

The investigation of some bacteria contaminations paper currency circulation in the Iraqi domestic Market in the city of Samawah by using CHROM agar

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ABSTRACT

The present study was carried out to determine the type and nature of bacterial contamination of Iraqi paper currency notes (Dinar) in circulation. 150 paper currency notes of different denominations were randomly collected from different places and different occupational groups in Samawah city. Identification and characterization results showed bacterial contamination of all 150 samples with 100% contamination.

A total of 285 bacterial isolates were obtained from the one hundred fifty samples made up of 7 different bacterial species. Bacteria isolated from Iraqi paper currency notes include: *Pseudomonas aeruginosa* was the highest proportion of the presence for the bacteria and it was (23%), while *Enterococcus faecalis* (22.1%), *Enterobacter cloacae* (18%), *E. coli* (15.8%), *Procteus mirabilis* (7.4%) and *Salmonella typhi* (3.2%).

Key words: Bacterial contamination, Iraqi paper currency, Pathogenic bacteria, Chromagar.

INTRODUCTION

Papers money are susceptible to bacterial contamination during continuous handling from person to person especially if handled with unclean hands or storing them at contaminated bags at moist, sweat and dark conditions, which are most favorable for the growth of coliforms as well as other pathogens¹. Pathogens associated with throat infections, pneumonia, tonsillitis, peptic ulcers, urino-genital tract infections, gastroenteritis and lung abscess had been reported².

The microorganisms implicated included members of the family Enterobacteriaceae, *Mycobacterium tuberculosis*, *Vibrio cholerae*, *Bacillus* species,

Staphylococcus sp., *Micrococcus* sp. and *Corynebacterium* sp. Most likely contaminants of paper money are environmental organisms such as Gram-positive flora (especially *Bacillus* sp.) and those arising from human normal skin flora such as *Staphylococcus aureus*³. Other microorganisms were isolated such as fungi that may pose a public health risk⁴. Paper money might be playing an important role in the spreading of drug resistant strains in the community⁵.

The aim of the study was to investigate the possibility of contamination of cash currency in circulation paper in the domestic market of the Samawah city.

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MATERIALS AND METHODS

Samples collection

One Hundred fifty samples were collected from the Iraqi paper currency (the dinar) traded in the local markets of the city of Samawah different categories (250,500,1000,5000,10,000). 30 samples of each category of cash during the period from October 2014 until April 2015. Samples were randomly collected from different places of the city of Samawah and various professional segments of society (butchers, fish vendors, vegetable vendors, fast-food vendors, university students and university staff). The samples were collected in a sterile plastic bags have received alternative banknotes after the closure of the bag and the information recorded by the samples and transferred directly to the laboratory to make them bacteriological tests.

Bacterial isolation

For the purpose of identifying the types of bacteria presence in the cash paper currency, each category of cash put in a test tube containing 10 ml of Brain heart infusion broth for the bacteria active and the most number isolate of types presence and the tubes requested well for two minutes and then incubated for 24 hours in 37°C. The samples lifted by sterile forceps were cultured in differential and selective media include (Mannitol salt agar, Macconkey agar, Eosin-Methylene blue agar EMB agar and Blood agar).

Secondary culture conducted for growing colonies on the selective media. Each group of

bacteria shows the phenotypic characteristics that distinguish them from other and sometimes inhibit the growth of other bacteria groups and then the bacteria cultured on chrome agar included, CHROM agar orientation, CHROM agar *staphylococcus aureus*, CHROM agar *pseudomonas*, CHROM agar *vibrio* and CHROM agar *Salmonella*. The media incubated for 37C in 24 hours.

Bacterial samples identification

It isolates diagnosed depending on classified Barki Bergy's manual⁶ and according to the methods used by the Collee⁷ and Macfaddin⁸.

RESULTS AND DISCUSSION

Paper currency has recently been identified as another mode of spread by which community-acquired infection may be transmitted, since paper currency is frequently transferred from one person to another⁹.

Through results reached during the study period that all samples Iraqi denominations of paper, which 150 samples were contaminated with different types of bacteria, as shown in the table¹.

In which table these results are present the 250 denomination was found to have the highest level of bacterial contamination 43% followed by other denominations 500 (32.6%), 1000(11.5%), 5000 (7.3%) and 10000 (5.2%) respectively. This accounts for the fact that the small denomination is widely used and exchanged many times¹⁰.

Table 1: Percentage occurrence of microorganisms per denomination of Iraqi paper currency (n=150)

Bacterial species	Category (30 samples for each category) n=150					Total & (%)
	250ID & (%)	500ID & (%)	1000ID & (%)	5000ID & (%)	10000ID & (%)	
<i>Pseudomonas aeruginosa</i>	27 (22)	30(32.3)	3(9.1)	3(14.3)	3(20)	66(23.1)
<i>Enterococcus faecalis</i>	27(22)	18(19.4)	9(27.3)	6(28.6)	3(20)	63(22.1)
<i>Enterobacter cloaca</i>	18(14.6)	24(25.8)	6(18.2)	0(0)	3(20)	51(17.9)
<i>Esherichia coli</i>	24(19.5)	12(12.9)	3(9.1)	3(14.3)	3(20)	45(15.8)
<i>Streptococcus aglactia</i>	15(12.2)	9(9.7)	3(9.1)	3(14.3)	0(0)	30(10.5)
<i>Proteus mirabilis</i>	9(7.3)	0(0)	6(18.2)	3(14.3)	3(20)	21(7.4)
<i>Salmonella typhi</i>	3(2.4)	0(0)	3(9.1)	3(14.3)	0(0)	9(3.2)
Total	123(43%)	93(32.6%)	33(11.5%)	21(7.3%)	15(5.2%)	285(100)

