Defending against Colon Cancer

By Eugene L. Heyden, RN

Colon cancer scares me. Actually, all cancers scare me. But colon cancer scares me an awful lot. I've seen the damage it can do. Perhaps you should be afraid of it, too.

> *Colorectal cancer remains the second leading cause of cancer mortality in the United States.* **(Orlich et al., 2015)**

Combined with rectal cancer, cancers of the colon are diagnosed in over 135,000 individuals in the United States each year. This year, 2017, it is anticipated that over 50,000 individuals in the United States will die from

colorectal cancer. And before they lose their life, it is safe to say that the majority will experience the nightmare of chemotherapy and surgery. A lot of death. A lot of suffering. That's what colorectal cancer is all about.

But there is some very good news to share. With screening, typically by colonoscopy, we are finding precancerous lesions and early-stage cancers in the colon and rectum, removing them, and potentially saving a life in a matter of a few minutes . . . problem solved. Unfortunately, even with colonoscopy, some pre-cancerous growths and relative large cancers are missed and trouble follows (Barclay et al., 2006).

Although we are talking colorectal cancer here, for sake of simplicity I will focus our attention on colon cancer. Besides, for all practical purposes, the rectum is the terminal portion of the colon. Indeed, although there are some genes more associated with colon cancer than with rectal cancer, and vice versa, *"colon cancers and rectal cancers are typically considered to be essentially the same disease."* (Hong et al., 2012) And, when it comes to health and cancer prevention, it is safe to say, "What is good for the colon is good for the rectum." Now with that out of the way . . .

There are many, many things that promote colon health and prevent colon cancer. Diet can do this, and I'll get to that later. But I can't think of a better place to begin our discussion on colon cancer prevention than with vitamin D.

Vitamin D

> *Several studies confirmed that* ***increasing vitamin D_3 lowers colon cancer risk, reduces polyp recurrence,*** *and that* ***sufficient levels of vitamin D are associated with better overall survival of colon cancer patients.***
>
> ***Vitamin D_3 has been estimated to lower the incidence of colorectal cancer by 50%****, which is consistent with the inverse correlation between dietary vitamin D_3*

intake or sunlight exposure and colorectal cancer. **(Klampfer, 2014, emphasis added)**

Vitamin D has a solid reputation when it comes to the prevention of a variety of cancers, colon cancer included. How does it act to prevent colon cancer? Let's take a look.

First, vitamin D supports the overall health of the individual colon cell, promoting its orderly growth and regulating its cycle of life (Guraya, 2014). It does this by regulating (activating or suppressing) genes involved in the control of cellular growth and function. When vitamin D is in adequate supply, the colon cell has a better chance of functioning normally and can make important decisions with greater ease. One important decision the colon cell almost always needs to make is what measures to initiate to address the threat of inflammation. Inflammation, inadequately addressed and left unrestrained, can lead to colon cancer.

Second, and speaking of inflammation, *"Since inflammation plays [an] important role in cancer development, vitamin D exerts a strong anti-inflammatory role in delaying or preventing cancer development and/or progression."* (Guraya, 2014) Not only does the colon cell need to respond to inflammation generated externally and posing a threat, the colon cell also needs to respond to inflammation generated by circumstances occurring within. Vitamin D helps the colon cell defend itself against inflammation regardless of its origin, and does so by orchestrating a variety of anti-inflammatory responses.

Third, vitamin D helps protect against ordinary, yet harmful insults such as exposure to secondary bile acids, an *"underrecognized cause of colon cancer."* (Ajouz et al., 2014) There *is* no escape from this threat. We need fat in our diet; therefore, we need bile acids in our life—appropriately secreted by the liver into the small intestine, via the gallbladder, to aid in the digestion of fat (more fat in the diet, more bile acids . . . could be a problem). Bile acids, although necessary, can pose a danger once they arrive in the colon. We need to defend against this threat.

