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Title :

Effect of Natural Phenolic Compound Curcumin on Neurophysiological, Biochemical and Behavioural Alterations in Aluminium-induced Accelerated Aging, in Rat Brain.

Abstract:

In this study, neuroprotective effect of a major component of turmeric (curcumin dose 30 mg/kg/day via gavage) was determined against Al-toxicity. Mounting evidence in the recent years have suggested that Al-toxicity inflicts severe toxic manifestations on the central nervous system. We have investigated the effect of age, aluminium and curcumin treatment in the light of electrophysiological, biochemical, behavioural and histological levels. Study was carried on male albino Wistar rats of two age groups, young (4 months) and old (18 months). Al-treated groups received a dose of 50 mg/kg/day $AlCl_3.6H_2O$ dissolved in double distilled (dd H_2O) drinking water for six months. In Al + curcumin treated group, curcumin dissolved in corn oil was co-fed orally via gavage at a dose of 30 mg/kg body wt for 6 months. Control and Al-treated young and old group received corn oil as a vehicle.

MUA was recorded to identify the neuronal-hyperexcitability in Al-intoxicated group and ascertain the effect of curcumin treatment in modulating the neuronal firing. Our data shows that Al-intake results in hyperfiring / hyperexcitablity with a general increase multiple unit action potential in both young and old Al-treated rats (Sethi et al., 2008). However, Cur-treatment significantly suppressed that increased MUA activity and transient epileptiform activity linked with Al-treatment (Sethi et al, 2009).

Biochemical study confirmed that Al- treatment depressed the activities of SOD, GPx, GST in both cortex and hippocampus region of the brain of both 10- and 24-month-old rats (Sethi et al., 2008), whereas curcumin counters Al-induced decline of antioxidative enzyme activity. This verifies the capability of curcumin to combat oxidative stress-related damages (Sethi et al.,

2009). Elevation of lipid peroxidation and decrement of Na-K ATPase and antioxidative enzyme activity are indices of brain aging. Our present study confirmed that curcumin treatment significantly elevates the activity of antioxidative enzymes. Therefore, results validate anti-aging potential of curcumin (Sharma et al., 2008).

Morris water maze tests were performed to investigate the visuo-spatial learning abilities and behavioral study data suggests that Al-treated rats have significantly lower ability to memorize in spatial learning tasks (Sethi et al., 2008). Co-administration of curcumin with Al treatment was effective in preventing memory decline observed in MWM tasks. Anti-dementic effect of curcumin against Al-neurotoxicity is a novel finding. Curcumin's anxiolytic potential was also evident in the open field performances by Al+ cur-treated rats (Sethi et al., 2009).

Our histological observations indicated that Al-treated groups exhibited putative cytomorphological alterations whereas Al + Cur-treated rats exhibited normal cellular structure like homogeneous cytoplasm with normal sub-cellular structures (Sethi et al 2009). In summary, the present findings and several other preclinical studies on rodents describes the effectiveness of curcumin against variety of neurodegenerative disorders without any side effects. Therefore, curcumin could now be considered for testing in the clinical trials and applied to improve the clinical outcome of patients suffering from a great variety of diseases/disorders.

Publications

Sethi P, Jyoti A, Hussain E, Sharma D. Curcumin attenuates aluminium-induced functional neurotoxicity in rats. *Pharmacol Biochem Behav. 2009. 93:31-39.*

Sethi P, Jyoti A, Singh R, Hussain E, Sharma D. Aluminium-induced electrophysiological, biochemical and cognitive modifications in the hippocampus of aging rats. *Neurotoxicology. 2008. 29:1069-1079.*

Sharma D, **Sethi P**, Hussain E, Singh R. Curcumin counteracts the aluminium-induced ageing-related alterations in oxidative stress, Na+, K+ ATPase and protein kinase C in adult and old rat brain regions. *Biogerontology. 2009.10:489-502.*