Alternative & Integrative Medicine
ISSN: 2327-5162

Dwivedi , Altern Integ Med 2013, 2:1
DOI: 10.4172/2327-5162.1000104

Short Commentary Open Access

ω-3-Polyunsaturated Fatty Acids and Colon Cancer

Dwivedi C*

Professor and Head, Department of Pharmaceutical Sciences, College of Pharmacy, South Dakota State University, USA

Colorectal cancer is the third most common cancer in USA. American Cancer Society has estimated about 103,170 cases of colon and 40,290 cases of rectal cancer in 2012. Colorectal cancer deaths account for 9% of all cancer deaths; 51,690 deaths from colorectal cancer are estimated in 2012 [1]. Fatty acid composition of dietary fat is one of detrimental factors in colon cancer development. Studies have indicated that diets containing high level of ω-6-polyunsaturated fatty acids such as linoleic acid enhance whereas diets containing ω-3- polyunsaturated fatty acids such as eicosapentaenoic acid reduce chemically-induced colon cancer development in rodents [2,3]. Diets containing fish oil (source of ω-3-polyunsaturated fatty acid) decrease colon carcinogenesis [4]. The effects of dietary fish oil on eicosanoid metabolism have been implicated as a potential mechanism of colon cancer prevention. ω-3-Fattyacids present in fish oil inhibit oxidative metabolism of arachidonic acid by the cyclooxygenase (COX) pathway responsible for prostaglandin synthesis which act as a tumor promoter [5].

Dietary mustard oil, a rich source of α-linolenic acid, an ω-3-fatty acid prevented colon cancer development in rats [6]. Dietary flaxseed oil, another very rich source of α-linolenic acid was effective in preventing colon cancer development in rats. Dietary flaxseed oil decreased the ratio of ω-6 to ω-3-fatty acids to optimal levels [7]. Dietary flaxseed meal, a rich source of α-linolenic acid, an ω-3-fatty acid and lignans also prevented colon cancer development in rats by increasing ω-3-fatty acids in serum and tissues, and decreasing expressions of COX-1 and COX-2 levels in tissues [8]. α-Linolenic acid and lignans (enterodiol and enterolactone derived from flaxseed) caused a decrease in cell proliferation and an increase in apoptosis in Caco-2, human colon cancer cells [9]. Dietary flaxseed also prevented intestinal tumor development in APC^{Min} mice (a transgenic mice with mutation in APC gene causing development of spontaneous intestinal tumors) by increasing ω-3-fatty acids and lignans, and decreasing expressions of COX-1 and COX-2 levels [10]. Dietary canola oil, another source of α-linolenic acid was effective in preventing colon cancer development in rats by increasing ω-3-fatty acids in serum and tissues and decreasing the expression of COX-1 and COX-2 in tissues [11].

These studies have provided evidence indicating consumption of ω-3-fatty acids provides protection against colon cancer development in animal models and cell culture. Thus, dietary consumption of ω-3 fatty acid (fish, mustard, flax, canola) may provide protection in humans too. However, further studies in human volunteers are needed to establish the efficacy of ω-3-fatty acids for preventing colon cancer.

References

1. Landis MD, Lehmann BD, Pietenpol JA, Chang JC (2013) Patient-derived breast tumor xenografts facilitating personalized cancer therapy. Breast Cancer Res 15: 201.
2. Reddy BS (1996) Dietary lipids and colon cancer, in G.A. Spiller (Ed) , handbook of lipids in human nutrition, CRC Press, Boca Raton, FL 129-134.
3. Torosian M, Charland S, Lappin J (1995) Differential-effects of omega-3 and omega-6 Fatty-acids on primary tumor-growth and metastasis. Int J Oncol 7: 667-672.
4. Reddy BS, Burill C, Rigotty J (1991) Effect of diets high in omega-3 and omega-6 fatty acids on initiation and postinitiation stages of colon carcinogenesis. Cancer Res 51: 487-491.
5. Reddy BS, Nayini J, Tokumo K, Rigotty J, Zang E, et al. (1990) Chemoprevention of colon carcinogenesis by concurrent administration of piroxicam, a nonsteroidal antiinflammatory drug with D,L-alpha-difluoromethylornithine, an ornithine decarboxylase inhibitor, in diet. Cancer Res 50: 2562-2568.
6. Dwivedi C, Muller LA, Goetz-Parten DE, Kasperson K, Mistry VV (2003) Chemopreventive effects of dietary mustard oil on colon tumor development. Cancer Lett 196: 29-34.
7. Dwivedi C, Natarajan K, Matthees DP (2005) Chemopreventive effects of dietary flaxseed oil on colon tumor development. Nutr Cancer 51: 52-58.
8. Bommareddy A, Arasada BL, Mathees DP, Dwivedi C (2006) Chemopreventive effects of dietary flaxseed on colon tumor development. Nutr Cancer 54: 216-222.
9. Bommareddy A, Zhang XY, Kaushik RS, Dwivedi C (2010) Effects of components present in flaxseed on human colon adenocarcinoma Caco-2 cells: Possible mechanisms of flaxseed on colon cancer development in animals. Drug Discov Ther 4: 184-189.
10. Bommareddy A, Zhang X, Schrader D, Kaushik RS, Zeman D, et al. (2009) Effects of dietary flaxseed on intestinal tumorigenesis in Apc(Min) mouse. Nutr Cancer 61: 276-283.
11. Bhatia E, Doddivenaka C, Zhang X, Bommareddy A, Krishnan P, et al. (2011) Chemopreventive effects of dietary canola oil on colon cancer development. Nutr Cancer 63: 242-247.

***Corresponding author:** Chandradhar Dwivedi, Distinguished Professor and Head, Department of Pharmaceutical Sciences, College of Pharmacy, South Dakota State University, Brookings, SD 57007, USA, E-mail: Chandradhar.dwivedi@sdstate.edu

Received February 20, 2013; **Accepted** February 21, 2013; **Published** February 25, 2013

Citation: Dwivedi C (2013) ω-3-Polyunsaturated Fatty Acids and Colon Cancer. Altern Integ Med 2: 104. doi: 10.4172/2327-5162.1000104