Efficiency of Some Disinfectants on Bacterial Wound Pathogens

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Abstract: Disinfectant are chemical agent used on inanimate object but can also be employed as antiseptic at a very low concentration. It is therefore imperative to determine the efficiency of some commonly used disinfectants on the frequently encountered bacterial wound pathogens. The antibacterial effects of these chemical agents were carried out using standard microbiological techniques. Results showed that the investigated disinfectants at 50% and 100% concentration cause 100% bacterial cell reduction. The Minimum inhibitory concentration of the investigated disinfectant ranged from 0.78 – 6.25% while the MBC ranged from 3.13 – 12.5%. The MBC to MIC ratio also ranged from 1 – 4, asserting the bactericidal power of the tested disinfectants. It can therefore be concluded that professionals involved in the care of wounds should consider the use of these agents for washing the surfaces of infected wounds in order to minimize the possible spread of multi-drug resistant bacterial pathogens from wound to other sources.

[Benjamin Thoha Thomas, Adebare Johnson Adeleke, Remi Ramota, Raheem-Ademola, Rachael Kolawole, Oluwaseunfunmi Sikirat Musa. **Efficiency of some Disinfectants on Bacterial Wound Pathogens.** Life Sci J 2012;9(2):752-755] (ISSN:1097-8135). http://www.lifesciencesite.com. 111

KEYWORDS: Disinfectants, bacteria, wound, pathogens

1. Introduction

Wound infection has been defined as the presence of pus in a lesion, as well as other general or local features of sepsis including pyrexia, pain and indurations (Shija, 1973). Wound may be encountered in clinical practice either post operatively, following trauma, in association with haemoglobinopathy or could primarily be of infective origin (Sule *et al*., 2002). All wounds, regardless of their origin may be contaminated by microorganisms or foreign bodies or both and all are likely to contain a significant amount of devitalized or necrotic tissue (Bell Chan *et al*., 1999). Wound infections represent an important cause of mobidity and account for 70 – 80% mortality (Wilson *et al*; 2004). The development of such infections represent delayed healing causing anxiety and discomfort for patient, longer stays in hospitals and add to cost of health care services significantly (Mohantay *et al*, 2004). If infection is deep seated or becomes generalized, appropriate systemic treatment must be administered (Murtlay *et al*., 1998). However, the management of infected wound is a challenge (Sule *et al*., 2002 but it is important that, the entry site be cleansed daily and treated with appropriate antiseptic (Kiernan, 1998). The present study was therefore designed to determine the efficiency of some commonly used disinfectants on the frequently encountered bacterial wound pathogens.

2. Materials and Methods

2.1 Disinfectants

Three commonly used disinfectants were selected for this study and they included; Methylated spirit, Dettol and Lysol. The table below presents the common names, scientific name and the commercial concentration of the selected disinfectants.

2.2 Test Organisms

Staphylococcus aureus, Enterococous faecalis, Pseudomonas aeruginosa, Escherichia coli, Klebsiella species, staphylococcus epidermidis and Proteus mirabilis were obtained from the Department of Medical Microbiology of the Olabisi Onabanjo University Teaching Hospital, Ogun State, Nigeria. Isolates were from clinical wound samples. The isolates identities were further confirmed in our laboratory using standard biochemical procedures (Barrow and Feltham, 1993). The isolates were maintained on Trytone soy agar (TSA) (Oxoid) at 4^{O}C before use for this work (Efuntoye *et al*., 2010).

Table 1. Types and Commercial Concentration of Disinfectants used in the study

Disinfectants	Scientific Name	Commercial Concentration (Percentage (%))
Dettol	Chloroxylenol	4.8 w/v oleum pini
Methylated Spirit	Idoptrophy Alcohol	95% Alcohol (v/v)
Lysol	Saponated cresol	5% cresol

2.3 Antibacterial Activity of the Disinfectants

The antibacterial activity of the selected disinfectant on the frequently encountered bacterial wound pathogens was evaluated using time kill test as describes by Ogunledun (2008). The minimum inhibitory concentration and the Minimum bactericidal concentration were carried out as described by NCCLS (2002). The minimum bactericidal concentration was defined as the lowest concentration of the disinfectants that produced negative subcultures. The MBC to MIC ratio was also determined and interpreted as described by Hazen (1998).

