STUDY OF MICROORGANISMS WITHIN THE HOUSING ENVIRONMENT

Submitted By

Heba Kamal Ahmed Abdel Aziz

B.Sc. of Science (Chemistry/Microbiology), Faculty of Science,
Zigzag University, 2005

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences

Department of Environmental Basic Sciences
Institute of Environmental Studies and Research
Ain Shams University

2018

APPROVAL SHEET

STUDY OF MICROORGANISMS WITHIN THE HOUSING ENVIRONMENT

Submitted By
Heba Kamal Ahmed Abdel Aziz
B.Sc. of Science (Chemistry/Microbiology), Faculty of Science,
Zigzag University, 2005

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences
Department of Environmental Basic Sciences

This thesis Towards a Master Degree in Environmental Sciences
Has been Approved by:

Name Signature

1- **Prof. Dr. Yasser Hassan Ibrahim Hassan**
Prof. and Head of Air Pollution Department
National Research Center (N.I.C.)

2- **Prof. Dr. Niven Saleh Gwelly**
Prof. and Head of Department of Botany and Microbiology
Faculty of Science
Cairo University

3- **Prof. Dr. Mahmoud Ahmed Ibrahim Hewaihy**
Prof. of Public Health, Department of Environmental Basic Sciences
Institute of Environmental Studies & Research
Ain Shams University

4- **Prof. Dr. Rawhia Abdel Menem Arafa**
Prof. of Microbiology and Botany
Faculty of Science (Girls)
Al-Azhar University

2018

STUDY OF MICROORGANISMS WITHIN THE HOUSING ENVIRONMENT

Submitted By

Heba Kamal Ahmed Abdel Aziz

B.Sc. of Science (Chemistry/Microbiology), Faculty of Science, Zigzag University, 2005

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Master Degree
In
Environmental Sciences
Department of Environmental Basic Sciences

Under The Supervision of:

1- Prof. Dr. Mahmoud Ahmed Ibrahim Hewaihy
Prof. of Public Health, Department of Environmental Basic Sciences
Institute of Environmental Studies & Research
Ain Shams University

2- Prof. Dr. Rawhia Abdel Menem Arafa
Prof. of Microbiology and Botany
Faculty of Science (Girls)
Al-Azhar University

2018

Acknowledgment

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully.

This thesis appears in its current form due to the assistance and guidance of several people. I would therefore like to offer my sincere thanks to all of them.

My deepest appreciation to **Prof. Dr. Mahmoud Ahmed** Institute of Environmental studies and Research Ain Shams University who provided me constructive criticism which helped me develop a broader perspective to my thesis. generously gave his time to offer me valuable comments toward improving my work, reading my reports, and for practical advice. I am also thankful to Him for commenting on my views, understand and enrich my ideas.

There are no proper words to convey my deep gratitude and respect for **Prof.Dr. Rawhia Abdel Menaem Arafa** Faculty of Science El Azhar University, for her encouragement, I am also thankful to her for reading my reports, commenting on my views and helping me understand and enrich my ideas. it is a great honor to work under her guidance and supervision.

My deepest appreciation to my friends

Dr. Mohammad Khedr and Dr. Ahmed Hamdy for encouraging me.

Most importantly, none of this would have been possible without the constant source of love, concern, support, strength and patience all these years of my family to whom this dissertation is dedicated to. I would like

to express my heart-felt gratitude to my daughter **Nour** and my son **Abdel Rahman**, I would like to thank my husband, **Hamed Abdel latif**. He was always there cheering me up and stood by me through the good times and bad.

I would also like to thank my sisters; **Dr. Hend,** Amany and my brother **Dr. Ahmed** they were always supporting me and encouraging me with their best wishes.

I dedicate this thesis for my **father** raised me, supported me taught, loved me and encouraged me.

Lastly, and most importantly, I wish to thank my **Mother**, she born me, raised me, supported me, taught me, and loved me. To her I dedicate this thesis.

