

## A MICROBIAL INVESTIGATION INTO THE HYGIENE STATUS OF THE DRAWERS USED FOR KEEPING CURRENCY BY VARIOUS PROFESSIONALS

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### Abstract

**Introduction:** Money, whether in the form of coins or paper notes is perhaps the most widely handled article by people everyday throughout the world. The current study was planned to detect the bacterial contamination in the drawers of various professionals where they keep their money.

**Materials & Methods:** The samples were collected from drawers of vendors for vegetables, fruits, drawer of butcher, & cobbler. Culture plates were observed for growth and bacterial isolates were characterized on the basis of their cellular morphology, staining (Gram's staining) and biochemical tests.

**Results :** - Bacterial concentration was found to be high in sample taken from drawer of butcher, followed by sample from cobbler in comparison to samples collected from drawers of fruit and vegetables vendors. . The results suggested that sample from drawer of vegetable vendor showed signs of *S.aureus*, *Bacillus* and *E.coli* bacteria. The sample from drawer of fruit vendor demonstrated *S.typhi*, *E.coli* and *Bacillus* bacteria. The sample from butcher's drawer showed *Pseudomonas*, *K.pneumoniae*, *H.influenza* and *S.aureus* bacteria whereas in the sample taken from cobbler' drawer, *Bacillus*, *S.aureus* and *Pseudomonas* were reported.

**Conclusion:** it is evident from results of current study that the drawers where the various vendors keep their currency acts as a reservoir for various microbes and also it plays a vital role in transmission of potential pathogens. There is need to spread awareness among the respective professional regarding hygiene maintenance at their work place including their counters.

**Key words:** Currency, Drawers, Microbial contamination.

### INTRODUCTION

Money, whether in the form of coins or paper notes is perhaps the most widely handled article by people everyday throughout the world. The transfer of paper currency has been the model of economic exchange since its introduction in China circa 1000 AD. In the late 1800s and early 1900s, scientists began to theorize that the transmission of money was associated with the transmission of disease.<sup>1</sup>

Microorganisms are known to spread via air, water, food etc. an important mechanism of the spread of pathogens by fomites. The microbes present in oral micro flora of humans also follow the same mode. Paper currency notes which are transferred from one individual to other are known to carry bacteria<sup>2</sup> on their surface and are responsible for transmitting them. These notes are susceptible to bacterial contamination during contaminate handing from person to person.

There are plenty of studies which have confirmed these theories and have shown that viable pathogenic organisms (viruses, bacteria, and fungi) can be isolated on the surfaces of both paper and coin currency.<sup>3, 4</sup> Contamination of objects by pathogenic microorganisms is of much public health concern as contaminated

materials can be sources of transmitting pathogens. Microbial contamination of paper money is not only confined to developing nations. Several studies from the United States reported contamination of coins and paper bills.<sup>5,6</sup>

But, the assessment of drawers for bacterial contamination where the various professionals keep their currency is not available in the published literature. It can presumably act as reservoir for microbes as it is expected to have the contaminated currency from various sources. Therefore the current study was planned to detect the bacterial contamination in the drawers of various professionals where they keep their money.

### MATERIAL & METHODS

The samples were collected from drawers of vendors for vegetables, fruits, drawer of butcher, & cobbler. Sterile swab was used to collect the sample from site and then immediately placed in sterile test tube containing 0.96% normal saline solution. These swabs were also inoculated into the nutrient broth. Inoculated nutrient broths were incubated at 37°C for 24 h, after which 1ml of the nutrient broth was sub cultured onto solid media –

Nutrient agar, Mac- Conkey's agar and Sabouraud's dextrose agar plates and incubated at 37°C for 24 - 48 h. Culture plates were observed for growth and bacterial isolates were characterized on the basis of their cellular morphology, staining (Gram's staining) and biochemical tests. The following biochemical tests were carried out – MR (Methyl Red) test, VP (Voges Proskauer) test, Catalase test, Oxidase test and Indole production test.<sup>7</sup>

## RESULTS

Microbial examination was carried out for four samples in which all were contaminated. Bacterial concentration was found to be high in sample taken from drawer of butcher, followed by sample from cobbler in comparison to samples collected from drawers of fruit and vegetables vendors.

