

GENOTOXIC EFFECTS OF CADMIUM AND LEAD
AGAINST *ACANTHAMOEBA CASTELLANI*
(CCAP 1591/2A) AND *ACANTHAMOEBA*
POLYTRICHA (CCAP 1591/3A)
A LABORATORY STUDY

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FAKULTI SAINS DAN TEKNOLOGI
UNIVERSITI MALAYSIA TERENGGANU
2008

**GENOTOXIC EFFECTS OF CADMIUM AND PLUMBUM AGAINST
ACANTHAMOEBA CASTELLANII (CCAP 1501/2A) AND
ACANTHAMOEBA POLYPHAGA (CCAP 1501/3A).
A LABORATORY STUDY**

By
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A research report submitted in partial fulfillment of
the requirements for the award of the degree of
Bachelor of Science (Biological Sciences)

**DEPARTMENT OF BIOLOGICAL SCIENCES
FACULTY OF SCIENCE AND TECHNOLOGY
UNIVERSITI MALAYSIA TERENGGANU
2008**

1100057866

This project should be cited as :

Syazwani, M.A. 2008. Genotoxic effects of cadmium and plumbum on *Acanthamoeba castellanii* (CCAP 1501/2A) and *Acanthamoeba polyphaga* (CCAP 1501/3A). A Laboratory Study. Undergraduate thesis, Bachelor of Science (Biological Sciences), Faculty of Science and Technology, Universiti Malaysia Terengganu. 49pp.

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**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II
RESEARCH REPORT VERIFICATION**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: GENOTOXIC EFFECTS OF CADMIUM AND PLUMBUM ON *ACANTHAMOEBA CASTELLANII* (CCAP 1501/2A) AND *ACANTHAMOEBA POLYPHAGA* (CCAP 1501/3A). A LABORATORY STUDY oleh SYAZWANI BT MOHD ASHARUDDIN, no. matrik: UK12191 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, Universiti Malaysia Terengganu.

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DECLARATION

I hereby declare that this thesis entitled GENOTOXIC EFFECTS OF CADMIUM AND PLUMBUM AGAINST *ACANTHAMOEBA CASTELLANII* (CCAP 1501/2A) AND *ACANTHAMOEBA POLYPHAGA* (CCAP 1501/3A). A LABORATORY STUDY is the result of my own research except as cited in the references.


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ACKNOWLEDGEMENTS

First of all, I would like to dedicate my highest grateful to Allah S.W.T for the strength and resilience bestowed on me in all my way to accomplish this project successfully.

My sincere gratitude goes to my supervisor, Assoc. Prof. Dr. Nakisah bt Mat Amin for her critical comments, valuable suggestions and going through the proposal, progress and earlier draft of the thesis. I have learnt many new things on how to conduct a research throughout this study. I also would like to convey my sincere thanks to my co-supervisor, Dr. Antonina bt Abdullah for providing me the toxicants used in this study.

Next, I would like to express my sincere appreciation to the post graduate student, Pn. Fatimah bt Hashim for excellent technical assistance given throughout this study especially during conducting the comet assay. I also would like to thanks all lecturers, science officers and lab assistants of Biological Sciences Department for the efficient cooperation given.

I wish to thank my parents and siblings for the continuous support and always boosted up my confidence to complete this project. I also appreciate all my beloved friends for supported me enormously.

Last but not least my gratitude expressed to all individual who involve and contribute directly or indirectly upon completion of this study.

