# A COMMUNITY GUIDE TO

# CANCER NUTRITION

A companion to
*The Long Table Cookbook: Plant-based Recipes for Optimal Health*
by Amy Symington

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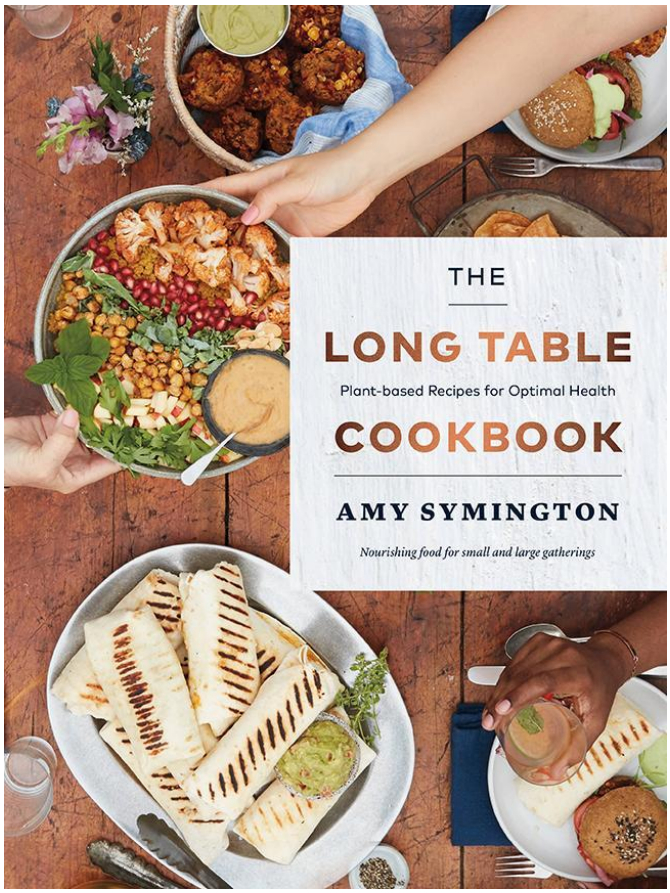
The following guide provides up to date, detailed and peer-reviewed research relating to the types of food to consume for cancer nutrition. Whether you have just been recently diagnosed with cancer, are in treatment or remission and aiming to prevent recurrence or are looking to take preventative measures, this guide provides evidence-based and practical information regarding foods to consume, how to consume them, and why.

This has been a Social Science and Humanities Research Council (SSHRC) funded project through the College and Community Social Innovation Fund (CCSIF) in partnership with Gilda's Toronto and George Brown College (GBC), Toronto, Canada.



ISBN 978-1-7388824-3-4 (e-book)
ISBN 978-1-7388824-2-7 (print book)

# The Long Table Cookbook: Plant-based Recipes for Optimal Health




*A Community Guide to Cancer Nutrition* was prepared in tandem with the *Long Table Cookbook: Plant-based Recipes for Optimal Health* by Amy Symington (Douglas & McIntyre, 2019).

## About the book

A nutritious diet is key to both the prevention and management of chronic illness, but to make us feel wonderful, it must also taste wonderful—and a meal shared with family and friends is even better. Grounded in this perspective, *The Long Table Cookbook* makes the transition to a health-optimizing plant-based diet simple and satisfying, featuring over seventy-five recipes along with the latest evidence-based nutritional advice, meal planning suggestions and tips for hosting community gatherings.

Chef Amy Symington and *The Long Table Cookbook* team have put a gourmet spin on healthy ingredients with recipes that are made to share. Readers won't be able to resist flavourful dishes like Watermelon, Mint, Tofu Feta & Arugula Salad, Caramelized Fennel, Sweet Potato & Pine Nut Cheese Pizza and Strawberry & Hazelnut Streusel Cake with Maple Vanilla Glaze. And while the recipes are satisfying and simple to prepare, they are also crafted to offer a balanced, nutrient-rich menu of whole foods.

