

# Assessment of Bacteria Associated with Baking Equipment in Selected Bakeries in Ago-Iwoye, Ogun State, Nigeria.

## ABSTRACT

Microbial contamination arising from the poor hygiene of bakery equipment can result in foodborne illnesses. This study was conducted to identify enteric bacteria associated with bread bakery equipment. Sterile swab sticks were used to collect samples from the surfaces of pre-baking and post-baking equipment, such as cutting machines, millers, mixers, scales, tables, and baking pans, from five bread bakeries in Ago-Iwoye. Pure cultures of isolates were tested for their cultural characteristics and biochemical properties to identify them. *Pseudomonas* spp., *Klebsiella* spp., *Salmonella* spp., and *E.coli* were identified as bacteria genera. *Klebsiella* spp. has the highest contamination frequency of 46.88%, followed by *Pseudomonas* spp. at 25%, *Salmonella* spp. at 18.75%, and *Escherichia coli* at 9.37%. To avoid food poisoning, strict hygiene practices should be followed when handling this equipment, and the production environment should be kept clean.

Keywords: Bakery, Bacteria, Contamination, Hygiene

## INTRODUCTION

Microbial contamination of bakery equipment can have serious consequences for food safety (Qian et al., 2021). Bakery equipment such as mixers, dough dividers, ovens, and other types of

machinery can harbor a wide range of microorganisms that can contaminate food products (Vargová et al., 2020). Bacteria can be transmitted to food products through direct contact or air (Masotti et al., 2019).

Poor hygiene practices are one of the most common ways in which bakery equipment is contaminated with microorganisms (Pacher et al., 2022). Equipment can become contaminated with microorganisms from raw ingredients, food products, or the environment if not properly cleaned and sanitised (Kamboj et al., 2020). Cross-contamination can also occur if the same equipment is used to process different types of food without being properly cleaned and sanitized between uses (Kamboj et al., 2020).

Microbial contamination of bakery equipment can cause various food safety problems (Soon et al., 2020). Foodborne illnesses can be caused by bacteria and other microorganisms, resulting in symptoms such as vomiting, diarrhea, and abdominal cramps (Gourama, 2020). Foodborne illnesses can result in hospitalization or even death in severe cases (Gourama, 2020). Bacterial contamination of bakery equipment can also affect food product quality and shelf life, resulting in spoilage and waste (Pacher et al., 2022).

Imperatively, Bakery owners and employees must follow good hygiene practices, including regular cleaning and sanitizing of equipment, to prevent microbial contamination of bakery equipment (Baines & Borradale, 2020). This can help reduce the risk of foodborne illnesses and ensure the safety and quality of food products (Baines & Borradale, 2020). Bakery owners and employees must also be aware of the potential sources of contamination and take precautions to prevent cross-contamination between different types of food products (Baines & Borradale, 2020). This study aimed to investigate the presence of enteric bacteria in bakery equipment.

## MATERIAL AND METHODS

This study selected five bakeries in the Ago Iwoye community of the Ijebu North local government in Ogun state. Using sterile swab sticks, samples were collected from the surfaces of the pre-baking and post-baking equipment and immediately transferred to Olabisi Onabanjo University's microbiology laboratory for bacteriological analysis. Bacteria identification and quantification of the resulting colonies after incubation at 37 °C was accomplished by examining the colonial characteristics and biochemical reactions. All samples were tested in triplicate and the results are displayed in tables and charts.

## RESULTS AND DISCUSSION

This study sampled 26 pieces of bakery equipment from five selected bakeries in the Ago Iwoye town area, including cutting machines, mixers, millers, tables, scales, and baking pans. A total of 32 isolates were recovered from these samples, with baking pans containing the most bacteria isolates and the cutting machine containing the fewest isolates (Table 1). These findings were similar to those reported by Somayeh et al., 2020 in a study examining microbial contamination of food contact surfaces and food handlers' hands, where food production equipment was heavily contaminated with enteric bacteria (Somayeh et al., 2020). Corroborating the findings of this study, Das et al. (2020) revealed microbial contamination of bakery products as a result of preparation under unsanitary conditions (Das et al., 2020). Evidently, baking pans are the most utilized equipment, making them susceptible to high levels of contamination.

