

EFFECTS OF MERCURY, LEAD, CADMIUM AND ZINC ON  
*Acetabularia cartilaginea*: A LABORATORY STUDY

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EFFECTS OF MERCURY, LEAD , CADMIUM AND ZINC ON  
*Acanthamoeba castellanii*: A LABORATORY STUDY

By

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Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

EFFECTS OF MERCURY, LEAD, CADMIUM AND ZINC ON *Acanthamoeba castellanii* :

A LABORATORY TEST oleh RAINEE A/P VELAMUTHU no. matrik: UK7439 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.

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Sincerely:

Rainee Velamuthu,2005.

## ABSTRACT

Heavy metals such as mercury, lead, zinc and cadmium are dangerous pollutants and often deposited with natural sediment in the bottoms of streams. Heavy metal poisoning can result when heavy metal dissolved in water and is withdrawn for agricultural or human use. *Acanthamoeba* are microscopic and single-celled organism that commonly found in the environment. Therefore, the aim of this study is to investigate the effect of mercury, lead, cadmium and zinc on *Acanthamoeba castellanii* in the laboratory. Any pollutant that enters the aquatic environment will effect the life of this amoeba in the food web of aquatic system. The results obtained from this study demonstrate that mercury, lead, cadmium and zinc can cause inhibition to the growth of *Acanthamoeba castellanii*'s population in the laboratory. In toxicity test, the most toxic metal has the lower EC<sub>50</sub> value. In this study, only 2.0 ppm of mercury and 13.4 ppm of cadmium needed to inhibit 50% of the amoeba population, while 23.8 ppm of lead and 143.3 ppm of zinc needed to cause such inhibition. Thus, *Acanthamoeba castellanii* seems to tolerate with high concentration of zinc and lead. The maximum inhibition observed in this study was 68.1% for Hg, 97.6% for Cd, 56.07 % for Zn and 66.27% for Pb. The amoeba cells after treatment with heavy metals were observed to be smaller and slower in movement. The treated cells after Acridine Orange Staining shows their nucleus stained orange, indicating the lost integrity of their membranes, which lead to death. The type of cell death observed in this study due to heavy metal toxicity is necrosis.



## KESAN MERKURI, PLUMBUM, KADMIUM DAN ZINC KE ATAS *Acanthamoeba Castellanii* : SUATU KAJIAN MAKMAL

### ABSTRAK

Logam-logam berat seperti kadmium, merkuri, zinc dan plumbum adalah bahan-bahan pencemar berbahaya. Keracunan logam berat adalah berpunca apabila logam berat larut dalam air. *Acanthamoeba* adalah organisma unisel dan mikroskopik yang selalunya dijumpai di persekitaran. Oleh itu, tujuan kajian ini adalah untuk mengkaji kesan kadmium, merkuri, zinc dan plumbum ke atas *Acanthamoeba castellanii* di makmal. Bahan-bahan pencemar yang menduduki persekitaran akuatik akan menjejaskan kitar hidup ameba dalam rantai makanan sistem akuatik. Keputusan yang diperoleh dari kajian ini menunjukkan kadmium, merkuri, zinc dan plumbum boleh merencatkan pertumbuhan populasi *Acanthamoeba castellanii* dalam makmal. Dalam ujian ketoksikan, logam yang lebih toksik mempunyai nilai  $EC_{50}$  yang paling rendah. Dalam kajian ini, hanya 2.0 ppm merkuri dan 13.4 ppm kadmium diperlukan untuk merencat 50 % populasi ameba, manakala 23.8 ppm plumbum dan 143.3 ppm Zinc diperlukan untuk perencatan. Tahap perencatan maksimum diperhatikan dalam kajian ini adalah 68.1% untuk Hg, 97.6% untuk Cd, 56.07% untuk Zn dan 66.27% untuk Pb. Sel-sel ameba yang telah dirawat menjadi kecil dan perlahan pergerakannya. Nukleus sel-sel yang telah dirawat dengan logam berat berwarna oren apabila diwarnakan dengan pewarna Acridine Orange. Ini menunjukkan ia kehilangan kekenyalan membran dan mengalami kematian sel iaitu necrosis.