Nutrition for Colorectal Cancer Survivors

Good nutrition may reduce the incidence of cancer and help prevent cancer progression. It is estimated that one third of cancer deaths in the U.S. can be attributed to diet in adulthood, including diet's effect on obesity. There are many studies underway to help further understand how diet and colorectal cancer are related. We do know, however, that improved **nutrition can be helpful for cancer survivors' in the following ways:**

- Enhance the immune system & increase energy levels.
- Improve physical and mental functioning.
- Facilitate recovery & decrease the toxicities of treatment.
- Reduce the risk of chronic diseases and may decrease the risk of cancer recurrence.

In a study including over 1000 colon cancer patients with stage III disease who received chemotherapy, eating a "Western-pattern diet" high in red and processed meat, sweets and desserts, dairy products, and potatoes was associated with a 3-fold higher risk of cancer recurrence and death. In the same population, patients who consumed 2 sugar-sweetened beverages (including soda, sports drinks, fruits and vegetable juices with added sugar) per day had a 67% greater risk of disease recurrence or death compared to patients who consumed these beverages less than 2 times per month.

Guidelines for a Healthy Diet

1) Plant Based Diet

A healthful diet for cancer survivors emphasizes minimally processed, whole foods and plenty of plant foods**. Plant foods include vegetables, fruits, beans/legumes, whole grains and nuts/seeds**. Plant foods contain vitamins, minerals, fiber, and various cancer-fighting *phytonutrients* (i.e., carotenoids, lycopene, indoles, flavonols). **Herbs & spices** (turmeric, ginger, cinnamon, rosemary, oregano, etc.…) and **green and white teas** are some of the richest sources of phytonutrients. **Vibrant, intense color** is one indicator of the phytonutrient content of plant foods.

<u>Phytonutrients</u>

The term phytonutrient refers to compounds produced by plants. Scientists have identified thousands of phytonutrients, although only a small fraction has been studied closely. Findings from laboratory studies have shown that **phytonutrients have the potential to:**

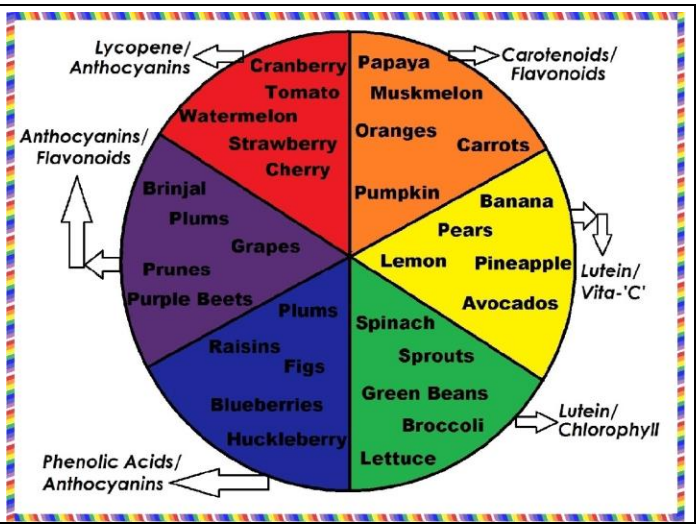
- Stimulate the immune system
- Block substances we eat, drink and breathe from becoming carcinogens
- Reduce inflammation that makes cancer growth more likely
- Reduce oxidative damage to cells that can spark cancer
- Slow the growth rate of cancer cells
- Trigger damaged cells to commit suicide before they can reproduce
- Help to regulate hormones

In the laboratory, the **phytonutrients and food sources below** have been shown to have **protective effects against the development of colorectal cancer**.

