

THE EFFECTS OF UNDER-AGE CHILDREN
WORKING IN A HOUSEHOLD TO A PERSONAL
AND SOCIAL LIFE IN THE FUTURE

RESEARCH REPORT

ADRIAN GUN'S DESIGN
EMILY GUN'S DAN TEKNOLOGI

KOLEJ UNIVERSITI GUN'S DAN TEKNOLOGI MELAKA

2004

1100030769

PERPUSTAKAAN KOLEJ UNIVERSITI SAINS & TEKNOLOGI MALAYSIA (KUSTEM)			
Pengarang Quah Hui Hsien		No. Panggilan Lp 16	
Judul Lung function study		PST 16	
Tarikh	Waktu Pemulangan	Nombor Ahli	Tanda tangan

**LUNG FUNCTION STUDY OF KINDERGARTEN CHILDREN LIVING IN A
VICINITY TO A PETROCHEMICAL INDUSTRIAL AREA IN PAKA,
TERENGGANU**

By

Quah Hui Hsien

**Research Report submitted in partial fulfilment of
the requirements for the degree of
Bachelor of Science (Biological Sciences)**

**Department of Biological Sciences
Faculty of Science and Technology
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA
2004**



**JABATAN SAINS BIOLOGI
FAKULTI SAINS DAN TEKNOLOGI
KOLEJ UNIVERSITI SAINS DAN TEKNOLOGI MALAYSIA**

**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

LUNG FUNCTION STUDY OF KINDERGARTEN CHILDREN LIVING IN A VICINITY
TO A PETROCHEMICAL INDUSTRIAL AREA IN PAKA, TERENGGANU.

oleh QUAH HUI HSIBN....., No. Matrik UK5407.....

telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperoleh Ijazah SARJANA MUDA SAINS (SAINS BIOLOGI)....., Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

Penyelia Utama **FARIDAH MOHAMAD**
Nama: **Jabatan Sains Biologi**
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21000 Kuala Terengganu, Terengganu.

Tarikh: 15/3/04.....

Penyelia Kedua (jika ada)

Nama:

Cop Rasmi

Tarikh:

Ketua Jabatan Sains Biologi
Nama: **PROF. DR. CHAN ENG HENG**
Cop Rasmi: **Jabatan Sains Biologi**
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21000 Kuala Terengganu.

Tarikh: 16/03/04.....

AKNOWLEDGEMENTS

I would like to express my gratitude to my supervisor Cik Faridah for her guidance and advice. Her patience and support is always highly appreciated.

And, special thanks to all the kindergarten's authorities, teachers, the children and their parents for cooperation. All of them haven given excellent responses in this study. Their cooperation, patience and understanding are always highly appreciated.

Also special thanks to all my friends for leading me a hand during sampling. Last but not least, my warmest family for their full support and encouragement.

TABLE OF CONTENTS

Title Page	i
Approval Form	
Acknowledgements	ii
Table of Contents	iii
List of Tables	v
List of Figures	vi
List of Abbreviations / Symbols	vii
List of Appendices	viii
Abstrak	ix
Abstract	x
1.0 Introduction	1
2.0 Literature Review	
2.1 Respiratory System	4
2.1.1 Defence Mechanism	6
2.1.2 Children Respiratory System	8
2.2 Air Pollution	9
2.2.1 Petrochemical	9
2.2.2 Health Effects of Air Pollution	10
2.2.3 Air Pollution and Children Health	12
2.3 Air Quality	14
2.4 Lung Function Test	16
2.5 Air Pollution in Malaysia	17
3.0 Methodology	18
3.1 Study Location	18

3.2 Study Population	18
3.3 Questionnaire	20
3.4 Lung Function Test	20
3.4.1 VC Measurement	23
3.4.2 FVC Measurement	23
3.5 Statistical Analysis	24
4.0 Results	25
4.1 Lung Function Measurements	25
4.2 Questionnaire	30
5.0 Discussion	35
5.1 Effects of Petrochemical Emission on Lung Function	35
5.2 Effects of Possible Confounders on Lung Function	36
5.3 Respiratory Symptoms and Diseases	38
5.4 Conclusion	39
6.0 Conclusion / Suggestion	41
References	42
Appendices	46
Curriculum Vitae	55

LIST OF TABLE

Table	Title	Page
1	Air emission from the petroleum industry suggested by World Bank Group.	15
2	Physical characteristic and spirometry measurements of female and male kindergarten children (mean \pm SEM) in reference area.	26
3	Physical characteristic and spirometry measurements of female and male kindergarten children (mean \pm SEM) in petrochemical industrial area.	26
4	Physical characteristic and spirometry measurement of kindergarten children (mean \pm SEM) – male and female combined	28
5	Correlation between height, weight and age and lung function in reference area and petrochemical industrial area.	29
6	Summary of children's activities after school, and respiratory symptoms and disease in reference area and petrochemical industrial area.	31

