHYLOCOCCUS AUREUS (FIG;2)	SENSITIVE	RESISTANT	SENSITIVE	-----	RESISTANT	RESISTANT	-----	SENSITIVE
KLEBSIELLA (FIG;3)	INTERMEDIATE RESISTANCE	—	INTERMEDIATE RESISTANCE	RESISTANT	RESISTANT	RESISTANT	—	RESISTANT
ENTEROCOCCUS (FIG;4)	RESISTANT	RESISTANT	RESISTANT	—	RESISTANT	RESISTANT	—	RESISTANT

## Discussion & Conclusion

Chemico- a combination of 60% Ethanol with Crude Coconut oil (dodecanoic acid) is the most effective disinfectant in our study. The agent can be considered as high level disinfectant for some of the pathogens like *Pseudomonas* and *staphylococcus*. So can

be used specifically for routine hospital uses including instrument disinfection, floor cleaning and waste disposal. And further studies required to find out efficacy against *enterococcus* and *klebsiella* by increasing high concentration. Finally, Hospital environmental services, health care and surgical rooms must stay up to date on

the most recent literature study about new disinfectant in the field to help ensure the safety of all educators, physicians, patients, visitors, staff and students to prevent infection

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