Abstract

Bacteria are found virtually in every environment. High levels of bacteria concentration indoors is an indication of high occupancy rate, poor ventilation, low cleaning facilities and poor building maintenance. we study airborne Bacteria in Indoor Environments in two residences areas covering summer, winter season to study the climate effect (temperature) also covering high level and low level population to study the socioeconomic effect (good aeration, ventilation, cleaning facilities and variation of occupation area per citizens).we examine the presence of airb0rne Bacteria in Indoor Environments and colony forming unit for each case and we found that *Exiguobacterium sp* was the most frequent bacteria (37.5%) in high level population in the Summer climate, Bacillus sp was the most frequent bacteria (26.7%) in high level population in the Winter climate, *Brachybacterium sp* was the most frequent bacteria (42.4%) in low level population in the summer climate and *kytococcus sp* was the most frequent bacteria (32.2%) in low level population in the winter climate. Also we found a significant increase in colony forming unit in low level residence population in summer than in High level residence population in summer which indication the negative effect of high occupancy rate, poor ventilation and low cleaning facilities on quality of air and a significant increase in colony forming unit in High level residence population in summer than in High level residence population in winter which indicate high level of airborne bacteria due to high temperature.

KEYWORDS:

Air, Microorganisms, airborne Bacteria, Seasons and residences level.

List of Contents

List of Tables

List of Figures

List of Abbreviations

Acronym	Definition
AER	Air exchange rate
ALRI	Acute lower respiratory infection.
ATS	American Thoracic Society
BMRC	British Medical Research Council
BS	British Smoke
CB	Carbon Black
CBC	Complete Blood Count
CFU	Colony forming unit
COPD	Chronic obstructive pulmonary disease
DALYs	Disability adjusted life years
DEP	Diesel exhaust particles
ECCS	European Community for Coal and Steel
GBD	Global Burden of Disease study
GSC	Genomic Standards Consortium
HAP	Household Air pollution
IAP	Indoor Air pollution
IAQ	Indoor Air quality
MIxS-BE	Minimum Information about any (x) Sequence-Built Environment
MTI	Median time to identification
MTR	Mass Transit Railway
NI	Nosocomial infection
NMMAPS	National morbidity, mortality and air pollution study
NTM	Nontuberculous Mycobacteria
PCR-DGGE	Polymerase chain reaction and denaturing gradient gel electrophoresis
PEX	Polyethylene
WHO	World Health Organization

Introduction

Introduction

1.1. Indoor Air Quality

How safe is the air in your surrounding environment that you spend much of your time? Indoor environments are fundamental environmental factors capable of impacting health. Air quality of indoor environments is one of the main factors affecting health, wellbeing and productivity of people. One of the problems of indoor air quality is affected by the presence of microorganisms which include bacteria, moulds and viruses ***(Wemedo et al., 2012)*** and people spends 80%- 90% of their time in indoors environment ***(Awad & Farag, 1999)*** by breathing on average 14 m3 of air per day ***(Brochu et al., 2006).*** These make people highly exposed to indoor air environments. As of these, in recent years there has been a growing interest in indoor microbe studies [WHO 2013]. The activity of people and equipment within the indoor environments is thought to be the principal factor contributing to the buildup and spread of airborne microbial contamination ***(Qian et al., 2012).*** Particular activities like talking, sneezing, coughing, walking and washing can generate airborne biological particulate matter. A review made by WHO on the number of epidemiological studies showed that, there is sufficient evidence for an association between indoor dampness-related factors and a wide range of effects on respiratory health, including asthma development, asthma exacerbation, current asthma, respiratory infections, upper respiratory tract symptoms, cough, wheeze and dyspnoea [WHO 2013]. Thus microbiological air quality is an important criterion that must be taken into account when indoor workplaces are designed to provide a safe environment. This study provides information on the current concentration of microorganisms and describes bacterial loads for different seasonal.

climate changes. Moreover, the impact of environmental factors (population level variation) on their multiplication and growth in the indoor air.

1.2. The microbial loads of the buildings

The microbial loads of the buildings were favored by the environmental conditions which enhance their development. And also it was stated by WHO that dampness situation has to be considered as the risk indicator for health risks of biological contaminants of indoor air [WHO 2013].