

Letter to Editor

A Brief Perspective on Anti-inflammatory Effects of Thymol and Carvacrol

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Dear Editor

We eagerly read the recent paper published by Gholijani N et al. entitled "The Suppression of Adjuvant-induced Inflammation and the Inhibition of the Serum and Tissue IL-17, TNF- α and IL-1 β levels by Thymol and Carvacrol" in "Herb Med J". This study adequately indicated the anti-inflammatory properties of the two mentioned plant-derived compounds. Thus, the authors intend in this letter to point to a few important notes in confirming this study. Inflammation is a defensive mechanism in the body that removes or deactivates pathogens. Although it is beneficial for the body, inflammation can be harmful if it is induced without being controlled properly. Moreover, inflammation plays a role in restoring homeostasis to the body after the onset of the disease and is useful in improving the damages (1). It is documented that cytokines, including TNF- α , IL-17 and IL-1 β , play substantial roles in inflammatory responses (2). One of these cytokines is TNF- α which is secreted by mononuclear phagocytes. TNF- α can induce acute phase proteins and is considered as a pyrogenic factor (3). Another cytokine is IL-17 which is produced by Th17, NK cells and neutrophils. It could exacerbate inflammation via increased immune cells proliferation and indirect neutrophil recruitment (4). IL-1 β is recognized as a mediator of acute inflammatory response against infections (5). Moreover, adjuvants can be used as exacerbation

factors for immune responses in animal models (6). Today, chemical drugs such as corticosteroids are used to reduce inflammation. But, important adverse effects of these drugs are well known and unavoidable (7). Today, researchers have shown that herbal medicines with low cost and minimal side effects are good alternatives to synthetic drugs (8).

Among these plants, peppers species are widely used as medicinal plants. Carvacrol (2-methyl-5-(1-methylethyl)-phenol) and Thymol (2-isopropyl-5-methylphenol) are the most important active ingredients of these plants especially *Zataria multiflora* and *Satureja hortensis* (Figure-1). These compounds are monoterpenoid phenols which are chemically very similar and only the position of their hydroxyl group differs (9). Several researches have documented that carvacrol exhibits various biological activities including but not limited to antioxidant, antimicrobial, antispasmodic, anti-inflammatory, analgesic, immunomodulatory and chemopreventive activities (10-12). Thymol had also beneficial properties including antioxidant, anti-inflammatory, antiseptic, antibacterial, antifungal, antinociceptive, properties. Numerous investigations have been carried out on the properties of these compounds, among which we now refer to a number of them concerning their anti-inflammatory properties and to confirm this study (13-15).

Many researches showed anti-inflammatory effects of carvacrol. Carvacrol could inhibit neutrophil elastase and production of E2, F1 and F2 prostaglandins. It

also can inhibit cyclooxygenase-2 (COX-2) activity (16-18). In addition to carvacrol, thymol showed anti-inflammatory effects through inhibition of human neutrophil elastase. Another study indicated that carvacrol and thymol, particularly carvacrol, play their anti-inflammatory roles via inhibited inflammatory edema and leukocyte migration (19).

Conclusion

Further studies about the anti-inflammatory effects of herbal compounds can lead to the development of useful herbal treatments to reduce inflammation. For this purpose, comprehensive investigation of signaling pathways involved in turning on and off the inflammation such as NF- κ B which plays a central role in inflammation, activation of lymphocytes, cell survival and the JAK/STAT pathway which is involved in the signaling of cytokines. Moreover, inflammatory mechanisms can be further investigated by adding inflammatory cytokines antagonists. In addition, techniques for silencing the gene in inflammatory conditions can provide more information about the anti-inflammatory mechanisms of plant compounds. Taken together, elucidation of cellular and molecular players in inflammation and immune responses would lead to more optimized application of herbal medicines.

Conflict of Interest

The authors declare that they have no conflict of interest.

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