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Isolation and Identification of Bacterial Types from Dinar Currency Coins Collected from Various Commercial Shops

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ABSTRACT

Metal coins act as a reservoir for enteric microorganisms, as demonstrated by many previous studies. In most advanced countries, there is a belief that continuous circulation around the clock causes food-related diseases. Most of the microorganisms isolated from coins belong to the families Enterobacteriacea, Mycobacterium tuberculosis, Vibrio cholera, Bacillus spp., and Staphylococcus. There are many different bacterial genera that cause many diseases to humans, which should not be neglected, and their risks and harms should be highlighted. The samples were collected from the city of Derna for the one Libyan dinar coin that is circulated in a number of shops, including bakeries, restaurants, food items, vegetable shops, and fruit shops, which are spread in different neighbourhoods of the city such as Al-Balad, Sheha, Al-Saheel Al-Sharqi, Ambakh, and Bab Tobruk. 70 samples were collected and placed in sterilized plastic bags, which were then sealed and transported to the laboratory for microbiological testing. Overall, the results of the current study are consistent with those of other studies that have identified Escherichia coli and Staphylococcus aureus as prevalent bacterial species in food samples. However, there are variations in the prevalence of bacterial species in different types of samples, which may be attributed to differences in geographical location, climate, hygiene practises, and other factors

1. INTRODUCTION

On a global level, money is one of the most frequently transferred items from hand to hand, and during its circulation, it can become contaminated with microorganisms. As a result, it can play a role in the transmission of these microorganisms to other people. For example, money can become contaminated with microorganisms from the respiratory or digestive systems during counting. Metal coins are widely exchanged for goods and services all over the world, and due to their frequent use and circulation among people, they can become contaminated with pathogenic bacteria. There are risks of disease transmission through contaminated coins, which can be a threat to public health (Umeh et al., 2007).

These papers, most frequently passed from hand to hand, can be contaminated with potentially pathogenic bacteria by different ways during handling, thus increasing the possibility of the transmission of potential pathogenic bacteria. It is fact that we buy day-to-day commodities that transfer microorganisms from one location to another, bacteria adhere to the notes during coughing or sneezing, and by placement on dirty surface (Ahmed et al.,2010) Also, the chance of transmission of pathogenic bacteria increases during the handling of money at low hygiene levels in a community or society (Gedik et al., 2013). In addition, contamination of money can also be traced to dust, soil, water, and the normal microflora of the body of handlers (Gedam et al., 2018). When metal coins become contaminated with pathogenic microorganisms such as bacteria, fungi, and viruses, there is a possibility that they can act as environmental carriers for the diseases caused by these microorganisms for many of the people who handle them, especially immunocompromised individuals such as the sick and children (Lamichhane et al., 2009). Microorganisms can survive for several months on dry surfaces (Kramer et al., 2006). There is an inverse relationship between the value of metal coins and microbial contamination, where lower-value coins are more contaminated with microorganisms. Usually, microorganisms are a cause of contamination and infection, and personal hygiene and electronic cards reduce the risk of infection (Al-Ghamdi et al., 2011). Study Objective: Determining the bacterial pollution rate of metal coins of the Libyan Dinar in the city of Derna, identifying bacterial species present, and raising public health awareness during money exchange to alert individuals to potential risks.

2. METHOD

The samples were collected from the city of Derna for the one Libyan dinar coin that is circulated in a number of shops, including bakeries, restaurants, food items, vegetable shops, and fruit shops, which are spread in different neighbourhoods of the city such as Al-Balad, Sheha, Al-Saheel Al-Sharqi, Ambakh, and Bab Tobruk. 70 samples were collected and placed in sterilised plastic bags, which were then sealed and transported to the laboratory for microbiological testing.**Preparing the samples for bacterial isolation**

Involves preparing sterilized water in glass flasks after sterilizing them in an autoclave. Then, the metal coin (one Libyan dinar) is soaked in distilled water in each flask and left for 6 hours. After preparing the media, 1 ml of the suspension (250 ml of the soaked sample) is taken, and isolation is performed using the perpendicular streaking method with an inoculation needle. The suspension is spread on two plates of each medium mentioned above, and the steps are repeated in the remaining media used in this study. Then, the plates are incubated for 24 hours. Note that the bacterial colonies were purified by quadruple streaking on nutrient agar plates until pure colonies were obtained. (Cheesbrough, 2005).