Table1 shows results of gram staining for the samples in which bacteria are characterized according to gram character (Gram positive & Negative). Sample from drawer of vegetable vendor showed gram positive cocci & bacilli and gram negative bacilli whereas sample from drawer of fruit vendor showed gram positive and negative bacilli. Sample from drawer of butcher showed gram positive cocci & gram negative bacilli and cocci whereas sample from drawer of cobbler showed gram positive cocci and gram negative cocci & bacilli.

Table2 monstates the results of various biochemical tests for the respective samples. The results suggested that sample from drawer of vegetable vendor showed signs of S.aureus, Bacillus and E.coli bacteria. The sample from drawer of fruit vendor demonstrated S.typhi, E.coli and Bacillus bacteria. The sample from butcher's drawer showed Pseudomonas, K.pneumoniae, H.influenza and S.aureus bacteria whereas in the sample taken from cobbler' drawer, Bacillus, S.aureus and Pseudomonas were reported.

Table1. Cellular morphology and gram staining characterization of sample

| Name of sample | Morphology | Gram Staining |
|----------------|------------|---------------|
| Vegetable      | Cocci      | Positive      |
|                | Bacilli    | Positive      |
|                | Bacilli    | Negative      |
| Fruit          | Bacilli    | Positive      |
|                | Bacilli    | Negative      |
| Butcher        | Bacilli    | Negative      |
|                | Cocci      | Positive      |
|                | Cocci      | Negative      |
| Cobbler        | Bacilli    | Positive      |
|                | Cocci      | Positive      |
|                | Cocci      | Negative      |

Table2. Biochemical characterization of the bacterial isolates from each sample

| Name of bacterial isolate       | MR Test | VP Test | Catalase Test | Oxidase Test | Indole Test |
|---------------------------------|---------|---------|---------------|--------------|-------------|
| Vegetable gram positive cocci   | +ve     | +ve     | +ve           | -ve          | -ve         |
| Vegetable gram positive bacilli | -ve     | +ve     | +ve           | +ve          | -ve         |
| Vegetable gram positive cocci   | +ve     | -ve     | +ve           | -ve          | +ve         |
| Fruit gram positive bacilli     | -ve     | +ve     | +ve           | -ve          | -ve         |
| Fruit gram negative bacilli     | +ve     | -ve     | +ve           | -ve          | -ve         |
| Butcher gram negative bacilli   | -ve     | -ve     | +ve           | +ve          | -ve         |
| Butcher gram negative cocci     | -ve     | +ve     | +ve           | -ve          | -ve         |
| Butcher gram positive cocci     | +ve     | +ve     | +ve           | -ve          | -ve         |
| Cobbler gram positive bacilli   | -ve     | +ve     | +ve           | -ve          | -ve         |
| Cobbler gram positive cocci     | +ve     | +ve     | +ve           | -ve          | -ve         |
| Cobbler gram negative cocci     | -ve     | -ve     | +ve           | +ve          | -ve         |

## DISCUSSION

The present study was conducted to report the microbial contamination in the drawers of fruit & vegetable vendors, drawers of butcher and cobbler where they keep their currencies.

