Full length article

Cardamonin (2’,4’-dihydroxy-6’-methoxychalcone) isolated from Boesenbergia rotunda (L.) Mansf. inhibits CFA-induced rheumatoid arthritis in rats

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ABSTRACT

Boesenbergia rotunda (L.) Mansf. had been traditionally used as herbs to treat pain and rheumatism. Cardamonin (2’,4’-dihydroxy-6’-methoxychalcone) is a compound isolated from Boesenbergia rotunda (L.) Mansf. Previous study had shown the potential of cardamonin in inhibiting the release of pro-inflammatory cytokines such as tumour necrosis factor-alpha (TNF-alpha), interleukin-1beta (IL-1beta), and interleukin-6 (IL-6) in vitro. Thus, the possible therapeutic effect of cardamonin in the rheumatoid arthritis (RA) joints is postulated. This study was performed to investigate the anti-arthritic properties of cardamonin in rat model of induced RA, particularly on the inflammatory and pain response of RA. Rheumatoid arthritis paw inflammation was induced by intraplantar (i.pl.) injection of complete Freund’s adjuvant (CFA) in Sprague Dawley rats. Using four doses of cardamonin (0.625, 1.25, 2.5, and 5.0 mg/kg), anti-arthritic activity was evaluated through the paw edema, mechanical allodynia and thermal hyperalgesia responses. Enzyme-linked immunosorbent assay (ELISA) was carried out to evaluate the plasma level of TNF-alpha, IL-1beta, and IL-6. Histological slides were prepared from the harvested rat paws to observe the arthritic changes in the joints. Behavioral, biochemical, and histological studies showed that cardamonin demonstrated significant inhibition on RA-induced inflammatory and pain responses as well as progression of joint destruction in rats. ELISA results showed that there was significant inhibition in TNF-alpha, IL-1beta, and IL-6 levels in plasma of the cardamonin-treated RA rats. Overall, cardamonin possesses potential anti-arthritic properties in CFA-induced RA rat model.

1. Introduction

Rheumatoid arthritis (RA) is an autoimmune disease which causes chronic systemic joint inflammation. RA patients experience swollen and painful joints which seriously impact their normal well-being. About 1% of the population worldwide is currently affected by RA (Gibofsky, 2012). The immune cells attack RA joints by inducing the release of cytokines such as tumour necrosis factor-alpha (TNF-alpha) and interleukins at the synovial membrane, leading to the initiation of angiogenesis and proliferation of the synovial fibroblasts which cause the formation of pannus (Holmdahl et al., 2014).

According to the European League against Rheumatism (EULAR) and American College of Rheumatology (ACR), disease-modifying anti-rheumatic drugs (DMARDs) such as methotrexate and sulfasalazine are the primary medication for the patients soon after the onset of RA (Singh et al., 2015; Smolen et al., 2013) while cocktails of DMARDs and glucocorticoids are given as the substitutes when the therapeutic effect of initial prescription wanes off (Smolen et al., 2013). The medical regimens for RA patients keep on changing not only due to the reduction of their beneficial effects over time, their adverse side effects which cause morbidity and mortality in patients are seriously considered as well (Singh et al., 2015). Due to the drawbacks in the currently available treatments for RA, new drug discovery is of research interest in order to offer patients with more choices of drugs other than the three main RA prescripions (Quan et al., 2008), with fewer or none adverse effects.

Boesenbergia rotunda (L.) Mansf., also known as fingerroot, is a rhizomatous plant species in Zingiberaceae family which had long been established as a medicinal plant family, commonly found in the Southeast Asian countries and tropical rainforests. (Basak et al., 2018).