Bile acids damage cell membranes, at least in part through an oxidative mechanism, provoking an inflammatory response and causing DNA damage. **(Fedirko et al., 2010)**

A bile acid is one thing; a secondary bile acid is quite another. Bacteria in the colon act on bile acids and create a more intense threat, known as a secondary bile acid. Fortunately, we have vitamin D. To protect us from both primary and secondary bile acids, as well as other threats that cause oxidative stress and DNA damage, vitamin D increases the capacity of the colon cell to mount an aggressive antioxidant response (Fedirko et al., 2010). Furthermore, vitamin D *"promotes bile acid degradation,"* secondary bile acids included. (see Fedriko et al., 2010) Vitamin D plays a positive role in so many biological processes. It should be in adequate supply.

Fourth, vitamin D stimulates genes involved in DNA repair (Fedirko et al., 2010; Guraya, 2014). DNA damage occurs in each and every cell, day-in and day-out, and at a rate of 10,000 to 1,000,000 damaged regions per day! (see Wikipedia, 2017) For the colon cell, it is a way of life. Bile acids cause DNA damage, as do many other threats (like that big, fat, juicy steak I saw you eating the other day, with no intention of sharing). But, the cells of the colon are ready. There are molecular machines positioned within each cell nucleus that tirelessly and continuously repair damaged DNA. Cells make DNA repairs in astonishing numbers each day—thousands upon thousands (Wikipedia, 2017). Why does the cell go to all this trouble? It does this so it can function normally. It does this hoping, above all hope, that it will not be transformed into a cancer cell, somehow knowing *"DNA damage is an early step in the initiate of cancer."* (Toden et al., 2006). A repaired segment of DNA is less likely to push a cell over to the dark side.

Fifth, vitamin D encourages the colon cell to die . . . and die right on time. Believe it or not, the normal life cycle of a colon cell involves suicide. The colon cell is literally programed to kill itself after only a short period of existence. It has no other choice. Its normal life span is 3–5 days. After that, it must die. "Why death at as such an early age," you ask? The colon cell lives in a crappy

neighborhood (so true), and is so often damaged by the threats it encounters, that if it were to become elderly (say, 7 or 8 days old) the damage that has accrued increases the likelihood that it could be transformed into a cancer cell. Pre-programmed, timely suicide solves this problem. This whole scheme of things has a name. It is called apoptosis. And it's important! *"Induction of apoptosis is directly linked with the anti-cancer action of vitamin D."* (Guraya, 214) Vitamin D, specifically its activated form (1,25(OH)2D), not only wants to encourage the death of the normal colon cell, it wants to encourage (as in, *strongly* encourage) the death of a colon cell that has been transformed into a cancer cell (Deeb et al., 2007). Apoptosis kills a cancer, too, unless something is standing in the way.

Sixth, vitamin D silences specific genes involved in the proliferation of colon cancer cells (Klampfer, 2014). Proliferation with respect to a cancer cell means unrestrained growth. Proliferation allows a cancer cell to divide and divide and divide to form an expanding tumor.

I could go on and on about the various ways vitamin D acts to prevent colon cancer, but we need to move on to other important matters. So, I'll briefly mention one more anti-cancer benefit offered by vitamin D.

Seventh, should a colon cell be transformed into a cancer cell, and begin to proliferate, it will need to establish an impressive vascular system (angiogenesis). You don't want this. Vitamin D may help in this regard. Vitamin D acts to inhibit angiogenesis (Deeb et al., 2006). Clearly, vitamin D wants to save you from colon cancer, but if supplies are limited, all bets are off.

> *Vitamin D supplementation has been shown to reduce CRC [colorectal cancer] related morality; thus reaffirming the significance of optimizing vitamin D concentrations for cancer prevention.* **(Guraya, 2017)**

Dietary considerations

> *Western dietary patterns—characterized by higher intake of red and processed meats, added sugar, and refined grains—have strongly linked with CLR [colorectal cancer] in numerous observational studies as well as in a systematic review and meta-analysis.* **(Mehta et al., 2017)**

> *It has been estimated that up to **25% of colorectal**, 15% of breast and 10% of prostate, pancreas and endometrial cancers could be prevented by shifting to a healthy Mediterranean diet.* **(La Vecchia, 2004, emphasis added)**