ABSTRACT

Heavy metals such as cadmium and plumbum or their compounds have been used extensively by various anthropogenic activities such as metal-finishing, mining and chemical industries. This has led to a sharp increase in the heavy metal contamination of water and greatly influences the behavior of aquatic ecosystem. This study was carried out to assess the genotoxic effects of cadmium and plumbum on the DNA of *Acanthamoeba castellanii* (CCAP 1501/2A) and *Acanthamoeba polyphaga* (CCAP 1501/3A) *in vitro*. These amoebae are free-living amoebae which play an important role in maintaining ecological balance as they function to consume bacteria in water hence controlling the bacteria population. Results from toxicity test showed the IC₁₀, IC₂₅ and IC₅₀ values against *Acanthamoeba castellanii* were 2.5 ppm, 5.0 ppm and 9.5 ppm respectively for cadmium and 0.5 ppm, 1.9 ppm and 22.0 ppm respectively for plumbum. Meanwhile, the IC₁₀, IC₂₅ and IC₅₀ values against *Acanthamoeba polyphaga* were 1.3 ppm, 3.0 ppm and 6.5 ppm respectively for cadmium and 1.2 ppm, 2.8 ppm and 14.3 ppm respectively for plumbum. In order to understand the genotoxicity of cadmium and plumbum, DNA damage detection using alkaline comet assay was determined at 2 hours post treatment with cadmium and plumbum upon both amoebae. The results demonstrated that both heavy metals cause damage to the DNA of the amoebae and the intensity of damage was increase in a concentration-dependent manner. Cadmium was observed to cause more severe DNA damage compared to plumbum. In conclusion, the data obtained show that cadmium and plumbum cause DNA damage in *Acanthamoeba castellanii* and *Acanthamoeba polyphaga*. Hence, anthropogenic activities should be strictly controlled for the sake of aquatic ecosystem sustainability.

ABSTRAK

Dewasa ini, logam berat seperti kadmium dan plumbum sering digunakan dalam pelbagai industri berat seperti perlombongan, kemasan logam, serta industri kimia. Aktiviti-aktiviti antropogenik ini menyebabkan persekitaran akuatik tercemar dengan logam berat dan seterusnya mengganggu keseimbangan ekosistem akuatik. Kajian makmal ini dijalankan untuk melihat kesan ketoksikan kadmium dan plumbum ke atas DNA *Acanthamoeba castellanii* (CCAP 1501/2A) dan *Acanthamoeba polyphaga* (CCAP 1501/3A). Ameba merupakan komponen penting di dalam ekosistem akuatik dimana ia berfungsi untuk mengawal pertumbuhan populasi bakteria di dalam air dengan. Ujian ketoksikan yang dijalankan ke atas *Acanthamoeba castellanii* menunjukkan nilai IC_{10} , IC_{25} dan IC_{50} bagi kadmium adalah masing-masing 2.5 ppm, 5.0 ppm dan 9.5 ppm manakala bagi plumbum, nilai IC_{10} , IC_{25} dan IC_{50} adalah masing-masing 0.5 ppm, 1.9 ppm dan 22.0 ppm. Nilai IC_{10} , IC_{25} dan IC_{50} bagi kadmium dan plumbum berdasarkan ujian ketoksikan yang dijalankan ke atas *Acanthamoeba polyphaga* adalah masing-masing 1.3 ppm, 3.0 ppm dan 6.5 ppm masing-masing bagi kadmium dan 1.2 ppm, 2.8 ppm dan 14.3 ppm masing-masing bagi plumbum. Kesan ketoksikan kadmium dan plumbum ke atas DNA kedua-dua ameba dikaji menggunakan teknik 'alkaline comet assay' yang dijalankan selepas rawatan 2 jam menggunakan kadmium dan plumbum ke atas kedua-dua ameba. Hasil kajian menunjukkan kedua-dua logam memberi kerosakan kepada DNA *Acanthamoeba castellanii* dan *Acanthamoeba polyphaga*. Kerosakan DNA dilihat meningkat apabila kepekatan logam meningkat. Kajian mendapati bahawa kadmium memberi kerosakan yang lebih tinggi berbanding plumbum. Kesimpulannya, logam kadmium dan plumbum menunjukkan kesan kerosakan ke atas DNA *Acanthamoeba castellanii* dan *Acanthamoeba polyphaga*. Aktiviti antropogenik perlu dikawal sepenuhnya untuk memastikan keseimbangan ekologi akuatik terus terpelihara.