

**ISOLATION AND IDENTIFICATION OF FREE-LIVING AMOEBAE FROM
GROUNDWATER CONTAMINATED WITH PURE CONDENSATE
PETROLEUM**

By

Norfazliza Ishak

Research Report submitted in partial fulfillment 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
2006

This project report should be cited as

Norfazliza. I. 2006. Isolation And Identification Of Free-Living Amoebae From Groundwater Contaminated With Pure Condensate Petroleum. Undergraduate thesis. Bachelor of Biological Sciences, Faculty of Science and Technology, Kolej Universiti Sains Dan Teknologi Malaysia, Terengganu. 82p

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**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:

**ISOLATION AND IDENTIFICATION OF FREE-LIVING AMOEBAE FROM GROUNDWATER
CONTAMINATED WITH PURE CONDENSATE PETROLEUM.**

Oleh Norfazliza binti Ishak, no. matrik: UK 7791 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Biologi sebagai memenuhi sebahagian daripada keperluan memperolehi Ijazah Sarjana Muda Sains (Sains Biologi), Fakulti Sains dan Teknologi, Kolej Universiti Sains dan Teknologi Malaysia.

Disahkan oleh:

.....


Penyelia Utama

Nama: PROF. MADYA DR. NAKISAH BT. MAT AMIN

Cop Rasmi:

Ketua
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21030 Kuala Terengganu.

Tarikh: 21/5/06

.....
Penyelia Kedua (jika ada)

Nama:

Cop Rasmi

Tarikh:

.....


Ketua Jabatan Sains Biologi

Nama: PROF. MADYA DR. NAKISAH BT. MAT AMIN

Cop Rasmi:

Ketua
Jabatan Sains Biologi
Fakulti Sains dan Teknologi
Kolej Universiti Sains dan Teknologi Malaysia
(KUSTEM)
21030 Kuala Terengganu.

Tarikh: 21/5/06

ACKNOWLEDGEMENT

First and foremost I would like to thank Allah The Almighty for His blessing; I acquired the spiritual strength to complete this thesis.

It is a great pleasure to be able to put on record for my deepest gratitude and appreciation goes to my supervisor, Prof. Madya Dr. Nakisah Mat Amin for her great support, valuable advice, encouragement, guidance and patience. Her trust and scientific excitement inspired me in the most important moments of making right decision and I'm glad to work with her.

I would like to take this opportunity to acknowledge Mr. Munawir from PETRONAS for their hospitality and field support during my sampling. I gratefully acknowledge the following people for their time, advice and contributions for making this piece of work possible: staffs of Biotechnology 3 Laboratory, INOS and master students who shared working place and knowledge with me especially kak Siti Faedah, kak Fatimah, kak Ida and kak Effa.

My most sincere thanks are dedicated to my project colleagues especially to Che Ku Dahlan b. Che Ku Daud, Izzatul Haiffa Ibrahim and Hasmee Heryanti Abd Ghani for their support, co-operation and understanding. Special thanks are accorded to my senior, course mates and friends.

I sincerely thank my parents, families and lectures for giving me fully supports and blessing throughout this project. My best regards to Biological Sciences Department and KUSTEM for giving me an opportunity to handle and complete this project.

TABLE OF CONTENTS

| Contents | Page |
|--------------------------------------|-------------|
| ACKNOWLEDGEMENT | ii |
| TABLE OF CONTENTS | iv |
| LIST OF TABLES | viii |
| LIST OF FIGURES | ix |
| LIST OF ABBREVIATIONS | xi |
| LIST OF APPENDIXES | xiii |
| ABSTRACT | xiv |
| ABSTRAK | xv |
| INTRODUCTION | 1 |
| 1.1 Introduction | 1 |
| 1.2 The Importance of Study | 5 |
| 1.3 Objectives | 6 |
| LITERATURE REVIEW | 7 |
| 2.1 Petroleum | 7 |
| 2.1.1 Condensate Petroleum | 8 |
| 2.1.2 Fate of Petroleum Leaks | 10 |
| 2.2 Microbial Degradation | 12 |
| 2.2.1 Case Studies of Bioremediation | 13 |
| 2.3 Classification of Amoebae | 17 |
| 2.4 Ecology of Amoebae | 20 |
| 2.4.1 Moisture. | 21 |