Whether cooking for four or twenty-four people, the vibrant recipes and beautiful photographs in *The Long Table Cookbook* will inspire readers to come together to enjoy their best health.

**All author royalties from the sale of *The Long Table Cookbook* benefit Gilda's Toronto.**

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# Overview of Cancer Nutrition

## Introduction <<Back>>

In 2021, it was calculated that approximately 40 percent of Canadians will be diagnosed with cancer in their lifetime and about 25 percent are expected to die from cancer (Canadian Cancer Statistics Advisory Committee, 2021). With those overwhelming statistics stated, significant progress has been made in terms of cancer control via prevention, screening, early detection, and treatment. This includes dietary and lifestyle interventions (Canadian Cancer Statistics Advisory Committee, 2021). When implementing interventions, it is important to turn to the evidence related to nutrition, dietary patterns, and lifestyle and their link to disease prevention and management. Authoritative reviews on the subject have estimated that approximately one-third of cancer diagnoses could be attributable to lifestyle factors including nutrition, dietary patterns, and physical activity (Wiseman, 2008). Following healthful, evidence-based recommendations relating to cancer prevention and management has been shown to affect cancer risk significantly, may help during and following cancer treatment, can improve rates of cancer survival and reduce the risk of cancer recurrence (Jones & Demark-Wahnefried, 2006; Rock et al., 2012; Schwedhelm et al., 2016; World Cancer Research Foundation [WCRF] & American Institute for Cancer Research [AICR], 2018a).

Specifically, for a society that is very consumed with what to consume, it may seem challenging to select foods to eat that will both satisfy one's palate and also meet one's nutritional needs. When it comes to choosing foods that will not only meet your nutritional needs but also boost your nutrition for disease prevention, research points to eating patterns, particularly when it comes to cancer prevention (Supic et al., 2013; WCRF & AICR, 2018a). This means that there isn't one specific 'superfood' or nutrient that you should primarily focus on. Rather, you should include a variety of foods and nutrients that show clinical evidence for cancer prevention and management in your daily eating patterns. Currently the research indicates that a diet centered around healthy plant-based foods is the optimal eating pattern for cancer prevention and management (Chikara et al., 2018).

## What to Consume for an Anti-cancer Diet <<Back>>

With that said, this guide focuses on foods from the plant kingdom, as plant food components such as fibre, antioxidants, phytochemicals, and its thousands of subcategories, have been shown to lower the incidence of cancer (Gonzales et al., 2014; Marsh et al., 2012; Supic et al., 2013; Tantamango-Bartley et al., 2013; WCRF & AICR, 2018a). Eating a plant-based diet has clinically been shown to affect DNA modifications, thereby reducing cancer expression and overall cancer risk (Supic et al., 2013; Tantamango-Bartley et al., 2013). The lowest incidence of cancers has been found among individuals eating the most fruits and vegetables, which is associated with the content of anticancer compounds in these plant foods (Béliveau & Gingras, 2006).

When choosing ingredients, it is important to select from a wide array of whole plant-based foods like fruits and vegetables, whole grains, nuts, seeds, and plant-based proteins as each tends to have its own set of unique health benefits and/or phytochemicals. Diversity is key when it comes to healthy eating patterns, as there are a plethora of anti-cancer functional foods waiting to be eaten in the plant kingdom (Béliveau & Gingras, 2006).

Since cancer and nutrition research is such a dynamic and emerging field, it can be overwhelming to sift through all the food and nutrition advice. Our aim in this guide is to provide you with tips based on evidence that have shown to be promising and substantial, as the "Evolution of scientific consensus" (Gonzales et al., 2014) can take some time. Based on research that has been used by cancer organizations to form nutrition guidelines, as well as dietary guidance from reviews and analyses, we have summarized these suggestions for your wellbeing. Taking the approach of Gonzales et al (2014) and applying the precautionary principle to nutrition and cancer, our suggestions are based on the best available evidence, even where some areas are still inconclusive.