If you want to further reduce your colon cancer risk, look no further than the Mediterranean diet. Actually, you can look a little further, as vegetarian and vegan diets also significantly reduce the risk of colon cancer (Orlich et al., 2015). All three diets have several things in common. And one thing in particular, they limit or entirely exclude the consumption of red meat. I know you don't want to hear any of this, but research has shown, without a doubt, that red meat—and most concerning, processed meat—promotes the development of colon cancer (Bastide at al., 2011). The Mediterranean diet limits red meat as well as processed meats, and therefore, in addition to a plethora of good things tucked inside this diet, offers an exceptional degree of protection against colon cancer. Since this diet allows you to still be a carnivore—allowing you to eat more chicken than you thought humanly possible—this diet may be more acceptable to you than a meatless, chickenless, vegetarian or vegan diet.

> *A healthy diet model in European countries is the traditional Mediterranean diet, which is based on abundant and variable plant foods, high consumption of cereals, olive oil as the main (added) fat, low intake of (red) meat and moderate consumption of wine.* **(Giacosa et al., 2012)**

Next, and with this little overview of the Mediterranean diet under our belt, let's look more closely at how the Mediterranean diet acts to defend against colon cancer.

First, by limiting red meat and processed meat, the Mediterranean diet limits the consumption of what is called heme. Heme is a portion of the

hemoglobin molecule. Hemoglobin is the molecule within a red blood cell that carries oxygen throughout the bloodstream (sometime before the animal appears on the menu). Heme holds an iron atom within, with iron adding yet another element of danger (more later). The problem with heme is that heme damages cells along with its DNA (Toden et al., 2006). This gives heme the ability to function as a true carcinogen (Oates and West, 2006). There is a little heme in chicken and fish, but red meat has 10 times more! (see Bastide et al., 2011; Sesink et al., 1999) Reduced heme exposure is one of the main reasons why the Mediterranean diet protects against colon cancer. Sorry folks, similar to beef, pork and lamb are rich in heme, and therefore pose a substantial colon cancer risk (Pericleous et al., 2013).

Second, the Mediterranean diet limits the consumption of dietary iron. The foods you eat on this diet are typically made from scratch, not the factory-made, iron-fortified foods typical of the Western diet. Importantly, by limiting red meat, the Mediterranean diet limits the iron held within heme. There is a ton of iron in red meat. Cut into a rare, juicy steak, and it will bleed. Just to give you an idea of how much iron is involved, consider the fact that one red blood cell (so small it cannot be seen with the naked eye), may hold up to 1 billion iron atoms! (see Casssat and Skaar, 2013) Incredible! That's a lot of iron. Enter the Mediterranean diet. This is a diet that restricts the consumption of dietary iron. No way does the average person need all the iron provided by the Western, red meat-based, iron-fortified diet. And why is iron such a threat with respect to colon cancer?

> *Iron is required for proliferation of normal and neoplastic [cancer] cells. The relationship between iron and cancer risk appears to be obvious in the colon due to its high concentrations of iron.* **(Cho et al., 2013)**

By limiting red meat, by limiting heme, the Mediterranean diet reduces the amount of iron available to threaten the colon cell. *"Iron can induce oxidative DNA damage."* (Cross, et al., 2010) In the colon, iron should be in short supply. In the Western diet, it is in generous supply.

Third, the Mediterranean diet provides a whole host of things that help promote colon cell health and act to prevent colon cancer. Case in point: The vegetable fibers you eat in abundance on this diet feed bacteria, and in turn, the bacteria produce metabolic by-products that feed the colon cell and act to prevent colon cancer in a variety of ways. One such by-product is butyrate.

> *Butyrate has a remarkable array of colonic health-promoting and antineoplastic properties: it is the preferred energy source for colonocytes, it maintains mucosal integrity and it suppresses inflammation and carcinogenesis through effects on immunity, gene expression and epigenetic modulation. Protein residues and fat-stimulated bile acids are also metabolized by the microbiota to inflammatory and/or carcinogenic metabolites, which increase the risk of neoplastic [cancer] progression.* **(O'Keefe, 2016)**

In addition to the abundance of fiber in the Mediterranean diet, this diet also includes generous amounts of vitamins such as folate, minerals such as calcium (often low in the Western diet), as well as a wide variety of bioactive substances that clearly provide health benefits and offer protection against colon cancer. (see Fedirko et al., 2010) The bioactive substances found in abundance in the plant-based, Mediterranean diet include chlorophyll from green vegetables, polyphenols, and quercetin—all offering positive health benefits and an impressive degree of protection against cancer of the colon and rectum (Oates and West, 2006; Bastide et al., 2011). Clearly, the Mediterranean diet offers so many health benefits, it is regarded as a templet of what a good diet should look like when it comes to colorectal cancer prevention. After all, diet is intimately associated with the development of cancers of both the colon and rectum.

