



## Efficacy and Antibacterial Activity of Scrupulous Commercial Soaps Against Bacterial Strains

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### ABSTRACT

The study aims to check the antibacterial activity of various branded soaps against bacteria present in wound infection. Wound infection is one of the major problem faced by modern population due to changing environment and pollution. Antibacterial soap has the ability to remove 65% to 85% of bacteria from human skin. To determine the antibacterial activity of antibacterial soap, three brands of commercial soap (CS-1, CS-2, CS-3) was evaluated against the bacteria isolated from wound samples. The antibacterial activity was determined by well diffusion method, Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC). The highest efficacy was shown by CS-1 against *Staphylococcus* spp. (24mm), the second most efficacy CS-2 was shown by *Pseudomonas* spp (22mm). The least efficacy CS-3 was shown by *Streptococcus* spp (19mm). MIC shows that CS-1 has good inhibitory concentration against all the test organisms, which is then further proved by MBC.

**KEYWORDS :** Commercial soaps, acne, antibacterial activity, MIC & MBC.

### INTRODUCTION

Soaps are the combination of fats, oils (of animal or vegetable origin) and Salt (1). Dermatological bars or cakes and disinfectants are chemical of different from soaps and contain modified detergents to enhance their use for antibacterial activity. An antibacterial soap can remove 65% to 85% of bacteria from human skin (2). The aim of this work is to compare the efficacy of locally available market soaps against skin infected bacteria such as *Staphylococcus* spp., *Pseudomonas* spp. and *Serratia* spp. as well as to provide data to clinician to decide for the selection of better and protective soap against pathogenic microorganism (3). Antibacterial soap and disinfectants are used as an adjunct to acne treatment, since they contain bacteriostatic agents (10). Soaps containing chemical agents which are active in reducing the incidence of pyogenic skin infection attributed primarily to *Staphylococcus aureus* associated with an increased susceptibility to skin infections with gram-negative species. The attribute of the soap includes gentleness on the skin, rich lather, protection against skin disorders (including rashes, eczema, scabies) treatment of skin infection (such as ringworm), protection of even skin toning and smoothness of the skin (4). It was seen clearly that Gram positive bacteria were killed at low concentration of soaps than Gram negative bacteria. The most resistant bacterium of all the soaps is *K. pneumoniae* following *P. aeruginosa*. It is proved experimentally that antibacterial soaps kill the bacteria at a specific concentration; they also have bacteriostatic activity and can inhibit the growth of bacteria. This study suggests that selection of soaps should depend on the working environment. The soap should have good ingredients which have the ability to kill bacteria but not to damage body tissues. Health care workers should use soaps according to criteria of Health and Hygiene.

### Materials and Methods

The experimental study includes different soaps which are commonly used by humans. The samples were purchased from Kumbakonam shops and their dilutions were made for testing the bactericidal activity of different organisms. The soaps used were CS1, CS2, CS3.

A total of three samples were collected from armpits, cubital and finger webs of 6 volunteers from Government Hospital in Kumbakonam. All the samples were labelled appropriately. The individual were selected because they volunteered to be sampled and their infected with burn wound, surgical wound. Three types of soaps were administered for evaluation these includes CS1, CS2, CS3. Swab technique was used to collect samples because it is non-destructive, reproducible and economical (9). Swabs sticks (samples) were kept in a covered rubber container and transported to the laboratory within 30 minutes for analysis. The samples were then subjected to microbial and biochemical tests.

The samples were then cultured on Blood agar, MacConkey and Cetrimide agar, using the streak plate method. The inoculated plates were then incubated at 37°C for 24 hours (11). The cultured plates were observed macroscopically for physical appearance of the colonies. The isolates were observed microscopically after gram staining as described by Cheesbrough, M 2005. (5).

### Isolated strains

Bacterial strains used in this study *Pseudomonas aeruginosa*, gram negative bacteria *Staphylococcus aureus*, *Streptococcus pyogenes* gram positive bacteria were collected from Vaishnavi Lab, Kumbakonam, Tamilnadu, India. All chemicals compounds and impregnated discs were used in this study from Hi-MEDIA, Mumbai, India.

