World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:9, No:02, 2015

Sulforaphane Attenuates Muscle Inflammation in Dystrophin-Deficient Mdx Mice via Nrf2/HO-1 Signaling Pathway

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Abstract : Backgrounds: Inflammation is widely distributed in patients with Duchenne muscular dystrophy (DMD), and ultimately leads to progressive deterioration of muscle function with the co-effects of chronic muscle damage, oxidative stress, and reduced oxidative capacity. NF-E2-related factor 2 (Nrf2) plays a critical role in defending against inflammation in different tissues via activation of phase II enzymes, heme oxygenase-1 (HO-1). However, whether Nrf2/HO-1 pathway can attenuate muscle inflammation on DMD remains unknown. The purpose of this study was to determine the anti-inflammatory effects of Sulforaphane (SFN) on DMD. Methods: 4-week-old male mdx mice were treated with SFN by gavage (2 mg/kg body weight per day) for 4 weeks. Gastrocnemius, tibial anterior and triceps brachii muscles were collected for related analysis. Immune cell infiltration in skeletal muscles was analyzed by H&E staining and immuno-histochemistry. Moreover, the expressions of inflammatory cytokines,pro-inflammatory cytokines and Nrf2/HO-1 pathway were detected by western blot, qRT-PCR, immunohistochemistry and immunofluorescence assays. Results: Our results demonstrated that SFN treatment increased the expression of muscle phase II enzymes HO-1 in Nrf2 dependent manner. Inflammation in mdx skeletal muscles was reduced by SFN treatment as indicated by decreased immune cell infiltration and lower expressions of the inflammatory cytokines CD45, pro-inflammatory cytokines tumour necrosis factor-α and interleukin-6 in the skeletal muscles of mdx mice. Conclusions: Collectively, these results show that SFN can ameliorate muscle inflammation in mdx mice by Nrf2/HO-1 pathway, which indicates Nrf2/HO-1 pathway may represent a new therapeutic target for DMD.

Keywords : sulforaphane, Nrf2, HO-1, inflammation
Conference Title : ICBMJD 2015 : International Conference on Bone, Muscle and Joint Diseases
Conference Location : London, United Kingdom
Conference Dates : February 16-17, 2015