> *There is strong evidence that the risk of CRC [colorectal cancer] can be modified by lifestyle and environmental factors. It has been demonstrated that* ***diet may account for or prevent as much as 80% of CRC incidence****.* **(Nyström M, Mutanen, 2009, emphasis added)**

Okay. You really don't want to give up or limit red meat entirely, at least anytime soon. I understand. Good news: You can block the negative effects of red meat by taking a page right out of the Mediterranean diet play book. A diet

high in calcium, or a diet high in vegetables (which is also high in calcium), both appear to offset the negative, carcinogenic effects of red meat consumption (Bastide et al, 2011; Oates and West, 2006) Also, preparing red meat at lower temperatures reduces the amount of several cancer-causing chemicals that are generated when meat is cooked on at higher temperatures (Pericleous et al., 2013). But just to be safe, I would still limit both red meat and processed meats in an effort to reduce the risk of colorectal cancer.

Alcohol restriction

> *The Mediterranean diet also involves a 'Mediterranean way of drinking', that is, moderate consumption of red wine mainly with food.*
>
> *. . . the risk of both colon and rectal cancer being about **50% increased** with high levels of alcohol consumption.* **(Giacosa et al., 2012, emphasis added)**

Mediterranean diet allows a little alcohol consumption, mainly red wine with meals, but not enough alcohol to make you an embarrassment to us all. Limit the use of alcohol and you limit the risk of colon cancer, pure and simple. I don't make the rules; I just share them with you. Make the prevention of colon cancer (and so many other problems associated with excess alcohol consumption) one great motivator to compel you to limit the intake of alcohol. *". . . comparing never drinkers, moderate drinkers who consume 2–3 drinks per day have a 21% increase CRC risk and heavy drinkers who have 4 or more per day have a 52% increased CRC risk."* (Hou et al., 2013)

Smoking succession

> *Up to 20% of current colorectal cancers in the United States may be due to tobacco smoke. Presumably tobacco smoke causes colon cancer due to the NDA damaging agents described for lung cancer. These agents may be taken up in the blood and carried to organs of the body.* **(Bernstein et al., 2013)**

Tobacco and excessive alcohol consumption cause about one-third of the total cancer burden, with precise figures varying from country to country. **(Giacosa et al., 2012)**

Need I say more?

Exercise as a defense

Higher levels of physical activity have been reported to reduce the risk of [colorectal cancer] by up to 40% . . .. **(Pericleous et al., 2013)**

A sedentary lifestyle is a risk factor for colorectal cancer (Hou et al., 2013). Obesity, as well. Both can lead to another risk factor, type 2 diabetes (Pericleous et al., 2013). The bottom line: Add increased physical activity and exercise to your plan to defend against colon cancer. If you sit on your butt all day long, your risk of colorectal cancer is 20% higher than is you live an active lifestyle (Hou et al., 2013).

Green tea, anyone?

Consumption of green tea has been associated with a 40% reduction in colorectal cancer risk in a cohort of 69,710 Chinese women. **(Pericleous et al., 2013)**

To reduce your risk of colorectal cancer, you may want to consider drinking green tea on a regular basis. Or, you can get your green tea by supplementing daily with green tea extract. A 40% reduction in the risk of colorectal cancer sounds nice to me.

