



Research Article

ANTIMICROBIAL ACTIVITY OF SOME CLEANING PRODUCTS AGAINST SELECTED BACTERIA

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Abstract: Cleaning products have been used from time immemorial to remove dirt and odour for cosmetic or medical reasons. These products encompass a wide range of products. This study evaluated the antimicrobial activity; including sensitivity and kill kinetics study, of Ariel detergent, Morning fresh liquid soaps, B 29 soap, Dettol cool medicated soap and Dettol hand sanitizer. Ariel was the most active against the selected bacteria probably because harsher ingredients are incorporated in its formulation, since it is used on inanimate objects. This was followed by Morning fresh for the above same reasons. Surprisingly, Dettol cool mediated soap and Dettol hand sanitizer had little activity or no against the selected bacteria. B 29 had no activity against all the bacteria.

Keywords: Cleaning products, Antimicrobial sensitivity, Short-time kill rate study

INTRODUCTION

Cleaning products are substances, be it liquid, solid or semi solid, which are used to remove dirt, including dust, microorganisms, stains, bad smells and clutter, in order to maintain health, beauty and remove bad odor from the body or inanimate objects, including clothes. Such products include cosmetics, detergents, disinfectants, antiseptics etc. A detergent is a surfactant or a mixture of surfactants with cleaning properties in dilute solutions¹. These substances are usually alkylbenzenesulfonates. Detergents are used for laundry, fuel additives, dish washing and as biological reagent. Detergents are commonly available as powders or concentrated solutions. Laundry detergent contain the following in addition to surfactant; water softeners, bleach, enzymes, brighteners, fragrance etc, example being Ariel detergent^{2,3}. Dish washing detergents are also referred to as liquid soap, for example Morning Fresh dishwashing liquid, and are said to be more effective than soap in cleaning⁴.

Soaps are salts of free fatty acid made via saponification, where alkaline substances react with fatty acids in fats or oils. Other substances are then added to this salt of free fatty acid or soap base, to produce the different types of soaps we have. They are mainly used as surfactants for washing, bathing and cleaning. They are also a component of lubricating grease⁵. Soaps are either non-antimicrobial soaps or an antimicrobial soap, also known as an antiseptic or medicated soap. Medicated soaps contain antiseptic substances in addition to the ordinary soap base. These antiseptic substances impart ability for the soap to kill germs even after it has been used as residual antiseptic substances remain on the skin. They may also kill off the beneficial normal skin flora especially on excessive use. Types of soaps include laundry soaps (for example B29) , kitchen soaps (for example B 29), personal soaps (for

example Dettol cool soaps). Dettol cool is a medicated soap that contains the antiseptic, chloroxylenol^{6,7}.

Hand sanitizers or hand antiseptic or antiseptic hand rub are liquid, foam or gel-like cleaning products used as alternative to hand washing with soap and water, when the hands are not visibly dirty, or to re-emphasize hand washing with non-antimicrobial soap prior to donning the hand gloves for a surgical procedure. The active ingredient(s) is/are usually antiseptic substance(s) like povidone-iodine, ethanol, isopropanol, benzalkonium chloride, triclosan etc. They are effective than non-antimicrobial soap and water hand washing in killing microbes⁸⁻¹¹.

This study evaluated the effectiveness of some cleaning products by determining how effective they are in killing commonly encountered pathogenic microbes in day to day activities.

MATERIALS AND METHODS

The Test Microorganisms

The test organisms used here are laboratory isolates of *Staphylococcus aureus* (SA), *Pseudomonas aeruginosa* (PA), *Escherichia coli* (EC) and *Streptococcus pneumoniae* (SP). The isolates were standardized to bring the cell population to McFarland's 0.5 nephelometer and this was done prior to the microbiological assay.

Cleaning agents

The cleaning agents whose antimicrobial potential was analysed include; Ariel detergent, B 29 soap, Dettol cool soap, Dettol hand sanitizer and Morning fresh which were designated A, B, D, H and M respectively. A, B and D were reconstituted in sterile distilled water to make a stock

solution prior to the microbiological assay. While the original preparation of H and M was used as their stock solution. A stock solution of 0.5g/ml of A was made, while the concentration of the stock solution of B and D was 0.17 g/ml. Five-fold dilutions of all the stock were then used for the following tests.

Sensitivity Screening

The antibiotic sensitivity was carried out by using the disc agar diffusion method. Briefly, the Petri dishes were divided into five sections; one section for each of the cleaning agents. Each of the plate was labeled according to the isolates. Three plates were used per isolates. Two for the stock solutions (ie, in duplicated) and one for the dilutions. 1ml of the standardized suspension of a laboratory isolate was put into the empty sterile Petri dishes that had been divided into five sections. A bijou bottles containing 19 ml of sterile molten Muller-Hinton agar at 45°C was poured into each of the plates containing the suspension of the isolate. These were mixed thoroughly and were allowed to set for 20 minutes. 6 mm cup borer were used to bore holes into each section in the plates and each section was labeled properly. 6 drops of each of the stock solutions and dilutions was dropped into the dug wells as labeled. The plates were allowed to stand for at least 30 minutes at room temperature, after which they were incubated at 37°C for 24 hours. The resultant inhibition zones diameters were measured and recorded.