One of the largest comprehensive reports on food, nutrition, and physical activity for cancer prevention is a joint report by the WRCF and the AICR (2018a). The overarching principle of their initial report in 2007 was the emphasis on the importance of eating non-starchy vegetables and fruits, pulses (legumes), and unprocessed grains as the centre of one's cancer preventative diet as they contain ample amounts of dietary fibre and micronutrients (WCRF & AICR, 2007). "These foods and not foods of animal origin are the recommended centre of everyday meals (WCRF & AICR, 2007)." As the research has been continuously updated, the messages have become more refined but the evidence for this central theme remains strong and consistent (WCRF & AICR, 2018a).

Physiologically, meat can have several potential nutritional benefits which include providing rich sources of protein, iron, zinc, and B-vitamins, as well as vitamin A (Rohrmann et al., 2013). Specifically, iron and folate are more bioavailable from meat products compared to plant-based sources (Rohrmann et al., 2013). However, animal-based foods also have potential adverse effects including increasing LDL cholesterol and saturated fatty acids. Moreover, the nutrients found within these foods that are potentially beneficial are easily obtained from whole, health promoting, plant-based foods (Rohrmann et al., 2013).

For example, current research suggests that a diet higher in plant-based protein and lower in red and processed meats reduces risk for chronic diseases, including cancer, and that those with a diet high in red and processed meat are at increased risk of premature death due to cardiovascular disease & cancer (Rohrmann et al., 2013; Thomson, 2015). Further, a high intake of meat, along with high sugar and fat intake, represents a Western dietary pattern that is associated with overweight and obesity; body fatness is not only a strong risk factor for developing cancer but also for cardiovascular disease and type 2 diabetes (WCRF & AICR, 2018a). Since red and processed

meat consumption is a modifiable risk factor for chronic disease, advice should be, and now often is, given within health promotion guidelines to reduce or eliminate consumption (Rohrmann et al., 2013).

## Global Dietary and Lifestyle Recommendations for the Prevention of Cancer <<Back>>

**Summary of Global Dietary and Lifestyle Recommendations for the Prevention of Cancer**

According to the review by the WCRF & AICR (2018a), the following dietary and lifestyle recommendations for cancer prevention and management for global application are based on only the strongest body of evidence. These are briefly summarized as:

1. Eat a diet rich in whole grains, vegetables, fruit, and legumes.
2. Limit the consumption of red and processed meat.
3. Limit alcohol consumption: no amount of alcohol is considered safe.
4. Be a healthy weight; observe dietary and lifestyle practices that help maintain a healthy body weight:
    a. Limit consumption of fast foods and other processed foods high in fat, starches, or sugar.
    b. Limit consumption of sugar sweetened beverages.
    c. Be physically active.
5. Do not use supplements for cancer prevention; aim to meet nutritional needs through diet alone.

Most importantly in this guide is the discussion of what to consume for cancer prevention and management and specifically focuses on foods from the plant kingdom. It provides a more granular view of the general recommendations made above to highlight specific, functional foods that may contribute to a lower risk of cancer (Gonzales et al., 2014; Marsh et al., 2012; Supic et al., 2013; Tantamango-Bartley et al. 2013; WCRF & AICR, 2007, 2018a).

Eating a plant-based diet has been clinically shown to positively affect DNA modifications, thereby reducing cancer expression and overall cancer risk (Supic et al., 2013; Tantamango-Bartley et al., 2013). More specifically, when reviewing dietary patterns of those following a plant focused diet, it may seem logical then that vegetarians were shown to have an 18 percent lower cancer mortality risk than non-vegetarians (Huang et al., 2012). Or in a meta-analysis of observational studies of vegetarian and vegan diets that a vegetarian diet may be protective and reduce cancer risk by 10 percent (Parra-Soto et al., 2022) and a vegan diet by 15 percent (Dinu et

