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Microorganisms associated with human jewellery

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Abstract

Microbes associated with jewellery and some body ornaments such as necklaces, earrings, hand chains, wristwatches, spectacles, rings, bangles and hairclips were investigated. Unused samples were obtained from the Oba Market, Akure, Nigeria to serve as control. Bacteria were found on all the samples collected for individuals while three out of the eight control samples had bacterial growth. The bacteria isolated include *Staphylococcus aureus, S. albus, Listeria murrayi, B. cereus, B. subtilis, Pseudomonas aeruginosa* and *Rothia dentocariosa*. No fungus was isolated from spectacles samples. Percentage occurrence of the fungal isolates from various samples were as follows: *Aspergillus niger* 75%, *A. flavus* 25%, *Diplococcium* sp. 25%, *Articulospora* sp. 50%, *Alternaria* sp. 38%, *Geotrichum* sp. 75%, *Acaulopage microspora* 12.5% and *Penicillum* sp. 38%. The bacterial load of the handchain was the highest, (9.6 x 10^4 cfu/ml), followed by wristwatches (8.4 x 10^4 cfu/ml), earrings (4.6 x 10^4 cfu/ml), necklace (4.4 x 10^4 cfu/ml), and bangles (4.0 x 10^4 cfu/ml) and ring (2.6 x 10^4 cfu/ml).

Key words: Jewellery, human being, microorganisms, microbial loads.

Introduction

Metals mostly used for jewellery, gold and silver, are indestructible and permanent in air and water under all conditions of temperature[1], but some of these metals are found to rust after some time of use. Normal flora of the human skin includes those microbes that are harmless and for the most part they do not cause disease and are even beneficial, most are commensals and therefore benefit from the association with the host but the host is not affected[2]. As long as the skin is physically and functionally intact, the tough, flexible and inert covering is remarkably resistant to infections. The normal skin flora found on most sites in adult are limited to Staphylococci and Diphtheroids[3,4]. When sweat is released on the skin, part of it is absorbed by the jewellery material and careless sanitization of the jewellery materials will encourage accumulation of sweat and growth of microorganisms some of which may be the normal flora of the skin[5]. It has been reported that *Bacillus sp.* may be resident on the skin of adults where washing facilities are reduced[6]; thus presence of *Bacillus* could be attributed to the uncleanliness of the individual putting on jewellery. Some food poisoning cases that had been reported could be traced to an infected food handler[7]. The present work was undertaken to determine the microbial load and types on the various jewellery with a view to providing relevant health information on this.

Materials and Methods

Samples of jewellery were collected from individuals which include students, civil servants and traders in Federal University of Technology, Akure and the immediate environment. Samples such as earrings, rings, necklaces and handchains were collected in sterile McCartney bottles while samples like wristwatches, bangles, spectacles and hairclips were collected using commercially prepared sterile swab sticks. The control samples were bought from Oba market in Akure, Ondo State and were collected in sterile polythene bag and brought to the laboratory aseptically. For each sample, five subsamples were collected.

Serial dilution up to 10^4 was made for each sample previously diluted in 9 ml of sterile 0.1% peptone water. Inoculations were done using both nutrient agar and potato dextrose agar. Plates containing NA were incubated at 37ºC for 24 hours while PDA plates were incubated at 25ºC for 72 hours. Bacterial isolates were identified according to Holt et al. [8] while molds were identified according to Barnet and Hunter[9].

Results

A total of 50 bacteria isolates were obtained and were identified as seven different bacteria species. The organisms were designated A to G and they included *Staphylococcus aureus, S. albus, Listeria murrayi, Bacillus cereus, B. subtilis, Pseudomonas aeruginosa* and *Rothia dentocariosa*. The sources of the bacterial isolates is shown in Table 1 with *Listeria murrayi* having the largest number of occurrence. A total of eight fungi were isolated from the samples and this is shown on Table 2. *Aspergillus niger* had the highest percentage occurrence of 75%. All the samples had fungal growth except for spectacles which had no growth on all the five samples. The bacterial load on all the samples ranges from 2.6 x 10^4 cfu/ml on hairclip to 9.6 x 104 cfu/ml on handchain. Table 3 shows the average bacterial count on the samples. There was a significant difference in the bacterial population of the samples at 5% level (Table 4).

Table 1. Sources of bacterial isolates on the jewellery samples.

