**Menthol inhibits oxidative stress and inflammation in acetic acid-induced colitis in rat colonic mucosa**

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**Abstract**

Inflammatory bowel diseases (IBD) such as ulcerative colitis and Crohn's disease are characterized by chronic inflammation of the gastrointestinal system. There is no permanent cure from IBD except constant medication or surgery to keep the disease in remission. In the present study, the effect of menthol, a major ingredient of peppermint has been investigated in acetic acid-induced colitis model in Wistar rats. Menthol (50 mg/kg/day) was orally administered for either 3 days before or 30 min after IBD induction for 7 days. The changes in body weight, macroscopic and microscopic analysis of the colon of rats of different experimental groups were observed on day 0, 2, 4 and 7. Acetic acid caused a significant reduction in mean body weight and induced macroscopic and microscopic ulceration along with a significant decline of glutathione (GSH) levels, an antioxidant substrate concomitant to increased malondialdehyde (MDA) level, a marker of lipid peroxidation and raised myeloperoxidase (MPO) activity, itself a marker for neutrophil activation. Acetic acid also induced the release of pro-inflammatory cytokines. Furthermore, acetic acid also raised the levels of calprotectin, a protein released by neutrophils under inflammatory conditions of the gastrointestinal tract. Treatment with menthol significantly improved IBD-induced reduction in mean body weight and mean macroscopic and microscopic ulcer scores and reduced activities of MPO and levels of MDA with concomitant increase in GSH level. Additionally, menthol treatment significantly reduced the levels of pro-inflammatory cytokines such as interleukin-1, interleukin-23 and tumor necrosis factor-α with no significant change in interleukin-6 levels. The data indicate that menthol improved body weight gain, mean macroscopic and microscopic ulcer scores, attenuated lipid peroxidation, oxidative stress and inflammation in the IBD rat mucosa.

**Keywords:** Menthol; acetic acid; colitis; inflammation; oxidative stress; rats.