al., 2017). Moreover, in some cases with site specific cancers, plant-based diets may be even more protective. For example, a vegan diet seems to confer lower risk for both overall and female-specific cancer in comparison to other dietary patterns, and vegetarians have an overall reduced risk of cancers related to the gastrointestinal tract (Tantamango-Bartley et al., 2013). In the California Teachers Study cohort, including data from 91,779 women, a 15 percent reduced risk of breast cancer was found when following a plant-based diet (Link et al., 2013). Tantamango-Bartley et al., (2016) found 35 percent less prostate cancer among those following a vegan diet than men in the other dietary groups.

Researchers suspect that higher intakes of fibre, soy, and anti-inflammatory antioxidants from fruits and vegetables, and lower intakes of saturated fat, animal protein, and serum insulin-like growth factor 1 from dairy products in a vegan diet, contribute to this lower cancer risk (Tantamango-Bartley et al., 2016). Those that do have cancer can utilize similar recommendations to manage the disease and help to prevent recurrence (Donaldson, 2004; WCRF & AICR, 2018a).

## Global Dietary and Lifestyle Recommendations in Detail <<Back>>

More specific guidance on nutrition and diet based on the strongest available evidence (WCRF & AICR, 2018a) includes the following:

1. Make whole grains, vegetables, fruit, and legumes the central part of your usual daily diet as they protect against colorectal cancer and likely several other forms. Consumption is also associated with lower risk of cardiovascular disease, type 2 diabetes, and overweight and obesity.
    - Incorporate these foods into most meals.
    - Eat at least five servings/portions (400 g or 15 ounces) of non-starchy vegetables or fruits every day.
    - Ensure your diet contains at least 30 grams per day of fibre from food. This is obtained from fibre-rich foods such as whole grains, legumes, vegetables, fruits, nuts, and seeds. Note that all plant-based foods contain fibre, whereas animal-based foods do not contain fibre.
    - Consume a diet with low glycemic load as a high glycemic load is a probable cause of endometrial cancer and predicts the risk of type 2 diabetes and cardiovascular disease. A low glycemic load is associated with foods that contain a low amount of sugar or other simple carbohydrates common in refined and highly processed foods. Consuming a diet that is rich in dietary fibre and includes whole grains, legumes, nuts, seeds, and whole fruits and vegetables, along with fats and other protein sources, is consistent with a low glycemic load diet.

2. Eliminate or limit the consumption of red and processed meats as they are a cause of colorectal cancer. High intakes are also associated with increased risk of cardiovascular disease, stroke, and type 2 diabetes:
    - For those who choose to eat red meat, limit the number of portions to no more than three per week (i.e., a total of 350-500 g or 12-18 ounces). Less red meat is appropriate if the diet is balanced to contain sufficient protein, iron, zinc, and vitamin B12 from other sources.
    - For those who still choose to eat meat, substitute red meat with chicken, fish, or eggs.
    - There are no safe levels of processed meat. Consume very little, or none at all.

3. Eliminate or limit alcohol consumption as it is a cause of many forms of cancer. Heavy alcohol use is also a cause of cardiovascular diseases, liver disease, and pancreatitis:
    - There are no safe levels of alcohol recommended as even small amounts are associated with increased risk of cancer.
    - Up to two drinks per day may be protective against kidney cancer, but the causal effect on the many other forms of cancer greatly outweighs the benefit.
    - There is no distinction between types of alcohol regarding cancer risk.

