

## **Assay for heavy metals using an inhibitive assay based on the acetylcholinesterase from *Pangasius hypophthalmus* (Sauvage, 1878)**

### **ABSTRACT**

Acetylcholinesterase (AChE) is generally used as an inhibitive assay for insecticides. A lesser-known property of AChE is its inhibition by heavy metals. In this work, we evaluate an AChE from silver catfish brain (*Pangasius* sp.), wasted from aquaculture industry, as an inhibitive assay for heavy metals. We discovered that the AChE was completely inhibited by  $\text{Cr}^{6+}$ ,  $\text{Ag}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Hg}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Zn}^{2+}$  and  $\text{Pb}^{2+}$  during an initial screening. When testing at various concentrations, the above heavy metals exhibited exponential decay type inhibition curves. The calculated  $\text{IC}_{50}$  for  $\text{Hg}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Ag}^{2+}$ ,  $\text{Cr}^{6+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Pb}^{2+}$ , and  $\text{Zn}^{2+}$  were 0.071, 0.088, 0.088, 0.87, 0.913, 1.1, and 1.572 mg/L, respectively. The Limit of Detection (LOD) and Limit of Quantification (LOQ) values of the heavy metals are within the range of the Maximum Permissibility Limit (MPL) allowed by the Malaysian Department of Environment (DOE) for Class-III rivers. The  $\text{IC}_{50}$  values for these heavy metals are comparable, and some are lower than those of the currently known assays, such as immobilised urease, *Daphnia magna*, Microtox<sup>TM</sup>, rainbow trout, papain and bromelain assays. Field trial works on an industrial drainage site had shown that the developed assay is applicable in detecting heavy metals in the water. The assay can be carried out in less than 30 min under ambient temperature.