

Currency Notes and Coins as Potential Vectors for Transmissible Diseases

Maria Jawed¹, Jawed Ahmed Badvi^{2*} and Kulsoom Jawed³

¹Post Graduate Researcher, Liaquat University of Health Sciences, Jamshoro, Pakistan

²Professor and Head of Department of Pathology, Khairpur Medical College, Khairpur, Pakistan

³Senior Lecture, Dow International Medical College, Karachi, Pakistan

***Corresponding Author:** Jawed Ahmed Badvi, Professor and Head of Department of Pathology, Khairpur Medical College, Khairpur, Pakistan.

Received: June 30, 2017; **Published:** September 04, 2017

Abstract

We buy day to day commodities transferring microorganisms from one location to another location, specifically to the depilated and immunocompromised patients who are vulnerable to get diseases. There are several reports of the occurrence of microorganisms, in particular bacteria, on cash banknotes and coins. Modern banknotes are made from a special blend of 75% cotton and 25% linen with small segments of fiber, so 'paper' money is something of an anisomery. The 'paper' is referred to as the substance during the manufacturing process; this is an appropriate name as bacteria require a substrate for growth. Banknotes and coins cause serious health hazard to the community so from this aspect we should choose another source to make the community free from the threat of infection and that is the electronic. This study is designed to provide the first insight to add to the limited body of literature on microbial contamination of currency (Pakistan currency circulating in country, papers as well as coins currency) and to address growing community concerns about the risk associated with microbial contamination and handling of money in the country, and electronic transaction.

Objectives

- To identify the common pathogens residual on circulating Pakistan's currency.
- To prove the Electronic transaction is safest for day to day trade as per criteria.

Keywords: Infection; Pakistan Currency; Microorganisms; ATM; Electronic Transaction

Methodology

Total study 720 samples were taken from different locations i.e. from Bank counter 243 samples, TM Machine 50 samples, Food seller 94 samples Medical store 35 samples, Milk seller 92 samples, Grocery shop 63 samples, Meat shop 80 samples, Road side mechanic 36 samples, Bus conductor 4 samples and from Beggars' 23 sample while study period was from 4.3.2010 to 31.12.2011 all the specimens were processed according to standard methods.

Introduction

Enterobacteriaceae are habitants of human gut, and their nearness in sustenance or on lifeless items is great marker of poor cleanliness. Species from the genera *Enterobacter*, *Klebsiella* and *Escherichia* isolated from banknotes may not themselves cause genuine ailment; be that as it may, their disengagement from cash may show the event of other pathogenic life forms. *Escherichia coli* is a central individual from the fecal coliform gathering and its nearness on banknotes is of general wellbeing [1]. Types of the Gram-negative Family *Pseudomonas*, which can cause genuine crafty diseases, likewise have been isolated from banknotes.

Staphylococcus aureus is the important bacterium, its poisons deliver harmful toxic shock syndrome this bacterium is dwelling on the surface of banknotes. A great number of adult populations carry *Staphylococcus aureus* on their skin, nasal cavity, in septic cuts, boils and spots. The potential role of influenza virus on banknotes in the spread of this disease has been documented. One strain, H3N2, can remain infective for up to 3 days, on banknotes, and other strains may be active for up to 17 days. Typically, humans carrying the influenza virus may shed copious amounts of virus during sneezing; contaminating any money they may be in contact with, Yeast and molds are usually associated with spoilage in foods, but they may also produce toxins that can make us ill and thus their presence on banknotes is also undesirable [1].

Indeed, even the fresh “fiver” of the Bank of England probably has regularly borne the germs of fever in its folds, and the amount all the more, at that point, the oily, stained, and very much thumbled one-pound note, or the paper portion of some outside monetary standards. Higher esteems have unmistakable favorable position that is less ordinarily possessing the packed poor, less took care of and dirtied, along these lines they may maybe as a rule run their circuit without having done much devilishness [2]. This study has exhibited that naira notes could be wellsprings of sully by microbial pathogens [3].