### Preparation of inoculum

Preparation of inoculum using Muller-Hinton broth was made according to manufacturer's instructions and 5ml of broth medium was transferred to screw capped tubes and sterilized by autoclaving at 121°C for 15 minutes. The tubes were cooled, the isolated strains were inoculated in an incubator overnight at 37°C.

### Assay of antibacterial activity

Overnight cultures were kept ready for antibacterial assay. Assay of the antibacterial activity of soaps was done by the following methods

1. Agar Diffusion method
2. Minimum Inhibitory Concentration technique

### Dilution of soaps

10g, 20g, 30g soaps were weighed and diluted, after solidification of the media wells were made, each well was incorporated with 20µl to 30µl of serially diluted soaps and further incubated at 37°C for 12 to 24 hours. The zone of inhibition was determined by measuring zone of inhibition using Kirby Bauer zone scale and noted to which commercial soap inhibited the growth of the organisms.

### Determination of Minimum Inhibitory Concentration

A minimum inhibitory concentration (MIC) is the lowest concentration of an antimicrobial that inhibits the growth of a microorganism after 18 – 24 h. The commercial soaps showed the antibacterial activity were subjected to the serial broth dilution technique to determine their minimum inhibitory concentration. The following concentration was obtained 10g, 20g, 30g, 40g. Equal volume of soaps and Muller Hinton Broth (3ml) was dispensed into sterilized test tubes. A quantity (1ml) of standardized inoculum was added to each of the test tubes which were incubated aerobically at 37°C for each 24 hour. A tube containing broth and

inoculum without soaps served as organism control. The lowest concentration of soaps which inhibited microbial growth turbidity was recorded as minimum inhibitory concentration.

**Evaluating the soap with different sector:**

Divide the soap plate into different sector and inoculate spot inoculum on the plate with each organism and further incubate the plate at 37°C for 18-24 hours.

**RESULT:**

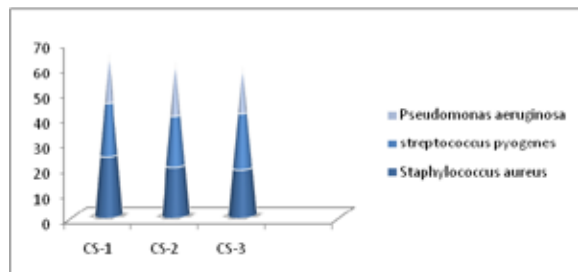
Table 1 represented the antibacterial activity of the three branded commercial soap at different concentration against the test organisms isolated from wound infection. The zones of inhibition against bacterial isolates were found to be a function of the relative antibacterial potency of the commercial soaps. The result shows if the concentration of soaps decreases the inhibition zone increases. This indicate that the antibacterial activity of commercial soaps increases when diluted with more amount of water.

The highest zone of clearance was obtained from CS-1 against *Staphylococcus aureus*( 24mm), and the lowest activity was shown by *Pseudomonas aeruginosa* with a diameter of (19mm). CS-2 shows highest efficacy against *Pseudomonas aeruginosa* (22mm) and the lowest zone of inhibition was (20mm), against *Streptococcus pyogenes*. While evaluating CS-3 is the highest zone was formed against *Streptococcus pyogenes* with (21mm) and the lowest efficacy was shown by *Staphylococcus aureus* with a diameter of (19mm).

Table 2 depicted about minimum inhibitory concentration with 10g, 20g, 30g of all soaps diluted to determine the minimum concentration of soap dilution which inhibited the growth of bacterial samples. While determination of Minimum Inhibitory Concentration (MIC) CS-1 shows better inhibition in minimum dilution of 10g against *Staphylococcus aureus* only 0.45nm of turbidity is recorded when measured with calorimeter. Thus CS-1 proved to have good bactericidal property against all the bacteria isolated from wound samples, CS-2 also shows better clearance but at highest concentration (30g). Though it shows highest activity against *Pseudomonas aeruginosa* the activity was enhanced only at highest concentration of soap dilution. CS-3 shows better inhibition at higher concentration (30g) against *Streptococcus pyogenes*. There is no activity at lowest concentration of 10 & 20g. figure 1 & 2 was plotted on the highest significance.