The number of bacterial isolated from 150 samples was 285bacteria. *Streptococcus agalactia* were only gram positive bacteria and the presence ratio was (10.5%). While the gram negative bacteria showed with the different ratios. *Pseudomonas aeruginosa* was the highest proportion of the presence for the bacteria and it was (23%), while *Entrococcus feacalis* (22.1%),

Enterobacter cloacae (18%), *E.coli* (15.8%), *Proteus mirabilis* (7.4%) and *Salmonella typhi* (3.2%), as shown in table (2).

The presence of enteric bacterial isolates on Iraqi paper currency is an indication of faecal contamination which means the poor personal hygiene¹¹.

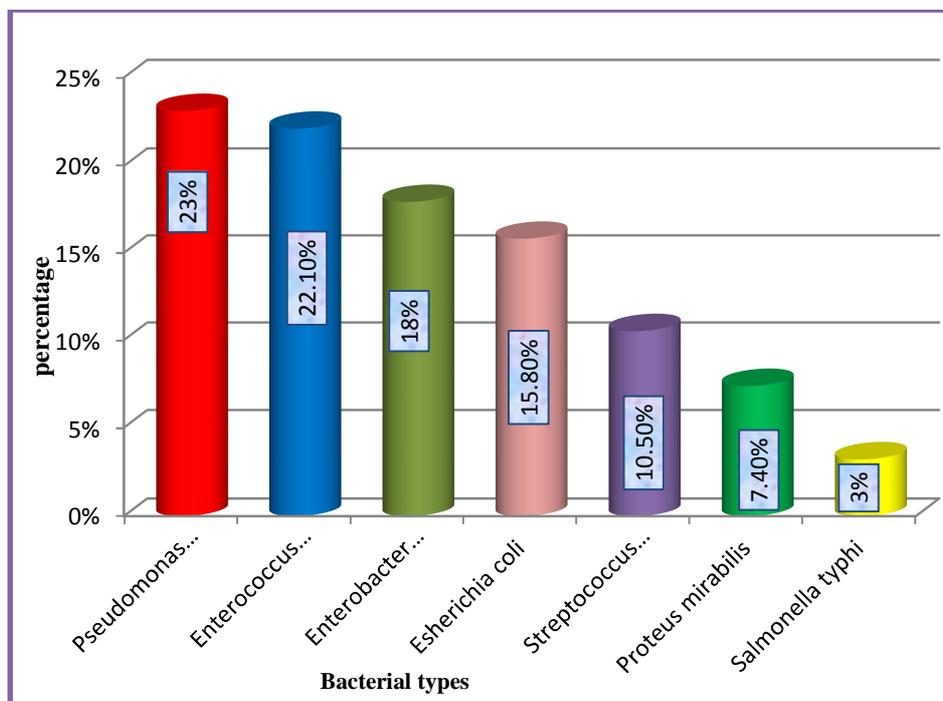


Fig. 1: The percentage of bacterial genus isolated from Iraqi paper currency

This study explicated that most number of isolates were founded in butchery 77, vegetable vendors 62, fish vendors 52, fast-food vendors41,university staff 27 and university students 26 respectively (Table 3), suggesting more handling of paper currency by many people made them more vulnerable to bacteria¹². Other source of collection denominations was: butchery 17, super market 16 restaurant 19 and

fisher 19, while the lowest number of enteric bacteria was isolated from officers which indicate that they are more likely to be conscious of safe personal hygiene as compared to other¹¹. These routes of transmission are of great importance in the health of many populations, where the frequency of infection is a great indication of local hygiene and environmental sanitation levels¹³.

Table 2: The Source of bacterial isolates in Iraqi paper currency

Source of samples	Number of isolates	Types of category	<i>Pseudomona s aeruginosa</i>	<i>Enterococcus feacalis</i>	<i>Enterobacter cloaca</i>	<i>Esherichia coli</i>	<i>Streptococcus agalactia</i>	<i>Proteus mirabilis</i>	<i>Salmonella typhi</i>	Total
Butchers	25	250+1000	13	26	6	12	9	5	6	77
fish vendors	25	500+1000	23	10	8	5	3	2	1	52
vegetable vendors	25	1000+5000	17	15	11	7	7	4	1	62
fast-food vendors	25	500+5000	9	7	14	3	6	1	1	41
university students	25	10000	3	2	7	8	2	4	0	26
university staff	25	10000	1	3	5	10	3	5	0	27
Total	150	-	66	63	51	45	30	21	9	285

CONCLUSIONS

Money has got the potential to change through many different hands and could be exposed to many different environments at a relatively high frequency. Another source of contamination was many people tongue wet their fingers when counting money. Great care should be taken when the same person facilitates the handling of money to avoid cross contamination. We recommend that currency notes must be handled with caution.

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