Study of bacterial, fungal, and parasitic contaminaiton of currency notes in circulation

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Abstract: *A total of 100 currency notes of various denominations in circulation were randomly studied for bacterial, fungal and protozoal contamination. All except four notes yielded one or more bacteria. Bacterial culture yielded single isolate in 33 notes, two in 44 notes, three in 12 notes and four in 7 notes. The predominant bacterial isolate was Bacillus sps followed by Coagulase negative Staphylococci and Micrococcus sps. Other bacteria that are either potential or confirmed pathogens included K. pneumoniae, E. coli, S. aureus, Pseudomonas sps and S. typhi. Only two notes were positive for Acid fast bacilli. 28 samples did not yield any fungal growth. Overall 118 fungal isolates were isolated, of which 34 could not be identified. All the fungi isolated were saprophytes. Saline and Iodine wet mount did not reveal any parasitic forms. We recommend that currency notes must be handled with caution.*

KeyWords: currency notes, paper currency

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Introduction

Money, whether in the form of coins or paper notes is perhaps the most widely handled article by people everyday throughout the world. Since people from all walks of life handle them, they are bound to get contaminated, either from the environment or from the persons handling them. This study was undertaken to detect not only the bacterial and fungal flora but also parasitic forms.

Materials and Methods

A total of 100 currency notes of denominations 1 (6), 2 (5), 5 (25), 10 (35), 20 (10), 50 (17) and 100 (2) in circulation were randomly collected at different times. Coins were excluded from the study. Persons handling the notes were asked to deposit them in sterile envelopes. The notes were taken to the laboratory immediately, picked from the envelope with sterile forceps and immersed into a test tube containing 10 ml of sterile normal saline. The tubes were shaken intermittently over a period of 45 minutes to facilitate dispersion into the saline. The tubes were then centrifuged at 3000 rpm for 10 minutes. The supernatant was discarded and the sediment was taken for saline wet mount, iodine wet mount, smear for acid fast staining and culture. Bacterial and fungal colonies were identified by standard techniques[1]. The sediments were subjected to both saline wet mount and Iodine wet mount to look for helminthic eggs and protozoal cysts. The smears were stained by Ziehl Neelsen technique.

Observations

Of the 100 notes subjected to bacterial culture, 4 did not yield any growth. Thirty three notes yielded single isolate, 44 notes yielded two isolates, 12 notes yielded three isolates and 7 notes yielded four isolates. The most common isolate was *Bacillus* sps (89) followed by Coagulase negative Staphylococci (24) and *Micrococcus* sps (18). The potential and confirmed pathogens included *Klebsiella pneumoniae* (8), *Escherichia coli* (7), *Acinetobacter* sps (6), *Pseudomonas* sps (4), *Staphylococcus aureus* (4) and *Salmonella typhi* (1). Other isolates included *Citrobacter freundii* (3), *Serratia marcescens* (2), *Brevibacterium* sps (1), *Budvicia* sps (1), *Erwinia* sps (1), *Ewingella* sps (1) and diphtheriodes (1).

Discussion

The rate of culture positivity was reported 78%[2], 94%[5] compared to 96% in the present study. Most studies showed the presence of Gram positive aerobic spore bearing bacilli; 100%[2], 91%[3] and 89% in the present study. Most studies indicated contamination of currency from the environment or the person's skin. Isolation of bacteria by various authors include gram positive anaerobic spore bearers[2], *Salmonella*[2,4], *Shigella*[2,3], *Enterococcus*[3], *Corynebacterium*[3], *Streptococcus pneumoniae*[3], *Proteus* [3,5,6], Enterotoxigenic *E. coli* and *Vibrio*[4]. While most studies concentrated on detecting and identifying the

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isolates, one study[4] counted the total bacteria and fecal coliforms on currency notes. Two other studies had isolated fungi and had detected *Candida albicans*[6], *Aspergillus*[2, 6], *Penicillium, Rhizopus* and *Fusarium*[2]. One study[2] indicated the detection of acid fast bacilli in two samples, but were found to be saprophytic.

Conclusion

If the currency notes get contaminated with pathogen or potential pathogen, then there is a risk of its transmission and subsequent infection. The practice of applying saliva on fingers for counting notes, keeping the coins in mouth by children, handling the currency by food handlers should at best be avoided. However, it is not known if these indeed serve as a mode of transmission. Regular disinfection of currency in bank by exposing to UV rays or fumigation has been wisely suggested[6]. With the contamination of currency notes being high one must exercise caution while handling them.

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