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Research Report

Analysis of anti-depressant potential of curcumin against depression induced male albino wistar rats

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ABSTRACT

The present study investigated the antidepressant potential of curcumin in olfactory bulbectomy and forced swimming test models of depression in male albino rats under chronic treatment. The experimental animals were divided into four groups, and curcumin was administered for 45 days. Our results showed that the curcumin significantly reduced olfactory bulbectomy-induced behavioral abnormalities including deficits in step-down passive avoidance, increased activity in the open area and immobility time. Chronic administration of curcumin significantly reversed levels of 3, 4-dihydroxyphenylacetic acid, noradrenaline, serotonin and 5-hydroxyindoleacetic acid in the hippocampus region of male albino rats. Also, curcumin normalizes the levels of dopamine, noradrenaline, and 5-hydroxyindoleacetic acid in the frontal cortex of rats. Taking all these results together, it may suggest that curcumin is potent compound acting against the depression in the male albino rats.

1. Introduction

Curcumin is an essential curcuminoid of turmeric, which comes under the family of ginger. Turmeric presents as desmethoxycurcumin and bis-desmethoxycurcumin forms. Natural phenols provide the yellow color of turmeric and exist as 1, 3-diketo and enol forms. The keto form is weaker than enol form (Manolova et al., 2014). Curcumin has been reported to have antioxidant and anti-inflammatory effects (Dutta et al., 2005; Weber et al., 2005; Lim et al., 2005; Biswas et al., 2005). Thiyagarajan and Sharma (2004) have reported the immunomodulatory, anti-inflammatory, antioxidant and neuroprotective effects. In Chinese traditional medicine, the curcumin has been used mental stress and hypochondriac distensive mania and pain. Yu et al. (2002) have reported the anti-depressant effect of curcumin in mice.

Schloss and Henm (2004) have reported the depressive disorders are commonly occurs in the Western countries.

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Even though, there are several drugs available for depression-related disorders that are producing adverse effects. Therefore, the discovery of natural medicinal products for this kind of disorders could minimize the negative impact. Chen and Tang (2004) have reported the potential of using Chinese traditional medicines for this type of disorders. Mazzio et al. (1998) have reported the inhibition of monoamine oxidase enzyme activity under curcumin treatment in C6 glial cells and this enzyme is known to play a fundamental role in depression-related disorders. Dar and Khatoon (2000) have reported the monoamine oxidase inhibitor-induced increase of monoaminergic neuro transamination and its role in depression-related disorders.

However, information and mechanism of curcumin action on depression-related disorders yet to be investigated. Therefore, the present study was aimed to investigate the chronic administration of curcumin against bilateral olfactory bulbectomy model and forced swim test in the male albino rats.

2. Results

2.1. *Curcumin effect on passive avoidance in olfactory bulbectomy rats*

Male albino rats with bilateral olfactory bulb ablation required 12 number of trial counts to attain the criteria. Trial counts were determined, and it was found to be 9 and 21 in the sham control and olfactory bulbectomy rats respectively. Curcumin administration significantly reduced the learning deficit in the olfactory bulbectomy rats. Curcumin treatment reduced the number trial counts 18, 15 and 12 at 10, 20 and 40 mg/kg bwt respectively (Fig. 1).