Identification of bacteria:

The B.D. Phoenix system was used to identify bacteria in the microbiology laboratory at Benghazi Medical Hospital. This system is used to test pure culture isolates, such as aerobic or facultative anaerobic bacteria, that are positive or negative for Gram staining. To perform the test, the culture must be in a pure state, and its age should be between 18 - 24 hours. When obtaining a pure sample for identification, it must be stained with Gram stain to confirm whether the bacteria are Gram-positive or Gram-negative. The Phoenix system has a panel for Gram-positive and Gram-negative staining. After confirming the type of bacteria, the appropriate panel is selected.

The identification process involves taking a light swab from the bacteria to be identified and placing it under contamination-free conditions in an identification of microbes (ID) tube. Then, it is calibrated to 0.5 in the calibration device designed for the system. 25µ of the ID tube contents are taken and placed in an antimicrobial susceptibility (AST) test tube. Then, the contents of both the ID and AST tubes are placed in the designated location on the panel.

After ensuring that the panel is attached to the Phoenix identification device, the results are automatically printed after approximately 24 hours, showing the name of the bacteria and the antibiotic that is effective against it.

3. RESULT

A total of 70 distinct bacterial species were isolated from various sources. Among these isolates, 8 different bacterial species were identified, as shown in Table 1. The most prevalent species were Streptococci spp. (27%), Escherichia coli (24%), Staphylococcus spp. (11%), and these were followed by Pseudomonas spp. (7%), Staphylococcus aureus (13%), Klebsiella spp. (9%), Salmonella spp. (6%) and Proteus spp. (3%) Refer to Table 1 and Figure 3 for a detailed breakdown of the bacterial isolates' numbers and percentages. (Table.1)

Table. 1 Numbers and percentage of Bacterial isolates from all sources (N=70).

%	N	Type of bacteria spp
27	19	*Streptococci spp.*
07	5	*Pseudomonas spp.*
13	9	*Staphylococcus aureus*
24	17	*Escherichia coli*
11	8	*Staphylococcus spp.*
03	2	*Proteus spp.*
09	6	*Klebsiella spp.*
06	4	*Salmonella spp.*

The most prevalent and hazardous bacterial species identified in bakery samples were Pseudomonas spp, accounting for 34%, and Staphylococcus spp, representing 20% of the total bacteria detected (Table.2)

Table. 2 Percentages of Bacterial Species Isolated from Bakery Samples

%	N	Type of bacteria spp
13	2	*Streptococci spp*
34	5	*Pseudomonas spp*
7	1	*Staphylococcus aureus*
13	2	*Escherichia coli*
20	3	*Staphylococcus spp*
0	0	*Proteus spp*
0	0	*Klebsiella spp*
13	2	*Salmonella spp*

The most prevalent and hazardous bacterial species identified in restaurants samples were Streptococci spp, accounting for 33%, and Escherichia coli, representing 25% of the total bacteria detected (Table.3)

Table. 3 Percentages of Bacterial Species Isolated from restaurants Samples

%	N	Type of bacteria spp
33	8	*Streptococci spp*
0	0	*Pseudomonas spp*
13	3	*Staphylococcus aureus*
25	6	*Escherichia coli*
8	2	*Staphylococcus spp*
8	2	*Proteus spp*
13	3	*Klebsiella spp*
0	0	*Salmonella spp*

The most prevalent and hazardous bacterial species identified in food items samples were Streptococci spp, accounting for 34%, and Staphylococcus aureus and Klebsiella spp, representing 22% of the total bacteria detected (Table.4)

Table. 4 Percentages of Bacterial Species Isolated from food items Samples

%	N	Type of bacteria spp
34	3	*Streptococci spp*
0	0	*Pseudomonas spp*
22	2	*Staphylococcus aureus*
11	1	*Escherichia coli*
11	1	*Staphylococcus spp*
0	0	*Proteus spp*
22	2	*Klebsiella spp*
0	0	*Salmonella spp*

The most prevalent and hazardous bacterial species identified in vegetable and fruit shops samples were Escherichia coli, accounting for 36%, and Streptococci spp, representing 22% of the total bacteria detected (Table.5).

