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OBSERVATIONS ON THE EFFICACY OF HOUSEHOLD SANITIZING AGENTS AGAINST UBIQUITOUS MICROORGANISMS

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ABSTRACT

The study was undertaken to assess the antimicrobial efficacy of two commercially available sanitizing agents such as dettol and savlon in the Department of Microbiology and Hygiene, BAU, Mymensingh during the period from July to December 2004. The stock solutions of dettol and savlon for surface applications were prepared as per recommendation of the manufacturer. One litre each of prepared stock solution of dettol and savlon was spread uniformly over one square meter floor surface. Three different floor surfaces such as tile floor, mosaic floor and ordinary cement floor were treated. The stock solutions were allowed to stand on the floor surfaces for a period of one, two and five minutes and total viable count of floor surface washings were determined. Antimicrobial activity of dettol and savlon was also determined against test organisms such as *Staphylococcus aureus*, *Pseudomonas fluorescens*, *Escherichia coli* and *Bacillus subtilis*. Total viable count of floor washing sample prior to exposure of antimicrobial agents was found highest in ordinary cement floor (600 cfu/ml) followed by mosaic floor (450 cfu/ml) and tile floor (350 cfu/ml). There was a progressive decline in viable organisms as the time of exposure of the sanitizing agents increased. The reduction of viable counts found after five minutes exposure of sanitizing agents with dettol were 150 cfu/ml, 75 cfu/ml and 65 cfu/ml and with savlon were 100 cfu/ml, 18 cfu/ml and 16 cfu/ml in ordinary cement floor, mosaic floor and tile floor respectively. Savlon possessed more inhibitory property than dettol against four test organisms. However, *Staphylococcus aureus* were found to resist the antibacterial properties of both dettol and savlon. It may be concluded that while using commercial chemical sanitizing agents for domestic purpose care should be taken in its selection and efficacy.

Key words: Efficacy, household, sanitizing agents, dettol, savlon, microorganisms

INTRODUCTION

A large variety of antimicrobial chemicals or disinfectants are marketed and widely used now a days in the home, restaurants, farms and working places. Persons involved in food handling practices and water hygiene management find it difficult to eliminate pathogens from contaminated surfaces and equipment due to the formation of surface biofilms that could protect bacteria intrinsic in the matrix and increase their resistance to by 10 to 100 times (Carpentier and Cerf, 1993). As a result of this occurrence certain antimicrobial chemicals kill microorganisms, while others inhibit their growth. Although the best disinfectant is active against a large number of microbial species and characterized as having a broad spectrum of activity, but there is not a single chemical agent that is optimal for all purposes (Pelczar *et al.*, 1993). Therefore it is necessary to determine in advance which agent will work best in a particular situation. The present study is undertaken to find out the antimicrobial efficacy of two most commonly used commercial sanitizing products, such as dettol and savlon.

MATERIALS AND METHODS

The experiment was conducted in the Department of Microbiology and Hygiene of Bangladesh Agricultural University (BAU), Mymensingh during the period from July to December 2004.

Preparation of stock solution

To assess the antimicrobial efficacy, two commercially available sanitizing agents, such as dettol and savlon were chosen. For dettol the active ingredient is chloroxylenol [$C_1C_6H_2$ $(CH_3)_2$ OH] and for savlon it is cetrimide solution with chlorhexidine hydrochloride [$CH_3(CH_2)_{15}N(CH_3)_2(C_2H_5)Cl$]. The stock solutions for surface applications were prepared as per recommendation of the manufacturer.

Cleansing and disinfecting of a selected area

One liter of the prepared stock solution of Dettol or Savlon was spread uniformly over a protected area of one square meter of floor surface. Three different floor surfaces, such as tile floor, mosaic floor and ordinary cement floors were treated. In each case the floor surfaces were cleansed and dried prior to disinfection.

According to the procedure of the experiment the stock solution was allowed to stand on the floor surfaces for one, two and five minutes. Five milliliter of sample was taken periodically after each exposure of one, two and five minutes and dispensed to sterile test tubes. To test the antimicrobial activity 1 ml of the collected sample was added into 9 ml sterile nutrient broth cultures containing Tween 80. The broth cultures were then subjected to determination of viable bacterial count (ISO, 1995) and later kept in the incubator at 37^0 C for 24 hours. Afterwards the cultures were examined for growth (no antimicrobial activity) or no growth (antimicrobial activity). This identical study was performed with other different floor surfaces.

Suspension of test organisms

The test organisms obtained from laboratory stock were *Staphylococcus aureus, Pseudomonas fluorescens, Escherichia coli,* and *Bacillus subtilis.* The organisms were obtained in pure cultures and were subcultured in nutrient broth to get suspensions of 18 to 24 hour cultures to be used for this study.

Evaluating antimicrobial activity of sanitizing agents

According to this technique a measured amount (0.1 ml) of the test organism suspension was added to 5 ml of recommended diluted sanitizing agent previously taken in a test tube. At specified time intervals (1, 2, 5, and 10 minutes) a loopful of material from each tube was transferred to a tube of sterile nutrient broth. The inoculated tubes were incubated for 24 to 48 hours and then examined for microbial growth (turbidity). 'No growth' (clear broth) indicates the dilution at which the chemical agent killed the test organism when it was exposed for a particular period of time.

