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

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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.
ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor, Dr. Eddy Cheah Seong Guan for his excellent guidance, care, and patience, as well as providing me with an excellent atmosphere for doing research. He has been supportive since the days I began working on this project. He helped me to come up with the thesis structure and guided me over almost a year of this project.

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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)
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:

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Date: ………………………………
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UNIVERSITI TUNKU ABDUL RAHMAN

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,

___________________

(YAP MING ZHE)
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<td>ACGIH</td>
<td>American Conference of Governmental Industrial Hygienists</td>
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<td>API</td>
<td>Analytical Profile Index</td>
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<td>BHIG</td>
<td>brain-heart infusion broth with glucose</td>
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<td>BLAST</td>
<td>Basic Local Alignment Search Tool</td>
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<td>CaCl$_2$</td>
<td>calcium chloride</td>
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<tr>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
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<td>CFU</td>
<td>colony-forming unit</td>
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<td>CLSI</td>
<td>Clinical and Laboratory Standard Institute</td>
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<td>CuSO$_4$</td>
<td>copper sulphate</td>
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<td>CytK</td>
<td>cytotoxin K</td>
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<td>DNA</td>
<td>deoxyribonucleic acid</td>
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<td>dNTP</td>
<td>deoxyribonucleoside triphosphate</td>
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<td>EDTA</td>
<td>ethylenediaminetetraacetic acid</td>
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<td>EFSA</td>
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<td>haemolytic toxin</td>
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<td>Nhe</td>
<td>non-haemolytic toxin</td>
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<td>NIOSH</td>
<td>National Institute of Occupational Safety and Health</td>
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<td>NTC</td>
<td>no-template control</td>
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<td>OD</td>
<td>optical density</td>
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PCR  polymerase chain reaction
PFGE  pulsed-field gel electrophoresis
rDNA  ribosomal deoxyribonucleic acid
TSA   tryptic soy agar
UV    ultraviolet
WHO   World Health Organization
ZnSO₄  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