Kill kinetics study

Two cleaning agents with higher zones of inhibition were subjected to a short-time kill kinetics study. Only SA and EC laboratory isolates were used here. The test organisms were subcultured in double strength nutrient broth for 48 hours prior to being used for this study. For the kill kinetics study, the reaction mixture consisted of 0.1 ml of a standard suspension of the test organism, 9.8 mls of nutrient broth, and 0.1 ml of the dilution of the cleaning agents was added. At intervals of 2 minutes 0.1 ml of the reaction mixture was sampled into 9.9 mls of normal saline to stop the killing activity. The 0.1 ml of the diluted reaction mixture was inoculated in duplicates in double strength nutrient agar and used for viable cell count. The plates were incubated at 37°C for 24 hours. The number of colonies was determined using a colony counter.

RESULTS AND DISCUSSION

Sensitivity of the cleaning agents

The sensitivity of the different representative test organisms to the cleaning agent is shown in table I & II below. Ariel detergent was found to be the most active, in concentrated and dilute solutions, of all cleaning products as it was active against all commonly encountered microbes in our environment used in this study. This was followed by Morning fresh. Both of these cleaning products were more active against Gram-positive cocci than rods. They are used on inanimate objects and so their ability to kill off microbes is higher. Surprisingly, B 29, multipurpose laundry soap was not active against any of these organisms. It therefore has little cleaning property and may just be able to remove grease. Suffice it to say that the exalted germ-killing dettol hand sanitizer and soap has little or no activity against these

organisms used in this study. This is indeed a far cry from their claim.

Table I: Sensitivity (in mm) of some representative organisms to the stock solutions of the cleaning agents

Cleaning agents	SA	EC	PA	SP
Ariel	26	20	15	29
B 29	0	0	0	0
Dettol cool	8	0	0	0
Dettol Hand sanitizer	0	5	6	6
Morning Fresh	20	8	8	14

Table II: Sensitivity (in mm) of some representative organisms to dilutions of the cleaning agents

Cleaning agents	SA	EC	PA	SP
Ariel	20	12	19	26
B 29	0	0	0	0
Dettol cool	7	0	0	0
Dettol Hand sanitizer	0	3	6	3
Morning Fresh	21	6	8	9

E. coli resides in the gastrointestinal tract and can easily contaminate toilet handle, seats and even clothes of children that are not yet potty trained. *Staph. aureus* is in the gut, oral cavity and eyes, and can be pathogenic. *Streptococcus pneumoniae* is commonly found in the pharynx and mouth, and may be found also in the nose, conjunctiva and vagina. It becomes pathogenic when it invades the lower respiratory tract¹². *Pseudomonas aeruginosa* is primarily a opportunistic and nosocomial pathogen¹³. Infections caused by these organisms can be prevented by removing and killing germs on our clothes, hands and body. This study shows that such cleaning agents like dettol cool and hand sanitizer and B 29 soap are not successful in producing the required cleaning effect especially in this era of antibiotic resistance. This may be as a result of the inability of cleaning agents B, D and H to diffuse through the agar and inhibit the growth of the bacteria used in this study.

Short time killing rate of the cleaning agents

The result of the short time killing rate of the two cleaning agents under study that gave a zone of inhibition above 13 mm is shown in table III below.

Table III: Killing rate of the cleaning agents

Test Organism	Cleaning agent	Reaction time	Viable cell count/ml
SA	Ariel	2	935
		4	102
		6	76
		8	53
		10	9
	Morning Fresh	2	314
		4	328
		6	421
		8	105
		10	17
EC	Ariel	2	571
		4	513
		6	37
		8	34
		10	16
	Morning Fresh	2	162
		4	66
		6	168
		8	337
		10	63

There is about a 2-fold reduction in the population of *Staphylococcus aureus* by Ariel detergent, 1.3-fold reduction in the population of this same organism by Morning Fresh liquid soap; from 2 – 10 minutes. There is 1.6 – fold reduction in the population of *E. coli* by Ariel detergent and a 0.4-fold reduction in viable cell count of *E. coli* by Morning Fresh liquid soap; from 2 -10 minutes. Ariel detergent is more active than morning fresh as it kills microbes more rapidly than Morning Fresh liquid soap. But, its rate of kill is faster on *Staph. aureus* than *E. coli*. An observable trend in the kill effect of morning fresh is that it has an initial rapid effect on the microbes, then the microbes start to thrive on its ingredients, but after sometime these ingredients accumulate and becomes to in their system and they begin to die. This is however unfortunate because clothes are usually for more than 10 minutes with Ariel detergent, while plates are usually not soaked when being washed with Morning Fresh liquid soap.

CONCLUSION

This study refutes and confirms some claims made by the manufacturers of the cleaning agents under study. Ariel as found to be the best of all the cleaning products as claimed. This was followed by morning fresh. B 29 soap had no activity against any of the organisms used in this study, while, its counterpart Dettol cool, a medicated soap had no activity against the microorganisms used in this study except *Staph. aureus*, contrary to the manufacturer's

claim. Dettol hand sanitizer was better off but its activity was little and it was not active against the notorious *Staph. aureus*. The kill rate study suggest that perhaps it is better to soak plates with morning fresh before washing, because in washing we want to reduce microbes to the barest minimum. However, this study does not take into consideration the effect of the actual physical washing action with the hands or a sponge on these microbes.

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