Phytonutrient	**Food Sources**
Allium Compounds	Chives, garlic, leeks, onions, scallions, shallots
Carotenoids	*Fruits:* Apricots, cantaloupe, citrus fruits, nectarines, papayas, peaches, watermelon *Vegetables:* Bok choy, broccoli, carrots, corn, greens (collards, kale, lettuce, spinach), pumpkin, red peppers, sweet potatoes, tomatoes and tomato products, winter squash
Flavonoids	*Fruits:* Apples, berries, cherries, citrus fruits, cranberries, currants, grapes, pears, plums *Vegetables:* Beets, bell peppers, broccoli, celery, chard, eggplant, kale, lettuce, onions, red cabbage, radishes *Beans:* Black beans, kidney beans, pinto beans *Herbs:* Parsley, rosemary, thyme *Other:* Cocoa powder, dark chocolate, coffee, tea
Indoles	*Cruciferous Vegetables:* Broccoli, Brussels sprouts, cabbage, cauliflower, horseradish, mustard greens, turnips, watercress
Inositol	*Whole Grains:* Bran from corn, oats, rice, rye and wheat *Nuts* *Legumes:* Soybeans and dried beans
Isothiocyanates	*Cruciferous Vegetables:* Arugula, broccoli, bok choy, Brussels sprouts, cabbage (red and green), cauliflower, collard greens, horseradish, kale, mustard greens, radishes, rutabaga, turnips, watercress
Polyphenols (coumarin, curcumin, resveratrol, tannins)	*Fruits:* Apples. blackberries, black raspberries, blueberries, cherries, red grapes, pears, pomegranates, strawberries *Other:* Chestnuts, peanuts, lentils, pecans, turmeric, walnuts

To maximize your intake of plant based nutrients from vegetables and fruits:

- Eat a variety of colorful fruits and vegetables
- Aim for 1½ to 2 cups of fruit and 2 to 5 cups of vegetables each day
- Add herbs and spices into your daily diet
- Drink green or white tea daily



Fruit and Vegetable Intake

Some research indicates that organic fruits and vegetables have higher phytonutrient content when compared to those non-organically grown. It is therefore preferable to buy organic fruits and vegetables, especially those found to contain the highest amounts of pesticide residue (see list below). However, buying organic produce may not always be possible, and it is more important to **eat a variety and an abundance of fruits and vegetables**, than it is to eat organic.

Fruits & Vegetables: 2016 Pesticide Residue Lists

Greatest Pesticide Residue *Buy these organic whenever possible*		**Least Pesticide Residue**
Strawberries		Avocado
Apples		Sweet Corn
Nectarines		Pineapples
Peaches		Cabbage
Celery		Sweet Peas
Grapes		Onions
Cherries		Asparagus
Spinach		Mangoes
Tomatoes		Papayas
Peppers		Kiwi
Cherry tomatoes		Eggplant
Cucumbers		Honeydew Melon
Snap Peas (*imported*)		Grapefruit
Potatoes		Cantaloupe
Blueberries *(domestic)*		Cauliflower
Lettuce		Sweet Potatoes
Kale/Collard greens		Mushrooms

Reference http://www.ewg.org

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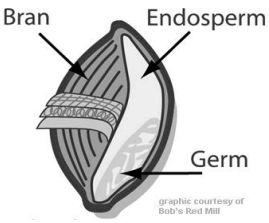
Dietary Fiber

Dietary fiber lowers the risk of colorectal cancer. Fiber may offer protection from colorectal cancer because it helps manage weight, decreases circulating insulin levels and promotes bowel regularity thus limiting the time that potential carcinogens remain in the digestive tract.

It is important to **add fiber into your diet gradually** to avoid any undesirable side effects, such as gas and bloating**. If you have recently had any type of gastrointestinal surgery, chemotherapy or radiation, your doctor may prescribe a low fiber diet while you heal.** When able, you can transition to a regular diet with a gradual increase in your fiber intake. It is recommended to consume 30-45 grams of fiber per day as tolerated.

Good sources of dietary fiber include vegetables, fruits, beans/legumes, whole grains and nuts/seeds

Whole grains: Whole grains contain so much more than carbohydrates including antioxidants, vitamins, minerals, fiber, and phytochemicals



Whole Grains Examples:
Amaranth, barley, brown rice, buckwheat (kasha), millet, oats, popcorn, quinoa, rye, triticale, wheat (berries, bulgur, cracked, flakes)

To ensure that breads, cereals, crackers, etc…are whole grains check the ingredients list. The first ingredient listed should contain the word “whole” or “sprouted”

- **Choose breads with 3 or more grams fiber per slice.**
- **Choose cereals with 5 or more grams fiber per serving**

Plan to include about 3 servings of whole grains per day. A serving is ½ cup of cooked grains or 1 slice of whole grain bread. The actual amount of whole grains a person needs varies depending on their size and activity level.

