

Chilling Challenges: Unveiling Microbial Dynamics and Risk Profiling in Household Refrigerators

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ABSTRACT

Background: Domestic refrigeration plays a pivotal role in food preservation and waste reduction; however, it faces substantial challenges associated with microbial contamination. Bacteria, molds, and yeasts can proliferate in cold environments, potentially resulting in foodborne illnesses, food spoilage, economic losses, and environmental implications. Addressing these concerns necessitates a comprehensive understanding of factors influencing microbial contamination in refrigerators, encompassing temperature regulation, hygiene practices, and food management.

Objective: This study aims to quantitate airborne bacteria and fungi in cold conditions. Through a survey-based method, we examined household refrigeration practices and conducted risk assessments to enhance refrigerator hygiene.

Design: A systematic analysis was undertaken on the microbial milieu of 127 household refrigerators. Petri dishes containing PCA and YPD media were positioned both inside and outside the fridges for 15 minutes, facilitating a comparative assessment of microbial populations. Refrigeration practices were assessed using a questionnaire and a survey conducted in Karachi. This holistic approach enabled a nuanced comprehension of microbial ecology within refrigerators and associated behavioral patterns. This insight led to a risk assessment based on ISO-31000 guidelines, specifically tailored to household refrigeration practices.

Results: Surveying around 1000 respondents in Karachi revealed refrigerator practices classified into three levels aligned with microbial counts concerning refrigeration practices: 24.77% fell under Level 1 (Satisfactory), 29.27% under Level 2 (Acceptable), and 17.48% under Level 3 (Unsatisfactory). Notably, 28.48% of respondents did not conform to any of these predefined levels.

Conclusion: We have established microbial thresholds for refrigerator environments, enabling a robust analysis of food storage conditions and hygiene practices."

Keywords: Microbial contamination, Food preservation, Hygiene practices, Risk assessment, Refrigerator ecology.
