Microbiological quality assessement of some brands of cosmetics powders sold within port harcourt rivers state, nigeria.

Omorodion, Nnenna.J.P, Ezediokpu Marycollete.N
Edward Grant.

Department of Microbiology, University of Port Harcourt, Choba, P.M.B 5323 Port Harcourt, River State, Nigeria.
nigwiloh@yahoo.com

Abstrast: A total of 20 cosmetic products consisting of 10 adult powders were randomly purchased in duplicates, based on the differences in their manufacturing dates and 10 baby powders were also randomly purchased in duplicates, based on the differences in their manufacturing dates from departmental stores in Port Harcourt, Rivers state and their microbial qualities were studied. A 10-fold serial dilution was carried out and plating was done in duplicates using standard spread plate technique. Result showed that all the products were contaminated, having total viable count ranging from 3.50 x 10^8 - 1.35 x10^9 cfu/g for the adult powder and 4.90 x10^8 -1.37 x10^9 CFU/g for the baby powder. Bacteria isolated from the baby powder were *Staphylococcus sp*p. 39%, *Bacillus spp.* 15%, *Streptococcus spp*. 27%, *Micrococcus spp.*15% and *Escherichia coli 4%* while bacterial isolates from adult powder were *Staphylococcus spp. 48%, Bacillus spp*. 6%, *Streptococcus spp*. 19% and *Micrococcus spp.* 4%. Escherichia coli were not isolated from any of the adult powders. Fungal isolates from the baby powders were *Aspergillus spp.* 30%, *Rhizopus spp.* 30%, *Candida spp*. 18%, *Trichoderma spp.* 15%, *Penicillium* spp. 7% while the fungal isolates from the adult powders were *Aspergillus spp*. 33%, *Rhizopus spp.* 29%, *Candida spp*. 24% and *Penicillium spp.* 14%. *Trichoderma spp.* was not isolated from any of the adult powders. In conclusion, the baby powders studied showed to be more contaminated than the adult powders. This may be as a result of poor manufacturing practices, poor hygiene, contaminated raw materials or the susceptibility of the ingredients contained in the baby powders. Therefore, good manufacturing practices (GMP) and hygiene must be carried out by manufacturers and personnel, water must be tested continuously for microbial growth, raw materials should be tested before use especially those of natural origin and cosmetic products should be stored in an aseptic environment to avoid contamination before vending in the markets**.**

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Key words; baby powders, microbial contamination, commercial cosmetics.

Introduction

A powder is a cosmetic product used by both men and women to improve their looks and also inhibit the growth of bacterial pathogen which may cause unpleasant odor and sometimes skin infections (Michael Macvren Dashen et al, 2011). The description of their functions can vary from decorative to protective. Cosmetic powders are used to smooth the appearance of the skin, minimize shininess caused by oily skin. It is also used to clear rashes from the skin, especially the ones caused by heat. Some powders with sunscreen can also reduce skin damage from sunlight and environmental stress.

Despite these functions, they are liable to microbial contamination either in the course of their preparation, by the personnel, storage environment, during transportation and/or use by the consumers which may lead to their spoilage. This spoilage may lead to alteration in organoleptic properties of these products which may manifest in terms of changes in color, odor and texture as well as biodegradation of active constituents of such products. Contaminating microorganisms in cosmetic powder may cause a spoilage of the product and when pathogenic, they represent serious health risk for consumers world wide (Becks and Lorenzoni, 1995, and Behravan et al, 2005). Microbial spoilage of different items such as food, papers and textiles has been known for many tears. It is perhaps a little surprising that the problem of microbial contamination in non-sterile medicines and cosmetics received detailed attention only recently. This possibly is due to over confidence in the traditionally good hygienic conditions under which such products are manufactured and also because it is assumed that added preservative will prevent microbial growth upon storage and/or during use. However, studies have shown that although many cosmetic preparations contain preservatives, microbial spoilage can still occur during storage or use. The warm and rather humid climatic conditions that prevail in most tropical countries including Nigeria, would tend to support the survival and growth of many microorganisms.