Table. 5 Percentages of Bacterial Species Isolated from vegetable and fruit shops Samples

%	N	Type of bacteria spp
27	6	*Streptococci spp*
0	0	*Pseudomonas spp*
14	3	*Staphylococcus aureus*
36	8	*Escherichia coli*
9	2	*Staphylococcus spp*
0	0	*Proteus spp*
5	1	*Klebsiella spp*
9	2	*Salmonella spp*

4. DISCUSSION

The study revealed that a majority of Libyan banknotes circulating in the Derna area are contaminated with various types of bacteria, including potential pathogens that can cause disease in healthy individuals and opportunistic pathogens that may cause illness within the community. The most commonly isolated bacteria were Staphylococcus spp., Streptococci spp., Staphylococcus aureus, Escherichia coli, Pseudomonas spp., and Klebsiella spp. These findings are consistent with those of Elemam et al. (2016), as well as Alwakeel and Nasser (2011) in Saudi Arabia, and Firoozeh et al. (2017) in Iran. The results of the study indicate that the most prevalent and hazardous bacterial species identified in different types of samples are as follows:

In bakery samples, Pseudomonas spp accounted for 34%, and Staphylococcus spp represented 20% of the total bacteria detected. In restaurant samples, Streptococci spp accounted for 33%, and Escherichia coli represented 25% of the total bacteria detected .In food item samples, Streptococci spp accounted for 34%, while Staphylococcus aureus and Klebsiella spp each represented 22% of the total bacteria detected . In vegetable and fruit shop samples, Escherichia coli accounted for 36%, and Streptococci spp represented 22% of the total bacteria detected. These findings highlight the presence of various bacterial species in different types of samples, emphasizing the importance of implementing proper hygiene and sanitation practices to minimize the risk of contamination and potential health hazards. Regarding the prevalence of bacterial species in bakery samples, a study conducted by Adebayo-Tayo et al. (2019) found that Staphylococcus aureus was the most prevalent bacterial species, followed by Bacillus spp. However, their study was conducted in Nigeria, and the differences in geographical location, climate, and hygiene practices may account for the variation in results. In terms of restaurant samples, a study by Al-Gabr et al. (2019) found that Escherichia coli was the most prevalent bacterial species, followed by Staphylococcus aureus. This is consistent with the results of the current study, which also identified Escherichia coli as a prevalent bacterial species in restaurant samples.

Regarding food item samples, a study by Al-Gabr et al. (2019) found that Staphylococcus aureus was the most prevalent bacterial species, followed by Escherichia coli. This is in contrast to the current study, which identified Streptococci spp as the most prevalent bacterial species in food item samples.

In vegetable and fruit shop samples, a study by Al-Gabr et al. (2019) found that Escherichia coli was the most prevalent bacterial species, which is consistent with the results of the current study.

Overall, the results of the current study are consistent with other studies that have identified Escherichia coli and Staphylococcus aureus as prevalent bacterial species in food samples. However, there are variations in the prevalence of bacterial species in different types of samples, which may be attributed to differences in geographical location, climate, hygiene practices, and other factors.

5. CONCLUSION

Overall, the results of the current study are consistent with other studies that have identified Escherichia coli and Staphylococcus aureus as prevalent bacterial species in food samples. However, there are variations in the prevalence of bacterial species in different types of samples, which may be attributed to differences in geographical location, climate, hygiene practices, and other factors.

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