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BACTERIAL CONTAMINATION OF INDIAN PAPER CURRENCY AND COINS

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ABSTRACT

Paper currency and coins serves as vehicles for the transmission of microorganisms since people of all categories use them. This may be due to the deposition of the moisture on the paper currencies, which provides a favourable condition for the microorganisms to grow on it. The objective of this study was to identify the microorganisms present on the currency notes and coins circulating in the community. A total of 30 currency notes and 30 coins were randomly collected from people of different categories. Microorganisms were identified using standardized microbiological techniques. Microorganisms were isolated from 100% of currency notes and 90% from coins. Our studies has shown the presence of various pathogenic microorganism such as *E.coli, Klebsiella, S.aureus* and *Acinetobacter* which are known to be involved in transmitting diseases in the community. The presence of high microbial load on currency notes and coins reveals that we must pay special attention while handling money.

KEYWORDS: Paper currency, *E. coli, Klebsiella, S. aureus* and *Acinetobacter.*

INTRODUCTION

Indian paper currency is commonly contaminated with pathogenic bacteria and this contamination may play a significant role in the transmission of different diseases. People and government are relevant about spread of pathogens through food, air, water and have taken enough steps to control it. But, they are not aware about the possibility of acquiring infection while applying saliva on fingers for counting currency notes which are widely

exchanged from hand to hand represents a universal medium for transmission of microbes in the environment and among humans.[1] Paper currency can be contaminated by droplets during coughing, sneezing, touching with previously contaminated hands or other materials and placement on dirty surface. Paper currency is commonly handled by various categories of people during transaction.[2]

Microbial contaminants may be transmitted directly, through hand- to-hand contact, or indirectly, via food or other inanimate objects. As a result, hand hygiene is considered critical for preventing food outbreaks and healthcare-associated infections. However, only few data are available about the types of patient care activities that are able to transmit the patient flora to healthcare workers' hands. In addition, it remains unclear how long bacteria can survive on paper or how many organisms may be transferred in a full hand to paper to hand transmission cycle.[3]

Contamination of objects by pathogenic microorganisms is of much public health concern as contaminated materials can be sources of transmitting pathogens. Studies of the contamination of money with microbial agents is lacking in most developing countries shortage of information may contribute to the absence of public health policies regarding currency usage, handling and circulation.[4]

Recent study conducted by Bandaru et al (2016), from Tamil Nadu observed that 89% and 11% of their samples shows the growth of bacteria and fungus respectively.[5] Another study by Dehghani M et al from Iran observed that Currencies with different denominations collected from people of various categories i.e., butchers, fish mongers, sweepers, roadside vendors, carpenters has shown the presence of various pathogenic microorganisms. Most of the dirty paper currencies which were collected mainly from the butchers, sweepers & fish mongers were found to be carrying most the pathogenic microorganisms.[6] The present study was intended to isolate and identify the bacteria present on the currency notes and coins circulating in community.

MATERIALS AND METHODS

The study was carried outinSchool of Health Sciences, Kannur University, Kerala, over the period of January to May 2015. A total of sixty currencies (thirty notes and thirty coins) were randomly collected from different people in the community. These notes and coins were collected in sterile envelops and transported immediately to the laboratory. A sterile, cotton

tipped swab moistened with sterile physiological saline was used to swab both sides of the currency note and coins. The swabs were directly inoculated on blood agar and Mac Conkey agar. The pairs of inoculated media were incubated aerobically at 37^0C for 24 hours and then examined for bacterial growth. The isolated bacteria was then identified as per standard techniques such as Gram staining, catalase test, coagulase tests, oxidase tests, hemolysis, sugar fermentation, and other biochemical tests, including tests for indole production, citrate utilization and urease activity; triple sugar iron (TSI) agar tests as per standard microbiological techniques.

RESULTS AND DISCUSSION

From the total of 30 currency notes and 30 coins analyzed, Microorganisms were isolated from 100% of currency notes and 90% from coins. The samples were collected randomly from people of different categories. Table 1 depicts the sampling distribution of currencies from Open Market, Milk Parlour, Food Vendors, Fish Market and from Banks.

Table 1: depicts the sampling distribution of currencies.

Sampling Distribution	Paper Note Samples			Coin Samples		
	Rs.5	Rs. 10	Rs. 50	Rs.1	Rs. 2	Rs.5
Open Market	2	4	-	4	-	2
Milk Parlour	4	-	2	2	4	-
Food Vendors	2	2	2	4	-	2
Fish Market	2	4	-	4	2	-
Banks	2	-	4	-	2	4

Of the sixty currencies and coins subjected to culture, all the currencies and coins obtained from various sources were contaminated with bacteria. From this study four different bacterial species were isolated.

Table 2: represents the isolation of bacteria from currencies.

Relative occurrence of bacterial species on currency note/coin in circulation.							
Bacterial Species	Currency note			Coins			Total
	Rs. 5	Rs. 10	Rs. 50	Rs.1	Rs. 2	Rs.5	
No Growth	-	-	-	-	-	-	-
Escherichia.coli	12	8	6	10	8	6	50 (50%)
Klebsiella	6	4	2	6	4	2	24 (24 %)
Staphylococcus species	2	4	4	6	2	2	20 (20%)
Acinetobacter	2	2	2	2	-	-	8(8%)

In our study it was observed that *Escherichia coli* was predominant isolates (50%)which is

the most faecal contaminant, followed by *Klebsiella*(24%) and *Staphylococcus spp*(20%). *Acinetobacter* (8%) also isolated from the samples. None of the samples was free of microorganism. Enteric pathogens like *Salmonella* and *shigella*species were not detected in the samples screened. The bacteriological analysis found a high prevalence of contamination, with the highest prevalence observed among currency notes and coins obtained from fish market and open air market.

Many studies from different part of world shows that both Indian currency notes and coins were contaminated with Gram positive and Gram negative bacteria. *E. coli* is usually non pathogenic, but some strains can cause serious (potentially fatal) food-poisoning. It also causes urinary tract infections, community-acquired pneumonia, sepsis and recurrent meningitis. *Klebsiella spp* can cause fatal acute bacterial myocarditis, pneumonia, meningitis, urinary tract infections and wound infections. It is an important nosocomial and pathogenic bacterium that causes opportunistic infections in skin and other tissues. *S. aureus* can cause a range of illnesses, from minor skin infections such as pimples, impetigo boils, food poisoning and abscesses, to life-threatening diseases such as pneumonia, meningitis, osteomyelitis, endocarditis, toxic shock syndrome (TSS), and septicemia. *Staphylococcus epidermidis* is usually non pathogenic but can cause infection in patients whose immune system is compromised. *Acinetobacter* have been associated with a variety of nosocomial infections including pneumonia, meningitis, urinary tract infections, skin and wound infections and septicemia.[7]

CONCLUSION

The isolation of bacterial agents from notes and coins in the study reported here confirmed that currency might be a vector playing an important role in the transmission of pathogenic microorganism in the community. Therefore handling of paper currency and coins deserve special attention. The practice of licking or applying saliva to the fingers while counting money is an important potential route of exposure to enteric pathogen. The evidence for the presence of pathogenic bacteria on money reinforces the need for strict hygienic practices among money handlers who also handle food and water.

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