In a situation where by a nutritionally rich cosmetic product is severely contaminated, rapid growth and multiplication would be expected. This could lead to biodegradation of the product and hence the risk of infection to consumers of the product (Raghad A. Razooki, 2009). The ability of microorganisms to grow and reproduce in cosmetic products has been known for many years (Fujital et al 2005). Bacteria and fungi can get to cosmetics and body care products in several ways. A spoiled product may be described as one that has been rendered unfit for use. As pharmaceuticals and cosmetics are consumed by or applied to the user, manifestations of spoilage are essentially subjective, spoiled can be caused by bacteria, yeast or fungi which are all extremely versatile in their metabolic activities. The versatile activities of microorganisms allow adaptation to a very broad range of environmental conditions. As a result, all classes of natural organic compounds are susceptible to degradation and synthetic compounds are also attacked. Cosmetic products are prone to microbial contamination as a result of special additives (including plant extracts and vitamins) that could serve as substrates for the contaminating organism (Okeke et al, 2001). Product contamination may arise from raw materials or water used in formulation or accidentally during use (Okeke et al, 2001). Studies are carried out till date to assess the incidence and hygiene status of many topical products. Using cosmetic preparations which are contaminated with microorganisms has been associated with several diseases.

Cosmetic powders have positive effects on adult and babies skin. However, critics have pointed out the negative effects of cosmetic powders on a person's skin which include; some cosmetic powders are contaminated with moulds and other microorganisms. It was reported that some of these cosmetic powders are contaminated with spores of microorganisms and can support their growth when they are poorly preserved.It is against this background that the microbiological quality assessment of some brands of adult powder and baby powder sold within parts of Port Harcourt metropolis was analyzed to determine their safely.

Reports of the microbial quality evaluations of cosmetic products have been from temperate countries and often in response to out breaks of infectious diseased. Ashour M.S. *et* al., (1989), Okeke and,Lamikanra (2001 (1992), Hugbo *et al*., (2003), Nasser (2008) Raghad A. Razooki (2009), Michael Macvren Dashen *et al.,* (2011). The environment of production and the raw materials if not properly assessed, result in heavy contamination. Growth of mould and other microorganisms may occur if the product is poorly preserved. Hence, the realization that there is a link between the raw materials used, the environment and contamination of product and the need to assess the microbial quality of some selected cosmetic powder to ascertain if they have been contaminated above acceptable limit for human application and the possible risk involved.The objective of this study is to assess the microbial quality of some selected brands of commonly used adult powders and baby powders with different dates of production in Port Harcourt market and to recommend the possibility of some health risk to consumers.

Materials and methods

Sample collection

A total of Twenty(20) samples consisting ten(10) adult powders with a different manufacturing dates] and ten(10) baby powders with different manufacturing dates]were randomly purchased from markets in Port Harcourt, River State.

Media used

Mannitol salt agar was used in the isolation of *Staphylococcus auerus* and *Pseudomonas aeruginosa,* Nutrient agar was used to determine the bacteria load of the sample. Sabourand agar was used for the isolation and enumeration of yeasts and molds. All of the media mentioned above were prepared under aseptic conditions according to the manufacturers specifications.(all obtained from Oxoid).

Bacteriological counts of the Cosmetic Powders

A stock sample of each cosmetic powder was prepared by depersing 10g of sample into 90ml of 0.1% peptone water. A ten-fold serial dilution was made and aliquots of the last two dilutions were inoculated on Nutrient agar and second and third dilutions in duplicates were inoculated on Mannitol salt agar using the Spread plate method. All the plates were incubated at 37 ^{0}C for 24-48 hours followed by colony count. Results were expressed as colony forming unit per gram CFU/g).

Yeasts and Moulds Count of the Cosmetic Powders

One ml of the last two dilutions mentioned in prepared above were inoculated on SDA plates using spread plate method. The plates were then incubated at 25^{0}C for 3-5 days. Colonies were counted after three days. Results of colony count was expressed as yeasts and moulds counts per gram.

Identification of Bacterial Isolates

- All bacterial isolates were identified based on their Gram reaction and biochemical Indole test, Catalase test, Coagulase test, Methyl –red test, Voges – Proskauer test, Oxidase test, Sugar fermentation

reactions as described by U.S.FDA manual online (Cunha 2002). (Chessbrough 2005)

Identification of fungal Isolates

All fungal isolates were identified based on their macroscopic and microscooic appearance with reference to manuals of (Barnett and Hunter, 1972) (Larone 1995).