Microbial contaminants may be transmitted either directly, through hand-to-hand contact, or indirect, via food or other inanimate objects. These routes of transmission are of great importance in the health of many populations in developing countries, where the frequency of infection is a general indication of local hygiene and environmental sanitation levels [4]. The possibility that currency notes might act as environmental vehicles for the transmission of potential pathogenic micro-organisms was suggested in the 1970s [5]. Paper currency is widely exchanged for goods and services in countries worldwide. It is used for every type of commerce, from buying milk at a local store to trafficking in sex and drugs. All this trade is hard on currency, with lower denomination notes receiving the most handling because they are exchanged many times [6].

Although paper currency is made to take abuse (up to 4,000 folds in each direction) in most parts of the world, including in Nigeria (where paper currency is a rugged mix of 75% cotton and 25% linen), it lasts less than a few years in circulation [6]. The average U.S. dollar, for instance like most currency notes worldwide lasts a mere 18 months. Paper currency also provides a large surface area as a breeding ground for pathogens [7]. The possibility that currency notes might act as environmental vehicles for the transmission of potential pathogenic micro-organisms was suggested in the 1970s [5].

Micro-organisms on the skin can be transferred from cashiers, salespeople and the general public to the currency notes while handling. Contamination from the anal region, wounds, nasal secretions and aerosols generated by sneezing and coughing are remarkable source of transfer of micro-organisms to currency notes. *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* and *Klebsiella aerogenes* have been reported to survive well on the skin and are known to be transferred from fabrics to hand as well as from hand to fabrics [8]. In this era of HIV pandemic this deserves special attention. On contaminated stethoscopes, *Bacillus* was isolated in 63% followed by coagulase negative *Staphylococci* and *Staphylococcus aureus*. *Candida* species and *Aspergillus* species were detected in 14% and 11% samples respectively. It is advised that regular disinfection of stethoscopes especially in nurseries and intensive care units where these may act as potential source of nosocomial infections. Although there is no direct evidence that presence of micro-organisms on currency results in infection, but still the strategies must be adopted to reduce the contamination of currency [9].

Aims of the Study

- To identify the common pathogens residual on circulating Pakistan’s currency.
- To prove the Electronic transaction is safest for day to day trade.

Materials and Method

720 specimens were taken from various areas i.e. from Bank counter 243 tests, ATM Machine 50 tests, Food vender 94 tests Medical store 35 tests, Milk merchant 92 tests, Grocery shop 63 tests, Meat shop 80 tests, Road side repairman 36 tests, Bus conductor 4 tests

and from Beggars’ 23 test while study period was from 4.3.2010 to 31.1.2011 every one of the examples were prepared by standard techniques.

Inclusion Criteria

- All the money circulating in Pakistan included paper and additionally coins. Mint endorsed cash noticed that had been almost or as of late created and acquired from the Bank.
- Clean portray noticed that had a spotless foam with no conspicuous harm from Bank counter, BANK ATM, Medical stores, sustenance dealers, markets, drain vender, sheep merchant, street side mechanics and transport conductors.
- Dirty/ravaged depicting notes either that were not obviously more than one portion of the first notes/coins or in a such condition that the esteem will be in imitable or harmed, drenched and held together with bits of stick tape, yet not for a situation of coin which indicated extremely grimy just, from sustenance vender, drain dealer, basic need merchant, lamb dealer, street side technician, poor people, transport conductors.

Exclusion Criteria

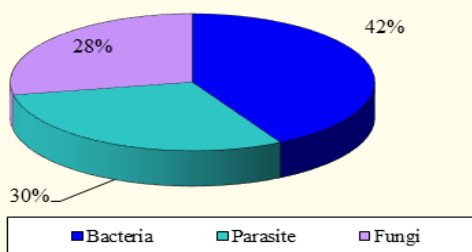
Limitations with mint means mint clean mean clear and dirty/mutilated mean dirty/mutilated.

Observation and Results

In this study 720 samples of currency were taken from Bank counter, food seller, milk seller, meat shop, grocery store, ATM, Road side merchant, Medical stores, Beggars, Bus conductors and were arranged according to the following groups for the isolation of Micro-organisms from Pakistan currency, circulating in Pakistan.

