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Coliform Contamination on different Paper Currency in Ajmer, Rajasthan, India

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Abstract:

Microorganisms are known to spread via air, water, food etc. an important mechanism of the spread of pathogens by formites. Food, water and soil borne infection are estimated to be affecting almost half of the world population. Paper currency notes which are transferred from one individual to other are known to carry bacteria on their surface and are responsible for transmitting them. These notes are susceptible to bacterial contamination during contaminate handing from person to person. An individual living in unhygienic conditions having unhygienic habits will contaminate the notes with bacteria e.g. habits such as using soling 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. Diseases continue to be a cause of major concern to human health in several part of the globe including in India, causing high morbidity, mortality and economic losses. Diseases that are transmittable contribute to paper currency this statistics by affecting human health and causing heavy looses directly or indirectly to economy. The aim of the present study was to ascertain the incidence and transmittance of microbes analysis from the paper currency collected from different regions of Ajmer and the presence of *Escherichiacoli*, *Enterobacter spp*. has been observed in the studied samples thereby highlighting the role of paper currency in spread of diseases.

Keyword: Bacterial contamination, *Enterobacter*, *Escherichiacoli*, Pathogens, Indian Paper currency

1.0 Introduction:

Microorganisms are known to spread via air, water, food etc. an important mechanism of the spread of pathogens by formites. Paper currency notes which are transferred from one individual to other are known to carry bacteria (Hosen, 2006) on their surface and are responsible for transmitting them. These notes are susceptible to bacterial contamination during contaminate handing from person to person. Uneke and Ogbu (2007), Studied that paper currency was widely exchanged for goods and services in countries worldwide. Ghanaian currency notes in circulation were found to be contaminated with pathogenic microorganisms which can spread human diseases (Patrick Feglo and Michael Nkansah; 2010). In India Basavarajappa et al., (2005), studied on bacterial, fungal, and parasitic contaminaiton of currency notes in circulation.

An individual living in unhygienic conditions having unhygienic habits will contaminate the notes with bacteria e.g. habits such as using soling 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 money makes for easy transfer of bacterial and thus cross contamination (Tagoe et al., 2011). *E. coli* appeared to have the least percentage of bacteria, isolating it goes to confirm other reports that currency notes can be commonly contaminated with enteropathogens (Umeh et al., 2007; Larkin et al., 2009) and, the notion that, currency notes represent a reservoir of enteric diseases (Udo et al., 1999).

Storage of these notes in polythenes, cotton, leather bags in humid and dark conditions also favour the growth of bacteria on these notes. It is possible to detect the presence of particular bacteria on these notes by isolating the pathogenic bacteria on their respective growth media followed by their identification by polyphasic approach. However, this is too laborious. Hence, the most common approach is to look for indicator. E. coli is one such bacterium which is used as an indicator organism for fecal

contamination of water. It is a Gram negative aerobic or facultative anaerobic non spore forming bacteria that ferment lactose with the production of acid and gas presence of E. coli in a water or food sample indicator the fecal contamination and also suggested that other pathogenic enteric bacterium may also be present in the sample. Many researchers examined that the transferring of bacteria from currency notes to humans through food (Lamichhane et al., 2009; Ministry of Health, 2007; Reither et al., 2007). In the present study the presence of coli form have been used as an indicator of contamination of currency notes obtained from various groups of people belonging to weaker social and economic status living in Ajmer Rajasthan (India).

2.0 Material and Methods:

2.1 Sample Collection:

Sample was collected from many social status people at different part of Ajmer as their work place. Currency notes were obtained from various groups of people namely Tempo driver, Beggar, Washer man, Butcher and Rickshaw driver. Rupees ten currency notes were obtained from individual and data including parameters such as age, income, material, status etc. The individuals were asked to put the currency notes into the sterile polythene bag; notes were not touched by the researcher using bare hands at any stage. In view of the rupees ten obtained the individual were given a different Rs 10/- notes by the researchers. Notes obtained were analyzed for the presence of coliform and the reaction was started on the same day of the collection of notes. Collection of notes was carried out between 14 07- 2008 to 22 -02- 2009.

2.2 Experiment Work and Methodology:

The coliforms were detected on the basis of fermentation of lactose as shown by Hosen et al., 2006 with a slight modification and Experiments was followed by K. R. Aneja (2009). Notes were soaked in 5ml sterile distilled water. On the other hand, 25ml lactose bromo cresole purple (BCP) broth was prepared and after proper sterilization, 5ml sample was aseptically added. It was mixed properly and transferred in three replicate tubes, which was then further placed to flask containing sterile 25ml of lactose bromocresole purple (BCP) broth following by vigorous mixing this media was disposed equally in 3 sterile 30ml test tubes each having an inverted Durham's tubes lactose bromocresole purple media. These tubes were incubated at 37˚C for 24-48 hours. These tubes observed for acid and gas production tubes giving positive reaction were used further 10ml of inoculums was streaked in eosin methylene blue (EMB) agar and incubated at 37˚C for 24 hours. One loopful inoculums was transferred to a fresh 30ml tube having inverted Durham's tube and 10ml LBCP. These tubes were incubated at 45˚C for 24 hours and were observed for gas and acid production. These notes were obtained for typical colonies having dark center and green metallic sheen, indicative of the presence of E. coli. Gram staining of such colonies was carried out. A portion of gram negative colony was then transferred to a fresh tube of LBCP with Durham's tube and observations regarding acid and gas production were recorded. Slants were also prepared for the colonies showing positive reaction for gas and production.

