Isolation and Identification of Pathogenic Microorganisms in Street Food

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Abstract

This project investigates the microbial hygiene of common street foods in [Location] by isolating and identifying bacterial and fungal contaminants from sliced fruits, packed snacks, and ready-to-eat items. A total of (__) samples were collected, serially diluted, and plated on selective and differential media for enumeration of total aerobic counts, coliforms, *Escherichia coli*, *Salmonella* spp., *Staphylococcus aureus*, and fungal contaminants. Isolates were characterized using Gram staining and biochemical tests. The study revealed elevated microbial loads in certain samples and frequent presence of coliforms and *S. aureus*, indicating inadequate hygiene during preparation and handling. Recommendations include improved vendor hygiene, temperature control, and regular food-safety monitoring.

1 Introduction

Street foods are widely consumed in developing countries due to their affordability and convenience. However, poor hygiene during preparation, storage, and vending exposes consumers to microbial contamination. Several studies report the presence of foodborne pathogens such as *E. coli*, *Salmonella* spp., and *Staphylococcus aureus* in ready-to-eat street foods, contributing to public health concerns.

The current study aims to:

- Assess the microbial hygiene of selected street foods.
- Isolate and identify predominant bacterial and fungal contaminants.
- Compare microbial loads with accepted food-safety standards.
- Provide recommendations to improve street-food hygiene.

2 Theory / Background

Microorganisms are ubiquitous in the environment and can easily contaminate foods during processing or handling [1]. Microbial load is expressed as colony forming units per gram (CFU/g) and reflects the number of viable cells capable of forming colonies on a suitable medium [2].

Selective and differential media facilitate the identification of specific organisms:

- Plate Count Agar (PCA): total viable count.
- MacConkey or EMB agar: coliforms and *E. coli*.
- XLD or SS agar: *Salmonella* spp.
- Mannitol Salt Agar: *S. aureus*.
- Sabouraud Dextrose Agar: yeasts and molds.

Indicator organisms such as coliforms and *E. coli* suggest fecal contamination, while the presence of *S. aureus* indicates contamination from human handlers.

3 Experimental Setup / Simulation Framework

Sample Collection

Samples of sliced fruits, packed snacks, and ready-to-eat foods were collected from various vendors across [Location] [3]. Each sample (approximately 25 g) was placed in sterile containers and transported to the microbiology laboratory within 2–4 hours under chilled conditions [4].

Figure 1: (Left) Sample of street food; (Right) Microbial colonies observed on agar plate.

Sample Preparation

Each 25 g sample was homogenized in 225 mL of sterile buffered peptone water (BPW) to obtain a 1:10 dilution. Serial tenfold dilutions (10^{-1} to 10^{-6}) were prepared using sterile saline.

Plating and Incubation

- Total viable count: PCA/Nutrient agar, 37°C for 24–48 h.
- Coliforms and *E. coli*: MacConkey or EMB agar, 37°C for 24 h.
- *Salmonella* spp.: enrichment in BPW, then XLD/SS agar, 37°C for 24–48 h.
- *S. aureus*: Mannitol Salt Agar, 37°C for 24 h.
- Yeasts and molds: Sabouraud Dextrose Agar, 25–30°C for 3–5 days.

Figure 2: Collection and preparation of street food samples for microbiological analysis.

Identification

Presumptive colonies were subjected to Gram staining and biochemical tests (IMViC, catalase, oxidase, urease, coagulase, and TSI). Identification was confirmed based on morphology, color change, and biochemical reactions.

Controls

E. coli ATCC 25922 and *S. aureus* ATCC 25923 served as positive controls; uninoculated media served as negative controls.

4 Data Analysis

The colony count from plates with 30–300 colonies was recorded. CFU/g was calculated using:

$$\text{CFU/g} = \frac{\text{Number of colonies} \times \text{Dilution factor}}{\text{Volume plated (g or mL)}}$$

Figure 3: Microbial colonies observed on nutrient agar after incubation at 37°C for 24 hours.

Microbial counts were expressed as $\log_{10}$ CFU/g. Descriptive statistics (mean, SD) were computed, and microbial loads among food types were compared using ANOVA or Kruskal–Wallis tests [5]. The results were compared with WHO and local food-safety standards.

Example acceptable limits:

- Total viable count (TVC): $< 10^5$ CFU/g.
- *E. coli*: absent or $< 10^2$ CFU/g.
- *S. aureus*: $< 10^4$ CFU/g.
- *Salmonella*: absent in 25 g.

5 Results

A total of 45 samples were analyzed (15 from each category). Mean total viable counts ranged between 4.5 and 6.8 $\log_{10}$ CFU/g.

Table 1: Example of Microbial Counts in Street Food Samples

Sample ID	**Food Type**	**TVC (CFU/g)**	**log CFU/g**	**Coliforms**	**S. aureus**	**Identifie**
F01	Sliced mango	2.3×10^6	6.36	1.2×10^4	3.0×10^3	*E. coli, S*
R05	Chicken kebab	1.0×10^7	7.00	ND	5.0×10^4	*S. aureus*
S03	Chips	4.5×10^4	4.65	2.0×10^2	ND	*B. cereus*

6 Discussion

High microbial counts were observed in ready-to-eat and sliced fruit samples, indicating contamination during preparation or exposure to ambient air [6]. The presence of *E. coli* and coliforms suggests poor washing practices and possible fecal contamination, while *S. aureus* points to human handling contamination [7]. Packed snacks showed relatively low contamination, likely due to minimal handling and prior processing [4]. Yeast and mold growth further indicated poor storage and high humidity conditions.

7 Conclusion

The study confirmed that street foods in [Location] harbor significant microbial contamination, with several samples exceeding acceptable safety limits. Regular monitoring, vendor hygiene training, and enforcement of basic sanitary practices are recommended to minimize risks of foodborne illness.

Recommendations

- Vendors should use clean utensils and cover foods.
- Provide accessible hand-washing facilities at vending sites.

- Conduct periodic food-safety inspections.
- Encourage consumer awareness on food hygiene.

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A Appendix A: Additional Data or Plots

Additional figures or detailed data tables can be added here if needed.

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