Curcumin From Traditional Iranian Medicine to Molecular Medicine

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More than 2000 years, turmeric has been used in traditional medicine in Iran and some other Asian countries (1), Avicenna (980-1037 AD) recommended mixture of turmeric and lamb tallow as a topical anti-inflammatory and pain relieving agent (2). In Indian, traditional medicine has been used as topical treatment for wound healing, bites, burns, acne and some other conditions such as dental diseases, dyspepsia and antacid (3, 4).

The spice turmeric (in Farsi Zardchobeh) has a very active component called curcumin. Curcumin is an anti-inflammatory and chemopreventive molecule (5). Diferuloylmethane or (1E, 6E)-1, 7-bis (4-hydroxy-3-methoxyphenyl)-1, 6-heptadiene-3, 5-dione is a chemical name of curcumin (Figure 1) (3, 6).

Recent clinical and experimental studies showed antioxidant, anti-inflammatory, chemopreventive, and chemotherapeutic activity of curcumin during the past 20 years (7, 8). Nuclear factor κB (NF-κB) signaling pathway is one of the most important pathways in the cellular and molecular inflammation (9, 10). In this cellular signaling pathway, cytokines and adhesion molecules are secreted (11). According to the molecular studies, curcumin inhibit NF-κB signaling pathway and could regulate cytokines production and influence immune response (12, 13). Curcumin has suppressed some genes expression, especially cytokines genes. Curcumin could down regulate the expression of TNF-α, IL-1, IL-6, IL-8, adhesion molecules (ICAM, VCAM), C-reactive protein (10).

That is why Iranian traditional medicine was recommended the topical mixture of turmeric in articular pain relieving and articular swelling due to NF-κB inhibition. Same molecular mechanism is found in topical nonsteroidal anti-inflammatory drugs (NSAIDs). Any human chronic inflammatory diseases such as asthma, bronchitis, inflammatory bowel disease, rheumatoid arthritis, coronary artery disease, atherosclerosis plaque stabilizing, diabetes mellitus, obesity, fatty liver, metabolic syndrome, depression, cancer, and allergy could be a therapeutic target of curcumin (10). However, bioavailability and drug delivery method of curcumin are impediment in modern pharmacology. Absorption of curcumin in human gastrointestinal tract is very difficult.

Many researchers are focussing on molecular and cellular aspects of curcumin activities (14), some others are focussing on curcumin delivery methods (15). Some new drug delivery methods such as curcumin nanoparticles and liposomal curcumin are considered (15). Unpublished data in our department in Mashhad University of Medical Sciences show acceptable bioavailability of Curcumin-derivative nanomicelles in comparison with curcumin capsules. The spice turmeric is our medical heritage of the centuries; this wonderful natural product has a great secret, which is an inhibitory effect on chronic inflammation without significant side effect. Curcumin, active component of this spice, could be an example of targeted therapy that was made by nature. We have to explore curcumin cellular and molecular targets.

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