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Bitter gourd (*Momordica charantia*): A potential mechanism in anti-carcinogenesis of colon

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TO THE EDITOR

Bitter gourd (*Momordica charantia*), has received widespread attention in the scientific community due to its beneficial effects, including anti-diabetic, anti-cancer and anti-inflammatory effects in laboratory studies[1]. However, a well-defined mechanism by which this important plant food exerts its beneficial effects has not been elucidated. We present some of the latest findings on the plant's effects against colon cancer.

Bitter gourd seeds are enriched with 9c 11t 13t (9 *cis*, 11 *trans*, 13 *trans*) conjugated linolenic acid (CLN)[2]. CLN collectively refers to a group of linolenic acid (18:3; c9, c11, c13) derivatives with positional (double bonds in carbon 9, 11 and 13 or 8, 10 and 12) and geometric (*cis*, Z and *trans*, E) isomers. Interestingly, 9c 11t 13t CLN-enriched bitter gourd seed extracts protect colon from chemical-induced carcinogenesis in rats[3]. The fatty acid significantly reduced the incidences as well as multiplicity of colonic adenocarcinoma. In a separate, short-term study, bitter gourd seed oil significantly reduced the number and frequency of aberrant crypt foci (ACF) in the colon of male F-344 rats treated with azoxymethane[4]. *In vitro*, bitter gourd seed oil inhibits proliferation and induces apoptosis of human colon carcinoma DLD-1 and HT-29 cells[5,6].

In an attempt to elucidate a possible receptor-mediated mechanism of anti-carcinogenesis, bitter gourd seed oil has been shown to increase the expression of peroxisome proliferator-activated receptor gamma (PPARγ), a member of nuclear hormone receptor superfamily[7]. Furthermore, 9c 11t 13t CLN activated PPARγ in transfection experiments[8], its effect comparable to BRL-49653, a specific ligand for PPARγ. These important studies indicate that bitter gourd's effect in the colon may be mediated in part by PPARγ.

Functionally, PPAR is a ligand-activated transcription factor, which is involved in gene expression in a tissue-, sex- and species-dependent manner. Upon activation, PPAR forms a heterodimer with RXRα and regulates gene expression by binding to PPAR-response elements (PPRE) on responsive genes. Target genes for PPAR include lipid metabolizing enzymes and growth regulatory genes. To date, three subtypes of PPAR (α, β and γ) have been identified in several species including human[9].

PPARγ is highly expressed in normal human colon and colon tumors as well as cell lines derived from colon cancer[10]. Expression of this receptor subtype in colon cells has been found equal to or even greater than adipose tissue, where it was originally characterized[10]. PPARγ activation has been shown to inhibit cell growth, promote differentiation and stabilize genes that are altered in colon cancer[10-12]. The current prevailing belief is that PPARγ's ability to enhance differentiation and apoptosis is a positive event, associated with cell-cycle arrest and reduced proliferation[12]. Similar beneficial effects (growth inhibition, induction of apoptosis) were observed with bitter gourd against colon carcinogenesis[3-7].

Taken together, there is an association of PPARγ in CLN-mediated effects in the colon. Further studies are required to understand the detailed mechanism.

REFERENCES

1 **Grover JK**, Yadav SP. Pharmacological actions and potential uses of Momordica charantia: a review. *J Ethnopharmacol* 2004; **93**: 123-132
2 **Takagi T**, Itabashi Y. Occurrence of mixtures of geometrical isomers of conjugated octadecatrienoic acid in some seed oils: analysis by open-tubular gas chromatography and high performance liquid chromatography. *Lipids* 1981; **16**: 546-551
3 **Kohno H**, Yasui Y, Suzuki R, Hosokawa M, Miyashita K, Tanaka T. Dietary seed oil rich in conjugated linolenic acid from bitter melon inhibits azoxymethane-induced rat colon carcinogenesis through elevation of colonic PPARgamma expression and alteration of lipid composition. *Int J Cancer* 2004; **110**: 896-901
4 **Kohno H**, Suzuki R, Noguchi R, Hosokawa M, Miyashita K, Tanaka T. Dietary conjugated linolenic acid inhibits azoxymethane-induced colonic aberrant crypt foci in rats. *Jpn J*

Cancer Res 2002; **93**: 133-142

5 **Tsuzuki T**, Tokuyama Y, Igarashi M, Miyazawa T. Tumor growth suppression by alpha-eleostearic acid, a linolenic acid isomer with a conjugated triene system, via lipid peroxidation. *Carcinogenesis* 2004; **25**: 1417-1425

6 **Yasui Y**, Hosokawa M, Kohno H, Tanaka T, Miyashita K. Troglitazone and 9cis, 11 trans, 13 trans-conjugated linolenic acid: comparison of their antiproliferative and apoptosis-inducing effects on different colon cancer cell lines. *Chemotherapy* 2006; **52**: 220-225

7 **Yasui Y**, Hosokawa M, Sahara T, Suzuki R, Ohgiya S, Kohno H, Tanaka T, Miyashita K. Bitter gourd seed fatty acid rich in 9c,11t,13t-conjugated linolenic acid induces apoptosis and up-regulates the GADD45, p53 and PPARgamma in human colon cancer Caco-2 cells. *Prostaglandins Leukot Essent Fatty Acids* 2005; **73**: 113-119

8 **Chao CY**, Huang CJ. Bitter gourd (Momordica charantia) extract activates peroxisome proliferator-activated receptors and upregulates the expression of the acyl CoA oxidase gene in H4IIEC3 hepatoma cells. *J Biomed Sci* 2003; **10**: 782-791

9 **Lemberger T**, Braissant O, Juge-Aubry C, Keller H, Saladin R, Staels B, Auwerx J, Burger AG, Meier CA, Wahli W. PPAR tissue distribution and interactions with other hormone-signaling pathways. *Ann N Y Acad Sci* 1996; **804**: 231-251

10 **Sarraf P**, Mueller E, Jones D, King FJ, DeAngelo DJ, Partridge JB, Holden SA, Chen LB, Singer S, Fletcher C, Spiegelman BM. Differentiation and reversal of malignant changes in colon cancer through PPARgamma. *Nat Med 1998*; **4**: 1046-1052

11 **Brockman JA**, Gupta RA, Dubois RN. Activation of PPARgamma leads to inhibition of anchorage-independent growth of human colorectal cancer cells. *Gastroenterology* 1998; **115**: 1049-1055

12 **Kitamura S**, Miyazaki Y, Shinomura Y, Kondo S, Kanayama S, Matsuzawa Y. Peroxisome proliferator-activated receptor gamma induces growth arrest and differentiation markers of human colon cancer cells. *Jpn J Cancer Res* 1999; **90**: 75-80

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