3.0 Result and Discussions:

The confirmative test conducted showed small colonies with dark black centres and greenish metallic sheen and large pinkish mucoid colonies with dark centres but rare colonies were produced by *E.coli* and *Enterobacter*, Aerogens, respectively (Pelczar et al 1998). The characteristic colonies further produced gas in the complete test and were found as Gram –ve bacilli and nonsporulated and thus, met the typical features of coliform. 10 samples were collected from butcher man and rickshaw driver found at 37˚C up to 80 and 90% positive respectively and at 45˚C 4 and 2 sample gave positive result. Samples were collect from beggar showed positive result in 3 samples out of 10 at 37˚C as 30%. In case of tempo driver 1 sample was showed positive result (table). All the samples were compared with control (Bank Note). Some bacteria isolates, such as *S. aureus* and *S. dysenteriae* are pathogenic microorganisms which can cross contaminate food, supporting reports from other parts of the world that paper currency are usually contaminated by microorganism that can cause a wide range of diseases (Umeh et al., 2007; El-Sakka et al., 2005; Kuria et al., 2009).

Table 1: Bacterial contamination in paper currency collected from various groups.

No.	Sample size	Sample From	+Ve At 37˚C	-Ve at 37˚C	% +Ve at 37˚C	45˚C	% +Ve at 45˚C	Control Bank Currency
1	10	Tempo driver	1	09	10	0	0	0
2	10	Beggar	3	07	30	0	0	0
3	10	Washer man	6	04	60	1	10	0
4	10	Butcher	8	02	80	4	40	0
5	10	Rickshaw driver	9	01	90	2	20	0

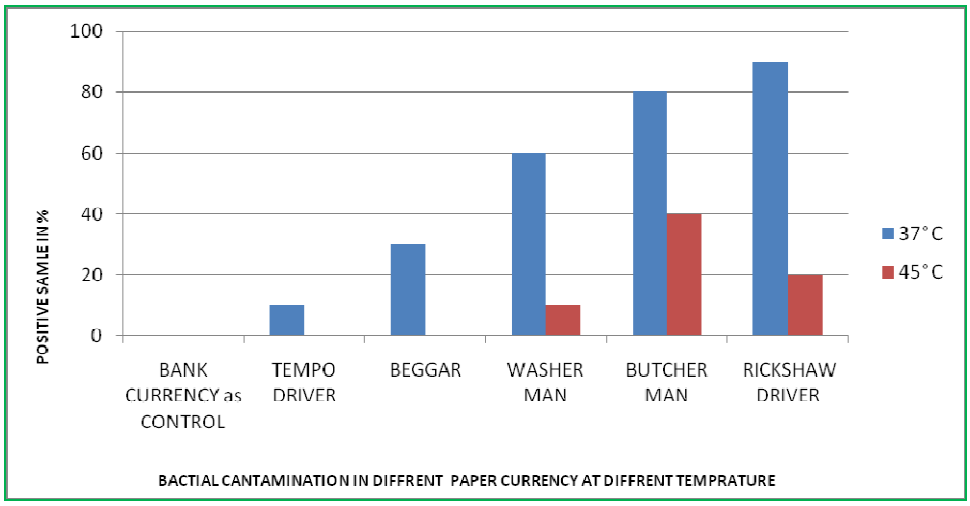

Fig. 2: Graphical representation showing the bacterial contamination on different Social status at different temperature

A) Bacterial colony on EMB **B) Isolated E-coli bacteria**

Fig.3: Showing bacterial growth on EMB and Isolated *E- coli* bacteria

Fig. 4: Indian paper currency (Ten Rupees) showing enlarge image with contamination

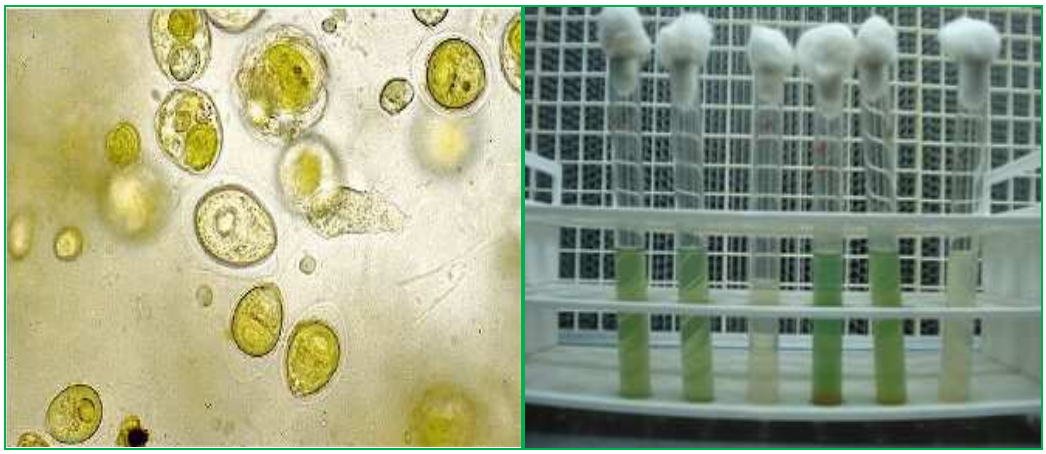

Fig. 5: Showing general image of coliform and biochemical estimation

4.0 Conclusion:

In this work we focused on contamination of currency notes obtained from various group of people belonging to weaker social and economic status living in Ajmer city in Rajsthan, India.

On the basis of confirmative test we found out that rickshaw driver, butcher man, and beggar contamination on paper currency note were positive. But in case of tempo driver 1 sample out of ten were positive and 9 samples were showed negative result comparative then newly Indian bank paper currency.

The Indian currency notes in circulation were found to be contaminated with various types of microorganisms. Food sellers should be educated and have awareness to avoid possible cross contamination between currency notes and food by avoiding handling currency notes as they sell. There should be public awareness of the fact that currency notes could be a source of infection and dangerous to health.

5.0 Acknowledgement:

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