

Heavy metal biomarker: Fish behavior, cellular alteration, enzymatic reaction and proteomic approaches

ABSTRACT

Due to the latest industrial development, many dangerous chemicals have been released directly or indirectly which resulted in the polluted water bodies. Water rehabilitation is an alternative way to restore the quality of water, followed by the environmental management to control the waste discharge to ensure the balance of the degradation rates or detoxifying by environmental factors. However, this process consumed a lot of time and cost. Besides, most of the metal ions, especially copper which is capable to bioaccumulate in aquatic organism and at the elevated level may cause physiological and biochemical alteration which leads to mortality. Environmental monitoring is the initial step presupposed evaluating the potential toxicity of effluent gushing at its purpose to discharge, avoiding the determining effects of contaminant in water bodies. Due to the high sensitivity of the aquatic life towards dissolving toxicant, the fish has been utilized as the biological measurement (Biomarker) to indicate the existence of toxicant exposure and/or the impact towards the evaluation of molecular, cellular to physiological level. Thus, this paper gives an overview of the manipulation of fish as a biomarker of heavy metals through behavior response, hepatocyte alteration, enzymatic reaction and proteomic studies which have proven to be very useful in the environmental pollution monitoring.