4. Maintain a healthy body weight and avoid weight gain. Greater body fatness and weight gain are strongly associated with increased risk of many cancer types, as well as cardiovascular disease and type 2 diabetes. Strong evidence indicates that to help maintain a healthy body weight (WCRF & AICR, 2018a):
    - Engage in at least 150 minutes of moderate physical activity each week. More time spent active is likely even more protective. Physical activity is also directly protective against some types of cancers.
    - Limit the amount of time spent sedentary, especially time spent watching screens (e.g., televisions, computers, phones, video games) for work or pleasure.
    - Limit the consumption of sugar-sweetened beverages as they make it easy to overconsume calories. These include beverages sweetened with sugar, honey, syrups, fruit juice or fruit juice concentrate as well as soda, sports or energy drinks, and sweetened water, coffee, or tea. For hydration, consume mostly water and unsweetened beverages, which may include unsweetened coffee or tea up to about four cups per day (or 400 mg caffeine). Fruit juices should also be limited to only small amounts.
    - Limit the consumption of fast foods and processed foods that contain high amounts of fat, starches, and sugars as they interfere with calorie control. Fast foods tend to be rich in calories and commonly include burgers, fries, fried chicken, and sodas or shakes. They may also include bakery items, snacks, candies, desserts, and other prepared foods.
    - Adopt a dietary pattern similar to a traditional Mediterranean diet (i.e., large amounts of fruits and vegetables, moderate amounts of meat and dairy, and olive oil). Avoid a

Western style dietary pattern that is high in free sugars, dietary fat, and meat and low in fruits and vegetables.

- Consume a diet rich in fibre. In addition to protecting against colorectal cancer, high fibre diets protect against weight gain, overweight and obesity.

5. It is preferable to aim to meet nutritional needs through diet, not supplements:
    - While calcium supplements are protective against colorectal cancer, so is dietary calcium.
    - High dose beta-carotene supplements increase the risk of lung cancer among current and former smokers.
    - The evidence for a protective effect of beta-carotene supplements in other situations, as well as vitamin D, selenium, or multivitamin supplements is still limited.

## Recommendations for Other Exposures <<Back>>

**Strong Evidence:** Recommendations for other exposures for which there is strong evidence of links to cancer (WCRF & AICR, 2018a) include:

- Avoid aflatoxin-contaminated food as it is a cause of liver cancer. Aflatoxin is produced from certain types of molds that can result from poor food storage conditions. It is generally of greater concern in regions of the world where cold or humidity-controlled storage is not readily available. Nonetheless, it is recommended to store foods that are susceptible to mold in cool, dry places. These include nuts, seeds, cereals, legumes, grains, dried figs, and dried fruit.
- Minimize the consumption of salt-preserved, salted, or salty foods as these are a probable cause of stomach cancer, and a possible cause of nasopharyngeal cancer. These foods include salted meat or fish, salt-preserved or pickled vegetables, dried salted fish, miso soup, and other salted confectionaries and are more commonly consumed in Asian diets. Also avoid consuming Cantonese-style salted fish, a very particular preparation method combining salting and fermentation that is generally only consumed regularly in the Pearl River Delta region of China.
- Eliminate exposure to cigarette smoke.

**Limited Evidence:** There are several other dietary risk factors that have been shown to influence the risk of cancer, but still lack the strength of evidence derived from enough long-term population-based studies required to make strong global recommendations (WCRF & AICR, 2018a). Evidence may be significant, but still limited to laboratory studies, controlled clinical trials, or a limited number of long-term population-based studies, or results between studies may be inconsistent.

Nevertheless, if choosing to use an abundance of caution for the prevention or management of cancer, these additional recommendations may be considered:

- Avoid grilled, broiled, barbecued, or charbroiled meats and fish. Although evidence of association with stomach cancer is still limited, proteins in meat and fish combined with high heat cooking methods produce carcinogenic substances known as heterocyclic amines. Cooking meat or fish over an open flame also produces likely carcinogens known as polycyclic aromatic hydrocarbons.
- Limit the intake of saturated fats. Saturated fats are found predominantly in animal products including meat and dairy, as well as some tropical oils such as palm and coconut oil. Plant centered diets generally have a lower content of saturated fat.
- Ensure that there is an adequate intake of omega-3 fatty acids. A lower ratio of omega-6/omega-3 fatty acids is more desirable in reducing the risk of many of the chronic diseases (Simopoulos, 2008) but it is best to focus on increasing the intake of omega-3 fatty acids.
- Consistently consume functional and phytochemical-rich foods (See '**What to Eat: Foods to Frequently Consume'**). Plant foods are rich in a variety of phytonutrients. While the available evidence is still somewhat limited, it is generally consistent in showing a protective effect for some types of cancers, including lung, breast, and colon. Some foods contain larger amounts of protective components than others and may be considered functional foods. Some of the potentially protective elements and food types include:

