

Beneficial Effects of Curcumin against Stress Oxidative and Mitochondrial Dysfunction Induced by Trinitrobenzene Sulphonic Acid in Colon

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Abstract : Oxidative stress is one of the main factors involved in the onset and chronicity of inflammatory bowel disease (IBD). In this study, we investigated the beneficial effects of a potent natural antioxidant, curcumin (Cur) on colitis and mitochondrial dysfunction in trinitrobenzene sulfonic acid (TNBS)-induced colitis in mice. Rectal instillation of the chemical irritant TNBS (30 mg kg⁻¹) induced the disruption of distal colonic architecture and a massive inflammatory cells influx to the mucosa and submucosa layers. Under these conditions, daily administration of Cur (25 mg kg⁻¹) efficiently decreased colitis scores in the inflamed distal colon by reducing leukocyte infiltrate as attested by reduced myeloperoxidase (MPO) activity. Moreover, the levels of nitrite, an end product of inducible NO synthase activity (iNOS) and malonyl dialdehyde (MDA), a marker of lipid peroxidation increased in a time depending manner in response to TNBS challenge. Conversely, the markers of the antioxidant pool, reduced glutathione (GSH) and catalase activity (CAT) were drastically reduced. Cur attenuated oxidative stress markers and partially restored CAT and GSH levels. Moreover, our results expanded the effect of Cur on TNBS-induced colonic mitochondrial dysfunction. In fact, TNBS induced mitochondrial swelling and lipids peroxidation. These events reflected in the opening of mitochondrial transition pore and could be an initial indication in the cascade process leading to cell death. TNBS inhibited also mitochondrial respiratory activity, caused overproduction of mitochondrial superoxide anion (O₂⁻) and reduced level of mitochondrial GSH. Nevertheless, Cur reduced the extent of mitochondrial oxidative stress induced by TNBS and restored colonic mitochondrial function. In conclusion, our results showed the critical role of oxidative stress in TNBS-induced colitis. They highlight the role of colonic mitochondrial dysfunction induced by TNBS, as a potential source of oxidative damages. Due to its potent antioxidant properties, Cur opens a promising therapeutic approach against oxidative inflammation in IBD.

Keywords : colitis, curcumin, mitochondria, oxidative stress, TNBS

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