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RESEARCH ARTICLE

BACTERIOLOGICAL ISOLATION IN THE RESTAURANT OF HAWLER CITY KURDISTAN REGION, IRAQ

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ABSTRACT

This investigation was applied to isolate and identify bacteria in three different restaurants order to predict their effects on people. Power plate method for isolation of bacteria the samples were inoculated into nutrient agar media by streak plate technique to obtain well isolated colonies. The results show the identity and the total colony forming units (CFU) for bacteria. The most frequently isolated bacteria were the bacterial species: *Bacillus cereus, Clostridium botulinum, Escherichia coli, Salmonella typhi, Shigella dysenteriae, Staphylococcus aureus* and *Lactobacillus subtilus* (11.12, 8.24, 20.11,17.32, 17.01, 10.31 and 8.27) % respectively. According to the bacteria the higher numbers of bacteria were isolated on menu and containers.

KEYWORDS

Restaurants, Bacteria, Identification, Containers, Menu.

1. INTRODUCTION

Due to daily handling, restaurant menus, tables, and containers may pose a risk of cross-contamination between patrons' hands and food, acting as a potential vector for certain food-borne illnesses if not routinely cleaned and disinfected (Moslem et al., 2010). The majority of bacteria in humans and most other animals are found in the gut and on the skin. Though many are helpful, especially in the gut flora, the immune system's defensive mechanisms render the great majority of bacteria in the body harmless. (Zheng et al., 2020). On the other hand, a number of bacterial species are harmful and can result in infectious illnesses such as leprosy, cholera, syphilis, anthrax, and bubonic plague. Respiratory infections are the most prevalent and deadly bacterial diseases. (Sears, 2005). In many infectious diseases, microorganisms are the pathogens that cause the illness. Pathogenic bacteria that cause diseases like tuberculosis, anthrax, and plague are among the organisms involved, as are fungi that cause diseases like histoplasmosis, candidiasis, and ringworm (Lepp et al., 2004).

The purpose of the study is to determine and isolate the bacteria in the restaurants and to find out their presence and their effects on the human health. Some of bacteria produce toxins, but not all the toxins can be eliminated by cooking(Cliver and Riemann, 2011). These bacteria are the source of foodborne illnesses. Foodborne illnesses are caused by Bacillus cereus, which survives when food is cooked incorrectly and releases endospores. Additionally, low-acid food that has been canned or improperly preserved and has not been processed using the proper preservation times and/or pressure can harbor Clostridium botulinum, which can cause botulism poisoning (Satterfield et al., 2010). Furthermore While the majority of Escherichia coli strains are not harmful, certain serotypes can seriously poison humans who eat food. Although it belongs to the enterbactericiae genus, Salmonella typhi is closely related to the Escherichia genus. They are the cause of diseases like paratyphoid fever and typhoid fever. When a person consumes foods high in the bacteria, infection nearly always results.

Less than 100 bacterial cells can be sufficient to cause an infection in some cases, depending on the age and health of the host. Shigella dysenteriae is the bacteria that causes dysenteric diarrhea worldwide through ingestion (fecal–oral contamination) (Yang et al., 2005). Also the bacterium Staphylococcus aureus is responsible for food poisoning through the production of an enterotoxin, and pathogenicity is also associated with coagulase positivity (Salyers et al., 1994). Dental caries have been linked to Lactobacillus subtilus species. Saliva's Lactobacillus subtilus count has long been used as a "caries test". It is characteristic of Lactobacillus subtilus to exacerbate pre-existing carious lesions, particularly those in coronal caries (Tasli et al., 2006). Pseudomonas aeruginosa, on the other hand, has the ability to cause food spoilage. Prominent instances comprise of P. fragilis causing dairy spoilage, P. taetrolens and P. mudicolens causing mustiness in eggs, and P. lundensis causing spoilage of milk, cheese, meat, and fish (Palleroni, 2010).

2. MATERIAL AND METHODS

2.1 Sampling

Sample swaps was taken in different places of selected Restaurant (menu, table, and containers) then samples transferred to the lab in the same day of sampling to be cultured on the growth medium for isolation and identification.