    - antioxidants (e.g., polyphenols, carotenoids, and flavonoids)
    - isoflavones
    - phytoestrogens
    - plant stanols and sterols
    - prebiotics and probiotics
    - soy proteins
    - sulphuric compounds

- Consume allium and cruciferous vegetables as they are especially beneficial.
- Consume foods containing protective nutrients such as selenium, beta-carotene, and other carotenoids, vitamin C, vitamin D, and vitamin E (Donaldson, 2004; WCRF & AICR, 2007).

The World Health Organization [WHO] (2022) estimates that 30-50 percent of cancers are preventable based on known interventions to decrease lifestyle, diet, and other exposure-related risk factors. Others estimate that following a healthy dietary pattern alone may decrease the risk of cancers by about 11-16 percent (Morze et al., 2020).

When discussing specifically nutrition for those going through cancer treatment or those finished cancer treatment and wishing to focus on recurrence prevention, the research and recommendations remain the same as above (Donaldson, 2004; Rock et al., 2022; WCRF & AICR, 2018a). Similar to the dietary cancer prevention guidelines, the data indicate that exercise, a high-quality diet focusing on plants, and management of stress, can improve the likelihood of cancer survival and prevent recurrence (Jones & Demark-Wahnefried, 2006; Rock et al., 2012; Schwedhelm et al, 2016). Moreover, adherence to a healthy dietary pattern is associated with a lower risk of premature death among cancer survivors (13-25 percent; Morze et al., 2020), whereas a Western dietary pattern (i.e., a diet high in alcohol, animal products and processed foods) is associated with a higher risk of premature death among cancer survivors (Schwedhelm et al., 2016).

Vegetables in particular are associated with lower risk of premature death among cancer survivors, whereas alcohol is associated with higher risk (Schwedhelm et al., 2016). Furthermore, eating a diet rich in healthy foods can help with preventing malnutrition and weight loss, both of which can lead to poorer prognosis (Hager, 2016; Ross et al., 2004).

Focusing on the lifestyle and dietary guidelines discussed here will provide not only a reduced risk of cancer along with a sense of empowerment to those wishing to prevent cancer, manage cancer, or prevent recurrence of cancer, but will also aid in reducing other chronic diseases such as cardiovascular disease, type 2 diabetes, and overweight or obesity.

As you will see in the next set of pages, we dive deeper into specific cancer preventing foods that can be incorporated into your daily eating patterns. Select foods from this list that appeal to you, so you can simultaneously enjoy what you're eating while boosting your body's defences against cancer development.

## Antioxidants During Cancer Treatment

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Eating whole plant-based foods high in powerful antioxidants is not a concern during cancer treatment, however, taking antioxidants in supplement form is not recommended during treatments (Lawenda et al., 2008), or generally to prevent cancer (WCRF & AICR, 2018a). Research indicates that some supplemental antioxidants can protect non-cancerous tissues from the damaging side effects of treatments (Block et al., 2007, 2008; Conklin, 2000). However, other studies indicate that antioxidant supplements may interfere with chemotherapy and radiation therapy. In turn, this can reduce the effectiveness of these treatments (Bairaiti et al., 2006; Greenlee, et al., 2009, 2012; Ladas & Kelly, 2010; Lawenda et al., 2008; Norman et al., 2003). Therefore, more research is needed on antioxidants in supplemental form during treatment and consequently emphasis should be placed on consuming whole plant-based foods high in antioxidants over supplements.