A	*Staphylococcus aureus*	WW2, WW5, B3, B2
B	*Staphylococcus epidermidis*	E1, E2, E3, E4, WW2, G1, G2, G4, G5, R1, HaCI
C	*Listeria murrayi*	NL3, NL4, NC5, WW5, WW2, B1, B2, B4, R3, R4, HaC4, E1, E2, NL1, E5, WW3, HaC2
D	*Bacillus cereus*	NL1, B5
E	*Bacillus subtilis*	E1, E2, HaC2, HaC3, NL5
F	*Pseudomonas aeruginosa*	HaC1, HaC5,
G	*Rothia dentocariosa*	HC1, HC2, HC3, G3, G5, E1, E4, WW3.

Note: 1,2,3,4,5 indicate the number of samples. Control samples of earing, hairclip and ring had *Bacillus sp* growth.
Legend : E = earings; NL = necklace; WW = wristwatch; HC = hair clip; Glasses/spectacles; B = bangles; R = ring; HaC = handchain.

Table 2. Percentage occurrence of fungi in jewellery and other body ornaments sampled.

Fungi	Ring	Earrings	Necklace	Wristwatch	Hairclip	Spectacles	Bangles	Hand chain	% Occurrence
A	+	-	+	+	-	+	+	+	75
B	+	-	+	-	-	-	-	-	25
C	-	+	-	+	-	-	+	-	25
D	-	-	-	+	-	+	+	+	50
E	+	-	-	+	.	+	-	+	38
F	+	+	+	-	-	+	+	+	75
G	-	+	-	-	-	-	+	-	12.5
H	+	-	-	+	-	-	-	-	38

A *Aspergillus niger*, B *Aspergillus flavus*, C *Diplococcium sp*., D *Articulospora* sp., E *Alternaria sp.,* F *Geotrichum sp*., G *Acaulopage microspora,* H *Penicillium sp*

Table 3. Average bacterial count of the bacterial population of the jewellery and body ornament samples.

Sample	Mean value
Earring	$4.6 \times 10^4 \pm 8000$
Necklace	$4.4 \times 10^4 \pm 10198$
Wristwatch	$8.4 \times 10^4 \pm 10198$
Hair-clip	$2.6 \times 10^4 \pm 13565$
Spectacles	$3.0 \times 10^4 \pm 6325$
Bangles	$4.0 \times 10^4 \pm 10954$
Ring	$4.0 \times 10^4 \pm 8944$
Handchain	$9.6 \times 10^4 \pm 8000$

Table 4. Analysis of variance for the bacterial population of the jewellery and other body ornaments sample.

SV	SS	Df	MS	F	F(air)
Between group	1.5380	7	0.2197	13.352	2.317
Within group	0.5198	32	0.0162		
Total	2.0578	39			

Discussion

The species of bacteria and mold isolated in this study ranged from diphtheroids and staphylococci which is similar to the reports given by Smith[3] and Kligman[4] that these species of bacteria are commonly found on most sites in adult. Samples of handchain and wristwatch were found to have the highest microbial load and this could be due to the fact that these two samples are always removed either before washing or bathing and they do not usually come in contact with water or soap. The accumulation of sweat on these samples can support microbial growth. Samples such as earring, necklace, hairclip and spectacles which are sometimes washed had lesser bacterial load. This corresponds with Ronald[5] who reported that proper cleanliness habits and good hygienic practices tend to prevent the establishment of non-indigenous microorganisms among the natural skin microflora by preventing the build–up of excessive concentrations of organic matter.

Bacillus subtilis and *B. cereus* were isolated from some samples and this is in agreement with Christie[6] who reported that *Bacillus sp*. may become resident on the skin of adults, where washing facilities are reduced. Thus presence of *Bacillus sp*. could be attributed to the uncleanliness of the individuals putting on jewellery. *S. aureus* was isolated from some samples of wristwatches and bangles. The growth of this bacteria can be encouraged by sweat which contains some salt and *S. aureus* is salt tolerant. Nasal carriage of *S. aureus* had been reported so this could be a source of the bacteria on the jewellery. Both *Bacillus cereus* and *S. aureus* isolated from samples have been implicated in food poisoning. These bacteria are pathogens when they find their way into food and the health of the consumer is at stake. Thomas and Michael[7] reported that these bacteria are known to cause food poisoning, and staphylococcal food poisoning occur through an infected food handler. Some of the fungi isolated are of significance to human health. *Aspergillus sp*. is responsible for a disease called aspergillosis while *A. flavus* is known to produce aflatoxin which is deadly to human when consumed.

Microorganisms including to the normal body flora that were isolated, such as, *Listeria murrayi*, are not likely to cause disease but when the skin is broken the normal body flora could become opportunistic, and then cause diseases. This is in agreement with the findings of Holt et al.,[8] who reported that some normal flora microbes can become opportunistic pathogens, which may cause infection if tissue injury occurs at specific sites or if the resistance of the body to infection is reduced.

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