ROLE OF AIR POLLUTION AT GASOLINE STATIONS IN ALLERGIC DISORDERS

BY

GEORGE ALBERT TAWFILIS

M.B.B.Ch., Ain Shams University (1981)
Master in Dermatology and Venereology, Cairo University (1987)

A Thesis Submitted in the Fulfillment for

DOCTOR OF PHILOSOPHY

In Environmental Sciences

Department of Medical Science

Institute of Environmental Studies & Research

AIN SHAMS UNIVERSITY

2005

Approval Sheet

ROLE OF AIR POLLUTION AT GASOLINE STATIONS IN ALLERGIC DISORDERS

BY

GEORGE ALBERT TAWFILIS

M.B.B.Ch., Ain Shams University (1981)
Master in Dermatology and Venereology, Cairo University (1987)

A Thesis Submitted in the Fulfillment for
Ph. D.
In Environmental Sciences
Department of Medical Science

This thesis has been approved by:

PROF. DR.GABR METWALLY SAYED AHMED
Prof.of Community, Environmental and Public Health
Faculty of Medicine, Al-Azhar University

PROF. DR. SALEH MOHAMED HASSAN EL SHIEMY
Prof.of Dermatology and Venereology
Faculty of Medicine, Ain Shams University.

PROF. DR. MOHAMED SAYED MANSOUR EL GEWAILY
Prof.of Community, Environmental and Occupational Medicine
Faculty of Medicine, Ain Shams University.

PROF. DR. MAHMOUD SERY MOHAMED EL BOUKHARY
Assistant Prof. in Medical Science Department
Institute of Environmental Studies & Research, Ain Shams University.

2005

ROLE OF AIR POLLUTION AT GASOLINE STATIONS IN ALLERGIC DISORDERS

BY

GEORGE ALBERT TAWFILIS

M.B.B.Ch., Ain Shams University (1981)
Master in Dermatology and Venereology, Cairo University (1987)

A Thesis Submitted in the Fulfillment for
DOCTOR OF PHILOSOPHY
In Environmental Sciences
Department of Medical Science

Under The Supervision of:

PROF. DR. MOHAMED SAYED MANSOUR ELGEWAILY
Prof.of Community, Environmental and Occupational Medicine
Faculty of Medicine, Ain Shams University

PROF. DR.MOUSTAFA MOKHTAR MOHAMED KAMEL
Prof.of Dermatology and Venereology
Faculty of Medicine, Ain Shams University

PROF. DR. MAHMOUD SERY Mohamed EL BOUKHARY
Assistant Prof. in Medical Science Department
Institute of Environmental Studies&Researches, Ain Shams University

PROF. DR. MAHMOUD AHMED IBRAHIM HOWAIHY
Assistant Prof. in Biological and Physical Sciences Department
Institute of Environmental Studies&Researches, Ain Shams University

Institute of Environmental Studies & Research
AIN SHAMS UNIVERSITY

2005

Acknowledgement

Thanks to God before and after. I would like to express my sincere gratitude and appreciation to Prof. Dr. Mohamed Sayed Mansour El-Gewaily Prof. of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain Shams University for his unlimited help, continuous advice, guidance, valuable remarks and great support throughout this study.

My deep thanks and appreciation to Prof. Dr. Mostafa Mokhtar Mohamed Kamel Prof. of Dermatology and Venereology, Faculty of Medicine, Ain Shams University for his kind assistance, meticulous supervision and generous help.

I am indeed indebted to Prof. Dr. Mahmoud Serry El Boukhary Ass. Prof. in Medical Science Department, Institute of Environmental Studies and Research, Ain Shams University for his great help and guidance during the preparation of this work as well as following up of every step in this thesis.

My sincere thanks to Prof. Dr. Mahmoud Ahmed Howaihy Ass. Prof. in Biological and Physical Sciences Department, Institute of Environmental Studies and Research, Ain Shams University for his valuable support specially in the environmental measures.

Also I would like to thank Dr. Magdy Allam and the members of the Egyptian Environmental Affairs Agency (EEAA) / Ministry of state for Environmental Affairs, for their great effort in measuring the air pollutants inside the gasoline stations, in areas around them and in control areas.

My sincere thanks and appreciation for Prof. Dr. Mohamed Abd El Kader El khafif, the Dean of the Institute of Environmental Studies and Research, and Prof. Dr. Mostafa Hassan Ragab, the head of the Medical Department, Institute of Environmental Studies and Research, for their generous help and support letters to facilitate my field work.

I want to express my thankfulness to Dr. Monir Saad, lecturer of statistics, Desert Research Institute for his tremendous effort in the statistical analysis for this work.

Lastly, I would like to thank my wife for her great help to create enough time for this thesis.

ABSTRACT

In this study, we investigated the relationship between gasoline-related air pollutants namely total hydrocarbons, carbon monoxide, sulfur dioxide, particulate matter and methyl tertiary butyl ether (MTBE), at the gasoline service stations, and allergic disorders. One hundred and eleven workers who represented all available exposed labors inside ten service stations (Occupational group), and 60 subjects that were living or working in close proximity to gasoline stations (Environmental group), were compared with 60 none exposed subjects (Control group). All individuals were subjected to complete general, dermatological and chest examinations. Investigations included pulmonary function testing (FEV1: Forced expiratory volume exhaled in the first second) and skin patch test. A significant relationship was noticed among the four types of allergy (skin, chest, nasal and eye allergies). Most cases had been suffering from more than one type of allergy at the same time. The concentrations of these gasoline-related air pollutants were measured in the ambient air of the gasoline stations, surrounded regions and the control areas. It was found that the higher the levels of MTBE, SO2, and hydrocarbons, in ambient air, the higher the number of subjects suffering from allergic disorders, however the most significant factor was MTBE.

CONTENT Page

LIST OF ABBREVIATIONS

MTBE: Methyl tertiary butyl ether

ETBE: Ethyl Tertiary butyl ether

TAME: Tertiary amyl methyl ether

THC: Total hydrocarbons

CD: Contact dermatitis

UV: Ultra violet

T.R.U.E.: thin layer rapid use epicutaneous test

FVC: Forced vital capacity

FEV1: Forced expiratory volume exhaled in the first second

RV: Residual volume

RADS: Reactive airways dysfunction syndrome

PM: Particulate matter

WHO: World health organization

EPA: Environmental protection agency

NAAQS: National ambient air quality standards

mcg: micrograms

µg: micrograms

PPM: parts per million

MHC: Major Histocompatibility Complex

DTH: Delayed type hypersensitivity

LIST OF ABBREVIATIONS (cont.)

CAMs: Cellular adhesion molecules

IL-1: Interleukin-1

APC: Antigen processing cells

SPSS: Statistical Package for Social Science (Computer program for statistical analysis)

ENL; Erythema nodosum leprosum , in leprosy

NIOSH: National institute for occupational safety and health

CD: contact dermatitis

MMEFR: Maximal midexpiratory flow rate

SO_2: Sulfur dioxide

CO: Carbon monoxide

O_3: Ozone

Pb: Lead

Hb: Hemoglobin

EEAA: Egyptian Environmental Affairs Agency

RFG: Reformulated gasoline

CDC: Center for disease control and prevention

NAAQS: National ambient air quality standards

RON: Research octane number

TBA: Tertiary butyl alcohol