- Group I: 240 currency of mint.
- Group II: 240 currency of clean.
- Group III: 240 currency of dirty/mutilated.

The sample site of distribution according to the groups are; 243 (33.8%) of currency from the bank counter including mint 190 and clean 53, 94 (13.1%) from food seller included clean 40, dirty mutated 54, 92 (12.8%) from milk seller including clean 47, dirty and mutilated 45, 80 (11.1%) from meat shop including clean 129, dirty/mutilated 51, 63 (8.8%) from grocery stores including clean 36 and dirty/mutilated 27, 50 (6.9%) from ATM machine that was mint, 36 (5%) from the road side merchant including clean 2 and dirty/mutilated 34, 35 (4.9%) from medical store including clean 33 and dirty/mutilated 2, 23 (3.2%) from beggars that was only dirty/mutilated, 4 (0.6%) from the bus conductor that was only dirty/mutilated.



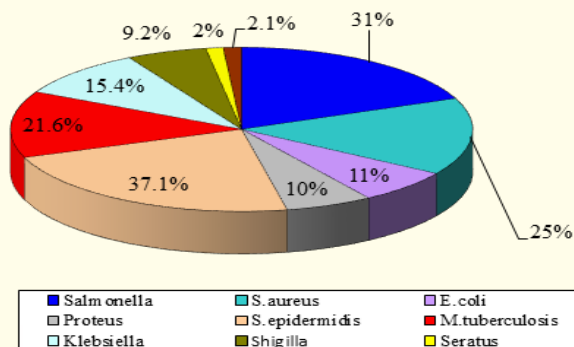


Figure 1: Distribution of Micro-Organisms (Bacteria, Parasite and Fungi) Isolated from 720 Specimens.

Location	No. of Samples	Salmonella	S. Aureus	E. coli	Proteus	S. Epider.	M. Tuber.	Kleb	Shigella	Seratus	Ps.	Total	%
Bank counter	243	3 (1.25%)	52 (21.3%)	01 (.41%)	0	12 (4.93%)	0	0	0	0	0	68	28.0
ATM	50	0	0	0	0	0	0	0	0	0	0	0	0.0
Medical store	35	03 (8.57%)	09 (25.57%)	06 (17.19%)	0	06 (17.14%)	0	0	2 (5.7%)	0	0	26	74.3
Food seller	94	37 (39.36%)	06 (6.38%)	05 (5.3%)	03 (3.1%)	07 (7.44%)	04 (4.2%)	02 (2.12%)	02 (5.12%)	0	0	66	70.2
Milk seller	92	27 (29.34%)	09 (9.78%)	09 (9.78%)	06 (6.52%)	05 (5.43%)	16 (17.39%)	01 (1%)	01 (1%)	0	0	74	80.4
Grocery store	63	09 (14.28%)	08 (12.69%)	03 (4.76%)	12 (19%)	05 (7.9%)	0	01 (1.58%)	0	0	0	38	60.3
Meat shop	80	22 (27.5%)	06 (7.5%)	11 (13.1%)	07 (8.75%)	02 (2.5%)	01	03 (3.75%)	01 (1.25%)	0	02 (2.5%)	55	68.8
Roadside merchant	36	08 (22.2%)	01 (2.77%)	05 (13.8%)	04 (11.11%)	0	0	04 (11.11%)	02 (5.53%)	0	0	24	66.7
Bus conductor	04	02 (50%)	0	01 (25%)	0	0	0	01 (25%)	0	0	0	04	100.0
Beggar	23	04 (17.89%)	02 (8.69%)	0	07 (30.43%)	0	0	03 (13%)	01 (4.34%)	02 (8.69%)	0	19	82.6
Total	720	115	93	41	39	37	21	15	09	02	02	374	51.9

Table 1: Bacteria Isolated from Various Locations.

