CYTOTOXIC EFFECTS OF ZINC AND MERCURY ON *ACANTHAMOEBA CASTELLANII* A LABORATORY TEST

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CYTOTOXIC EFFECTS OF ZINC AND MERCURY ON *ACANTHAMOEBA CASTELLANII*: A LABORATORY TEST

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PENGAKUAN DAN PENGESAHAN LAPORAN PROJEK PENYELIDIKAN I DAN II

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk: CYTOTOXIC EFFECTS OF ZINC AND MERCURY ON *Acanthamoeba castellanii* oleh Izzatul Haiffa Binti Ibrahim, No. Matrik UK 7687 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.

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ABSTRACT

Mercury and zinc are heavy metals that were used to investigate their effects of different concentration on the growth of *Acanthamoeba castellanii* in the laboratory. They are dangerous pollutants and often deposited with natural sediment in the bottoms of streams. Any pollutant that enters the aquatic environment will affect the life of this amoeba in the food web of aquatic system. In this study, amoebae were exposed to 5 different mercury concentrations (0.1, 0.2, 0.5, 1.0, 3.2) ppm and 5 different zinc concentrations (20, 40, 80, 100, 180) ppm. These heavy metals were added into the culture medium and were exposed for a period of 72 hours at 30°C. The results obtained from this study demonstrate that mercury and zinc cause inhibition to the growth of *Acanthamoeba castellanii*'s population and had caused the amoeba population growth curve declined. The highest percentage inhibition observed in this study was 72% for Hg and 55.34 % for Zn. In toxicity test, the most toxic metal has the lower value of EC_{50}. In this study, only 2.0 ppm of mercury needed to inhibit 50% of the amoeba population, while 158.6 ppm of zinc needed to cause such inhibition. This showed that *Acanthamoeba castellanii* seems more sensitive to the presence of mercury ions in the culture medium than zinc ions. The amoeba cells after treatment with heavy metals were observed to be smaller and slower in movement. The treated cells after Acridine Orange Propodium Iodine Staining shows their nuclei were stained orange, indicating the lost integrity of their cell membranes, which lead to death in necrosis type of cell death. Observation under Scanning Electron Microscopy (SEM) showed that the cells membrane of the amoeba after treatment was damaged.

KESAN TOKSIK ZINK DAN MERKURI KE ATAS
Acanthamoeba castellanii : SUATU KAJIAN MAKMAL

ABSTRAK

Dalam kajian ini, logam merkuri dan zink telah digunakan untuk melihat kesan ke atas pertumbuhan *Acanthamoeba castellanii* melalui kepekatan berbeza di makmal. Keracunan logam berat adalah berpunca apabila logam berat larut dalam air. Bahan-bahan pencemar yang menduduki persekitaran akuatik akan menjejaskan kitar hidup ameba dalam rantai makanan sistem akuatik. Dalam kajian ini, ameba telah didedahkan kepada lima kepekatan logam merkuri (0.1, 0.2, 0.5, 1.0, 3.2) ppm dan lima kepekatan logam zink (20, 40, 80, 100, 180) ppm. Logam-logam ini ditambah ke dalam kultur medium ameba dan dieram selama 72 jam pada suhu 30°C. Keputusan yang diperoleh dari kajian ini menunjukkan merkuri dan zink boleh merencatkan pertumbuhan populasi *Acanthamoeba castellanii* dan menyebabkan peratusan perencatan pertumbuhan populasi amoeba menurun. Peratusan perencatan pertumbuhan tertinggi dicapai oleh logam merkuri ialah 72% dan untuk logam zink ialah 55.34%. Dalam ujian ketoksikkan, logam yang lebih toksik mempunyai nilai EC_{50} yang paling rendah. Dalam kajian ini, hanya 2.0 ppm merkuri diperlukan untuk merencat 50 % populasi ameba, manakala 158.6 ppm bagi zink. Ini menunjukkan *Acanthamoeba castellanii* didapati lebih sensitif terhadap kehadiran ion merkuri berbanding ion zink yang terdapat di dalam medium kultur. Sel-sel ameba yang telah dirawat menjadi kecil dan perlahan pergerakannya. Nukleus sel-sel yang telah dirawat dengan logam berat berwarna oren apabila diwarna dengan pewarna

Acridine Orange. Ini menunjukkan ia kehilangan kekenyalan membran dan mengalami kematian sel iaitu necrosis. Melalui pemerhatian di bawah mikroskop elektron, menunjukkan bahawa membran sel ameba berlubang dan musnah.