Processed foods and foods high in sugar such as baked goods, desserts, candies, sodas, sugary drinks and products made with refined grains such as white bread, crackers and cereals are usually low in nutrients and fiber. Additionally, these foods promote weight gain and insulin resistance, which are associated with the development and promotion of many chronic diseases, including diabetes, cardiovascular disease, and various cancers, including colorectal cancer. As a cancer survivor it is important to limit or avoid these foods. Instead choose nutritious foods. **Nutrient dense foods will help you function at your best.**

2) Adequate Protein Intake

Protein, found in both animal and plant foods, is a "building block" nutrient. Your body uses protein to build tissue, like white and red blood cells, other cells in the immune system, skin, hair, and muscle. Including small amounts of protein with each meal will help you feel satisfied and provide more sustained energy. While protein is an important nutrient, most Americans consume more than enough to meet their daily needs. Protein needs may increase or decrease with specific medical conditions or treatments. **Ask your healthcare team if you have questions about your individual protein needs**.

Red meat (beef, lamb, and pork) and processed meat consumption has been linked to higher colorectal cancer risk and higher mortality from cancer and heart disease in many studies. **It is recommended that you limit red meat intake and avoid processed meats (meats preserved with nitrates/nitrites such as hot dogs, sausages, bologna and some lunch meats) altogether**.

Healthful Sources of Protein:
Plant & Lean Proteins

Plant Protein Sources:

- Organic soy including:
  - edamame, tofu, tempeh, miso, soy beverages, etc.
- Beans/legumes including:
  - garbanzo beans, kidney beans, black beans, split peas, lentils, etc.
- Nuts and seeds including:
  - all types of nuts and seeds, natural peanut butter or other nut butters

Lean Protein Sources:

- Fresh or frozen fish, crab or shrimp
- Canned salmon or canned chunk light tuna packed in water
- Canned sardines packed in water or olive oil
- Organic free-range chicken or turkey
- Lowfat or nonfat organic milks or non-dairy milk (soy or hemp)
- Lowfat or nonfat organic plain yogurts (read labels and avoid those with high sugar content)
- Egg whites and Omega-3 eggs (DHA-enriched)
- Best cheese options include goat, sheep, part-skim mozzarella, sheep feta, part-skim ricotta, & the veggie cheese selections

3) Include Healthy Dietary Fats

Essential Fatty Acids

Essential fatty acids are fatty acids that humans must eat because the body requires them for health but cannot synthesize them. **Omega-3** and **omega-6** fatty acids are **essential fatty acids**. They are necessary for the formation of healthy cell membranes, proper development and functioning of the brain and nervous system, and for production of hormone like substances called **eicosanoids.** Some research suggests that excessive intake of omega-6 fatty acids has the potential to increase blood pressure, inflammation, platelet aggregation, allergic reactions and cell proliferation, but few studies have examined this in humans. Omega-3 fatty acids tend to have the opposite effect so have important anti-inflammatory action. Generally speaking**, fat from vegetable or seafood sources** have been shown to be **very beneficial for health**, while **fat from animal products** (such as meat and whole-fat dairy) and processed fats known as partially hydrogenated oils are **less healthy.**