| | |
|--|-----------|
| 2.4.2 Temperature | 21 |
| 2.4.3 Porosity. | 21 |
| 2.4.4 Organic content. | 22 |
| 2.4.5 Habitats | 22 |
| 2.4.6 pH and amoebae | 22 |
| 2.5 Amoebae in Aquatic Ecosystem | 23 |
| 2.6 Freshwater Lakes & Ponds | 24 |
| 2.6.1 The surface. | 24 |
| 2.6.2 The Water Column. | 24 |
| 2.7 The Lake Bottom. | 25 |
| 2.8 The Roles of Amoebae in Environment | 26 |
| 2.5.1 Potential as Parasite or Pathogen | 26 |
| 2.5.2 Food Chain | 27 |
| 2.5.3 Pollution Indicator | 28 |
| METHODOLOGY | 29 |
| 3.1 Sources of Samples | 29 |
| 3.1.1 Amoebae | 29 |
| 3.2 Media Preparations | 29 |
| 3.2.1 Non-nutrient Agar (NNA) | 29 |
| 3.2.2 Page's Amoebae Saline | 30 |

| | |
|---|-----------|
| 3.2.3 Nutrient Agar | 30 |
| 3.3 Isolate and Identify The Amoebae | 31 |
| 3.4 Maintenance of The Amoeba Cultures | 31 |
| 3.4.1 Sub-cultivation of Amoebae | 31 |
| 3.4.2 Heat-killed <i>Escherichia coli</i> | 32 |
| 3.5 Determination of Hydrocarbon Concentration | 32 |
| 3.5.1 Cleaning of glassware | 32 |
| 3.5.2 Cleanup step (Alumina, Silica, Glass wool and Na ₂ SO ₄) | 33 |
| 3.5.3 Activation of Silica and Alumina | 33 |
| 3.5.4 Deactivation step | 33 |
| 3.5.5 Liquid-Liquid Extraction | 33 |
| 3.5.6 Sample Fractionation | 34 |
| 3.5.7 Gas Chromatography-Flame ionization Detector | 35 |
| 3.5.8 Identification and Quantification | 36 |
| RESULTS | 37 |
| 4.1 Isolation and Identification of Amoeba from Non-contaminated Groundwater with Condensate Petroleum | 37 |
| 4.1.1 Amoeba A | 38 |
| 4.1.2 Amoeba B | 41 |
| 4.2 Isolation and Identification of Amoebae from Contaminated Groundwater with Condensate Petroleum | 46 |
| 4.2.1 Amoeba C | 47 |

| | |
|--|-----------|
| 4.3 Determination of Hydrocarbon Concentration in Groundwater Contaminated with Pure Condensate Petroleum | 50 |
| DISCUSSION | 53 |
| 5.1 Isolation and Identification of Amoeba from Contaminated and Non contaminated Groundwater with Condensate Petroleum | 53 |
| 5.2 Determination of Hydrocarbon Concentration in Groundwater Contaminated with Pure Condensate Petroleum | 59 |
| 5.3 Potential of <i>Platyamoeba</i> in Petroleum Degradation | 61 |
| CONCLUSION | 62 |
| REFERENCES | 63 |
| APPENDICES | 73 |
| CURRICULUM VITAE | 82 |

LIST OF TABLES

| TABLE | TITLE | PAGE |
|-------|--|------|
| 1 | Polycyclic aromatic hydrocarbon content in condensate petroleum | 9 |
| 4.1 | Concentration of aliphatic hydrocarbon in contaminated and non-contaminated samples ($\times 10^4$ ppm) | 46 |
| 4.2 | Concentration of aromatic hydrocarbon in contaminated and non-contaminated samples ($\times 10^4$ ppm) | 46 |

