CULTURE ASSESSMENT OF THE BACTERIAL QUALITY OF AIR IN THE FOOD PREPARATION AREAS OF A CAFETERIA AND CHARACTERISATION OF THE GRAM-POSITIVE BACTERIAL SPECIES ISOLATED

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By

YAP MING ZHE

A project report submitted to the Department of Biological Science

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ABSTRACT

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YAP MING ZHE

The exact role of bioaerosols in the spread of disease and spoilage of food remains poorly understood despite their significant impacts. This study aimed to assess the levels of culturable airborne bacteria in the food preparation areas, of a UTAR Perak Campus cafeteria and characterise the Gram-positive bacteria species isolated. The airborne bacteria were collected via the culture impaction method. The levels of culturable bacteria in the air were determined and their association with the temperature and relative humidity at the sampling points was investigated. Gram-positive bacteria were selected from among the primary isolates obtained and identified via the 16S rDNA sequencing. The Gram-positive bacterial species that are potentially associated with foodborne illness were confirmed via the API tests. They were then further characterised via the [CONFIDENTIAL], [CONFIDENTIAL], antibiotic susceptibility test, and pulsed-field gel electrophoresis (PFGE) subtyping. The findings from this study showed that the levels of airborne bacteria were higher in [CONFIDENTIAL] than in [CONFIDENTIAL] on average. Statistical analysis

showed that the levels of airborne bacteria in the air were correlated to the temperature and relative humidity. The identities of the Gram-positive bacteria were successfully determined via the 16S rDNA sequencing and they were clustered into: [CONFIDENTIAL]. Out of the six [CONFIDENTIAL] isolates, five (1A1, 1A10, 1D9, 3B4, and 3D2) were identified as [CONFIDENTIAL] and one (2E5) was identified as [CONFIDENTIAL]. All these isolates are potentially diarrhoeagenic since they were shown to possess various [CONFIDENTIAL] in their genome. Besides, they were also tested to be resistant to both ampicillin and penicillin. Therefore, the [CONFIDENTIAL] species isolated in this study are a concern to food safety and quality due to their pathogenic and spoilage potentials, respectively.

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For my aunt,

Yap Siew Hun;

Without her, I would not be here today.

Thank You.

DECLARATION

I hereby declare that the project report is based on my original work except for quotation and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institution.

_____

(YAP MING ZHE)

APPROVAL SHEET

This project report entitled "**CULTURE ASSESSMENT OF THE BACTERIAL QUALITY OF AIR IN THE FOOD PREPARATION AREAS OF A CAFETERIA AND CHARACTERISATION OF THE GRAM-POSITIVE BACTERIAL SPECIES ISOLATED**" was prepared by YAP MING ZHE and submitted as partial fulfilment of the requirement of degree of Bachelor of Science (Hons) Biotechnology at Universiti Tunku Abdul Rahman.

Approved by:

_____

Date: …….....

(DR. EDDY CHEAH SEONG GUAN)

Supervisor

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Date: _____

PERMISSION SHEET

It is hereby certified that **YAP MING ZHE** (ID No: **12ADB06987**) has completed this final year project entitled "**CULTURE ASSESSMENT OF THE BACTERIAL QUALITY OF AIR IN THE FOOD PREPARATION AREAS OF A CAFETERIA AND CHARACTERISATION OF THE GRAM-POSITIVE BACTERIAL SPECIES ISOLATED**"under the supervision of Dr. Eddy Cheah Seong Guan from the Department of Biological Science, Faculty of Science.

I hereby give permission to the University to upload the softcopy of my final year project in pdf format into the UTAR Institutional Repository, which may be made accessible to the UTAR community and public.

Yours truly,

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(YAP MING ZHE)

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ACGIH	American Conference of Governmental Industrial Hygienists
API	Analytical Profile Index
BHIG	brain-heart infusion broth with glucose
BLAST	Basic Local Alignment Search Tool
$CaCl_2$	calcium chloride
CDC	Centers for Disease Control and Prevention
CFU	colony-forming unit
CLSI	Clinical and Laboratory Standard Institute
$CuSO_4$	copper sulphate
CytK	cytotoxin K
DNA	deoxyribonucleic acid
dNTP	deoxyribonucleoside triphosphate
EDTA	ethylenediaminetetreacetic acid
EFSA	European Food Safety Authority
EntFM	enterotoxin FM
E-value	expect value
$FeSO_4$	iron sulphate
FNA	fortified nutrient agar
Hbl	haemolytic toxin
$MgCl_2$	magnesium chloride
$MgSO_4$	magnesium sulphate
MH	Müller-Hinton
MLST	multilocus sequence typing
NaCl	sodium chloride
NCBI	National Center for Biotechnology Information
Nhe	non-haemolytic toxin
NIOSH	National Institute of Occupational Safety and Health
NTC	no-template control
OD	optical density

PCR	polymerase chain reaction
PFGE	pulsed-field gel electrophoresis
rDNA	ribosomal deoxyribonucleic acid
TSA	tryptic soy agar
UV	ultraviolet
WHO	World Health Organization
$ZnSO_4$	zinc sulphate

˚C	degree Celsius
×	times
bp	base pair
G	gramme
h	hour
L	litre
µL	microlitre
µM	micromolar
min	minute
mL	millilitre
mm	millimetre
mM	millimolar
ng	nanogramme
nm	nanometre
U	unit
V	volt
v/v	volume per volume
w/v	weight per volume