



MICROBIAL CONTAMINATION OF CURRENCY NOTES IN CIRCULATION

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ABSTRACT

Currency is very important to our life as it facilitates the needs of common man. Paper currency is widely exchanged for goods and services in countries worldwide. It is used for all type of commerce. Paper currency provides a large surface area as a breeding ground for pathogens. Currency notes could carry potentially pathogenic organisms.

Paper currency, an exchangeable fomite, is constantly subjected to contamination. The species of this study was to identify the micro-organisms present on the currency notes circulating in buldana district. A total of 40 currency notes (Rs.10, Rs.20, Rs.50 and Rs.100) were randomly collected from bank, Municipal Corporation, food sellers, butchers, hospital.

Persons handling the notes were asked to deposit them in sterile envelopes. The notes were taken to the laboratory immediately and microorganisms isolated by using Eosin methylene blue agar, mannitol salt agar, Bismuth sulfite agar and Cetrimide agar.

All the notes collected during this study were contaminated by micro-organisms. Species isolated were *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi* and *pseudomonas aeruginosa*.

The currencies used by public (bank, hospital, Municipal Corporation) in India were found to be extremely contaminated with various pathogenic bacteria followed by the currency used by butchers and food sellers. Infected currency was identified as a potential public health hazard, as pathogens

could spread by circulating the contaminated notes. We recommend that currency notes must be handled with caution.

Keywords: Buldana currency notes, pathogenic microorganisms, contamination.

INTRODUCTION

Microorganisms are known to spread via air, water, food etc. an important mechanism of the spread of pathogens by fomites. Paper currency is widely exchanged for goods and services in countries worldwide.

It is used for every type of commerce. Accumulated data obtained over the last 20 years on the microbial status and survival of pathogen on currency notes indicate that this could represent a potential cause of sporadic cases of food borne illness. The paper currency notes may harbor various deadly pathogenic microorganisms. Currency in the form of notes represents a universal medium for the transmission of bacteria in the environment and among humans.

There is a possibility that currency notes might act as environmental vehicles for the transmission of potential pathogenic microorganisms. An individual living in unhygienic conditions having unhygienic habits will contaminate the notes with bacteria e.g. habits such as using saliva to count the paper notes also leads to the contamination and these notes will act as a vehicle delivering bacteria to contaminate the hands of the next user. The currencies act as a tool for easy transfer of bacteria and thus cross contamination takes places.

The possibility that currency notes might act as environmental vehicles for transmission of potential pathogenic microorganisms. Various pathogens related with throat infection, pneumonia, tonsillitis peptic ulcers, urogenital tract infection, gastro enteritis and lung abscess had been reported.

	<i>cus aureus</i>	Agar		
3	<i>Salmonella typhi</i>	Bismuth Sulfide Agar	08	20 %
4	<i>Pseudomona s aeruginosa</i>	Cetrimid e Agar	05	12.5 %

MATERIALS AND METHODS

Sample collection:

A total of 40 currency notes were randomly collected from people like butchers, food sellers, bank, hospital and municipal corporation workers. The currency collected and used were Rs.10, Rs.20, Rs.50 and Rs.100. To collect the currency notes, the individuals were asked to drop currency or money into a sterile plastic packet, which were sealed and immediately transported to the lab for microbial analysis.

Isolation of Microbes:

Cotton swabs moisturized with nutrient broth sterilized. The sterile cotton swab rubbed onto both surfaces of currency notes and then inoculated onto:

- 1) Mannitol Salt Agar - For isolation of *Staphylococcus aureus*
- 2) Bismuth Sulfide Agar - For isolation of *Salmonella typhi*
- 3) Eosin Methylene Blue agar - For isolation of *Escherichia coli*
- 4) Cetrimide Agar - For isolation of *Pseudomonas aeruginosa*

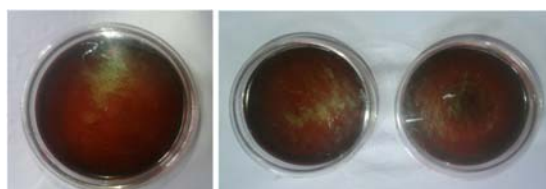
All the plates incubated at 37 c for 24 hours.

