Microbiological Safety Assessment of Cooked Foods After Portioning in Airline Catering Under Cold Chain Systems at Different Storage Durations

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ABSTRACT

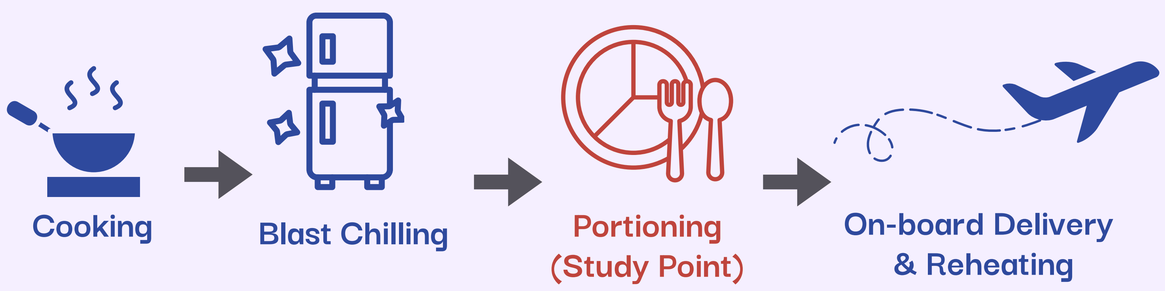
Airline catering operations involve large-scale cooked food production which requires strictly quality control under cold chain systems at 4°C, with a regulatory requirement to deliver meals on board within 24 hours. However, variations in storage duration may promote microbial growth, which may lead to a direct risk of food safety and passenger meal standards.

This study aimed to evaluate the relationship between storage duration and microbial counts in cooked foods following the portioning process at 4°C, at storage intervals of 0, 24, and 36 hours. The results revealed that total microbial counts increased progressively over time, from 1.2×10^3 CFU/g at 0 hour to 4.5×10^4 and 1.8×10^5 CFU/g at 24 and 36 hours, respectively. Despite this increase, all counts remained within established food safety standards. No contamination of *Escherichia coli* or *Listeria monocytogenes* was detected at any time point, while *Bacillus cereus* was found only in trace amounts at 36 hours, which was below the hazardous thresholds.

In conclusion, using the cold chain system at 4°C effectively maintained microbiological safety of cooked foods prepared by the Catering Department of Thai Airways International Public Company Limited for up to 36 hours, which exceeded the standard 24-hour requirement. Therefore, results from this research can be used to apply for a risk management and guideline planning for a more food safety storage.

INTRODUCTION

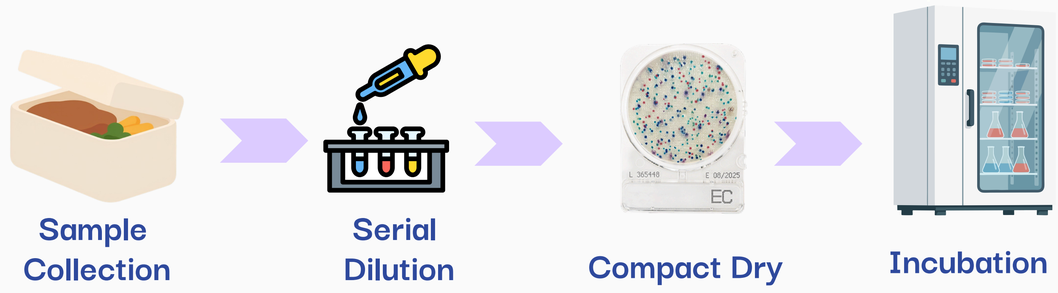
Current international standards for airline catering require portioned cooked meals to be maintained at 4°C and loaded onto aircraft within 24 hours. However, real-world operations are frequently disrupted by flight delays, cancellations, or scheduling changes, causing food to be stored beyond the recommended timeframe and increasing the risk of microbial growth and foodborne illness. Despite extensive microbiological safety research in the general food industry, studies specific to airline catering, particularly on the effect of extended post-portioning storage on microbial counts, remain limited.



OBJECTIVES

- To determine total microbial counts at 0, 24, and 36 hours of storage at 4°C.
- To detect contamination of foodborne pathogens : *E. coli*, *L. monocytogenes*, and *B. cereus*.
- To analyze the relationship between storage time and microbial growth compared to safety standards.
- To evaluate the effectiveness of the cold chain system in a real airline catering environment.

METHODOLOGY



FOOD SAMPLE

Pork neck sliced with curry sauce

STORAGE CONDITIONS

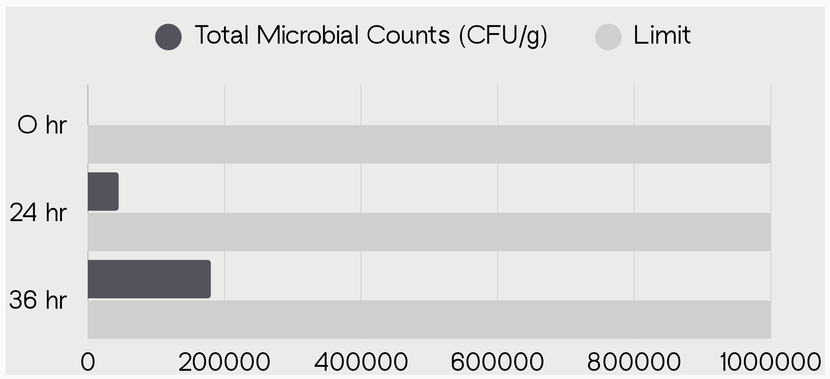
- **Temperature: 4°C**
- **Storage duration : 0, 24, and 36 hours**

MICROBIOLOGICAL ANALYSIS

- **Total Microbial Counts (CFU/g)**
- ***E. coli***
- ***L. monocytogenes***
- ***B. cereus***

Testing was performed using **Compact Dry** microbiological plates under controlled laboratory conditions

RESULTS & DISCUSSION



TIME	TMC	*B.cereus*	*E.coli*	*L.mono*
0 hr	1.2×10^3	ND	ND	ND
24 hr	4.5×10^4	ND	ND	ND
36 hr	1.8×10^5	2.5×10^2	ND	ND
LIMIT	$<1\times10^6$	$<1\times10^3$	<3 MPN/g	Zero tolerance

Note: ND = Not Detected, TMC = Total Microbial Counts (CFU/g),
B. cereus = *Bacillus cereus*, *E. coli* = *Escherichia coli*, *L. mono* = *Listeria monocytogenes*

Escherichia coli
Not detected

Listeria monocytogenes
Zero tolerance

Bacillus cereus
Detected at 36 hr below the limit

Total Microbial Counts
Well below the limit

- **The significant increase in total microbial counts between 24 and 36 hr was consistent with microbial growth kinetics under refrigeration.**
- **The detection of *B. cereus* at 36 hr, although within safe limits, suggested an increasing risk if storage was extended beyond this point.**
- **The absence of *E. coli* and *L. monocytogenes* throughout all time points reflected effective cooking processes and good hygiene practices.**

CONCLUSIONS

- **Microbial counts increased progressively with storage time but remained within safety limits at all time points.**
- **The 4°C cold chain system effectively maintained microbiological safety for up to 36 hours, though findings are limited by a single food type.**

REFERENCES

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