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# THE ANTIBACTERIAL ACTIVITIES OF SELECTED MEDICATED SOAPS ON CLINICALLY ISOLATED *STAPHYLOCOCCUS AUREUS*

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## ABSTRACT

Antibacterial activities of three selected medicated soaps (Detol, Tetmosol and Ghana medicated Soap) and two local soaps (Brown and white) were carried out on clinical isolate of Staphylococcus aureus that was obtained in the Kogi State Teaching Hospital Laboratory, Anyigba, Kogi State. The organism was subjected to morphological & biochemical tests for confirmation in the microbiology Lab, Kogi State University before the antibacterial assay was carried out. The results showed that Ghana medicated soap (100 mg/ml) have the highest inhibition zone and the least was white local soap (100 mg/ml). This trend was also observed in all the concentration used, which indicated that the activities of the soap samples were concentration dependent. It is worthy of note that the brown local soap had the highest efficacy on the test organism after the Ghana medicated soap. This is an indication that this local soap has potential of being used as antibacterial agent and the active ingredients could be investigated in the later studies.

## Introduction

The human skin makes contact with thousands of microbes that are pathogenic to man. When proper hygiene is not practiced, these microbes may replicate, produce toxic substances and

eventually cause disease. Some of these microbes cause diseases on the skin while others become pathogenic only when they migrate to mucous membranes and other vital organs.

*Staphylococcus aureus* has been known to be one of the many dangerous and versatile pathogens with high death rates in humans as a consequence of community-acquired and hospital-acquired infections (Becker, 2004).

S. aureus is a member of the Micrococcaceae family; a group of pyogenic cocci known to cause various suppurative or pus forming lesion in humans and other animals. It is a non-motile and non-spore forming facultative anaerobic organism that grows by aerobic respiration or fermentation. On microscopical examination, the organisms appear as Gram-positive cocci in clusters. The distinction of *S. aureus* from other staphylococcal species is very important in clinical microbiology laboratories because this pathogen serves as an important source of nosocomial infections; this is done on the basis of the yellow pigmentation of colonies and positive results of coagulase, mannitol fermentation and deoxyribonuclease test. *S. aureus* ' ability to synthesize the enzyme coagulase makes it the most pathogenic of the Staphylococci. Prevention and treatment of infections caused by this pathogen is very important to public health especially with the emergence of multi drug resistant strains which has led to the search for new antibiotics or the modification of existing ones *(Al-saimar and Al-Hamdi., 2013).*

Soaps play an important role in the prevention and treatment of infections because they have the ability to remove and kill pathogens and this ability is well exploited in skin hygiene. Skin hygiene, particularly of hands, is considered one of the primary mechanisms to reduce risk of transmission of infectious agents by both the contact and faecal-oral routes. The washing of hands with soaps and water is a routine practice which was established many generations before now as a means to ensure personal hygiene and over the decades, bathing, scrubbing and washing traditions have become established within the health care setting *(Diekema, et al., 2001).*

## Materials and Methods

### Study area

The study area is Anyigba Metropolis, Kogi State, in the North central Geopolitical zone of Nigeria. The Anyigba town which has been known for ages as a major commercial center in the Eastern part of kogi state and of the Igala tribe.

### Sources of sample

The samples for the study were randomly purchased from drug stores and pharmaceutical shops within the Anyigba, Kogi state.

### Sample collection and preparation

A total of 5 samples of four (5) different brands of locally used antiseptic soaps designated A, B, C, D and E as control were randomly purchased from drug stores and pharmaceutical shops within Anyigba. The soaps were designated A, B, C, D and E as control respectively. The soaps were reconstituted with a sterile distilled water to make a stock solution prior to the microbiological assay. The test organisms used in the study are those obtained from the laboratory, Kogi state university, anyigba. The test organisms were further identified and the biochemical and morphological characteristics were confirmed (Cheesbrough, 2005). The isolates were subcultured into Mannitol salt agar slant and were maintained at $4^0$C on their respective slants.

### Sterilization of materials

The glass wares used were washed in soapy water, rinsed, dried and then sterilized by dry-heat method in hot air oven at 160ºC for 1½ hours. Wire loops and needles were sterilized by heating to red hot in open gas flame. Cup borers were dipped into 70% ethanol before flaming to burn off the alcohol and then cooled beside the flame before use.

**Media and reagent preparation**

The media used were obtained in the commercially prepared powdered (dehydrated) form and were prepared according to the manufacturer's instructions. Specified quantity of each powdered media were reconstituted in specified volume of distilled water in a conical flask and mixed properly by shaking. The flask was then stoppered and sterilized by autoclaving at 121ºC and 15psi for 15 minutes. The autoclaved media were allowed to cool to 45-50ºC in a water bath before dispensing into pre-sterilized petri dishes and allowed to solidify.

**Biochemical analysis of the test organism**

The biochemical tests carried out were coagulase test, catalase test, citrate test and indole test respectively.

**Microbiological analysis of samples**

The method of disc agar-diffusion as described by Cheesbrough, 2005 was adopted using a sterile nutrient agar and pour plate method. One (1) ml of the standardized suspension of the test organism was put into the empty sterile petri dish that had been sterilized. After autoclaving, the sterile medium was allowed to cool at 45ºC, and 19ml of sterile molten agar was dispensed from the autoclavable bottles into each of the plates containing the suspension of the isolate. These were mixed thoroughly and were allowed to solidify for 20 minutes. 6mm cup borer was used to bore three (3) holes at definite intervals in the plates, and various concentrations of soap samples were introduced into the bored holes and were labeled. The plates were allowed to stand for at least 30 minutes at room temperature for proper diffusion, after which they were incubated in duplicates for each of the antiseptic soaps at 37ºC for 24 hours. After incubation, the resultant diameter of zone of inhibition were measured and recorded.