OBSERVATION

TABLE I
GROWTHS OF MICROORGANISMS ARE OBSERVED AS FOLLOWS.

Sr . No	Pathogenic organism	Nutrien t medium	Numbe r of curren cy notes positiv e	Percenta ge
1	<i>Escherichia coli</i>	Eosin Methyle ne Blue agar	14	35 %
2	<i>Staphylococ</i>	Mannito l Salt	10	25 %

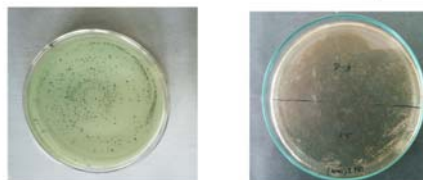
There were total 40 samples inoculated. After incubation, On Mannitol salt agar yellow colonies with yellow zones and pink colonies appears that shows the presence of *Staphylococcus aureus*. On Bismuth sulfide agar black color colonies appears that shows the presence of *Salmonella typhi*. On Eosin methylene blue agar, small pink and green metallic sheen colonies are appear that shows the presence of *Escherichia coli*. On cetrimide agar, bluish tinge colonies appear that shows the presence of *Pseudomonas aeruginosa*



Growth of *E. coli* on EMB



Growth of *S.aureus* on Mannitol salt agar

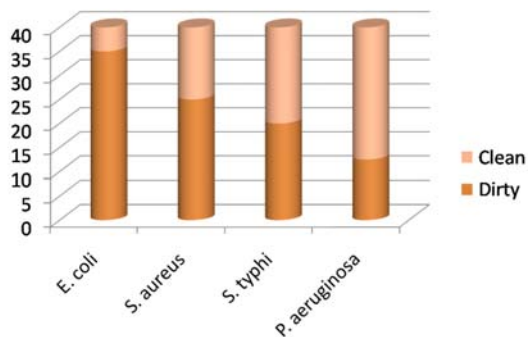


Growth of *S.typhi* on Bismuth sulfite agar Growth of *Paeruginosa* on Cetrimide agar

RESULTS AND DISCUSSION

Total 40 currency notes samples studies for isolation of pathogenic microorganisms. The percentage of *E.coli* is higher and *Pseudomonas aeruginosa* is lower. The currency notes also contains *Salmonella typhi* and *Staphylococcus aureu*. This isolation of pathogenic microorganisms on currency notes indicates that there are chances of transmission of pathogen

among people. Thus creates a problem of community health.



(Chart I) Percentages of pathogenic organism

Staphylococcus aureus produces golden yellow color colonies on Mannitol Salt agar. *Salmonella typhi* produces black colonies on Bismuth Sulfide Agar. *E.coli.* produces greenish metallic sheen growth on Eosin Methylene Blue agar. *Pseudomonas aeruginosa* produces colonies with bluish tinge on certrimide agar.

CONCLUSION

From this study it can be concluded that Indian currency is commonly contaminated with pathogenic bacteria and this contamination may play a significant role in the transmission of infectious diseases. Compared to butcher, municipal, hospital and food seller's sample, the bank sample was less contaminated and the recommendations are as below:

- It is recommended that currency notes must be handled with caution and great care especially during the preparation and handling of food to avoid contamination.
- Personal hygiene to reduce risk of infection is recommended especially for those who simultaneously handle food and money.
- Food sellers and butchers, and other common people should be educated to avoid possible cross contamination between currency notes and food.
- There should be public awareness of the fact that currency notes could be a source of infection and could be dangerous to health.
- Regular microbial testing of currency notes and establishment of method for

large scale replacement of contaminated currency should be employed.

- Introduction of plastic currency notes which can be washed easily as in Australia can serve as an alternate.

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