2.2 Bacteria Isolation and Identification

For isolation of bacteria the samples were inoculated into nutrient agar media by streak plate technique to obtain well isolated colonies. All inoculated media were kept at 37°C for overnight in an incubator (Benson, 2002).

Gram Stain: Prepared according to the manufacturer's specifications, and used this solution for study the morphological characteristics of bacterial cells under microscope (JF, 2000).

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1 - Following culture on Blood agar for gram positive bacteria and Macconky agar for gram negative bacteria, the morphological properties of the colonies are determined based on their shape, color, height, texture, diameter, and other characteristics.

2 - Microscopic Properties: Relying on bacterial staining with gram stain to observe the stain's reaction, bacterial shape, cell formation, and spore formation and their mutual regulation (Yaseen, 2013).

3. Results and Discussion

According to the results, the total number of bacteria CFU in the first, second, and third restaurants is displayed in tables (1, 2, and 3). 298 CFU, the higher count of bacteria found in the first restaurant, was isolated on a table, whereas 220 CFU, the lower count, was found on the menu. In the second restaurant, the container had the highest number of bacteria (280 CFU), while the table had the lowest number (220 CFU). In the third restaurant, table 52 CFU had the lowest number of bacteria found, whereas menu 80 CFU had the highest number. The illness known as mucormycosis is an uncommon but dangerous risk. When this mold gets into the air and gets into the sinuses or lungs, it can cause illness. Open wounds are another way for it to get into the bloodstream. Because their skin is so susceptible to infection, people who have burns are more likely to get this illness. Among other symptoms, mucor mycosis can cause fever, coughing, eye swelling, and black discharge from the nose (Kirk et al., 2008).

Figure (1, 2, 3) Two of the isolated bacterial species are Clostridium botulinum and Bacillus cereus, which were isolated from restaurants due to their presence in unsalted preserved food. Additionally, bacteria such as Salmonella typhi, Lactobacillus subtilus, Staphylococcus aureus, and Escherichia coli were isolated from restaurants due to their presence in undercooked meat, egg cortex, lettuce, fruit juice, and other food items (Ray and Ryan, 2014). Due to the fact that Shigella dysenteriae is present in salad, milk, and its derivatives, it was decided to isolate the bacteria from restaurants. However, Pseudomonas aeruginosa was isolated due to its widespread distribution in unsterilized water (Palleroni, 2010).

Figure (4, 5, 6) As we see in the results in all restaurants, the higher number of microorganisms were present on the menu and containers (sugar, salt, pepper…etc) may relate to the not routine cleaning and disinfecting of these places. Your essential salt and pepper shakers may have an abundance of aerobic bacteria. These are known for thriving in areas where there is oxygen(Hindy and Awad, 2000). Types of Coliform bacteria and E. coli, which are bacteria found in the gut and feces, are among those that might be present. Menus, like nearly anything that is passed around and touched often, are a prime candidate for contamination. In one study, bacteria including E. Coli and Staph were detected in traces (Gámez et al., 2016). Major health issues are rare in the majority of healthy individuals who come into contact with rhizopus.

Table 1: Total bacteria count in first restaurant (CFU)

Area	Number of bacteria
Menu	220
Table	298
Containers	225

Table 2: Total bacteria count in second restaurant (CFU)

Area	Number of bacteria
Menu	251
Table	220
Containers	280

Table 3: Total bacteria count in Third restaurant (CFU)

