**In vitro** effect of different concentrations of lead on cholinergic and bioenergetic systems in rat brain regions

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Exposure to environmental Pb is a major public health concern because of the global pervasiveness of this heavy metal and its documented health effects. Pb has been known to have effects on wide range of molecular and cellular mechanisms in the mammalian brain, including energy metabolism. Exposure to these metals in the developmental period can lead to a number of behavioural changes in children. The deleterious effects of these metals appears to be proportional to the degree of exposure with their high levels leading to an encephalopathy in children. Such high levels can lead to mental retardation, cognitive impairments and serious maladaptive behaviour in children. The recent work has shown in vitro effect of Pb on AChE activity (Reddy et al., 2003) in the developing nervous system. Keeping in view of these findings, the present study was aimed at examining the impact of in vitro Pb exposure on cholinergic system which play a crucial role in learning and cognitive functions, and the development of central nervous system. In the present study, the specific activity of AChE was determined in the Pb incubated synaptosomal fractions of cerebral cortex, hippocampus and cerebellum of control. The results showed that the specific activity of AChE was significantly higher in hippocampus followed by cerebral cortex, cerebellum. Exposure to Pb resulted in a decrease in the AChE activity in all brain regions; however, the inhibition was more in the synaptosomal fraction incubated with high concentration of Pb (100µM). Inhibition in the activity of both Mg²⁺-ATPase and Na⁺K⁺-ATPase was observed in synaptosomal fractions of different brain regions of developing rats following Pb-exposure. Cortex documented higher levels of Na⁺K⁺-ATPases followed by cerebellum and hippocampus of the control sample. And Hippocampus documented higher levels of Mg²⁺-ATPase followed by cortex and cerebellum. Low operation of oxidative pathway by Pb resulted in decreased formation of free energy, cellular energy metabolism and altered chemical and physical characters of phospholipids which might have decreased Mg²⁺ATPase activity. Pb may exert an inhibitory effect directly on Na⁺K⁺-ATPase. It is known that brain derived Na⁺K⁺-ATPase is among the enzymes particularly affected by Pb. Inhibition of enzyme activity may be due to interaction of Pb with sulphydryl (–SH) groups of the enzyme molecule. The inhibition of ATPase activity could change the gradients of Na⁺ and K⁺ across the cell membrane and disturbs several actions of nerve cells. The extent of Na⁺K⁺-ATPase inhibition was dependent on the K⁺ concentration suggesting an interference with the K⁺ site of the enzyme. ATPase inhibition may also occur by competitive inhibition of ATP.

Biography

Archana Thakur basically worked in the field of Biochemistry, Molecular biology and Biotechnology. She completed her Doctoral Degree in JNU, New Delhi, India. Around 15 publications have been published in high impact factor journals. Now looking after Educational administration of the State Universities, Fellowships, Scholarship schemes and day to day coordination of important policy matters pertaining to administration of Higher Education in the UGC Office, New Delhi, India as Deputy Secretary.

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