# Physical Activity, Cancer Prevention and Cancer Care

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More people who have been diagnosed with cancer are living more than five years due to improvements in cancer screening and detection, diagnosis, and treatment options (Rock et al., 2012; Ferrer et al., 2011; Ellison, 2021). With this extended lifespan, there is a need for informed lifestyle choices to help successfully complete therapy and improve long term outcomes (Rock et al., 2012). Weight management, a healthy diet, and physical activity are all important for preventing recurring incidences of cancer (WCRF & AICR, 2018a). Overall quality of life can be improved through these lifestyle changes as they may decrease the negative physical and psychosocial consequences associated with cancer (Ferrer et al., 2011).

Since 2006, new evidence has emerged on the relationship between nutrition, physical activity, quality of life, comorbid conditions, cancer recurrence, the development of second primary cancers, and overall survival (Rock et al., 2012). Although the evidence is incomplete, some conclusions and recommendations can be drawn relating to choices about body weight and physical activity (Rock et al., 2012). In particular, new evidence is emerging that suggests exercise interventions may help with regulating cancer-related fatigue (Brown et al., 2010).

## Physical Activity for Cancer Prevention

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The Expert Panel on the WCRF believes that the more physically active people are, the lower the risk of developing some cancers (WCRF & AICR, 2018a). There is strong evidence that being physically active decreases the risk of colon, breast (post-menopause), and endometrial cancers, and some suggestive evidence that it may also decrease the risk of cancer of the esophagus, lung, liver, and breast (pre-menopause) (WCRF & AICR, 2018g). Physical activity also reduces the risk of cardiovascular disease and type 2 diabetes, and improves mental health and general well-being, delays the onset of dementia, and helps to maintain a healthy body weight (WHO, 2020). In addition, sedentary behaviours have been associated with increased risk of cancer, cardiovascular disease, and type 2 diabetes, and increased risk of death from cancer and cardiovascular disease (WHO, 2020). The importance of keeping moving for health and longevity can't be understated!

For cancer prevention, adults and children should meet or exceed their national guidelines for physical activity. According to the most recent physical activity guidelines for Canadians, adults (18-64 years) should engage in at least 150 minutes of a combination of moderate and vigorous intensity activity each week (Canadian Society for Exercise Physiology, 2021a). This should include muscle strengthening activity using major muscle groups at least twice per week and to engage in several hours of light physical activity each week, such as standing, walking, gardening, or cooking. Sedentary behaviours should be limited to no more than eight hours per day, including no more than three hours of recreational screen time, and sitting time should be broken up as often

as possible. Seven to nine hours of good quality sleep each night are also recommended.

Older adults (65 years and older), should also engage in at least 150 minutes of moderate to vigorous physical activity each week, including muscle strengthening activity two days per week, and activities that challenge balance (Canadian Society for Exercise Physiology, 2021b). Older adults should also engage in several hours of light activity each week. As for younger adults, sedentary behaviours should be limited to less than eight hours per day with less than three hours of screen time and breaking up sitting as often as possible. Also recommended are seven to eight hours of good quality sleep each night.

Throughout life, physical activity, along with a healthy diet, are key lifestyle components that help to maintain body weight within a healthy range. Healthy body weights are also key to cancer prevention as body fatness is associated with an increased risk of many forms of cancer (WCRF & AICR, 2018a).

Furthermore, research suggests that increased levels of physical activity may be associated with further reductions in cancer risk (Blanchard et al., 2008). Optimal intensity, length, and frequency of physical activity is unknown; however, 300 minutes of moderate intensity, or 150 minutes of vigorous intensity exercise, on a weekly basis is likely associated with further cancer prevention (Kushi et al., 2012). Additionally, for individuals who are inactive, or have just started to engage in regular physical activity, levels below the recommended guidelines can still be beneficial, with a gradual increase towards recommended amounts (Kushi et al., 2012). Any activity is better than no activity!