3. RESULTS

The results of the effect of the disinfectants on the frequently encountered bacterial wound pathogens as summarized in table 2 and 3 showed that the disinfectants were very effective at both 50% and 100% concentrations. These agents causes 100% reduction in the bacterial growth examined. Results of the minimum inhibitory concentration of the tested disinfectants showed that the disinfectants demonstrated inhibitory activities against the test organisms to varying degrees. The minimum bactericidal concentrations of all the disinfectants ranged from 3.13 – 12.5%. The minimum bactericidal concentration to the minimum inhibitory concentration (MBC/MIC ratio) were found to be between 1- 4%.

Table 2: Effect of Some Disinfectants on bacterial wound pathogens at 100% concentration

Organisms	Dettol				Lysol				Methylated Spirit			
	Bactericidal growth (%)											
	30S	60S	90S	120S	30S	60S	90S	120S	30S	60S	90S	120S
SA	O	O	O	O	O	O	O	O	O	O	O	O
EF	O	O	O	O	O	O	O	O	O	O	O	O
PA	O	O	O	O	O	O	O	O	O	O	O	O
EC	O	O	O	O	O	O	O	O	O	O	O	O
KS	O	O	O	O	O	O	O	O	O	O	O	O
SE	O	O	O	O	O	O	O	O	O	O	O	O
PM	O	O	O	O	O	O	O	O	O	O	O	O

Table 3: Effect of some disinfectants on bacterial wound pathogens at 50% concentration

Organisms	Dettol				Lysol				Methylated Spirit			
	Bactericidal growth (%)											
	30S	60S	90S	120S	30	60	90	120	30	60	90	120
SA	O	O	O	O	O	O	O	O	O	O	O	O
EF	O	O	O	O	O	O	O	O	O	O	O	O
PA	O	O	O	O	O	O	O	O	O	O	O	O
EC	O	O	O	O	O	O	O	O	O	O	O	O
KS	O	O	O	O	O	O	O	O	O	O	O	O
SE	O	O	O	O	O	O	O	O	O	O	O	O
PM	O	O	O	O	O	O	O	O	O	O	O	O

Table 4: Minimum Inhibitory Concentrations of the selected Disinfectants on Bacterial Wound Pathogens

Organisms	Disinfectants (%)		
	Dettol	Lysol	Methylated Spirit
SA	3.13	6.25	6.25
EF	3.13	6.25	6.25
PA	3.13	3.13	6.25
EC	1.56	3.13	3.13
KS	1.56	3.13	3.13
SE	3.13	6.25	3.13
PM	0.78	1.56	1.56

Table 5: Minimum Bactericidal Concentrations of Some Selected Disinfectants on Bacterial Wound Pathogens

	Disinfectants (%)		
Organisms	Dettol	Lysol	Methylated Spirit
SA	6.25	12.5	12.5
EF	6.25	12.5	12.5
PA	6.25	6.25	12.5
EC	3.13	6.25	12.5
KS	3.13	6.25	12.5
SE	3.13	12.5	12.5
PM	3.13	6.25	6.25

Table 6: Minimum bactericidal concentration and Minimum inhibitory concentration of the tested disinfectants.

	MBC/MIC ratio for the investigated disinfectants		
Organisms	Dettol	Lysol	Methylated Spirit
SA	2	2	2
EF	2	2	2
PA	2	2	2
EC	2	2	4
KS	2	2	4
SE	1	2	4
PM	4	4	4

5. Discussion

Over the years, disinfectants have played important roles in the control of infections (Rutala, 1996). All the tested disinfectants were very active against the wound pathogens. This finding is contrary to the findings of Ihsan and Thuraya (2011) who reported some commonly used disinfectants in Iraq which were not effective against bacterial wound pathogens at 100% and 50% concentration. The difference observed in our study could be due to difference in the species or strains of the organisms used. The minimum inhibitory concentrations for all the disinfectants were found ranging from 0.78 – 6.25%. This observation corroborates that of Frohm *et al*. (1996) who also asserted that bacteria will continue to be killed even at a surface level if they come in contact with a disinfectant regardless of the concentration of such disinfectants. The MIC to MBC ratio ranged from 1 – 4 and incidentally falls within the range reported by Hazen (1998) to be cidal for any agents. This observation further stressed that these agents are effective bactericidal agents. It can therefore be concluded that these agents should be used for cleansing the inanimate objects that could serve as formites for wound pathogens and also, at a very low concentration, should be considered good cleansers for infected wounds.

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5/5/2012