Name of the organisms	Zone of inhibition in mm								
	CS-1			CS-2			CS-3		
	10g	20g	30g	10g	20g	30g	10g	20g	30g
<i>Staphylococcus aureus</i>	20	22	24	19	20	21	14	16	19
<i>Streptococcus pyogenes</i>	15	17	20	15	18	20	13	14	21
<i>Pseudomonas aeruginosa</i>	13	15	19	14	16	22	15	17	18

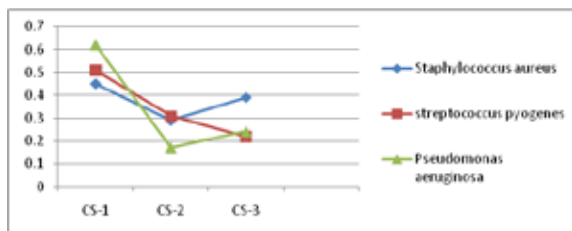
**Table 1: Evaluation of Antibacterial Activity of Commercial Soap By Well Method In Bacterial Strains**



**Fig:1 Evaluation of Antibacterial Activity of Commercial Soaps By well Method In Bacterial Strains .**

Name of the organism	CS-1			CS-2			CS-3		
	10g	20g	30g	10g	20g	30g	10g	20g	30g
<i>Staphylococcus aureus</i>	0.45	0.33	0.22	0.47	0.35	0.29	0.55	0.42	0.39
<i>Streptococcus pyogenes</i>	0.66	0.55	0.51	0.50	0.43	0.31	0.40	0.31	0.22
<i>Pseudomonas aeruginosa</i>	0.88	0.70	0.62	0.35	0.22	0.17	0.42	0.30	0.24

**Table 2: Minimum Inhibitory Concentration of Commercial Soaps**



**Fig.2: Minimum Inhibitory Concentration Of Commercial Soaps**

**DISCUSSION:**

Soaps are generally used for the removal of germs and for cleaning purpose. Soaps usage is very common and now a day's especially antibacterial soaps are very popular. According to company's claim their antibacterial soaps are bacteria killers. So with the use of antibacterial soaps we can get dual functions, removal as well as killing of bacteria. The purpose of the study was to determine the bactericidal activity of both the antibacterial as well as of the beauty soaps being used in our daily life. Antibacterial soaps considered to be more effective than beauty (plain) soaps and deodorant (8). This study suggests that anti-septic soaps were more effective against Gram-negative and Gram-positive bacteria than were plain soaps. When efficacy of antibacterial soaps was compare medimix was found to be more effective against *pseudomonas*, in agar diffusion method. Safeguard was found to be more effective against *staphylococcus aureus* than all the soaps (6).

In the current investigation on efficacy of commercial soaps against the concentration 10g/ml, 20g/ml, and 30g/ml of bacterial strains, CS-1 shows maximum inhibition against *Staphylococcus aureus* (24mm), CS-2 shows highest activity against *Pseudomonas aeruginosa* (22mm), and CS-3 was revealed activity against *Streptococcus pyogenes* (19mm).

MIC of sufi soap against *staphylococcus aureus* was 10240 µg/ml, and MIC of sunlite was 20480 µg/ml, where as MIC of lux was 24576 µg/ml. this showed that sufi soap and sunlite exhibited more activity against *Staphylococcus aureus* than Lux(7).The MIC was observed at 10g/ml concentration of CS-1 against *Staphylococcus aureus*,30g/ml concentration of CS-2 against *Pseudomonas aeruginosa* and *Streptococcus pyogenes*. The result of antibacterial activity and the MIC assays showed promising evidence for the antibacterial activity of commercial soaps against enteric pathogens.

**CONCLUSION**

This study reveals and confirms that some claims made by the manufacture of the commercial soaps under study, CS-1 & CS-2 shown better activity against the test organism. CS-3 was better off but its activity was little against the microorganism used in this study except *streptococcus pyogenes*, contrary to the manufacture claim. This area of research requires attention of scientists and people from soap industry, because quality of soaps is very important as they are the need of every home and hospital environment. Health is wealth accordingly we can advice and give awareness to the society for using standardised soaps and maintain health and hygiene.

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