LIST OF FIGURES

| FIGURE | TITLE | PAGE |
|--------|---|------|
| 2.1.2 | Fate of petroleum leaks (Essaid <i>et al.</i> , 1996). | 11 |
| 2.2.1 | Conceptual model of the subsurface contaminant plume's microbial geochemistry (Krumholz <i>et al.</i> , 1996). | 16 |
| 4.1 | Cysts of <i>Filamoeba nolandi</i> , (A) on agar observed under the inverted microscopy; (B-D) under DIC microscopy (magnification x 400). | 34 |
| 4.2 | Various shapes of trophozoites of <i>Filamoeba nolandi</i> (A-F) under the DIC microscopy (magnification x 400). | 35 |
| 4.3 | Cysts of <i>Acanthamoeba polyphaga</i> ; (A) stellate, (B) rectangular, (C) triangular in outline on agar observed under the inverted microscopy; (E-F) under DIC microscopy (magnification x 400). | 37 |
| 4.4 | Trophozoites of <i>Acanthamoeba polyphaga</i> on agar observed under the inverted microscopy (magnification x 400). | 38 |
| 4.5 | Trophozoites of <i>Acanthamoeba polyphaga</i> (A-D) under the DIC microscopy (magnification x 400). | 39 |
| 4.6 | The variety shape of <i>Acanthamoeba polyphaga</i> (A-E) observed under the Scanning Electron Microscopy (SEM). | 40 |
| 4.7 | Cysts of <i>Platyamoeba stenopodia</i> on agar observed under the inverted microscopy (magnification x 400). | 42 |
| 4.8 | Cyst of <i>Platyamoeba stenopodia</i> under Scanning Electron Microscopy (SEM). | 43 |
| 4.9 | Trophozoites of <i>Platyamoeba stenopodia</i> on agar observed under inverted microscopy (magnification x 400). | 43 |

| | | |
|------|---|----|
| 4.10 | Trophozoites of <i>Platyamoeba stenopodia</i> (A-C) under the DIC microscopy (magnification x 400). | 44 |
| 4.11 | Concentrations of Aliphatic Hydrocarbon in the Contaminated Sample. | 47 |
| 4.12 | Concentrations of Aromatic Hydrocarbon in the Contaminated and Non-contaminated Samples. | 47 |

LIST OF ABBREVIATIONS

| | |
|---------------|---------------------------------|
| <i>et al.</i> | And others (in Latin) |
| % | Percentage |
| i.e. | example |
| °C | Degree Celsius |
| F | Fahrenheit |
| L | Liter |
| g | Gram |
| mL | Milliliter |
| mm | Millimeter |
| nm | Nanometer |
| m | Meter |
| μL | Micro liter |
| μm | Micrometer |
| ppm | Part per million |
| DIC | Differential Interface Contrast |
| SEM | Scanning Electron Microscope |
| Naph | Naphthalene |
| Acy | Acenaphthalene |
| Ace | Acenaphthene |
| Flu | Fluorene |
| Phen | Phenanthrene |
| Anth | Anthracene |
| Flt | Fluoranthene |
| Pry | Pyrene |

| | |
|-------|-------------------------|
| BaA | Benzo [a]anthracene |
| Chry | Chrysene |
| BbF | Benzo[b]fluoranthene |
| BkF | Benzo[k]fluoranthene |
| BaP | Benzo[a]pyrene |
| DiaA | Dibenzo[ah]anthracene |
| BghiP | Benzo[g,h,i]perylene |
| INPY | Indeno[1,2,3-c,d]pyrene |

LIST OF APPENDICES

| APPENDIX | TITLE | PAGE |
|----------|---|------|
| 1 | Aromatic standards (80ppm) | 73 |
| 2 | Aliphatic Standard 150ppm | 74 |
| 3 | Molecular structure for 16 compounds of PAHs | 75 |
| 4 | General classification of hydrocarbons | 76 |
| 5 | Biotech Laboratory, Institut Penyelidikan Oseanografi, (INOS), KUSTEM | 77 |
| 6 | Amoeba culture in the incubator | 77 |
| 7 | Autoclave machine | 78 |
| 8 | Light microscopy | 78 |
| 9 | Samples | 79 |
| 10 | Scanning Electron Microscope (SEM) | 79 |
| 11 | Gas chromatography-FID | 79 |
| 12 | Evaporator rotatory | 80 |
| 13 | Oven for hydrocarbon glassware | 80 |
| 14 | Tetradyhete solution | 80 |
| 15 | Stub | 80 |
| 16 | Maximum Contaminant Level (MCL) mg/L | 81 |
| 17 | Water Health Based Limits (HBLs) for aromatics hydrocarbon (PAHs) | 81 |