After the analysis of samples from each site showed that there are confirmatory signs of microbial contamination. There is no comparable available literature but there are studied which have discussed bacterial contamination of currencies.<sup>8, 9, 10</sup>

The current study has shown high level of microbial contamination among butcher and cobbler samples which can be due to lack of attention to hygiene practices and their way of exchanging currencies. The bacterial species isolated in current study is similar to those found on currency notes in previous studies.<sup>9, 11</sup>

The presence of Staphylococcus species in drawer of vegetable vendor and cobbler have been reported which may be due to rubbing off or may be surfing from a skin flake. Pathogenic Staphylococci harboured either by an asymptomatic carriers or a person with a disease, can be spread by the hands or expelled from the respiratory tract. As saprophytes, Staphylococci are ubiquitous, being found on normal skin and in the nose, mouth and intestine as well as in the air, water, milk and sewage and on fomites. Infections occur when Staphylococci enter the body through breaks, cuts and abrasions in the skin.<sup>12</sup> The Bacillus was reported in samples from fruit & vegetable vendor's and cobbler's drawers in current

study. Bacillus is a vast group of hardy spore forming species that live in soil and are found in the environment could also be transferred on money due to its placement on dirty surfaces or handling with dirty hands. Bacillus produces an emetic exotoxin capable of inducing disease in man.<sup>13</sup> Enteric pathogen i.e. E.coli was reported from drawers of fruit & vegetable vendors which is a serious concern as it has been established that E.coli can survive up to eleven days on inert surfaces.<sup>14</sup>

In conclusion it is evident from results of current study that the drawers where the various vendors keep their currency acts as a reservoir for various microbes and also it plays a vital role in transmission of potential pathogens. There is need to spread awareness among the respective professional regarding hygiene maintenance at their work place including their counters.

In future more complex study using molecular methods would be required to accomplish further investigation on the antibiotic resistance pattern, plasmid profile and pathogenicity of the isolates obtained.

## REFERENCES

- 1.Schaarschmidt. Upon The occurrence of bacteria and minute algae on the surface of paper money. Nature, 30, 360, 1884.
- 2.Hosen JM, Sarif DI, Rahman MM, Azad MAK. Contamination of coliforms in different paper currency notes of Bangladesh. Pak. J.Biol. Sci 2006. 9: 868 - 870.
- 3.Kuria JK, Wahome RG, JobalaminM, Kariuki, SM. Profile Of bacteria and fungi on money coins. East African Medical Journal 2009. 86 (4), 151-155.
- 4.Lamichhane J, Adhikary S, Guatam P, Maharjan R. Risk of Handling Paper Currency in Circulation Chances of Potential Bacterial Transmittance. Nepal Journal of Science and Technology, 10, 161-166, 2009
- 5.Abrams BI,Waterman NG. Dirty money. J. Am. Med. Ass 1972; 219: 1202-1203.
- 6.Gadsby P. Filthy lucre: bugs, drugs and grime hitch a ride on the back of every buck. Discover.1988; 19: 76-84.
- 7.Mac Faddin, JF. In Biochemical Tests for Identification of Medical Bacteria. William and Wilkins. Baltimore, 1980. 2nd edition.
- 8.OO K, Win P, Han A, AYE T. Contamination of currency notes with enteric bacterial pathogens. Diarrhoeal Diseases Research:92-4. 6.
- 9.Pope T, Ender P, Woelk W, Koroscil M, Koroscil T. Bacterial contamination of paper currency. Southern Medical Journal2002;95(12):1408-10. 7.
- 10.Singh D, Thakur K. Microbiological surveillance of currency. Indian Journal of Medical Microbiology2002;20(1):53-5.
- 11.El-Dars FMS, Hassan WH. A preliminary bacterial study of Egyptian paper money. Int. J. Environ. Health Res. 2005; 15: 235-240.
- 12.Pelczer MJ, Reid RD, 1965. Microbiology, 2 Ed. (Mc Graw-Hill, New York) 1958. pp: 446.

13.Silman R, Rahm S, Shales DM. Serious infections caused by Bacillus sp. Medicine.1987; 66: 218-223.

14.Pomerayer RDMC, Gaylarde CC. The influence of temperature on the adhesion of mixed culture of Staphylococcus aureus and Escherichia coli to propylene. Food microbial. 2000;17: 361-365.

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