RESULTS AND DISCUSSION

The results in Table 1 revealed that the total viable bacterial count of the tile floor samples after treatment with 'Dettol' for 1, 2 and 5 minutes as recorded were 150, 95 and 65 cfu per ml respectively. Analogously treatment with 'Savlon' evidenced recovery of less quantization exhibiting 35, 30, and 16 cfu per ml respectively. On the other hand the total viable bacteria obtained from dettol post-treatment mosaic samples for the above mentioned periods were 175, 102 and 75 cfu per ml respectively, while with 'Savlon' treatment there were survivability of 45, 32 and 18 cfu per ml respectively. In case of cement floor treated with 'Dettol' the TVC found 375, 220 and 150 cfu per ml after exposure of 1, 2 and 5 minutes, but when treated with 'Savlon', the bacterial population declined considerably to 210, 105 and 100 cfu per ml respectively.

Table 1. Antimicrobial efficacy of Dettol and Savlon used to sanitize different types of floor surfaces

Type of floor surface	TVC / ml prior to exposure of sanitizing agents	Sanitizing agents	TVC / ml post-exposure of sanitizing agents			Total reduction (%)
			1 min	2 min	5 min	
Tile floor	350	Dettol	150	095	065	81.42
		Savlon	035	030	016	95.42
Mosaic floor	450	Dettol	175	102	088	80.44
		Savlon	045	032	030	93.33
Cement floor	600	Dettol	357	220	150	75.00
		Savlon	210	105	100	83.33

TVC = Total viable count.

It is evident from the results that the antibacterial effect of 'Dettol' and 'Savlon' employed to sanitize different kinds of floor surfaces varied consistently. This variation is particularly noticeable, which is very much related with the nature of contact surfaces. This closely relates with the agreement of (Block, 1991; Olmsted, 1996; Rutala, 1996). The highest rate of reduction of viable bacteria occurred on the tile floor surface (dettol, 81.42% and savlon, 95.42%), followed by mosaic (dettol, 80.44% and savlon, 93.33%) and cement floor surfaces (dettol, 75.00% and savlon, 83.33 %). The proportion of microbial cells present in floor surface samples after application of 'Dettol' and 'Savlon' is nearly dependent on exposure time. In all cases microorganisms although were still post-application viable, but progressively died on prolonged exposure. The apparent efficacy of antimicrobial activity was assessed and 'Savlon' was recognized to possess superior antibacterial property to 'Dettol'.

Thus it is noteworthy from the above findings that the recovery of viable bacteria obtained post-application of sanitizing agent was of highest density in cement floor samples, followed by mosaic and tile floor surfaces. This marked difference in bacterial load may be thought to be due to a build-up of a wide range of harmful organisms living on surfaces as transient and resident microbes. Sheena and Stiles (1982), Anderson (1989) and Larson (1995) similarly indicated the accumulation of microbes residing on contact surfaces of inanimate objects. Since cement floor is rough and there are many visible and invisible crevices and fine cracks, these may be abodes of microorganisms. Organic matters may remain lodged there. The study of laboratory findings revealed that persistent bacteria are killed more slowly by 'Dettol' than 'Savlon'. The more efficacy of this sanitizing agent may be attributed to the capability of improved penetration of organic matter and biofilms in application situations. Similar result has also been obtained by Favero (1985). The researcher led to the opinion that chloroxylenol possessed low germicidal activity (Favero, 1985). Although the residual effect of this halogen derivative of xylenol persist for several hours but this is minimally affected when organic matters are heavily present. On the other hand the active ingredient of savlon which is cetrimide solution with chlorhexidine hydrochloride is a more powerful antibacterial agent than dettol because of its residual antimicrobial activity. The action of chlorhexidine causes disruption of cytoplasmic membrane resulting in the precipitation of cellular contents, as a consequence microorganisms die (Larson, 1995).

Table 2. Evaluation of antimicrobial activity of Dettol and Savlon against test organisms

Test organisms	Dettol				Savlon			
	1 min	2 min	5 min	10 min	1 min	2 min	5 min	10 min
Staphylococcus aureus	+++	++	++	++	+	+	–	–
Pseudomonas fluorescens	+	+	+	+	+	–	–	–
Escherichia coli	++	++	++	+	–	–	–	–
Bacillus subtilis	++	++	++	++	–	–	–	–

+ Slight growth, ++ Moderate growth, +++ Heavy growth, – No growth, The growth estimation was made on the basis of optical density (Nephelometer).

Table 2 represents the findings of the antibacterial activity of 'Dettol' and 'Savlon' against test organisms. It has been observed that the former had no effect after one minute of exposure, but there was diminished growth after continued exposure for 2 to 10 minutes. On the other hand it was clearly demonstrated that *Pseudomonas fluorescens* was most susceptible of the test organisms in response to both 'Dettol' and 'Savlon' treatments. Dettol and savlon possessed more or less equal antibacterial property against *E. coli* and *B. subtilis*. *E. coli* and *B. subtilis* grew moderately in broth culture exhibiting diminished growth. Pelczar (1993) demonstrated reduction of test organisms in broth culture previously given treatment with commonly used disinfectants. The cause of greater antimicrobial activity is remarkable. The striking reduction of all test organisms after 5 minutes of exposure indicated that as household disinfectant savlon is more desirable, effective and active against ubiquitous test organisms. Its use to disinfect inanimate objects, such as floors, walls, table surfaces may be advocated. However, when applied to cement surfaces it will be advisable to thoroughly dry clean the surface first and then to apply the disinfectant appropriately avoiding any missing areas and recontamination of disinfection areas. The study revealed that cleansing with household sanitizing agents would support presumptive advice to practice applying to inhibit or reduce and destroy undesirable potential pathogen. Further work is needed to identify a suitable safer disinfectant with optimum efficacy in farms and farm surroundings. In selecting a disinfectant the recommendations of Larson (1995), Rutala (1996), Boyce and Pittet (2002) are noteworthy. In this regard the desired characteristics such as absorption and persistence should be considered along with the evidence of safety and efficacy, its acceptability to the users and most importantly, its cost.

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