**Data analysis**

Data obtained from this research work were analysed using ANOVA. Descriptive statistics in form of means and standard deviation and Duncan post hoc were also used to assess the data. The analyses were done using SPSS 16.

## Results

The antibacterial activities of five (5) different soap samples were tested of *Staphylococcus aureus* at various concentration. Three of the soaps were medicated soaps and two were local soaps. The results were presented in the table 2 and 3 shows the disclosure of the assayed soap samples. The Dettol soap contain chloroxylenol 0.5% and Tetmosol contain monosulfiram 5% w/w. The active ingredient concentrations of other soaps were not disclosed.



**TABLE 1: Labelled Disclosure of the Assayed Medicated Soap**

| Soap | Ingredient | Exp. Date | Indicators |
|---|---|---|---|
| Dettol | Chloroxylenol 0.5% | 03/03/2022 | Bacteriacide |
| Testmol | Monosulfiram 5% w/w | 03/03/2022 | Scabicide |
| Ghana Med | - | - | - |
| Brown local | - | - | - |
| White local | - | - | - |

The results from table 2 shows the morphorplocogical and biochemical test of *Staphylococcus aureus*. It was found to be positive to gram reaction, Catalase, Coagulase and Cititate tests but negative to oxidate and Indole test.

**Table 2: Identification of *Staphylococcus aureus***

| Cell shape | Elevation | Edge | Shape | Gram reaction | Catalase | Coagulase | Oxidate | Cititate | Indole | Probable organism |
|---|---|---|---|---|---|---|---|---|---|---|
| Cocci | Convex | entire | Grape-like cluster | + | + | + | - | + | - | *Staphylococcus aureus* |

The result in the table 3 shows the zones of inhibition of the soap samples on *staphylococcus aureus.* Ghana medicated soap has the highest efficacy on the tested organism at all concentration used followed by the brown local soap but the white local soap appears to be the lowest on the tested organism at all concentration used.

**Table 3: Diameter Zones of inhibition (mm) of soap samples on *staphylococcus aureus***

| Soap Conc (mg/ml) | B.S | D.S | T.S | W.L.S | G.M. S |
|---|---|---|---|---|---|
| 100.00 | 24.O±0.46 | 21.0±0.97 | 11.0±0.64 | 4.8±0.90 | 26.0±0.90 |
| 50.00 | 22.0±0.14 | 17.0±0.84 | 9.0±0.46 | 3.5±0.70 | 24.0±0.46 |
| 25.00 | 17.0±0.49 | 14.0±1.22 | 8.0±0.25 | 2.8±0.50 | 23.0±0.13 |
| 12.50 | 13.0±0.82 | 9.0±0.008 | 7.0±0.77 | 2.3±0.40 | 18.0±0.62 |
| 6.25 | 10.6±0.35 | 6.0±0.06 | 6.0±0.94 | 1.6±0.20 | 13.0±0.40 |

**Keys**

B.S = Brown Soap

D.S = Dettol soap

T.S = Tetmosol soap

W.L.S = White local soap

G.M.S = Ghana medical soap

## Discussion

Results of this study revealed that most of the soap used for the study had antibacterial activity. Although at varying degrees as indicated by the inhibition of the growth pattern of the isolate. When the efficacy of the soap were compared using the disc agar diffusion it was observed that Ghana medicated soap was the most effective against all bacterial strain tested having the highest zone of inhibition of (26mm) against *Staphylococcus aereus* and (13mm) against *staphylococcus aereus* at the lowest concentration and of the highest concentration respectively used.

White local soap exhibits the least effectiveness at (11mm) against *staphylococcus aereus* at the highest concentration used and 6mm at the lowest concentration.

The best antibacterial activity was G.M.S exhibiting the maximum zone of inhibition for the test isolate. This could be attributed to the unique formulation in its makeup but it is unknown since it is not disclosed on the soap label. Tetmosol had a moderate activity which is attributed to monosulfiran within its formulation (white house station, 2008).

The inhibition of growth pattern of the isolate indicates the varying activities of the organism to resist the antimicrobial effect of the soaps. However this variation could be due to differences in nature and structure of the bacterial cell which is inconsequential because just one isolate was used. But rather it is attributed to interaction between each soap to the isolates cell wall since this is the target of any antimicrobial agent or disinfectant.

The active ingredients in the soaps are what distinguish in the antibacterial agent which is unfortunately unknown for some of the soaps used as they are locally made.

The chemical constituents functions by denaturing activity and inferring with microbial metabolism. This depends on a number of factors such as the inherent properties of the organisms, contact time, the composition of the soaps concentration or individual formulation and skin sensitivity.

Medicated soaps are intended for reduction of the inoculum sizes of pathogenic and non-pathogenic organisms. The letter includes normal flora which two types are known i.e. residents that are the normal flora skin and the other human body parts and transients flora that are picked up from objects or other human begins (white house station, 2008).

Thus it is routine practices to wash hands prior to eating after examining of patients, and before surgery. In order to remove some potentially harmful transcient flora as well as reduce a number of resident flora which might be cause infections (Obi, 2014).

The present study agrees with the findings of (Obi, 2014) who reported antibacterial activities of tetmosol and Dettol. He reported tetmosol being used for its scabicidal effects, however exhibited a moderate antimicrobial activity which to great extent is attributed to monosulfiram within its formulation.

## Conclusion and recommendation

From this study it is worthy of note that the brown local soap had the highest efficacy on the tested organism after Ghana medicated soap. These are the indication that this local soap has potential of being used as antibacterial agents and the active ingredients could be investigated in the later studies.



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