Discussion

In this study, it is well appreciated that from 720 examples bacteria, parasites and fungi are isolated which coordinate the studies directed by Abraham and Waterman [10], microbiology today [1] who claims the similar results. Microbes isolated including *Salmonella* were 115 (16%), *Staphylococcus aureus* were 93 (12.9%), *E. coli* 41 (5.7%), *Proteus* 39 (5.4%), *Staphylococcus epidermidis* 37 (5.1%), *Mycobacterium tuberculosis* were 21 (2.9%), *Klebsiella* were 15 (2.1%), *Shigella* 9 (1.8%), *Serratia* 2 (0.3%), *Pseudomonas aeruginosa* 2 (0.3%). While parasites obtained in-

corporate *Ascariasis lumbricoidis* 187 (26%), *Enterobius vermicularis* were 60 (8.3%), *Tenia saginata* were 23 (3.2%), growths confined incorporate *Candida albicans* were 151 (21%), *Aspergilosis* were 83 (12.5%) and *Cryptococcus* were 20 (2.8%). This study affirms the claim made by the study directed by Microbiology today [1] and by Abraham and Watermann [5] that cash notes go about as the vehicle for transmission of various species of microscopic organisms Michaelis, *et al.* [11], Charnock [12], Xu, *et al.* [13], Russel [8] and Lalonde [14] that the contamination of objects by pathogenic micro-organisms is much public health concern as contaminated material can be sources of transmitting pathogens. Paper money presents a huge risk to public health since communicable disease can spread through contact with fomites, hence the present study confirms that isolation of microorganisms including bacteria, parasites and fungi are being transmitting pathogens from the one to another person and continues this process of transmitting of pathogen by handling of the currency notes, especially if handled with unclean hands or kept in dirty surrounding. In my study which coincide with the study conducted by Siddiqui [15] and table 4 shows that negligible number of pathogens were found from the mint notes obtained from the bank counter, they may be isolated during counting with hands as *Staphylococcus* and *Staphylococcus epidermidis* are the normal flora of the skin, my study proves that the mint notes are less carriers of the pathogens as total 30 (4.16%) micro-organisms were isolated from 720 sample size, so the mint notes have no role to spread the disease.

Recommendation

- Prompt hand washing mass campaign (Through electronic media and print media) after handling of money.

Bibliography

1. Aidoo K. "Dirty money". *Microbiology Today* (2011): 162-165.
2. Khin NO, *et al.* "Contamination of currency notes with enteric bacterial pathogens". *Journal of Diarrhoeal Diseases Research* 7 (1989): 92-94.
3. Umeh EU, *et al.* "Microbial contamination of 'Naira' (Nigerian currency) Notes in circulation". *Research Journal of Environmental Sciences* 1.6 (2007): 336-339.
4. Cooper E. "Intestinal parasitoses and the modern description of diseases of poverty". *Transactions of the Royal Society for Tropical Medicine and Hygiene* 20 (1991): 168-170.
5. Abrams BL and Waterman NG. "Dirty money". *The Journal of the American Medical Association* 219 (1972): 1202-1203.
6. Gadsby P. "Filthy lucre--Money is contaminated with bacteria". *Discover* (1998).
7. Podhajny MR. "How dirty is your money? Paper, Film and Foil Converter" (2004).
8. Russell C. "Filthy lucre a problem for EIT". EIT Hawke's Bay, New Zealand (2006).
9. Singh DV, *et al.* "Microbiological surveillance" (2002).
10. Abrams BL and Waterman NG. "Dirty money". *The Journal of the American Medical Association* 219 (1972): 1202-1203.
11. Michaels BV, *et al.* "Use of alcoholic instant hand sanitizer as part of a food service hand hygiene program". *Food Service Technology* 3.2 (2003): 71-80.
12. Chamock C. "Swabbing of waiting rooms magazines reveals only low levels of bacterial contamination". *British Journal of General Practice* 55 (2005): 37-39.

13. Xu J., *et al.* "Ribosomal DNA (rDNA) identification of the culturable bacterial flora on monetary coinage from 17 currencies". *International Journal of Environment and Health* 67.7 (2005): 51-55.
14. Lalonde M. "Time for antibacterial wallets-Germ fester on paper money". *The Gazette* (2007).
15. Siddique S. "Dirty money. You're carrying more than cash in your wallet". *The Philippine Star* (2003).

Volume 11 Issue 5 September 2017

© All rights reserved by Jawed Ahmed Badvi., *et al.*