Creative Journal of Pharmaceutical Research (www.cjpr.org) ISSN:2395-4779
Original Research Article

Cancer Preventive Role of Ellagic Acid - A REVIEW

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Received: Sep 10th 2015 Revised and Accepted: Jan 5th 2016

Sabina Khanam., *et al.: In Cancer Preventive Role of Ellagic Acid.*

Ellagic acid (EA) are polyphenolic compounds found in a wide variety of fruits. Ellagic acid is a complex planar molecule which demonstrates a variety of anticarcinogenic activities. It acts as a scavenger to bind cancer causing chemicals, making them inactive. It also has anti-bacterial, anti-viral properties. EA exhibits important health promoting effects via its antioxidant, anti-proliferative, chemo-preventive, anti-atherogenic, anti-apoptotic, anti-inflammatory activities and it also repairs DNA damage. We have determined in our literature review the cancer preventive role of ellagic acid.

Key words: Ellagic acid, Carcinogenic, Preventive.

Introduction

Ellagic acid is a polyphenol antioxidant found in numerous fruits and vegetables including blackberries, raspberries, strawberries, cranberries, walnuts, pecans, pomegranates, wolfberry and other plant foods. The antiproliferative and antioxidant properties of ellagic acid have spurred preliminary research into the potential health benefits of ellagic acid consumption. The highest levels of ellagic acid are found in raspberries. In plants, ellagic acid is present in the form of ellagitannin. Ellagic acid contains antioxidant, anti-mutagen and anti-cancer properties (9).

Research shows that ellagic acid, which is an anti-carcinogenic, inhibits the growth of cancer cells. It also causes apoptosis or normal cell death in those cancer cells.

Ellagic acid is active in antimutagenesis assays, and has been shown to inhibit

chemically induced cancer in the lung, liver, skin and esophagus of rodents and TPA-induced tumor promotion in mouse skin (10).

The anti-proliferative properties of ellagic acid are due to its ability to directly inhibit the DNA binding of certain carcinogens, including polycyclic aromatic hydrocarbons and nitrosamines (4,5,8). Ellagic acid down-regulates insulin-like growth factor (IGF-II) (7) and activates expression of tumor suppressor genes p53/p21, leading to cell cycle arrest at the G1/S phase and apoptosis (6) Ellagic acid prevents carcinogen induced tumorigenesis by activating detoxifying enzymes (2) and inhibiting certain cytochrome P450 enzymes involved in the generation of mutagens (1, 11).

Some of the pharmacological activities of ellagic acid can be attributed to its metabolic products (urolithins). The antioxidant activity of ellagitannins, ellagic acid and its intestinal microbial metabolites, was studied using a cell-based assay. The urolithins were reported to possess stronger antioxidant activity when compared with parent ellagic acid and ellagitannins.

- ✓ Following exposure to Ellagic acid from red raspberries, human cervical cancer cells, infected with the human papilloma virus (HPV), die within several days due to a process termed apoptosis (normal cell death).

- ✓ Ellagic acid causes the growth cycle (G1) arrest of cancer cells, thus, inhibiting cell division and cellular proliferation.

How Ellagic Acid Work

Ellagic acid acts as a scavenger to bind cancer causing chemicals, making them inactive. It inhibits the ability of other chemicals to cause mutations in bacteria. In addition, ellagic acid from red raspberries prevents binding of carcinogens to DNA and

reduces the incidence of cancer in cultured human cells exposed to carcinogens.

Effectiveness

Inhibition of carcinogenesis by ellagic acid has been demonstrated in animals with esophagus, tongue, lung, colon, liver, and skin tumors.

Liver	Pancreatic
Lung	Prostate
Breast	Skin
Cervical	Tongue
Colon	Leukemia
Esophageal	

It has also shown effectiveness against cervical carcinoma in the lab. Ellagic acid inhibits the initiation of tumors through a number of mechanisms, including inhibition of metabolic activation of carcinogenic compounds (such as polycyclic hydrocarbons, nitroso-containing chemicals or food preservatives, and aflatoxins) into forms that induce cell DNA damage.

A complete list of cancers against which ellagic acid has shown effectiveness in either the laboratory or actual human tests.

CONCLUSION

The focus of current research has moved to bioavailable metabolites of ellagic acid. We have attempted to present inference based framework to explain role of ellagic acid in prevention of oral carcinogenesis. Structural optimization of ellagic acid to improve its bioavailability does not look promising strategy, as any structural change may significantly alter its anticarcinogenic actions. Advancements in the field of targeted drug delivery system can be used to overcome this challenge.

References

1. Barch DH, Rundhaugen LM, Thomas PE, Kardos P, Pillay NS (1994) Dietary ellagic acid inhibits the enzymatic activity of CYP1A1 without altering

hepatic concentrations of CYP1A1 or CYP1A1 mRNA. Biochem Biophys Res Commun 201: 1477-1482.

2. Barch DH, Rundhaugen LM (1994) Ellagic acid induces NAD(P)H:quinine reductase through activation of the antioxidant responsive element of the rat NAD(P)H:quinone reductase gene. Carcinogenesis 15: 2065-2068.

3. Cliffton, E.E. (1967). Am. J. Med. Sci. 254, 483-490.

4. Mandal S, Stoner GD (1990) Inhibition of N-nitrosobenzylmethylamine-induced esophageal tumorigenesis in rats by ellagic acid. Carcinogenesis 11: 55-61.

5. Mandal S, Shivapurkar NM, Galati AJ, Stoner GD (1988) Inhibition of N-nitrosobenzylmethylamine metabolism and DNA binding in cultured rat esophagus by ellagic acid. Carcinogenesis 9: 1313-1316.

6. Narayanan BA, Geoffroy O, Willingham MC, Re GG, Nixon DW (1999) p53/p21(WAF1/CIP1) expression and its possible role in G1 arrest and apoptosis in ellagic acid treated cancer cells. Cancer Lett 136: 215-221.

7. Narayanan BA, Re GG (2001) IGF-II down regulation associated cell cycle arrest in colon cancer cells exposed to phenolic antioxidant ellagic acid. Anticancer Res 21: 359-364.

8. Siglin JC, Barch DH, Stoner GD (1995) Effects of dietary phenethyl isothiocyanate, ellagic acid, sulindac and calcium on the induction and progression of N-nitrosomethylbenzylamine-induced esophageal carcinogenesis in rats. Carcinogenesis 16: 1101-1106.

9. Vattem DA and Shetty K. "Biological Function of Ellagic Acid: A Review".

Journal of Food Biochemistry 2005; 29: 234-266.

10. Whitley, A.C., G.D. Stoner, M.V. Darby and T.Walle, 2003. Intestinal epithelial cell accumulation of the cancer preventive polyphenol ellagic acid-extensive binding to protein and DNA., Biochem Pharmacol., 2003 Sep. 15: 66: 907-915.

11. Zhang Z, Hamilton SM, Stewart C, Strother A, Teel RW (1993) Inhibition of liver microsomal cytochrome P450 activity and metabolism of the tobacco-specific nitrosamine NNK by capsaicin and ellagic acid. Anticancer Res 13: 2341-2346.

12. Zee- Cheng, R.K.Y. and Chang, C.C.J (1986) – Drugs of the Future 11, 1029-1033.