Results

The results obtained shows that the bacterial load of Baby powder ranges from $4.90X10^8$ to $1.37X10^9$ CFU/g. The bacterial load of Adult powder ranges from 3.50 X 10 8 to 1.37 X 10 9. (Table 1 and 2) The results obtained also shows that the Fungal counts of Baby powder ranges from $1.50X10^5$ to $6.0X10^9$ CFU/g. The fungal counts of Adult powder ranges from $1.50 X 10^5$ to $5.5 X 10^5$. (Table 3 and 4).Out of the 20 samples of cosmetic powders that were analysed**,** bacteria isolated from the baby powder were *Staphylococcus* spp. 39%, *Bacillus spp.* 15%, *Streptococcus* spp. 27%, *Micrococcus* spp.15% and *Escherichia coli* 4% while bacterial isolates from adult powder were *Staphylococcus* spp. 48%, *Bacillus* spp. 6%, *Streptococcus* spp. 19% and *Micrococcus* spp. 4%. *Escherichia coli* were not isolated from any of the adult powders. Fungal isolates from the baby powders were *Aspergillus* spp. 30%, *Rhizopus* spp. 30%, *Candida* spp. 18%, *Trichoderma* spp. 15%, *Penicillium* spp. 7% while the fungal isolates from the adult powders were *Aspergillus* spp. 33%, *Rhizopus* spp. 29%, *Candida* spp. 24% and *Penicillium* spp. 14%. *Trichoderma* spp.

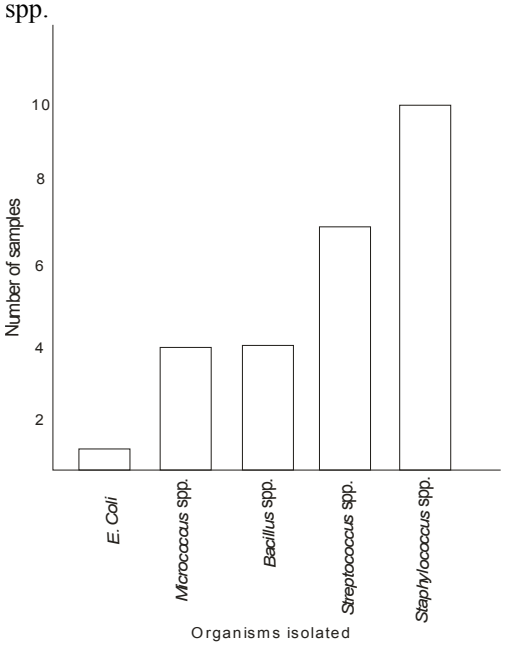

Fig 1: freqency of occurrence of bacteria isolates from baby powder

Table 1: Bacteria Counts of the baby powders

Samples Manufacturing Dates		Average Count	CFU/g
1. BP1	(07/11)	106.5	1.06×10^9
2. BP2	(03/12)	137.0	1.37×10^9
3. BP 3	(06/10)	119.5	1.19×10^9
4. BP 4	(07/11)	89.00	8.90×10^8
5. BP5	(08/11)	136.0	1.36×10^9
6. BP6	(03/12)	84.50	8.45×10^8
7. BP7	(10/09)	91.50	9.15×10^8
8. BP8	(02/12)	88.50	8.85×10^8
9. BP9	(06/10)	49.00	4.90×10^8
10. BP10	(09/11)	60.50	6.05×10^8

Table2: Bacteria Counts of the adult powders

Samples Manufacturing Dates		Average Count	CFU/g
11. AP 1	(08/10)	57.50	5.75×10^8
12. AP2	(03/12)	47.00	4.70×10^8
13. AP3	(10/11)	135.5	1.35×10^9
14. AP4	(07/12)	57.00	5.70×10^8
15. AP5	(01/12)	42.00	4.20×10^8
16.AP6	(06/12)	41.00	4.10×10^8
17. AP7	(08/11)	97.50	9.75×10^8
18. AP8	(03/12)	45.00	4.50×10^8
19. AP 9	(06/11)	46.50	4.65×10^8
20. AP 10	(05/12)	35.00	3.50×10^8

