AFRICAN JOURNAL OF CLINICAL AND EXPERIMENTAL MICROBIOLOGY JAN 2004 ISSN 1595-689X VOL.5 NO.1
AJCEM/2002111/2412


# ANTI BACTERIAL ACTIVITY OF SOME SELECTED DISINFECTANTS REGULARLY USED IN HOSPITALS.

[1]Olowe, O. A., [2]Olayemi, A. B., [2]Eniola, K. I. T., [1]Adeyeba, O. A.

[1]Department of Medical Microbiology and Parasitology, College of Health Sciences, LAUTECH, Osogbo

[2]Department of Biological Sciences, University of Ilorin, Ilorin

Correspondence to: A. O. Olowe

**The antibacterial activities of three commercial disinfectants: Dettol, Robert and Savlon against *Staphylococcus aureus, Pseudomonas aeruginosa, Escherichia coli, Salmonella typhi, Klebsiella spp.* and *Bacillus spp.* were investigated. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were determined using the well technique of media diffusion method. The highest MIC of 1:10 against *Pseudomonas aeruginosa* by Roberts and the lowest MIC of 1:60 by Savlon against *Staphylococcus aureus* were observed. The highest minimum bactericidal concentration (MBC) of 1:10 against *Escherichia coli* and *Pseudomonas aeruginosa* was by Robert. All test organisms were susceptible to various dilution of Savlon used.**

## INTRODUCTION

Since microorganisms were identified as agents of infection, various methods have been described to either eliminate them totally or just restrict the number of viable cells. Some workers (1) observed that environmental surfaces are epidemiological important reservoir of nosocomial bacterial species. Disinfection is defined as the selective elimination of certain undesirable organisms in order to prevent their transmission (2). This is achieved by the use of chemical substance called disinfectants. Disinfectants are used in hospitals as pre-operative and surgical scrubs, general disinfection of surfaces and for disinfecting cleaning equipment.

It is well established that concentration have a great influence on the effectiveness of disinfectant i.e. a bactericidal disinfectant may become bacteriostatic at a lower concentration. The in-use topping of old dilutions and use of disinfectant concentration lower than recommended concentration

have been identified as dangerous practices (3). Usually disinfectants are referred to as bactericidal or bacteriostatic without defining the concentration, the identity state of the organism and condition under which the two come in contact (4). The mode of actions of disinfectants is thought to be linked to destruction of proteins, lipids or nucleic acids in the cells or its cytoplasmic membrane, although microorganisms differ in their sensitivity to chemical germicides (5). Some researchers (6) have reported the survival in and contamination of working dilutions of some disinfectants in hospital by some microorganisms. This study therefore investigates the antibacterial activity of some commonly used disinfectant against some pathogenic bacteria commonly encountered in the environment. The nature of antibacterial activity, minimum inhibitory concentration and minimum bactericidal concentration were examined.

## MATERIALS AND METHOD

Six bacterial species: *Staphylococcus aureus, Bacillus spp, Klebsiella spp, Pseudomonas aeruginosa, Salmonella typhi* and *Escherichia coli* obtained from the medical microbiology and parasitology laboratory of the University of Ilorin Teaching Hospital were used as test organisms. Varying concentrations of the disinfectant were prepared by dilution (7). The media diffusion method was employed in the determination of the minimum inhibitory concentration (MIC) of the disinfectants while the media dilution method was employed in the determination of the minimum bactericidal concentration (MBC) (8).

## RESULTS

The minimum inhibitory concentrations (MIC) of the test disinfectants are shown in Table 1. The organisms showed varying sensitivity to the disinfectants. The lowest bacteriostatic concentration was 1:20 dilution of Robert against *Klebsiella spp.* while the highest was 1:60 dilution of Savlon against *Staphylococcus aureus.* Table 2 shows the minimum bactericidal concentration (MBC) of disinfectants. The highest bactericidal concentration was 1:20 dilution of Dettol against *Bacillus spp.* while the

lowest was 1:10 dilution of Robert against *Pseudomonas spp.* and *E. coli.* Savlon appeared to be the most potent against the organisms.

*Pseudomonas spp.* and *Klebsiella spp.* appeared to be the most resistant of the organisms while *Staphylococcus aureus* appeared to be most sensitive.

