The nervous system shows selective vulnerability to various toxic insults including environmental toxicants like metals, neuroactive viruses, ischemia, genetic causes, prions etc. Aluminium (Al) is a ubiquitous metal widely used as pharmaceutical formulations, food and drinking water. The exposure to this particular metal is dramatically increased in recent years due to the excessive usage causing disturbances in living sphere. The potential adverse effect of this metal can be hazardous to normal functioning of organ, including central nervous system activities. Nervous system has long been recognized as the primary target site for Al-induced toxicity. As the nervous system is incapable of dividing, destruction of even small number of neurons essential for specific function may leave the individual with a neurological deficit.

Aluminium acetate is used in formulations of medicine. However indiscriminate use of aluminium acetate may lead to harmful effects in human beings leading to bio-accumulation. The sequence of events resulting in Al acetate-induced neurotoxicity has been elucidated in the present study especially on the brain.

A number of hormones are being identified as modulators of neuronal degeneration that occurs in experimental paradigms and human disorders. It is hoped that treatment and therapeutic practices of this kind could help to remove Al burden in the body and neuronal vulnerability. Melatonin was first discovered by Learner and his colleagues in 1958 and this is initially used for the treatment of irregular skin pigmentation in humans with certain diseases due to its association with dermal melanophore and however it is not proven in non-mammalian vertebrates.

Within a decade of its discovery the melatonin had been shown to be functionally related to several physiological processes. Melatonin is known to have a wide margin of safety. Its uptake into cells and tissues is found in all organisms.
This pineal hormone has the membrane receptors in various regions of brain and produces neuroprotective effects by crossing all morphophysiological barriers, including blood-brain barrier. In the present study the impact of repetitive administration of melatonin was investigated for its pharmacological and therapeutic effects on brain, with regard to its memory enhancing, metal chelating, antioxidant activity, cytoprotective ability and anti-inflammatory activity.

The present study is aimed to evaluate the possible protective role of melatonin against aluminium induced stress after sub-chronic exposure. To arrive at this objective the melatonin is used as therapeutic agent to combat the toxic effect of aluminium. Chapter-I deals with behavioural studies undertaken to examine the locomotory activity, anxiety, exploration, memory and learning. Chapter-II has been studied on the role of antioxidant defense mechanism through both enzymatic and non-enzymatic pathways. Chapter-III pertains to metal accumulation studies of aluminium. Chapter-IV Morphological insight was carried out to study the structural alterations at both microscopic and ultra-microscopic levels histopathological toxicity and Chapter-V Inflammation relationship with respect to different treated groups were studied by using m-RNA expression studies.

Despite the extensive studies carried out all over world on Al-neurotoxicity, the present study would provide additional information on the mechanism of Al acetate-induced neurotoxicity and melatonin therapeutic approach on different aspects of behavioural, metal bioaccumulation studies, detoxification mechanism, histology and inflammation.