LIST OF FIGURES

Figure	Title	Page
1	Human Respiratory System.	5
2	Location plan of the petrochemical industrial area and the location of petrochemical processing plant in Paka.	19
3	Vitalograph Spirometer.	21
4	Standing Position.	22
5	Spirometry Measurement of Kindergarten children.	28
6	Smoke release from the petrochemical plant.	32

LIST OF ABBREVIATIONS/SYMBOLS

API	Air pollution index.
BTPS	Body temperature and pressure
CO	Carbon monoxide.
CO ₂	Carbon dioxide.
COPD	Chronic Obstructive Pulmonary Disease.
ELF	Epithelial lining fluid.
FEV ₁	Forced expiratory volume in 1 second.
FEV ₁ %	Percentage of forced expiratory volume in 1 second.
FVC	Forced vital capacity
H ₂ S	Hydrogen sulphide
NH ₃	Ammonia
NO ₂	Nitrogen oxide
NO _x	Oxides of nitrogen
O ₃	Ozone
PAHs	Polycycle aromatic hydrocarbons
Pb	Lead
PM ₁₀	Particulate matter with diameter less than 10 µm
PM _{2.5}	Particulate matter with diameter less than 2.5 µm
SO ₂	Sulphur dioxide
SO _x	Oxides of sulphur
VC	Vital capacity
VOC	Volatile organic compound

LIST OF APPENDICES

Appendix	Title	Page
1	Parents permission form	46
2	Questionnaires	47

ABSTRAK

Laporan ini merupakan keputusan daripada kajian mengenai fungsi paru-paru kanak-kanak tadika yang tinggal berdekatan dengan kawasan perindustrian petrokimia. Masalah respirasi sering dikaitkan dengan masalah pencemaran udara walaupun kurang kajian dijalankan di Malaysia. Perindustrian petrokimia telah dilaporkan merupakan sumber pencemaran udara yang utama, bahan pencemaran dari loji petrokimia merupakan bahan karsinogen ini. Objektif kajian ini adalah untuk menguji fungsi paru-paru kanak-kanak tadika yang tinggal berdekatan kawasan perindustrian petrokimia (kawasan kajian) dan membandingkannya dengan kanak-kanak yang tinggal jauh dari kawasan perindustrian petrokimia (kawasan rujukan). 66 kanak-kanak dari tiga tadika di kawasan perindustrian petrokimia dan 65 kanak-kanak dari tiga tadika di kawasan rujukan telah dipilih sebagai subjek kajian. Satu set soal selidik telah diedarkan dan diisi oleh ibubapa kanak-kanak masing-masing dan fungsi paru-paru mereka diuji dengan menggunakan vitalograph spirometer dalam keadaan berdiri. Seperti yang dijangka, fungsi paru-paru kanak-kanak yang tinggal berdekatan kawasan perindustrian petrokimia adalah lebih rendah daripada kanak-kanak di kawasan rujukan. Mereka menunjukkan perbezaan yang signifikan dalam ukuran VC, FVC dan FEV₁. Di samping itu, simptom-simptom respirasi terutamanya batuk adalah lebih prevalen di kawasan perindustrian petrokimia berbanding dengan kawasan rujukan. Oleh itu, gas yang dibebaskan dari kilang perindustrian petrokimia di Paka mungkin meninggalkan kesan yang tidak baik terhadap sistem respirasi kanak-kanak seperti yang ditunjukkan iaitu, fungsi paru-paru yang rendah dan prevalen yang tinggi terhadap simptom-simptom respirasi.

ABSTRACT

Reported herewith are the results from a study of lung function of kindergarten children living near a petrochemical industrial area. Air pollution has been associated with respiratory symptoms although there is a lack of such studies in Malaysia. Petrochemical industrial area is reported as the major air pollution sources with the pollutants from the plant considered as environmental carcinogens. The objective of this study was to determine the lung function of kindergarten children living near the petrochemical industrial area (study area) compared to children living farther away from the plant (reference area). 66 kindergarten children from three kindergartens in petrochemical industrial area and 65 kindergarten children from three kindergartens in reference area have been chosen as the study subjects. A set of questionnaires were distributed and filled by the parents and the lung function (VC, FVC and FEV₁) was tested by a vitalograph spirometer in standing position. As expected, the lung functions of kindergarten children living near the petrochemical were significantly lower than children in reference area. They showed significant differences in measurement of VC, FVC and FEV₁. In addition, respiratory symptoms especially cough, were more prevalent in petrochemical area compared to reference area. Therefore, the emission from the petrochemical industry in Paka may have some adverse impact on these children's respiratory system as indicated by low lung function and high prevalence of respiratory symptoms.