Heredity as a threat

Of common malignancies, colorectal cancer (CRC) has one of the largest proportions of familial cases. Kindred and twin studies estimated that

approximately 30% of all CRC cases are an inherited form of the disease. **(Jasperson et al., 2010)**

Even in the hereditary colon cancer syndromes, in which the susceptibility is inherited dominantly, cancer develops only as the result of progressive accumulation of genetic alterations. **(Nyström M, Mutanen, 2009)**

Most fortunately, genetics are not the final word. Why is this important? It gives the individual hope that should a close relative or identical twin contract colon or rectal cancer, it doesn't mean they cannot take actions to substantially reduce their risk. This entire article is all about what to do or what not do to reduce the risk of colorectal cancer. Perhaps those who have a strong family history of this disease should pay very close attention to what we have discussed in this presentation.

To close this section on genetics, may I suggest: If the family ties to colorectal cancer are strong, an aggressive screening program is in order—particularly so if a close family member contracted colorectal cancer before age 50 (Mishra and Hall, 2012). Under this circumstance, a once-every-5-year colonoscopy is simply not often enough. In certain situations, a screening colonoscopy should be *"initiated by "20–25 years of age and repeated every 1–2 years."* (Jasperson et al., 2010) Your physician will advise you.

Conclusion

It certainly looks like there is a lot we can do to prevent colon cancer. I've changed my life after writing this article. Hopefully, after reading it, you will change your life, too. I've seen colon cancer. I've seen the damage it can do.

Dedication

Highly Recommended (click on image to follow link)

References

Ajouz H, Mukherji D, Shamseddine A 2014 Secondary Bile Acids: An Underrecognized Cause of Colon Cancer. World Journal of Surgical Oncology. May 24; 12(1):164

Barclay RL, Vicari JJ, Doughty AS, Johanson JF, Greenlaw R 2006 Colonoscopic Withdrawal Times and Adenoma Detection During Screening Colonoscopy. New England Journal of Medicine. Dec 14; 355(24):2533–2541

Bastide NM, Pierre FH, Corpet DE 2011 Heme Iron from meat and Risk of Colorectal Cancer: A Meta-Analysis and a Review of the Mechanisms Involved. Cancer Prevention Research. Feb 1; 4(2):177–184

Bernstein C, Prasad AR, Nfonsam V, Bernstein H 2013 DNA Damage, DNA Repair and Cancer. In New Research Directions in DNA Repair. InTech, DOI: 10.5772/53919

Cassat JE, Skaar EP 2013 Iron in Infection and Immunity. Cell Host & Microbe. May 15; 13(5):509–519

Cho M, Eze OP, Xu R 2013 A Brief Review of the Controversial Role of Iron in Colorectal Carcinogenesis. J. Clin. Exp. Pathol. 3(137):2161–0681

Cross AJ, Ferrucci LM, Risch A, Graubard BI, Ward MH, Park Y, Hollenbeck AR, Schatzkin A, Sinha R 2010 A Large Prospective Study of Meat Consumption and Colorectal Cancer Risk: An Investigation of Potential Mechanisms Underlying This Association. Cancer Research. Mar 15; 70(6):2406–2414

Deeb KK, Trump DL, Johnson CS 2007 Vitamin D Signalling Pathways in Cancer: Potential for Anticancer Therapeutics. Nature Reviews. Cancer. Sep 1; 7(9):684

Fedirko V, Bostick RM, Long Q, Flanders WD, McCullough ML, Sidelnikov E, Daniel CR, Rutherford RE, Shaukat A 2010 Effects of Supplemental Vitamin D and Calcium on Oxidative DNA Damage Marker in Normal Colorectal Mucosa: A Randomized Clinical Trial. Cancer Epidemiology and Prevention Biomarkers. Jan 1; 19(1):280–291

Giacosa A, Barale R, Bavaresco L, Gatenby P, Gerbi V, Janssens J, Johnston B, Kas K, La Vecchia C, Mainguet P, Morazzoni P 2012 Cancer Prevention in Europe: The Mediterranean Diet as a Protective Choice. European Journal of Cancer Prevention. Jan 1; 22(1):90–95

Guraya SY 2014 Chemopreventive Role of Vitamin D in Colorectal Carcinoma. Journal of Microscopy and Ultrastructure. Mar 31; 2(1):1–6

