RESEARCH PAPER

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Antitumorigenic action of fenugreek seeds

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1,2-dimethylhydrazine (DMH) is a toxic environmental pollutant. Humans are exposed to DMH through rocket fuel and Gyromitra species of mushroom. DMH induced colon tumor in rats mimics human colon tumor in morphological and histological aspects. Thus, DMH model is well established and correlated with human problems.The effects of dietary fenugreek seeds on induced colon tumor and oxidative stress was investigated in male Wistar rats. Rats administered with a weekly subcutaneous injection of DMH (20 mg/kg body weight) for 15 weeks developed colon tumor with 100% incidence, and showed a significant, i) decrease in lipid peroxidation (LPO) measured interms of thiobarbituric acid reactive substances (TBARS), ii) decrease in phospholipid, a major substrate for LPO and iii) increase in glutathione dependent enzymes- glutathione peroxidase (GPx) and glutathione S-transferase (GST), when compared to control rats. However, supplementation of dietary fenugreek to DMH treated rats significantly decreased the tumor incidence to 16.66%, increased the TBARS and phospholipid content and decreased the GPx and GST activities when compared to DMH treated rats. It is suggested that fenugreek act as antitumorigenic agent by influencing DMH induced colon tumor incidence and oxidative stress through its constituents flavonoids, saponin, protease inhibitors and dietary fibre.

Key words : Fenugreek, Colon cancer, Phospholipid, Lipid peroxidation, Glutathione, Mushroom.

INTRODUCTION

1,2-dimethylhydrazine (DMH) is a toxic environmental pollutant. Humans are exposed to DMH through rocket fuel and Gyromitra species of mushroom. DMH induced colon tumor in rats mimics human colon tumor in morphological and histological aspects. Thus, DMH model is well established and correlated with human problems. Several biomarkers have been suggested for biomonitoring the action of antitumorigenic agents of which oxidative stress is well established. This is because oxidative stress is an important aspect in contributing to the cancer development (Bobek *et al.*, 2000). 1,2-Dimethylhydrazine (DMH) a potent colon carcinogen has been reported to elicit oxidative stress associated with decreased lipid peroxidation and increased antioxidant enzymes during experimental colon tumorigenesis (Manoj *et al.*, 1999).

Dietary intervention is one of the most promising approaches in the suppression of colon cancer (Garay and Engstrom, 1999; Tiwari, 2001). Several natural foods act as antitumorigenic agent by ameliorating the oxidative stress during experimental tumorigenesis. Phytochemicals such as flavonoids, saponins and protease inhibitors from plant foods ameliorate oxidative stress (Hayatsu *et al.*, 1998; Richter *et al.*, 1999) and prevent tumor development (Lipdkin *et al.*, 1985; Mure and Rossman, 2001)

From this aspect it is logical to assume that plants rich in phytochemicals could be used for the amelioration of oxidative stress and prevention of tumor incidence. Seeds of fenugreek (*Trigonella foenum graecum*) is consumed as a spice and food additive in many parts of country. It is a good source of phytochemicals (Jain and Aggarwal, 1990)

Recently we have reported that fenugreek seeds prevent colon tumorigenesis by influencing the metabolism of bile acid, phospholipid and microfloral enzymes (Devasena *et al.*, 2003a; Devasena *et al.*, 2003b). It was also demonstrated that fenugreek modulates hepatic and colonic oxidative stress during its antitumorigenic action (Devasena and Menon, 2002. Devasena *et al.*, 2005).

This part of our study was carried out to investigate whether fenugreek influences colonic oxidative stress during DMH induced colon tumorigenesis. We have measured colonic i) phospholipid (a major substrate for lipid peroxidation - LPO), ii) thiobarbituric acid reactive substances – TBARS (an index of lipid peroxidation) and iii) activities of glutathione dependent enzymes as markers of oxidative stress.

MATERIALS AND METHODS

Animals:

Male albino rats of Wistar strain weighing between 100 and 120 g were obtained from the Central Animal House, Department of Experimental Medicine, Annamalai University. Animals were housed in polypropylene cages. Commercial pellet feed containing 5% fat (obtained from Hindustan Lever Limited, Mumbai, India) was powdered and mixed with 15% peanut oil making a total of 20% fat in the diet. The feed and water were given ad libitum