PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
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Pakistan Journal of Nutrition 9 (8): 773-775, 2010
ISSN 1680-5194

Bacteriological and Antibiotic Sensitivity Patterns of Bacterial Isolates from Creams and Lotions Hawked in Sagamu, Ogun State

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Abstract: Fifteen cosmetic products, consisting of 10 creams and 5 lotions were randomly purchased from a local market in sagamu and their microbial qualities studied in addition to the antibiotic sensitivity patterns of different isolates obtained from the selected creams and lotions. While only one of the creams was devoid of any microorganism including fungi, organisms isolated from others include *Staphylococcus aureus* 38%; *Klebsiella*, 28%; *Pseudomonas aeruginosa*, 21%; *Bacillus* spp, 7% and Penicillium, 28%. Antibiotic sensitivity study reveals that these isolates displayed different sensitivity patterns to the antibiotics used but cotrimoxazole, tetracycline and nalidixic acid will be of assistance in case of infection from these cosmetic products. However, majority of the creams and lotions evaluated did not meet the official monograph's requirements and as such may be a potential health hazard to unsuspecting consumers moreso that all the isolates display some degree of resistance to various antibiotics used.

Key words: Cosmetic products, creams, lotions, antibiotics, resistance

INTRODUCTION

Creams and lotions are external preparations with different rheological properties. Despite this difference, they are both liable to microbial contaminations either in the course of their preparation, transportation and/or use by the consumers which may lead to their spoilage. This spoilage may lead to alteration in organoleptic properties of creams and lotions which may manifest in terms of changes in color, odour and/or taste; as well as biodegradation of active constituent of such creams and lotions.

However, spoilage may result in loss in term of cost on the part of manufacturer and infection on the part of consumers of such spoilt products.

For instance, Orth *et al.* (1996) reported an outbreak of invasive mycoses caused by *Paecilomyces lilacinus* from contaminated skin lotion in Switzerland; cutaneous manifestation of which was reported by Itin *et al.* (1998). Becks and Lorenzoni (1995) reported a link between outbreak of *Pseudomonas aeruginosa* in neonatal intensive care unit in U.S.A. and contaminated hand-lotion just as Kallings *et al.* reported in (1966) that hydrocortisone ointment containing *Pseudomonas spp* used in the treatment of ophthalmic diseases resulted in sever eye infections.

Nonetheless, reports of microbial quality evaluations of cosmetics and toiletries have mainly been from temperate countries (Malcom, 1976; Baird, 1977; Brannan and Dille, 1990) and often in response to outbreaks of infectious disease (Becks and Lorenzoni, 1995; Itin *et al.*, 1998). Few studies have been carried out in Nigeria, such as Okore (1992), Okeke and Lamikanra (2001) and Hugbo *et al.* (2003).

While some of the studies cited above dealt with just isolation of contaminating organisms and preservative efficacy studies, none of them attempted to study antimicrobial susceptibility patterns of the contaminating organisms.

In this study, however, attempt was made to study bacteriological quality of 15 selected creams and lotions hawked in Sagamu in addition to antimicrobial susceptibility patterns of the contaminating organisms.

MATERIALS AND METHODS

MacConkey agar, Cetrimide agar, Mannitol salt agar, Mueller-Hinton agar, Sabauroud Dextrose agar; all Oxoid products.

1 g of cream to be studied was accurately and aseptically weighed into sterile tube containing 4ml Ringer's solution to which 0.25% Tween 80 has been added and made up to 10 ml using the same vehicle. 1 ml aliquot was pipetted into 9 ml sterile water and serial dilution made to 10^3. From the final dilution was pipetted 1 ml and plated on the surface of sterile agar media prepared. The agar plates were incubated at 37°C for 48 h and 25°C for 7 days for bacteria and fungi respectively. Total count was done by counting the number of colonies on Mueller-Hilton agar while counts on different agar media were also made.

The isolated organism on each medium was further identified using conventional biochemical methods.

Antimicrobial susceptibility pattern of each isolate was done using conventional disc diffusion method according to NCCLS standard.

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Table 1: Container label disclosures on selected creams and lotions

Samples	Date of Production	Expiry Date	Nafdac Number	Lot Number	Manufacturer Address
Sample 1	+	+	+	-	+
Sample 2	-	-	+	-	+
Sample 3	-	+	-	+	-
Sample 4	+	+	-	-	+
Sample 5	+	+	+	-	-
Sample 6	+	+	+	-	-
Sample 7	+	+	+	+	+
Sample 8	+	+	+	-	+
Sample 9	+	+	+	-	-
Sample 10	+	+	+	-	-
Sample 11	+	+	-	-	+
Sample 12	+	+	-	+	-
Sample 13	+	+	+	-	+
Sample 14	+	+	+	-	+
Sample 15	+	+	+	+	+

