

The lesson to be learned from Broccoli and turmeric

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Broccoli, a salad vegetable, and turmeric, herbs are known to humankind from times immemorial [1,2]. There are several observations documented in the literature regarding the beneficial effects of the compounds present in these two food gradients [3-5]. Now it is the high time for translating ingredients from kitchen to clinic because of translational and nutrigenomics research. In that context, broccoli and turmeric are two ideal foodstuffs. There are phytochemicals and antioxidant compounds in these two herbs that have profound health benefit ranging from preventive to the curative phase of diseases [6-8]. Antioxidants are believed to be beneficial, but it can act both as friend or foe varying upon the microenvironment of the milieu interior in the scenario of the molecular pathogenesis of a disease [9,10]. Clinical Trials with antioxidants have yet not produced many encouraging results [11,12]. Instead, other than ascorbic acid (vitamin C) the antioxidants including Vitamin E are proved to increase mortality in all causes [13,14]. Therefore, use of antioxidants must consider seriously, and from the point of the molecular pathogenesis of the diseases, their use should be justified. It is found that oxidative stress is associated with most of the diseases [15]. The major non-communicable chronic diseases of the recent times like diabetes mellitus, obesity, atherosclerosis etc. are related to oxidative stress [16]. In such conditions, supplementations of the antioxidant vitamins are not expected to improve the levels of the antioxidant enzymes [17]. It is particularly noteworthy that the activity of antioxidant enzymes is observed to be diminished in these chronic illnesses. In this context, there is a ray of hope from broccoli and curcumin.

Sulforaphane and curcumin are phytochemicals available abundantly in broccoli and curcumin respectively [18,19]. It is seen that both two compounds interact with Nrf2, a transcription factor and causes its translocation in the nucleus from the cytoplasm [6,8,20]. In the nucleus, Nrf2 binds with the antioxidant responsive element and induce transcription of detoxification enzymes like glutathione peroxidase, thioredoxin reductase [21,22]. This is expected to nullify oxidative stress by stimulating our genetic machinery. Therefore, it is observed that Nrf2 expression plays a beneficial role in inflammation, diabetes mellitus, neurodegenerative disorders etc. [23-25]. In malignancy, Nrf2 can have a dual role. Before the initiation of malignancy, it is expected to cause chemoprevention, but in established malignancy, it may inhibit apoptosis of the cancer cells by stimulating the antioxidant machinery of the body [26]. Also, in tuberculosis these phytochemicals can play a negative role as oxidants produced in a respiratory burst may be taken care of by triggering of the oxidant detoxification system and that can make the stay of the intracellular bacilli more comfortable [27,28]. The expected molecular interaction of the phytochemicals from broccoli and curcumin is elaborated in Figure 1. We feel that now it is time for focused clinical trial with individual phytochemicals that are observed to be beneficial.

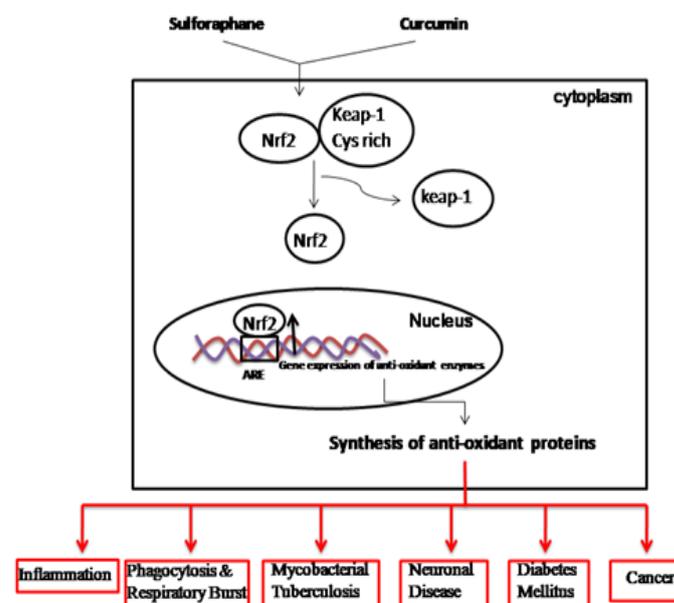


Figure 1. Effect of Sulforaphane and curcumin on anti-oxidant proteins: the effect of Sulforaphane and curcumin in the cells results in the dissociation of Nrf2-Keap-1 complex which releases the Keap-1 and then Nrf2 translocates into the nucleus, binds to the antioxidant response element (ARE) sequence and initiates the transcription of gene responsible for synthesis of anti-oxidant enzymes which then moves into the cytoplasm and translate to anti-oxidant proteins and the expression of these protein is expected to affect the molecular pathogenesis of diseases [8,20]. In diabetes mellitus and inflammatory disorders action of Nrf2 is expected to be beneficial [23,24]. While in tuberculosis Nrf2 may play a negative role [27]. In cancers and neurodegenerative disorders, it may act as a double edged sword [25,26]. Focused Clinical trial is necessary to dissect this problem in more detail.

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