Table 1: Incidence of Bacteria Isolates on Bakery Equipments

Equipment	Bacteria present	Isolates
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Cutting machine (1)	<i>E coli</i> (1)	1
Mixer (2)	<i>Klebsiella</i> (2), <i>Salmonella</i> (2)	4
Miller (1)	<i>Klebsiella</i> (2)	2
Tables (5)	<i>Klebsiella</i> (4), <i>Pseudomonas</i> (2)	6
Scale (5)	<i>Klebsiella</i> (2), <i>Pseudomonas</i> (2), <i>Salmonella</i> (2)	6
Baking pan (12)	<i>E. coli</i> (2), <i>Klebsiella</i> (5), <i>Pseudomonas</i> (4), <i>Salmonella</i> (2)	13

The overall number of isolates recovered from bakery equipment included four Enterobacteriaceae genera, *Escherichia coli*, *Klebsiella*, *Pseudomonas*, and *Salmonella*. *Klebsiella* was found to be the most common of the four genera in this study, followed by *Pseudomonas*, *Salmonella*, and *Escherichia coli*, which was the least common (Figure 1). These findings were consistent with those of Korenekova et al. (2022), who found *Klebsiella* to be one of the most common genera in a study of bacteria in flours. Undoubtedly, baking flours have the potential to transport microbial contamination from one piece of equipment to another (Koreneková et al., 2022). In contrast, Alegbeleye et al. (2017) found *Escherichia coli*, the least common isolate in this study, to be the most common isolate in their study, contradicting the findings of this study (Alegbeleye et al., 2017). The findings of this study could be influenced by the transport and handling of vended bread, which were not considered in this study. Nonetheless, unsanitary equipment can affect the microbial load of bakery products.

Table 2: Frequency of Bacteria Isolates

ORGANISM	FREQUENCY
<i>E.coli</i>	3
<i>Klebsiella</i>	15
<i>Pseudomonas spp</i>	8
<i>Salmonella</i>	6

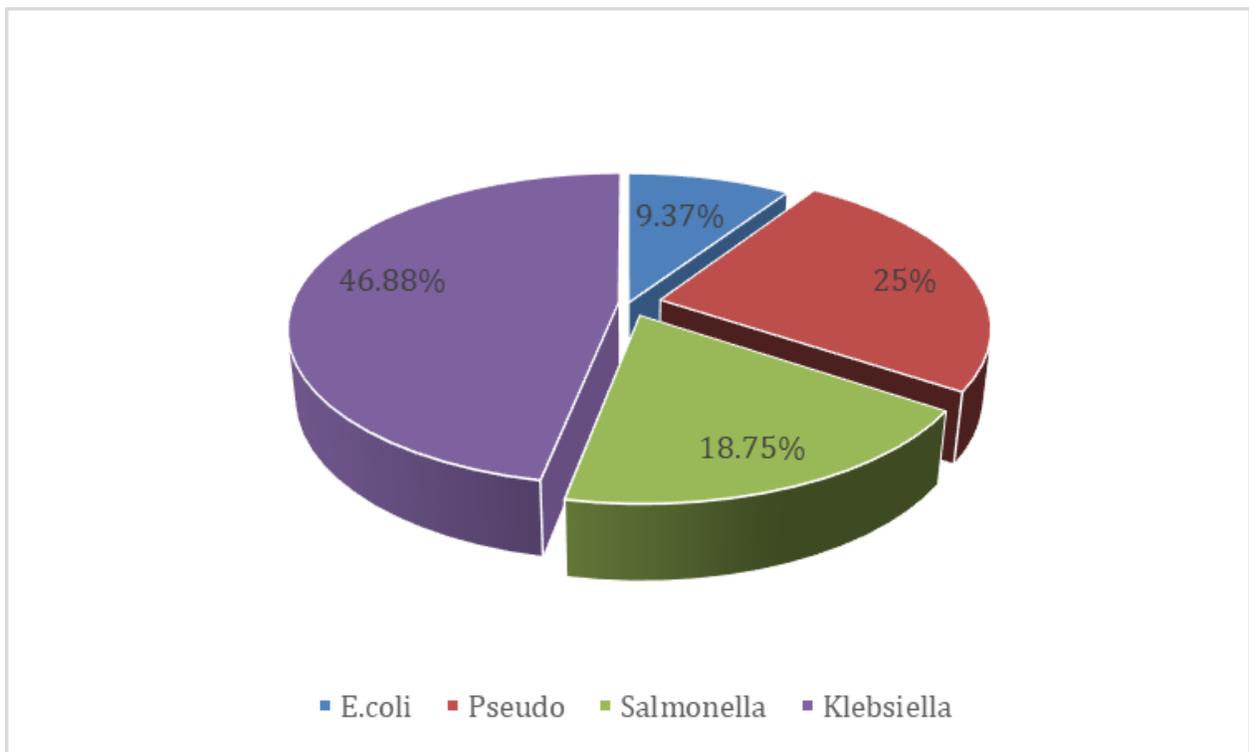


Figure 1: Percentage occurrence of bacteria isolates

## CONCLUSION

According to the study findings, bakery equipment has a very low rate of bacterial contamination. Organisms isolated from bakery equipment as well as unsanitary conditions indicate poor sanitary control and measures. Raw bread materials have been identified as a potential source of spoilage bacteria. Bakery equipment surfaces were identified as potential reservoirs of spoilage enterobacteria. Equipment quality control, effective sanitation, and prevention of the accumulation of dough and crumbs on equipment surfaces should help to reduce and control the incidence of bread spoilage microorganisms in commercial bread production.

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