Table 2: Microbial counts (cfu/ml) and types found in cream and lotion

Samples	Bacterial Count	Types	Fungal Count	Types
Sample 1	NIL	-	NIL	-
Sample 2	2.4 x10^3	*Staph. aureus*	NIL	-
Sample 3	0.8 x 10^3	*Bacillus spp*	NL	
Sample 4	0.32 x 10^3	*Staph aureus*	1.23 x 10^3	*Penicillum spp*
Sample 5	1.2 x 10^3	*Klebsiella*	NIL	
Sample 6	0.64 x 10^3	*Pseudomonas aeruginosa*	NIL	
Sample 7	2.24 x 10^3	*Klebsiella*	0.97 x 10^3	*Penicillum spp*
Sample 8	1.36 x 10^3	*Staph. aureus*	NIL	
Sample 9	0.48 x 10^3	*Pseudomonas aeruginosa*	NIL	
Sample 10	0.24 x 10^3	*Klebsiella*	NIL	
Sample 11	1.26 x 10^3	*Staph aureus*	NIL	
Sample 12	1.84 x 10^3	*Pseudomonas aeruginosa*	NIL	
Sample 13	2.4 x 10^3	*Staph. aureus*	1.54 x 10^3	*Penicillum spp*
Sample 14	2.56 x 10^3	*Klebsiella*	NIL	
Sample 15	NIL	-	1.44 x 10^3	*Penicillum spp*

RESULTS AND DISCUSSION

From the creams and lotions evaluated, only 13 of 15 had date of manufacture indicated; 14 had expiry date; 11 with NAFDAC number while only 4 had lot/ batch number. 9 had address of the manufacturer indicated as shown in Table 1. This implies that there are container label disclosure deformities on the majority of the creams and lotions evaluated. Lack of batch/lot number should be viewed with seriousness as post-marketing surveillance, hence recall, of the product would be difficult to carry out in case of untoward effect (s) development. The fact that many of these products did not disclose the address of the manufacturer in addition to lack of batch number and yet claimed to have NAFDAC number call for suspicion.

Microbiologically, organisms isolated include *Staphylococcus aureus, Bacillus spp, Klebsiella spp, Pseudomonas aeruginosa* as well as fungus, *Penicillum spp*. This result differs from that of Okeke and Lamikanra (2001) in that fungus was not isolated by them and *Escherichia coli* was not isolated from our own study. Also, *Pseudomonas aeruginosa* and *Klebsiella spp* were not isolated by (Hugbo *et al*., 2003).

Staphylococcus aureus was the predominant organism isolated i.e. 33%, *Klebsiella* accounts for 26%, *Pseudomonas aeruginosa*, 20% and *Bacillus*, 6%, least isolated as shown in Table 2.

However, counts in general ranged between 0.24 x 10^3 and 2.56 x 10^3 cfu/ml for bacteria; 0.97 x 10^3 and 1.54 x 10^3 for fungus. Moreover, the initial bacterial loads per gram of material in 8 of 15 samples exceeded 1 x 10^3 cfu which is the acceptable limit for bacteria in non-sterile topical products.

Isolation of *Pseudomonas aeruginosa* and *Bacillus*, both free-living is an indictment of the raw materials used as well as the conditions prevalent in the environment in which the products are manufactured and packaged.

Water employed in manufacture has been described as the most likely source of *Klebsiella* in cosmetics (Crowshaw, 1977) and is a likely source of *Klebsiella i*solated in this study.

Nonetheless, isolation of *Staphylococcus aureus* from creams and lotions studied is a function of personal hygiene on the part of the personnel producing the products since skin is the natural habitat of the organism. Generally, those products from where *Bacillus, Klebsiella* and *Pseudomonas* were isolated

Table 3: Antibiogram profiles of bacterial isolates from creams and lotions

Antibiotic	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6	SAM 7	SAM 8	SAM 9	SAM 10	SAM 11	SAM 12	SAM 13	SAM 14
Cotrimoxazol	R	R	S	S	S	R	R	S	R	S	S	S	S
Nitrofurantoin	R	R	R	R	R	R	R	R	R	R	R	R	R
Ciprofloxacin	R	R	R	R	S	R	R	S	R	R	S	S	S
Gentamycin	S	S	S	R	R	R	R	R	R	S	R	R	R
Ofloxacin	R	S	R	R	R	R	R	S	R	R	R	S	S
Tetracycline	S	R	R	S	S	R	R	S	S	R	R	R	R
Amoxycillin	S	R	R	R	R	R	S	R	R	S	R	R	R
Nalidixin	R	R	R	S	S	S	R	R	S	R	R	R	S
Augmentin	R	S	R	R	R	R	R	R	R	R	R	R	R
Colistin	R	R	R	R	R	R	R	R	R	R	R	R	R
Erythromycin	R	R	R	R	S	R	R	R	R	R	R	R	R

R = < 12 mm, S = >18 mm

should not have been released for use considering the potential health hazard these organisms pose to consumers.

All the isolates vary in their antibiotic sensitivity patterns to all the antibiotics used for the study as shown in Table 3.

All the *Staphylococcus aureus* isolates were sensitive to at least 3 antibiotics with the exception of that isolated from sample 8 which showed sensitivity to only one antibiotic; amoxicillin.

All *Pseudomonas* isolates were sensitive to cotrimoxazole and ciprofloxacin while all *Klebsiella* isolates were sensitive to nalidixin.

The result of antibiotic susceptibility study clearly showed that resistant bacteria strains have permeated cosmetic products.

Conclusion: As shown from the study, of the 9 cosmetics with the name and address of their manufacturer, 5 were imported from the neighboring African countries such as Cote 'd ivoire with all showing a high level of contamination. This suggests that more stringent means of testing and analyzing imported cosmetics should be adopted by the regulatory agencies such as NAFDAC.

It is disheartening to see some cosmetic products with no lot number, no address of the manufacturer still carrying NAFDAC number. This gives room for suspicion as some of the products may be fake.

Moreover, manufacturers of cosmetic products should adhere strictly to the principle of good manufacturing practice

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