Fatty Acid	Dietary Sources	Recommendations
Saturated fatty acids	Meats, poultry skin, baked goods, and whole milk dairy products, including butter, cheese, and ice cream	Reduce or eliminate meat and whole milk dairy products.
Trans fatty acids	Margarine, fried foods, commercial peanut butter, salad dressings and various processed foods including breads, crackers, cereals, and cookies	Avoid trans or hydrogenated fats. Products may be labeled "trans fat free" if they contain less than 0.5 mg per serving.
Omega-9 fatty acids	Extra-virgin olive oil, almond oil, canola oil, macadamia nut oil, almonds, and avocados	Include these healthy fats daily.
Omega-3 fatty acids EPA and DHA ALA	Cold-water fish (for example: salmon, sardines, black cod, trout, herring), breastmilk, and DHA enriched eggs Flaxseeds, chia seeds, walnuts, hempseeds, and pumpkin seeds	Include these healthy fats daily through diet and/or supplements. It may be wise to consume cold water fish or fish oil supplements at least twice weekly to obtain an adequate amount of EPA and DHA. If you choose to use a supplement, opt for one that is highest in EPA and DHA concentration.
Omega-6 fatty acids: Arachidonic acid Linoleic acid	Meats, butter, egg yolks, whole milk, and whole milk dairy products Common vegetable oils, such as corn oil, safflower oil, sunflower oil, and cottonseed oil, and processed foods made with these oils	Reduce or eliminate meat and whole milk dairy products. Limit consumption of linoleic acid-rich oils. Substitute an omega-9 fatty acid-rich oil for your current cooking oil or fat.

Other Vitamins & Minerals to Consider

Vitamin D is a fat-soluble vitamin required for bone health, immune system function, and discouraging cancer cell growth. Our bodies make vitamin D from sun exposure**. Dietary sources include fatty fish, eggs, fortified foods and dietary supplements.** The Dietary Reference Intake (DRI) for vitamin D is 600-800 IU per day depending on age, however; many vitamin D experts feel that this recommendation is too low. To be sure that you have adequate vitamin D levels, have your blood level of vitamin D level checked ("25-OH, Vitamin D"). One study found that people with colorectal cancer with a pre-diagnosis Vitamin D blood level of ≥40 ng/ml had an improvement in overall survival compared to those with lower Vitamin D levels. Similarly, other studies have found that **higher blood levels of Vitamin D are associated with prolonged survival and reduced colorectal cancer-specific mortality**. Several studies have also found an inverse relationship between Vitamin D levels and colorectal cancer risk, where higher levels of Vitamin D are associated with reduced risk.

If supplementing, use vitamin D3, the more absorbable form and take with food. **Stay below the Tolerable Upper Limit (TUL) of 4000 IU per day** unless advised by your health care provider.

Calcium appears to have a **protective effect for colorectal cancer**. Calcium suppresses epithelial cell proliferation in patients with pre-cancerous colon polyps. A recent case-control study found a negative association between calcium intake and colorectal cancer risk, with higher levels of calcium associated with decreased risk. Individuals who consumed greater than1,000 mg of calcium per day, had a 46% decreased risk for colorectal cancer. In addition to reducing the risk of getting colorectal cancer, calcium may play a role in survival outcomes for those with colorectal cancer. A recent prospective cohort study found that **post-diagnosis total calcium intake was associated with marginally statistically significant reduced colorectal cancer-specific mortality**.

The Dietary Reference Intake (DRI) for calcium is between **1000-1200 mg per day** depending on age. **Good sources of calcium include low-fat dairy products, green leafy vegetables, canned fish with bones, tofu, black strap molasses and various fortified foods.**

Folic Acid is a B vitamin that appears to exert a **protective effect for colorectal cancer**. Many studies report an inverse association between folic acid intake and colorectal cancer risk, with greater intake resulting in lower risk. However, whether folic acid works against cancer may depend on when it is taken. Some research indicates that folic acid may not be helpful and possibly harmful in people who already have cancer or precancerous colon polyps. Until more is known about the effects of folic acid in colorectal cancer survivors, **avoid**

supplementing with greater than 400 mcg per day. Obtaining folate from food sources such as green leafy vegetables and beans is safe.

Additional Nutritional and Lifestyle Factors for Colorectal Cancer Survivors

Physical Activity: Stage III colon cancer survivors that engaged in 18 to 26.9 MET (metabolic equivalent task) hours per week of physical activity experienced a 49% lower risk of cancer recurrence when compared to individuals that engaged in less than three MET-hours weekly. You can achieve 18 MET-hours per week by walking at a brisk pace (3 mph) for six hours per week or jogging (10 min/mi pace) for three hours per week.

In another study, women with stage I-III colorectal cancer who increased their physical activity level after diagnosis had a 52% lower risk of dying from colorectal cancer compared to women who did not change their activity level, independent of how much activity the women were doing before they were diagnosed.