**Table 1: The minimum Inhibitory Concentration of Disinfectants**

| Test Organism | Dettol | Robert | Savlon |
|---|---|---|---|
| *Klebsiella spp.* | 1:40 | 1:20 | 1:80 |
| *Pseudomonas spp* | 1:40 | 1:40 | 1:80 |
| *Escherichia coli* | 1:60 | 1:40 | 1:80 |
| *Bacillus spp* | 1:60 | 1:60 | 1:100 |
| *Salmonella typhi* | 1:60 | 1:60 | 1:100 |
| *Staphylococcus aureus* | 1:60 | 1:60 | 1:160 |

**Table 2: The minimum Bactericidal Concentration of the Disinfectants**

| Test Organism | Dettol | Robert | Savlon |
|---|---|---|---|
| *Klebsiella spp.* | 1:20 | 1:20 | 1:180 |
| *Pseudomonas spp* | 1:20 | 1:10 | 1:180 |
| *Escherichia coli* | 1:40 | 1:10 | 1:180 |
| *Bacillus spp* | 1:120 | 1:180 | 1:180 |
| *Salmonella typhi* | 1:180 | 1:180 | 1:180 |
| *Staphylococcus aureus** | 1:60 | 1:100 | 1:180 |

Key. * = Susceptible to all Concentration used .

## DISCUSSION

Result obtained confirmed the submission that concentration affects the activity of disinfectants. The different active component could have contributed to the difference in activity of the disinfectants. The disinfectants appear to have broad spectrum of activity, showing activity against Gram-positive and Gram-negative bacteria. It has been recommended that disinfectants for general use should be able to kill a wide range of common or potential pathogens (9). The media component could also have affected the outcome of the activity testing; the presence of organic matter has long been identified as a factor that affects the action of disinfectants.

*Pseudomonas spp.* has been consistently reported as a problematic organism, in showing resistance not only to antibiotic but also to disinfectants (6, 9, 10) although the resistance factor has not been elucidated in the case of resistance to disinfectants. On the other hand, the emergence of *Klebsiella spp.* showing resistance to the disinfectant is of interest as it has not been previously shown to survive in and contaminate disinfectants (6).

*Klebsiella spp., Pseudomonas aeruginosa* and *Escherichia coli* were pointed out as organisms that have been well documented as agents of nosocomial infection and suggests interruption of transmission or cross contamination, and appropriate disinfection as part of measures of controlling nosocomial infections. That the tested disinfectant showed activities against these organisms is thus cheering information. In view of the importance of disinfection in clinical practice and domestic hygiene, and the danger of development of resistance by the organisms exposed to the disinfectant, it will be in the overall interest of all to ensure that only fresh preparations of disinfectants are used routinely and dilution should be restricted to the concentration ranges that have been found to have definite activity against the organisms.

## REFERENCES


1. Olayemi AB, Eniola KIT. Nosocomial bacterial contamination of environmental surfaces at the University Teaching Hospital, Ilorin, Nigeria. *Afr. J. Clin. Exper. Microbiol.* 2000; **1(1)**: 47-50.

2. Reber H. Disinfection proposal for definition (Second International Colloquim about the evaluation of disinfectants in Europe). *Zebtra Blatt Bacteriol.*1973; **157**: 7

3. Onaolapo JA. Contamination of hospital disinfectants and antiseptics. *Pharmacy World J.* 1990; **74**: 118-119.

4. Duerden BI, Reid TMS, Jewdury JM, Turk DC. Principles of infection control, sterilization and disinfection. A new short textbook of microbial parasitic infection. 1987: 340-346.

5. Balows A, Hausler WJ Jr, Hermann KH, Shadomy HJ. Sterilization, disinfection and antiseptics. Manual of Microbiology. 1991: 185-195.

6. Olayemi AB, Obayan Y. Contaminated disinfectants in health clinics in Ilorin, Nigeria. *Infect. Control Hosp. Epidemiol.* 1994; **15(19)**: 581-582.

7. Cappucino JG, Sherman N. Laboratory Manual of Microbiology, 4th edition, The Benjamin/Cummings Publishing Co. Inc.

8. Stokes KJ, Bassett DCJ, Thomas WRG. Contamination of disinfectant solution. *Lancet.* 1970; **2**: 57.

9. Singleton P. Bacterial in Biology, Biotechnology and Medicine, 4th edition. John Wiley and sons, Ltd. 1999.

10. McCracken AW, Cawson RA. Clinical and Oral Microbiology. McGraw-Hill. Washington 1983; 396-397.