ABSTRACT

The objective of this study is to isolate and identify the species of amoebae from groundwater contaminated and non-contaminated with pure condensate petroleum. This study was conducted as an initial step to investigate the potential of the free-living amoebae to clean the oil spills as other microbes. Results of this study show that at least two species of amoeba had been isolated from non-contaminated groundwater which is *Filamoeba nolandi* and *Acanthamoeba polyphaga* and one species from the contaminated groundwater samples which is *Platyamoeba stenopodia*. The species of amoebae was identified according to their morphology, locomotion, cysts and trophozoites following the key of Page (1988). The concentrations of aliphatic hydrocarbon only found in the contaminated sample but the concentrations of aromatic hydrocarbon were found in both samples; contaminated and non-contaminated. Six aliphatic compounds were found in the contaminated samples which are C₁₄ (0.2214x10⁴ ppm), C₁₆ (2.525X10⁴ ppm), C₁₈ (1.441X10⁴ ppm), C₂₀ (1.715x10⁴ ppm), C₂₂ (1.489x10⁴ ppm) and C₃₂ (3.5x10⁴ ppm). Five aromatic compounds were found in the contaminated samples which are Naphthalene (0.05x10² ppm), Acenaphthalene (0.099x10² ppm), Fluorene (0.072x10² ppm), Phenanthrene (0.60²x10² ppm) and Anthracene (0.275x10² ppm) while one compound was found in the non-contaminated sample which is Pyrene (0.054x10² ppm).

**PENGASINGAN DAN PENGENALPASTIAN SPESIES AMEBA YANG
BERASAL DARI AIR BAWAH TANAH YANG TERCEMAR OLEH
PETROLEUM KONDENSAT YANG ASLI**

ABSTRAK

Objektif bagi kajian ini adalah untuk mengasingkan dan mengenalpasti spesies ameba daripada air bawah tanah yang tercemar dan tidak tercemar oleh kondensat. Kajian ini adalah satu langkah permulaan bagi mencari ameba yang berpotensi untuk membersihkan tumpahan minyak selain daripada mikrob yang sedia ada. Keputusan menunjukkan sekurang-kurangnya terdapat dua spesies ameba yang ditemui di dalam sampel air yang tidak tercemar iaitu *Filamoeba nolandi* dan *Acanthamoeba polyphaga* manakala terdapat satu spesies di dalam air yang tercemar iaitu *Platyamoeba stenopodia*. Spesies ameba ini di kenalpasti berdasarkan morfologi, pergerakan, bentuk cysts dan trophozoites mengikut garis panduan yang di berikan oleh Page (1988). Kepekatan hidrokarbon alifatik hanya dijumpai di dalam sampel air yang tercemar tetapi kepekatan bagi hidrokarbon aromatik dijumpai di dalam sampel air yang tercemar dan tidak tercemar. Enam kepekatan hidrokarbon alifatik yang dijumpai di dalam sampel air yang tercemar ialah C₁₄ (0.2214x10⁴ ppm), C₁₆ (2.525X10⁴ ppm), C₁₈ (1.441X10⁴ ppm), C₂₀ (1.715x10⁴ ppm), C₂₂ (1.489x10⁴ ppm) dan C₃₂ (3.5x10⁴ ppm). Lima kepekatan bagi hidrokarbon aromatik di dalam air yang tercemar adalah Naphthalene (0.05x10² ppm), Acenaphthalene (0.099x10² ppm), Fluorene (0.072x10² ppm), Phenanthrene (0.60²x10² ppm) dan Anthracene

(0.275×10^2 ppm) manakala satu kepekatan yang dijumpai di dalam sampel air yang tidak tercemar ialah Pyrene (0.054×10^2 ppm).