Aim to perform 30 – 60 minutes of moderate-to-vigorous intensity exercise at least 5 days a week. If this level is unachievable for you, any amount or form of exercise will provide health benefits. Start slowly, and increase the duration and intensity of activity over time as you become more fit.

Heterocyclic Amines (HCAs) are compounds formed in meats during high-temperature cooking which are carcinogenic. The most important variables contributing to the formation of HCAs are:

- Cooking temperature greater than 300°F
- Cooking time greater than 2 minutes
- Cooking methods such as frying, grilling, broiling and barbecuing
- Charring of meat

When eating meats you can decrease the formation of HCAs by:

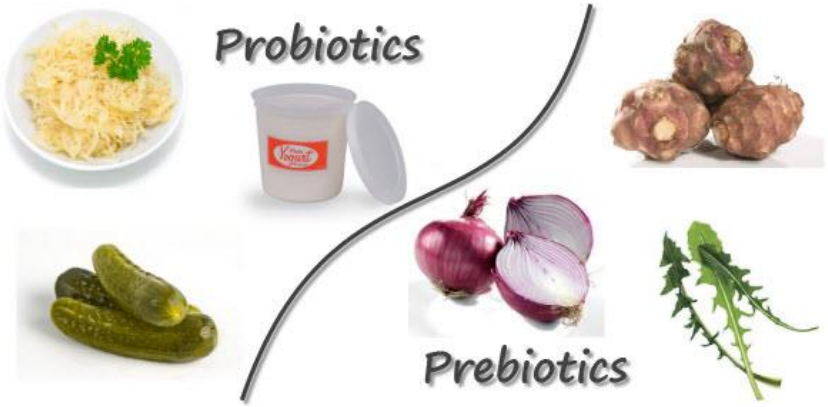
- Choosing lean, well-trimmed meats to grill
- Using marinades
- Brief microwave preheating
- Choosing smaller portions that require less time to grill
- Grilling vegetables or meat alternatives (such as soy products).

Limiting Alcohol Consumption is recommended. Studies have found associations between alcohol consumption and colorectal cancer. Alcohol alters normal folate metabolism, which may play a role on the effect of alcohol on colorectal cancer risk.

It is recommended to **limit alcohol to no more than two drinks per day for men and no more than one drink per day for women.** A drink is equal to 5 ounces of wine, 12 ounces of beer or 1 ½ ounce of hard liquor.

