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Promises of Curcumin as an Effective Medicinal Agent: A Short Communication

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Abstract

Curcuma longa (turmeric) has ancient history of the use as Ayurvedic medicine. Its constituents include curcumin, demethoxycurcumin, bisdemethoxycurcumin, sugars, proteins, and resins etc. There are large number of pharmacological activities exhibited by turmeric which include antioxidant, antimicrobial, anti-inflammatory properties etc. Curcumin, commonly called diferuloyl methane. It is a hydrophobic polyphenol found in the rhizome (turmeric) of the herb Curcuma longa. Curcumin also shows chemo-resistance and radio-resistance activity. Its anticancer effect is mainly mediated through induction of apoptosis. Its medicinal activities can be utilized in rheumatism, carcinogenesis and oxidative stress-related pathogenesis. This article explores the medicinal activity and uses of curcumin in various diseases.

Key Words: Anticancer, Activity, Curcumin, Drug , Medicine, Therapeutics

INTRODUCTION

Turmeric is comprised of a group of three curcuminoids: curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin, as well as volatile oils (tumerone, atlantone, and zingiberone), sugars, proteins, and resins. The curcuminoid complex is also known as Indian saffron [1]. Curcumin is a lipophilic polyphenol that is nearly insoluble in water [2] but is quite stable in the acidic pH of the stomach [3]. The American Department of Health and Human Services together with the Department of Agriculture has published malignant neoplasms as one of the major causes of mortality and suggested targeting a 16% reduction in deaths of males and 9% in females through the adoption of required dietary behaviours (Fig. 1) [4].

Although curcumin has very low absorption after ingestion, various studies have suggested that even low levels of physiologically achievable concentrations of curcumin may be sufficing for its chemo-preventive and chemotherapeutic activity. Therefore, curcumin controls multiple targets (which is also known as multi-targeted therapy), which is needed for the treatment of most diseases, it is cost effective and has been found to be safe in human clinical trials. However, in spite of its higher efficacy and safety, curcumin has not yet been formally approved as a therapeutic agent [5]. This space between the great levels of many preclinical studies and the shortcomings of its correct clinical use due to poor aqueous solubility, together with low oral bioavailability, lead to many uncertainties of its medicinal effect in the Western region of the world.

MEDICINAL EFFECTS

In simple aqueous and aqueous-organic solutions, curcumin is susceptible to fast degradation, which increases as the basicity of the solutions increases, and also on exposure to sunlight. It has an intense yellow color, that changes to deep red in basic pH solution.The metabolic products of curcumin are different from the degradation products, where O-conjugation and reduction are the important processes initiated through the enzymatic reactions. Small doses of turmeric (curcumin) are taken every day as a spice by the population in many Asian countries. In one epidemiologic survey, in terms of its dietary use in Nepal, turmeric consumption was found to be up to 1,500 mg per person daily, equivalent to approx. 50 mg/day of curcumin [7]. In India, where the average

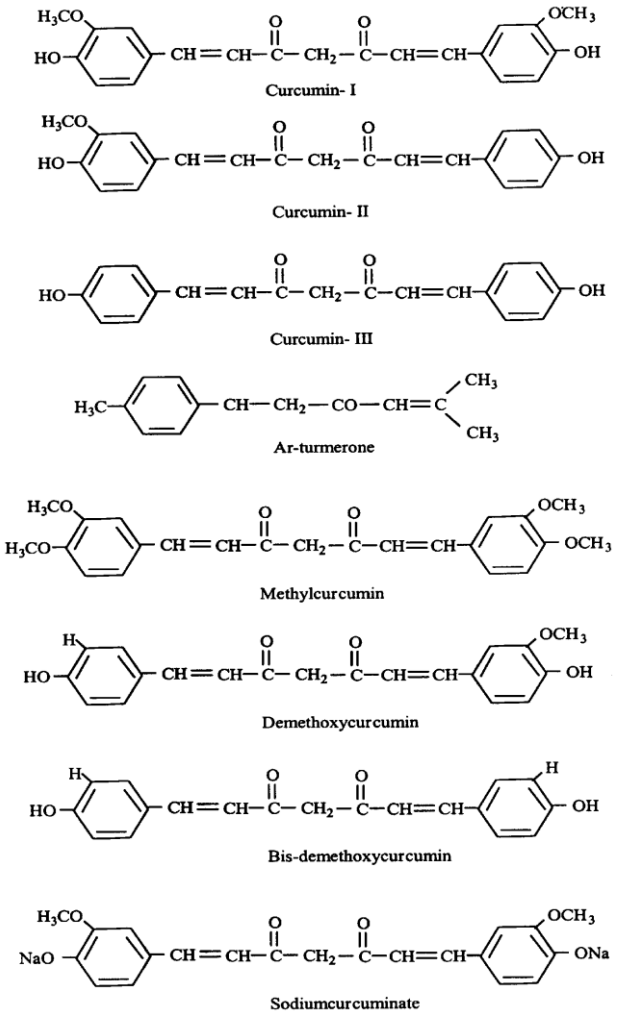

Figure 1: Structure of natural curcuminoids (Courtesy: Chattopadhyay I et al. [6]

intake of turmeric can be as high as 2,000–2,500 mg per day (corresponding to approx. up to 100 mg of curcumin), no toxicities or adverse effects have been reported or studied at the population level [8]. However the doses administered in clinical trials are expected to be rather higher than those normally consumed in the diet. This fact underlines the need for systematic safety and toxicity studies. Based on repeated studies, turmeric is Generally Recognized As Safe (GRAS) by the US FDA, and curcumin has been granted an acceptable daily intake level of 0.1–3 mg/kg-BW by the Joint FAO/WHO Expert Committee on Food Additives, 1996 [9].

The numerous properties of curcumin and its well documented antioxidant properties were used to test its efficacy in various illnesses. Curcumin has been largly investigated for its effectiveness for cardiovascular protection, and has been used in neurodegenerative disorders, especially Alzheimer's disease and Parkinson's disease. In addition, curcumin's potential activity in cystic fibrosis has received considerable media attention [10-11]. A majority of chemotherapeutic agents, including those isolated from plants e.g. Taxol, Vincristin, etc., not only induce cancer cell apoptosis but also severely damage the normal cells of the host. Curcumin is a part of our daily dietary habit and its use in large quantities since ancient times has proved that it is a safe product.

CONCLUSIONS

Curcumin is an extensively gifted molecule provided by nature to protect humans from various chronic health problems. Seeing at the chemical structure of curcumin, it is natural to assume that chemistry of curcumin. However, with increasing scientific understanding it seems to be more complicated, unique and tough to comprehend. It is a symmetric molecule abundant in turmeric with relatively high stability in natural form.

CONFLICT OF INTEREST: None

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