Table 3: Fungal Counts of the baby powders

Samples Manufacturing Dates		Average Count	CFU/g
1. BP1	(07/11)	4.5	4.5×10^5
2. BP 2	(03/12)	5.0	5.0×10^5
3. BP3	(06/10)	3.0	3.0×10^5
4. BP4	(07/11)	1.5	1.5×10^5
5. BP5	(08/11)	6.0	6.0×10^5
6. BP6	(03/12)	5.5	5.5×10^5
7. BP7	(10/09)	3.0	3.0×10^5
8. BP8	(02/12)	5.0	5.0×10^5
9. BP9	(06/10)	1.5	1.5×10^5
10.BP10	(09/11)	4.0	4.0×10^5

Table 4: Fungal Counts of Adult powders

Samples Manufacturing Dates		Average count	Cfu/g
11. AP1	(08/10)	1.5	1.5×10^5
12. AP12	(03/12)	4.0	4.0×10^5
13. AP13	(10/11)	3.5	3.5×10^5
14. AP 14	(07/12)	3.0	3.0×10^5
15. AP15	(01/12)	4.0	4.0×10^5
16. AP16	(06/12)	4.0	4.0×10^5
17. AP17	(08/11)	5.5	5.5×10^5
18. AP18	(03/12)	4.5	4.5×10^5
19. AP19	(06/11)	3.0	3.0×10^5
20. AP 20	(05/12)	3.0	3.0×10^5