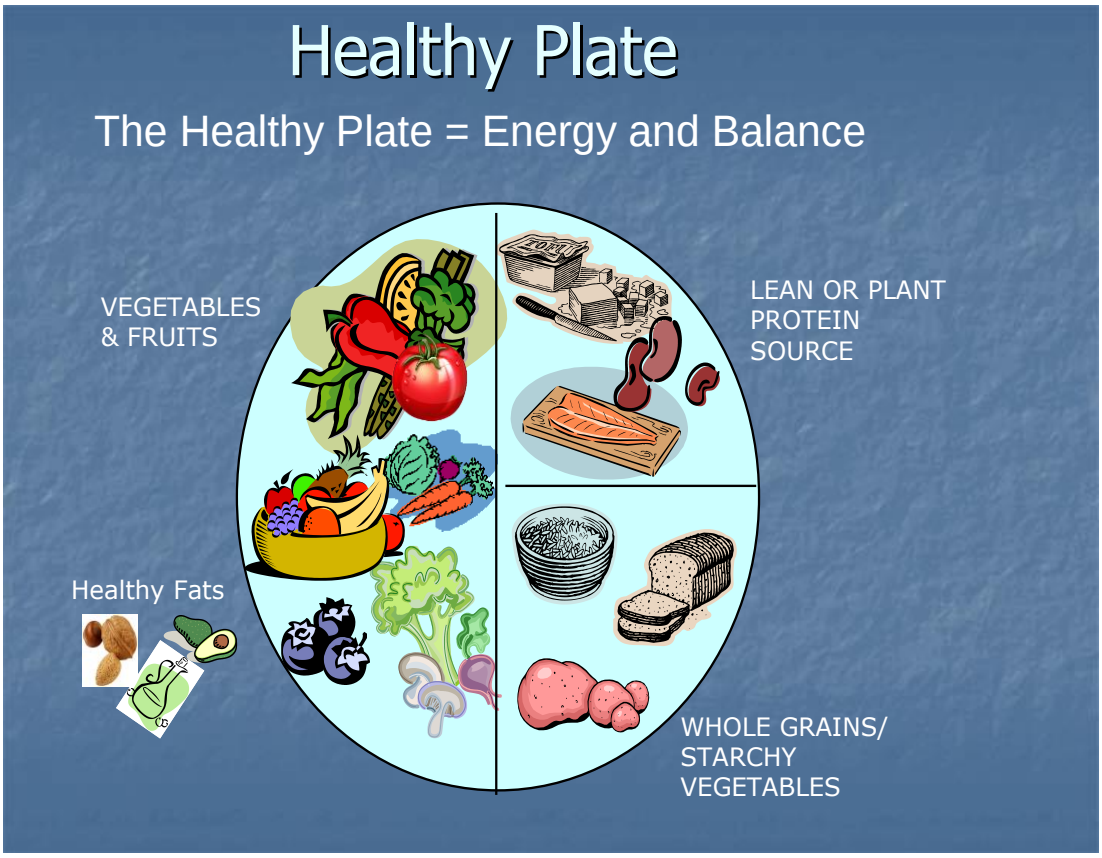
Probiotics are healthy bacteria that live inside the human digestive tract. They help maintain normal bowel function and boost the immune system. We can increase the number of healthy bacteria in our intestines by eating foods that have probiotics. **Food sources of probiotics include: yogurt and yogurt drinks with live active cultures, kefir (a fermented milk drink), tempeh and miso (fermented soybeans), sauerkraut, pickles and Kim chi (fermented cabbage)**. Probiotics can also be taken in the form of a dietary supplement. Although there is currently no recommended amount, most experts suggest using a refrigerated probiotic supplement providing a minimum of 2 billion colony forming units (CFUs) per day, with a blend of Lactobacillus and Bifidobacteria probiotics.

Prebiotics are compounds in foods that provide fuel and nutrients to probiotics, helping the healthy bacteria to grow and multiply. Common prebiotics include non-digestible soluble fibers. **Food sources of prebiotics include: chicory root, Jerusalem artichokes, onions, garlic, leeks, dandelion greens, asparagus, bananas, whole wheat, barley, legumes (lentils, beans, soybeans, peas) and flaxseeds.**



Putting It All Together

A lifestyle that combines a healthy diet, regular exercise and stress management is a key component of a vibrant survivorship. The "Healthy Plate" eating model and the healthy diet summary can be used as a general guide for planning a nutritious diet. If you have recently completed or are currently in treatment, please ask your doctor or registered dietitian for specific dietary and activity guidelines, as your individual needs may different. **It is recommended to discuss any significant dietary changes that you are planning to make with your healthcare team.**



- Eat every 4-6 hours
- Plate = the size of two hands
- Protein + Fiber + Vegetables/fruit = satiety, sustained energy, high nutrient content
- Include small amounts of healthy fats.
- Allow yourself to have small amounts of treat foods occasionally to prevent feeling deprived.

Ida & Joseph Friend Cancer Resource Center
UCSF Comprehensive Cancer Center

SUMMARY - HEALTHY COLORECTAL CANCER DIET:

- Eat 8 to 10 colorful vegetables and fruit servings daily
  - Two to three pieces of fruit
  - One cup or more of vegetables with lunch and dinner
- Consume 30-45 grams of fiber daily
  - You will likely meet your fiber goal if you eat 8 to 10 servings of fruits and vegetables plus one serving of beans/legumes or at least two servings of whole grains daily.
- Avoid processed and refined grains/flours/sugars
  - Keep WHITE off your plate: bread, pasta, rice, cream sauces, cakes, and more
- Limit meats & whole milk dairy products
  - Include lean protein with every meal with at least one plant source daily.
- Include healthy fats like cold water fish (salmon, trout, herring, sardines, black cod), flaxseed, chia seeds, pumpkin seeds, walnuts, soybeans, olive oil, avocados, almonds.
- Eat 1-2 tablespoons of seeds daily such as ground flaxseed, chia seeds or pumpkin seeds.
- Drink plenty of fluids, water or non-caffeinated beverages throughout the day.
  - Avoid sodas, sugar-containing drinks, fruit juice
  - Limit alcohol
- Consume adequate amounts of vitamin D & calcium daily
- Engage in daily physical activity
- Modify diet to manage nutrition related side effects of treatment and achieve or maintain a healthy body weight.

