Role of Indian spices in cancer prevention: A Review

Dr. Chaiti Ganguly

Department of Biotechnology, IILM Academy Of Higher Learning , Greater Noida , India

Abstract— *Indian Spices from time immemorial were considered with the philosophic concepts of improving health. Laboratory research has further demonstrated the effectiveness of a number of bioactive dietary components that have the ability to prevent cancer and other chronic diseases. Cytotoxic effects of numerous herbal extracts against cancerous cells have been reported. Research provides strong support for the future acceptance of natural compounds as chemo-preventive agents. In Indian cooking variety of spices are used for their specific delicious taste. Research on the health benefits of spices over the last century has elucidated the effects of spices as antioxidant, anti-inflammatory, anti-microbial, cardioprotective, neuroprotective and anti-cancer compounds. There has been a growing realization that spices possess anticarcinogenic properties which is supported by experimental evidences. Cancer chemoprevention is the inhibition or reversal of preinvasive carcinogenesis before cellular invasion across the basement membrane. The goals are to prevent incident precursors and cancer, regress prevalent precursors, and/or suppress recurrent precursors. The focus of cancer medicine in the 21st century is moving towards improved prediction of risk, prevention of disease, preservation of health, personalization of treatment, and more patient participation in decision-making.*

Keywords— Indian Spices, Cancer chemoprevention, Herbal Extracts.

I. INTRODUCTION

Cancer development, a dynamic and long-term process, involves many complex factors with a stepwise progression that ultimately leads to metastasis, an uncontrolled spreading and growth of cancerous cells throughout the body. The three critical steps in this process for several types of human cancer formation are initiation, promotion and progression.

There is no suitable method of pre-diagnosis of cancer. Generally cancer is diagnosed at their secondary or tertiary stages. At this stage radiation therapy, chemotherapy, surgery or gene therapy is the alternatives of which, gene therapy is very costly and is not available to everyone and other treatments have their own side effects. The growing understanding of the process of carcinogenesis and cancer biology has resulted in an appreciation of the fact that human cancer is a final outcome of genetic and non –genetic events occurring over twenty years or more. This allows for Preventive interventions. Prevention of cancer is a feasible approach for cancer control in India.

India has a rich heritage of medical sciences and scientific health care approach which was holistic in nature that considered all aspects of human health and disease including preventive efforts. But there was a black out of traditional wisdom and medical practices which were replaced by primarily treatment oriented practices that most often ignored the preventive aspects. Fortunately attention is once again being focused on holistic health and prevention of diseases. Preventive measures taken timely and properly is likely to improve general health of the population, prevent cancer as well as other chronic ailments like heart disease, diabetes etc.

Cancer chemoprevention is the inhibition or reversal of pre-invasive carcinogenesis before cellular invasion across the basement membrane. The goals are to prevent incident precursors and cancer, regress prevalent precursors, and/or suppress recurrent precursors (primary, secondary and tertiary chemoprevention, respectively). [1,2][Kelloff et.al., 1995; Sporn et. al., 1976].

The focus of cancer medicine in the 21st century is moving towards improved prediction of risk, prevention of disease, preservation of health, personalization of treatment, and more patient participation in decision-making

Epidemiological studies have provided convincing evidence that natural dietary compounds can modify this process.[3,4] (Kaefer and Milner, 2008; Mehta et al., 2010). Laboratory research has further demonstrated the effectiveness of a number of bioactive dietary components that have the ability to prevent cancer and other chronic diseases. [5,6,7] (Kamatenesi et al., 2011; Afolayan et al., 2010; Gathirwa et al., 2011). Cytotoxic effects of numerous herbal extracts against cancerous cells have been reported.[8] (Bisi-Johnson et al., 2011). Such promising research provides strong support for the future acceptance of natural compounds as chemo-preventive agents.

Spices are defined by the US Food and Drug Administration as "aromatic vegetable substances, in the whole, broken, or ground form, whose significant function in food is seasoning rather than nutrition. They are true to name, and from them no portion of any volatile oil or other flavoring principle has been removed"[9] (Lampe, 2003)

Indian Spices from time immemorial were considered with the philosophic concepts of improving health, since it was understood that they could affect the four humors (blood, phlegm, yellow bile and black bile) and influence the corresponding moods (sanguine, phlegmatic, choleric and melancholic. Archeologists discovered evidence that as early as 50,000 B.C., humans used the leaves of plants for flavoring meats and around 2300 B.C. for wine making. Alexander the Great's campaigns in Central Asia around 330 B.C. are often credited for the dissemination and adoption of herbs and spices among many cultures because they introduced Asian, Persian, Indian, and Greek cultures and ideas. In Indian cooking variety of spices are used for their specific delicious taste. Research on the health benefits of spices over the last century has elucidated the effects of spices as antioxidant, anti-inflammatory, anti-microbial, cardioprotective, neuroprotective and anti-cancer compounds. There has been a growing realization that spices possess anticarcinogenic properties which is supported by experimental evidences.[10,11,12,13](Unnikrishnan and Kuttan, 1990; Das, 2004b; Das et al., 2004; Sengupta et al., 2005). Curcumin, turmeric's active constituent, protects against free radical damage as an antioxidant and works as COX 2 inhibitor to control cancer initiation[14] (Surh,Y.J. et.al ; 2003) and undergoing phase I clinical trial.[15] (Cheng et. al., 2001). Ginger (*Zingiber officinale*) has been identified in several studies as a plant with a high antioxidant content. [16,17] (Shobana & Naidu 2000 a; Halvorsen et. al., 2002). A preliminary screening of 35 different Indian spices and herbs indicated that clove, cinnamon, bishop's weed, chili (*Capsicum annum*), horseradish, cumin, tamarind, black cumin, pomegranate seeds, nutmeg, garlic, onion, tejpat, celery, and cambodge had potent antimicrobial activities against the test organisms *Bacillus subtilis* (ATCC 6633), *Escherichia coli* (ATCC 10536), and *Saccharomyces cerevisiae* (ATCC 9763). [18] (De et al., 1999).

Evidences from experimental and epidemiological studies suggested that spices used in Indian cooking have protective role against cancer. But these works are done to some extent in a scattered way. Some have found beneficial results using the spices while some used the active components. Some of the studies were done in an in vitro system others have selected an in vivo model. Therefore more focused research on specific experimental model and understanding the mechanism of action is necessary. Further investigations are required to define the protective role of different spices and herbs when used as food components as well as when used pharmacologically using specific compounds. It is also important to find out at which stage these chemo-preventive agents modulate carcinogenesis by cell cycle analysis and in situ proliferation. Detailed study on their mechanism of action is also desirable.

II. CONCLUSION

Indian Spices from time immemorial were considered with the philosophic concepts of improving health. Laboratory research has further found the effectiveness of a number of bioactive dietary components that have the ability to prevent cancer and other chronic diseases. Cytotoxic effects of numerous herbal extracts against cancerous cells have been reported. Research provides strong support for the future acceptance of natural compounds as chemo-preventive agents. Research on the health benefits of spices over the last century has found the effects of spices as antioxidant, anti-inflammatory, anti-microbial, cardio-protective, neuro-protective and anti-cancer compounds. There has been a growing realization that spices possess anti-carcinogenic properties which is supported by experimental evidences

CONFLICT OF INTEREST

None declared till now.

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