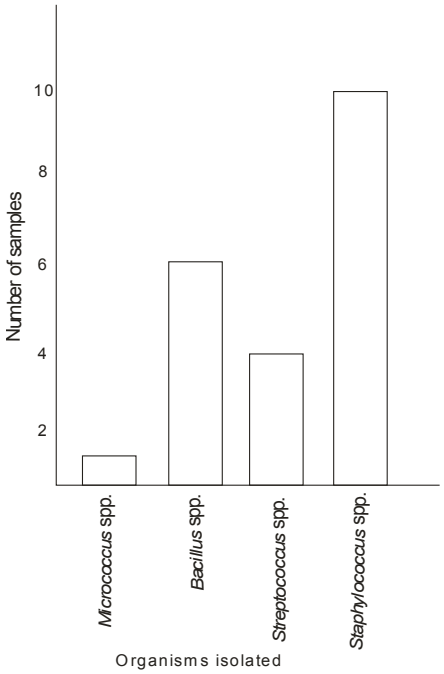

Fig 2:Freqency of occurrence of bacteria isolates from adult powder

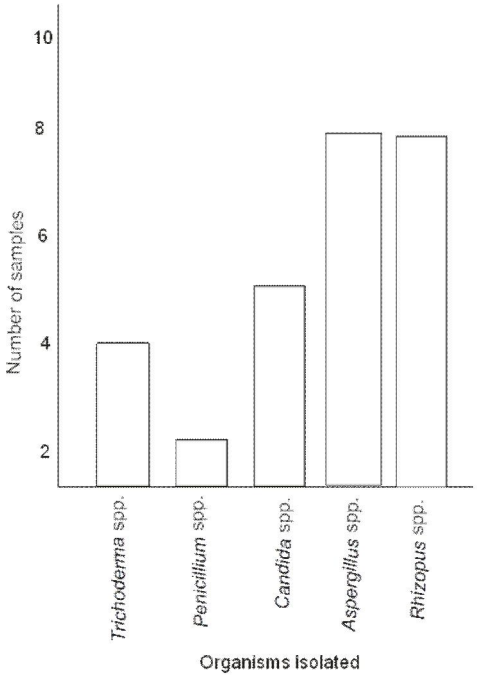

Fig. 3: Frequency of occurrence of fungal isolates in baby powder

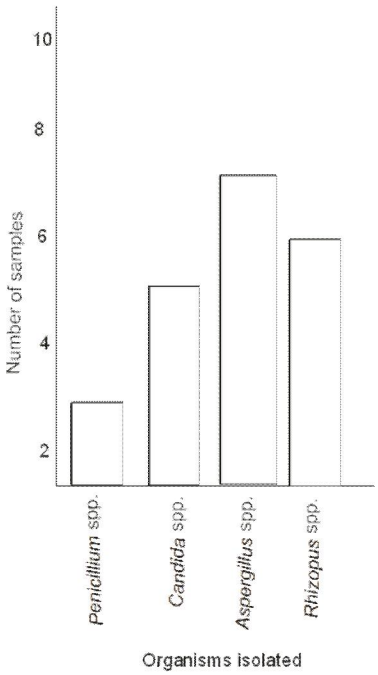

Fig. 4: Frequency of occurrence of fungal isolates in adult powder

Discussion

The frequency of occurrence of bacteria in the total sample shows that all the samples are contaminated with bacteria. Thereby indicating that cosmetic powders can permit the growth of bacteria. Though, from the comparison with the adult powder, it was observed that most of the baby powders were more contaminated with bacteria than the adult powders. It was also observed that gram positive organisms were the predominant contaminants in the powders. Hugbo *et al.,* (2003) isolated *Aspergillus fumigatus*, *Penicillium* spp., *Microsporium* spp. and reported that *Staphylococcus* spp. and other gram positive cocci were the most predorminat; gram negative isolates were hardly found. This leads to a presumption that the powders are more susceptible to gram positive bacteria than gram negative bacteria. The frequency of occurrence of fungi in the total sample shows that all the samples are contaminated with one form of fungi or the other. It also shows that the fungal contaminants are higher in the baby powder than the adult powder. In previous studies, Michael Macvren Dashen *et al.,* (2011) isolated *Staphylococcus aureus*, *Clostridium tetani, Candida albicans, Bacillus spp, Aspergillus niger, Aspergillus fumigatus, Penicillium spp, Rhizopus oligosporus, Fusarium spp.* while Ashour *et al.,* (1989) isolated Staphylococcus aureus, *Escherichia coli*, *Enterobacter agglomerans* and *Citrobacter freundii.* The high bacteria and fungi counts obtained may be due to poor storage, manufacturing practice or handling. Some of the organisms isolated have been

implicated as causative agents of gastroenteritis. The International Microbiological Standard recommended limit for bacteria contaminants in cosmetic products is $1.0x10^3$cfu/g for bacteria, $1.0x\ 10^2$CFU/g for moulds and 0 CFU/g of coliform at the time they reach the consumer. It was observed that both the total bacterial count and the total fungal count of the adult and baby powder values are above the recommended limits. Bacterial contaminants isolated were *Staphylococcus* spp. 40%, *Bacillus* spp. 24%, *Streptococcus* spp. 22%, *Micrococcus* spp. 12% and *Escherichia coli* 2% respectively. Fungal contaminants isolated were *Aspergillus* spp. 45%, *Rhizopus* spp. 24%, *Candida* spp. 15%, *Trichoderma* spp. 7%, *Penicillium* spp. 9% respectively. Isolation of *Bacillus* spp. and *Micrococcus* spp. both free living is an indictment of raw materials used as well as the conditions prevalent on the environment in which the products were manufactured and packaged. while *Escherichia coli* and *Streptococcus* spp. indicates fecal contamination of the water used in the manufacture. Nevertheless, isolation of *Staphylococcus* spp. is a function of personal hygiene on the part of the personnel producing the products since skin is the natural habitat of the organism. *Bacillus* spp. and *Staphylococcus* spp. in cosmetic products causes skin irritation. *E. coli* causes fatal illness to humans including bloody diarrhea and kidney failure. Generally, the results obtained from this study showed that these cosmetic powders were highly contaminated, with the baby powder having the higher contamination. The differences in the manufacturing dates of each product studied, had no significant relevance in the microbial quality as all the samples were sporadically contaminated irrespective of their manufacturing dates. High microbial quality as observed in this study could be caused by air contamination, poor manufacturing practice and improper storage. The conclusion drawn from this study shows that both the adult powder and the baby powder have values capable of causing health hazards due to high microbial loads. This study has also shown that the baby powders are more contaminated than the adult powder. This may be as a result of poor manufacturing practices, poor hygiene, contaminated raw materials or the susceptibility of the ingredients contained in the baby powders.

Recommendation

1. Good manufacturing practices and hygiene must be carried out by manufacturers and personnel.
2. Water must be tested continuously for microbial growth. It might be necessary to sterilize deionized water to obtain a sufficient purity.
3. Raw materials should be tested before use especially those of natural origin.
4. Cosmetic products should be stored in a clean environment to avoid contamination.
5. It is necessary to reassess production processes to ensure that technique capable of reducing microbial contaminations are employed.

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