Dietary supplements

Dietary supplements include a variety of substances like vitamins, minerals, and herbs and come in many forms such as tablets, capsules, liquids, or powders. These products run the gamut – they can be very useful and helpful and dangerous at the same time. It's important to know what you're taking, the dosages, and how they may interact with any medications or treatments. The Food and Drug Administration does not control the purity and safety of supplements, so caution is essential. Discuss the use of supplements with your health care provider.

Below are some websites with dietary supplement information:

Consumer Lab: Evaluates quality of over-the-counter supplements.
http://www.consumerlab.com

Council for Responsible Nutrition
Trade association representing ingredient suppliers and manufacturers in the dietary supplement industry
http://www.crnusa.org

NIH Office of Dietary Supplements: Comprehensive information on dietary supplements.
http://dietary-supplements.info.nih.gov

Quackwatch
A nonprofit corporation whose purpose is to combat health-related frauds, fads, fallacies, and misconduct.
http://www.quackwatch.com

Resources

Books

- Anticancer: A New Way of Life – written by David Servan-Schreiber, MD, PhD (2009)
- Foods to Fight Cancer – written by Richard Beliveau, PhD and Denis Gingras PhD (2007)
- Integrative Oncology, 2nd Edition – written by Donald Abrams, MD and Andrew Weil, MD (2014)
- Life Over Cancer: The Block Center Program for Integrative Cancer Treatment – written by Keith Block, MD (2009)

Cookbooks

- The Cancer-Fighting Kitchen: Nourishing Big-Flavor Recipes for Cancer Treatment and Recovery – written by Rebecca Katz with Mat Edelson (2009)
- Cancer Wellness Cookbook: Smart Nutrition and Delicious Recipes for People Living with Cancer – written by Kimberly Mathai (2014)
- Fast Food, Good Food: More Than 150 Quick and Easy Ways to Put Healthy, Delicious Food on the Table – written by Andrew Weil (2015)
- The Longevity Kitchen – written by Rebecca Katz with Mat Edelson (2009)
- One Bite at a Time: Nourishing Recipes for People with Cancer, Survivors, and Their Caregivers – written by Rebecca Katz, Marsha Tomassi, and Mat Edelson (2008)
- 12 Best Foods Cookbook: Over 200 Recipes Featuring the 12 Healthiest Foods - written by Dana Jacobi (2005)

Newsletters/Magazines

- Cooking Light– http://www.cookinglight.com
- Environmental Nutrition – http://www.environmentalnutrition.com # (800) 829-5384
- Nutrition Action Health Letter – http://www.cspinet.org/nah/ Fax: (202) 265-4954

Websites

- American Cancer Society – http://www.cancer.org , (415) 394-7100
- American Institute for Cancer Research – http://www.aicr.org, 800) 843-8114
- Consumer Lab – Evaluates quality of over-the-counter supplements - http://www.consumerlab.com
- Environmental Working Group – Provides information about the environment and health - http://www.ewg.org
- Ida and Joseph Friend Cancer Resource Center – UCSF Mt.Zion – http://cancer.ucsf.edu/crc, 415) 885-3693
- National Cancer Institute http://www.nci.nih.gov/, (800) 4-CANCER # (800-422-6237)
- The Nutrition Source, Harvard School of Publich Health – general nutrition information - https://www.hsph.harvard.edu/nutritionsource/
- Osher Center for Integrative Medicine – Cancer and Nutrition Information - http://www.osher.ucsf.edu/patient-care/self-care-resources/cancer-and-nutrition/

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