Bacteria	Number of bacteria
Menu	80
Table	52
Containers	60

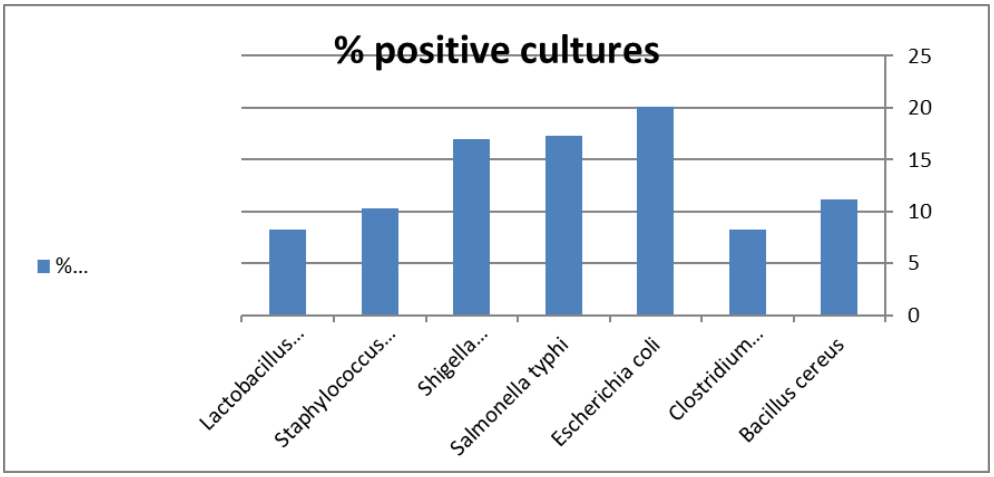

Figure 1: Bacterial frequency, the graph shows the percentage of different bacteria species isolated from sample in three different restaurants of Hawler City Kurdistan Region, Iraq.

Figure 2: Some Bacterial frequency, Bacteria Slide Set isolated on menu

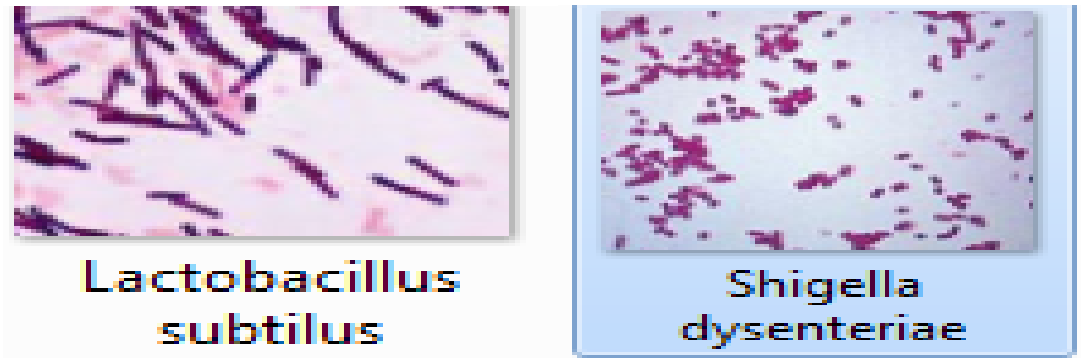

Figure 3: Some bacterial frequency, Bacteria Slide Set isolated on containers.

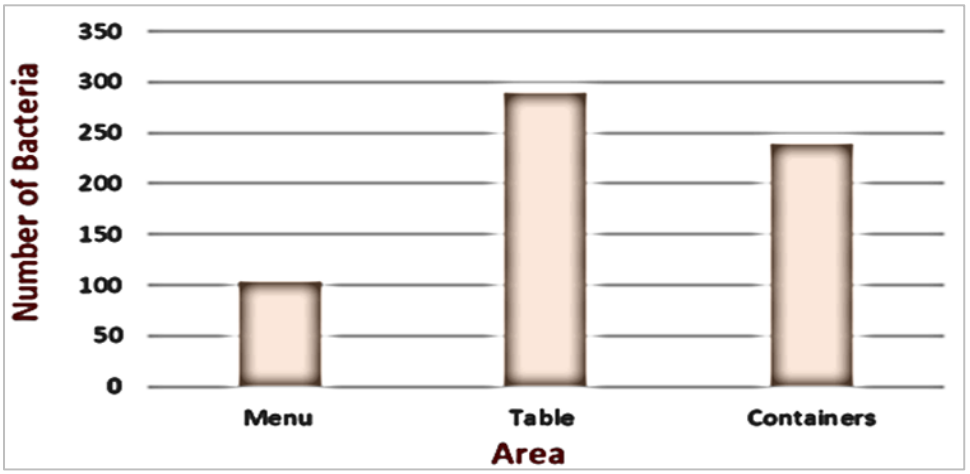

Figure 4: The relation between counted bacteria in different area (First reataurant)

