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The use of Lates calcarifer as a biomarker for heavy metals detection

Abstract

Fish are ubiquitous organisms that have many features that designate their potential as a biomarker of heavy metals pollution. Thus, an investigation was done to detect the effect of heavy metals on cholinesterase (ChE) activity from Lates calcarifer organs which were gill and muscle. Ammonium sulphate precipitation was performed along with ion exchange chromatography to purify the enzyme. In the substrate specificity study, ChE from L. calcarifer gills was capable of breaking down acetylthiocholine iodide (ATC) at a faster rate compared to the other two synthetic substrates, which are butyrylthiocholine iodide (BTC) and propionylthiocholine iodide (PTC). In contrast, the muscle ChE has a higher affinity towards PTC. The maximum activity of ChE observed at the temperature ranging from 20 to 30 °C in Tris–HCl buffer pH 8. ChE from the two organs of L. calcarifer showed an inhibitive reaction towards heavy metals, but with different effects. ATC from gills showed 50 % inhibition by Cu, Hg and Pb, while PTC from muscle showed 50 % inhibition by Pb. The variation of inhibitory effect that was shown by ChE from L. calcarifer organs can be further studied in designing a biosensor kit that is sensitive towards heavy metal.

Keywords

Biomarker; Biosensor; Cholinesterase; Heavy metals