Guraya SY 2017 The Association of Vitamin D Deficiency with Colorectal Cancer: A Wake-Up Call for Physicians and Health Authorities. Middle East Journal of Cancer April; 8(2):65–68

Hong TS, Clark JW, Haigis KM 2012 Cancers of the Colon and Rectum: Identical or Fraternal Twins? February; 2(2):117–121

Hou N, Huo D, Dignam JJ 2013 Prevention of Colorectal Cancer and Dietary Management. Chinese Clinical Oncology. Jun; 2(2):13

Jasperson KW, Tuohy TM, Neklason DW, Burt RW 2010 Hereditary and Familial Colon Cancer. Gastroenterology. May 31; 138(6):2044–2058

Klampfer L 2014 Vitamin D and Colon Cancer. World Journal of Gastrointestinal Oncology. 14 Nov 15; 6(11):430–437

La Vecchia C 2004 Mediterranean Diet and Cancer. Public Health Nutrition. Oct; 7(7):965–968

Mehta RS, Song M, Nishihara R, Drew DA, Wu K, Qian ZR, Fung TT, Hamada T, Masugi Y, da Silva A, Shi Y 2017 Dietary Patterns and Risk of Colorectal Cancer: Analysis by Tumor Location and Molecular Subtypes. Gastroenterology. Jun 30; 152(8):1944–1953

Mishra N, Hall J 2012 Identification of Patients at Risk for Hereditary Colorectal Cancer. Clinics in Colon and Rectal Surgery. Jun; 25(02):67–82

Nyström M, Mutanen M 2009 Diet and Epigenetics in Colon Cancer. World Journal of Gastroenterology. Jan 21;15(3):257

Oates PS, West AR 2006 Heme in Intestinal Epithelial Cell Turnover, Differentiation, Detoxification, Inflammation, Carcinogenesis, Absorption and Motility. World Journal of Gastroenterology. Jul 21; 12(27):4281

O'Keefe SJ 2016 Diet, Microorganisms and Their Metabolites, and Colon Cancer. Nat Rev Gastroenterol Hepatol. Dec 1; 13(12):691–706

Orlich MJ, Singh PN, Sabaté J, Fan J, Sveen L, Bennett H, Knutsen SF, Beeson WL, Jaceldo-Siegl K, Butler TL, Herring RP 2015 Vegetarian Dietary Patterns and the Risk of Colorectal Cancers. JAMA Internal Medicine. May 1; 175(5):767–776

Pericleous M, Mandair D, Caplin ME 2013 Diet and Supplements and Their Impact on Colorectal Cancer. Journal of Gastrointestinal Oncology. Dec; 4(4):409

Sesink AL, Termont DS, Kleibeuker JH, Van der Meer R 1999 Red Meat and Colon Cancer. Cancer Research. Nov 15; 59(22):5704–5709

Toden S, Bird AR, Topping DL, Conlon MA 2006 Resistant Starch Prevents Colonic DNA Damage Induced by High Dietary Cooked Red Meat or Casein in Rats. Cancer Biology & Therapy. 2006 Mar 1;5(3):267–272

Wikipedia 2017 DNA Repair. https://en.wikipedia.org/wiki/DNA_repair July 21

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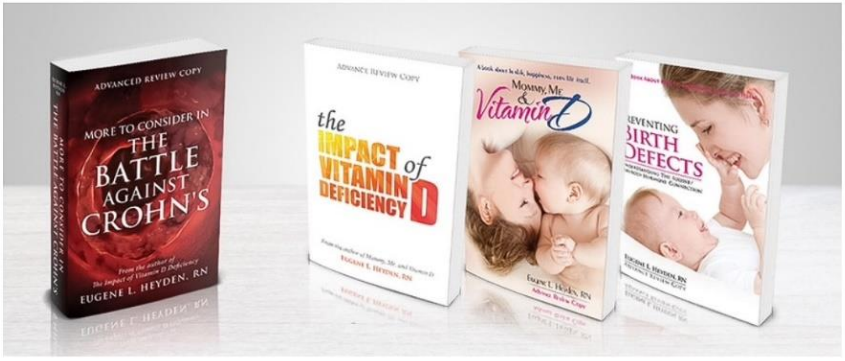

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