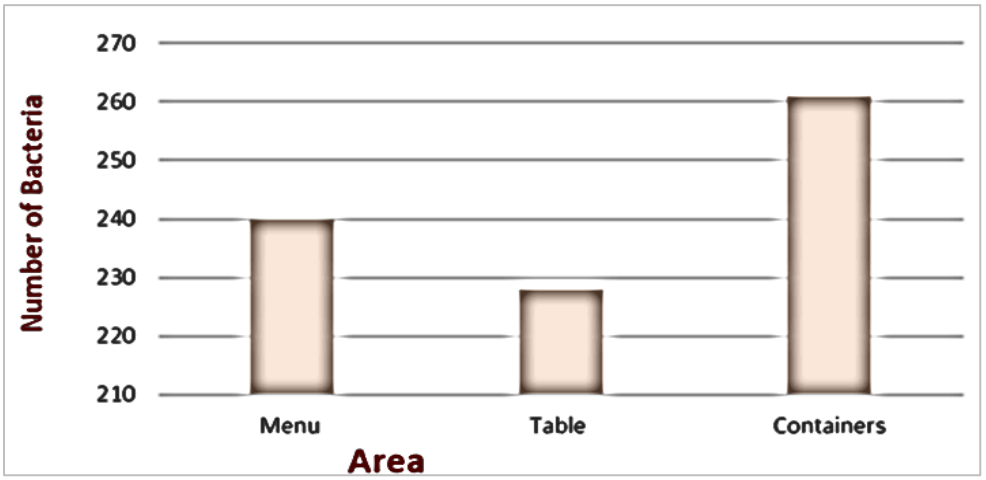

Figure 5: The relation between bacteria counted in different area (Second restaurant)

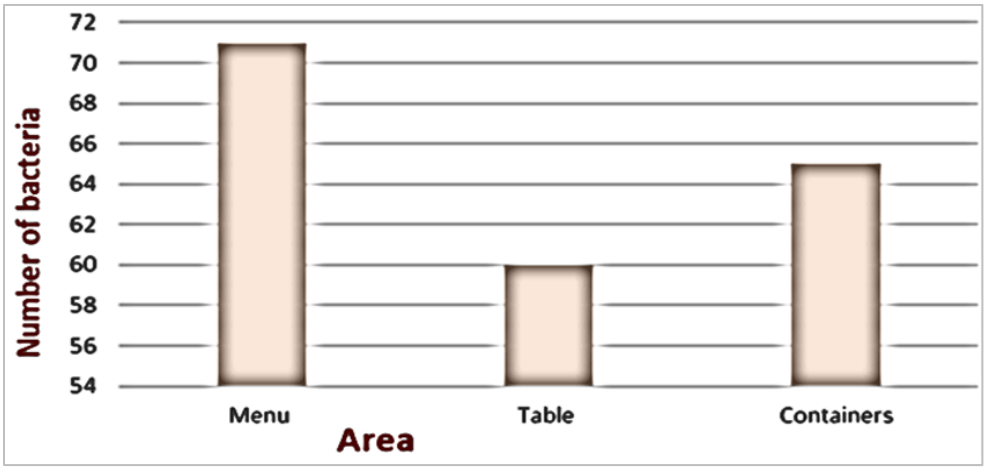

Figure 6: The relation between counted bacteria in different area (Third restaurant)

4. Conclusion

298 CFU, the higher count of bacteria found in the first restaurant, was isolated on a table, whereas 220 CFU, the lower count, was found on the menu. In the second restaurant, the container had the highest number of bacteria (280 CFU), while the table had the lowest number (220 CFU). In the third restaurant, table 52 CFU had the lowest number of bacteria found, whereas menu 80 CFU had the highest number. Every location where samples were collected from it had an entirely bacterial agent-contaminated atmosphere. The findings demonstrated that certain pathogenic agents, such as Shigella dysenteriae, Clostridium botulinum, and Bacillus cereus, are present in restaurants. Other pathogenic agents are primarily located on menus and containers.

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