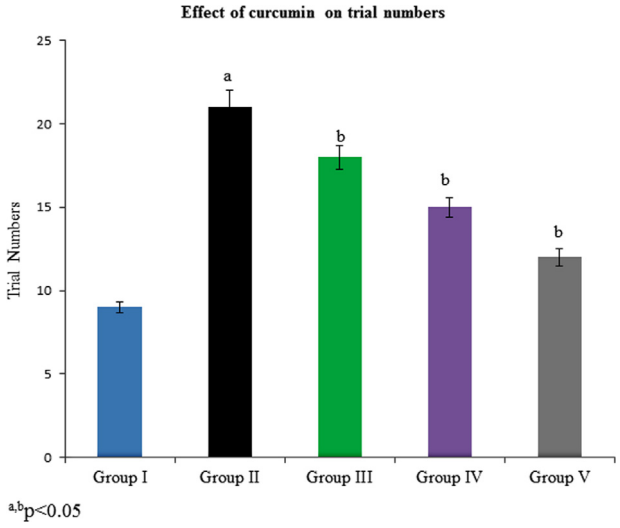

Fig. 1 – Chronic effect of curcumin administration on passive avoidance in the olfactory bulbectomy model of male albino rats. Curcumin was diluted in normal saline and administered orally for 45 consecutive days. Values were expressed mean ± SD. $^{ab}p < 0.05$. The olfactory bulbectomy (lesion) group was compared with sham control group ($^{a}p < 0.05$). Curcumin treated groups were compared with an olfactory bulbectomy (lesion) group ($^{b}p < 0.05$).

2.2. *Curcumin effect on the open field test in olfactory bulbectomy rats*

The number of peepings and rearings and ambulation counts was determined in the sham control and olfactory bulbectomy rats. The number of peepings and rearings was found to be 15.1 and 30.3 in the sham control and olfactory bulbectomy rats respectively. The number of peepings and rearings and ambulation counts was found to increase in the olfactory bulbectomy rats compared to sham control rats. Chronic administration of curcumin significantly reduced the hyperactivity in the olfactory bulbectomy rats. Curcumin treatment reduced the number peepings and rearings 27.1, 24.1 and 18.6 at 10, 20 and 40 mg/kg bwt respectively (Fig. 2A). The number of ambulation counts was found to be 51.4 and 119 in the sham control and olfactory bulbectomy rats respectively. Curcumin treatment reduced the ambulation counts 101, 80 and 62.3 at 10, 20 and 40 mg/kg bwt respectively (Fig. 2B).

2.3. *Curcumin effect on the serotonin*

Serotonin level was determined in the hippocampus and cortex region of the brain. The quantity of serotonin was found to 279.2 and 141.4 ng/g in the hippocampus region of sham control and olfactory bulbectomy rats respectively. The quantity of serotonin was found to decrease in the hippocampus and frontal cortex of olfactory bulbectomy rats compared to sham control rats. Chronic administration of curcumin significantly increased the serotonin level in the hippocampus and frontal cortex of olfactory bulbectomy rats. Curcumin treatment significantly increased the serotonin level 162.3, 210.3 and 257.7 ng/g at 10, 20 and 40 mg/kg bwt respectively, in the hippocampus of olfactory bulbectomy rats (Fig. 3). The quantity of serotonin was found to 635 and 378.4 ng/g in the cortex region of sham control and olfactory bulbectomy rats respectively. Curcumin treatment significantly increased the serotonin level 507.4, 570.8 and 605 ng/g at 10, 20 and 40 mg/kg bwt respectively, in the frontal cortex of olfactory bulbectomy rats (Fig. 4).

2.4. *Curcumin effect on the dopamine*

Dopamine level was determined in the hippocampus and cortex region of the brain. The quantity of dopamine was found to 315 and 215.5 ng/g in the hippocampus region of sham control and olfactory bulbectomy rats respectively. The quantity of dopamine was found to decrease in the hippocampus and frontal cortex of olfactory bulbectomy rats compared to sham control rats. Chronic administration of curcumin significantly increased the dopamine level in the hippocampus and frontal cortex of olfactory bulbectomy rats. Curcumin treatment significantly increased the dopamine level 247.4, 265.8 and 290.6 ng/g at 10, 20 and 40 mg/kg bwt respectively, in the hippocampus of olfactory bulbectomy rats (Fig. 3). The quantity of dopamine was found to 287 and 166.6 ng/g in the cortex region of sham control and olfactory bulbectomy rats respectively. Curcumin treatment significantly increased the dopamine level 191.4, 222 and 261.4 ng/g at 10, 20 and 40 mg/kg bwt respectively, in the frontal cortex of olfactory bulbectomy rats (Fig. 4).