It is also noteworthy that a large meta-analysis found that even among those diagnosed with cancer, a higher level of physical activity prior to diagnosis was associated with a 20 to 40 percent lower mortality rate from that cancer (Friedenreich et al., 2019). This further emphasizes the importance of physical activity for health and longevity.

## Physical Activity During Cancer Treatment <<Back>>

There has been an increasing number of studies examining the value of physical activity during cancer treatment (Rock et al., 2012). In addition to being safe and feasible, the evidence suggests that exercise during cancer treatment can improve physical functioning, bone health, fatigue, mental health, and overall quality of life (Rock et al., 2012). Importantly, some studies have suggested that exercise may help with successful chemotherapy completion, though this remains to be confirmed by further research (Campbell et al., 2019; Rock et al., 2012). There is also now good evidence for many cancer types that physical activity improves survival; a large meta-analysis showed a 20 to 40 percent reduction in cancer-specific mortality with higher physical activity post-diagnosis (Friedenreich et al., 2019).

After an extensive review, the American Society of Clinical Oncology (Ligibel et al., 2022) concluded that oncology professionals should recommend aerobic (cardiovascular) and resistance training (strength building) for patients undergoing treatment for cancer, including preoperative exercise for those undergoing lung cancer surgery. Sarcopenia, or muscle wasting, is a common side effect of cancer and cancer treatment. Physical activity, along with adequate dietary protein, will help prevent muscle loss, maintain good health, and increase longevity.

As with diet, physical activity, should be individualized based on the patient's circumstances, cancer type, treatment type, side effects, and personal preferences (Campbell et al., 2019; Rock et al., 2012; Wong et al., 2018). Physical activity recommendations should also consider the patient's pre-treatment physical activity practices and abilities. Those who were more sedentary should begin with lower intensity activities, like stretching and walking, and advance slowly from there. Age and related pre-existing conditions such as arthritis, osteoporosis, or peripheral neuropathy, as well as those with lymphedema or bone metastases, must also be considered to avoid accident and injury (Campbell et al., 2019; Rock et al., 2012). Studies have found that physical activity programs are significantly more beneficial for quality of life and physical functioning when they are supervised by professionals rather than self-directed (Buffart et al., 2017). For those who were previously on an exercise plan prior to chemotherapy/radiation, fulfilling their exercise goals overall might not be feasible, but the main goal should be to maintain activity as much as possible (Rock et al., 2012). Nonetheless, the best physical activity is the one that you will do - and do regularly and safely!

## Physical Activity in Cancer Survivors

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Several observational studies have shown that physical activity after cancer diagnosis is associated with reduced risk of cancer recurrence, as well as reduced mortality rates among cancer survivors from breast, colorectal, prostate, and ovarian cancers (Rock et al., 2012). Physical activity among cancer survivors is also associated with a decreased risk of cancer recurrence and a second primary cancer (WHO, 2020). However, a large survey found that more than 50 percent of cancer survivors are not meeting physical activity recommendations (Blanchard et al., 2008).

Many studies also show that exercise improves quality of life, fatigue, psychosocial distress, depression, as well as self-esteem (Rock et al., 2012). A meta-analysis concluded that exercise interventions result in improved quality-of-life outcomes during and after the intervention (Ferrer et al., 2011). Another meta-analysis showed that cancer survivors randomized to an exercise intervention or control showed significantly reduced cancer related fatigue, and benefits increased linearly with greater intensity of resistance exercise (Brown et al., 2010).

The WCRF & AICR (2018g) advise that cancer survivors should try as much as they are able to follow physical activity guidelines for their age group. If this is not feasible or recommended,

others advise they should strive to reach those levels of activity over time with progressive increases (Campbell et al., 2019). An International Multidisciplinary Roundtable has summarized evidence and recommendations for cancer survivors for specific types of physical activity (i.e., aerobic, resistance training) and outcomes and provides guidelines for specific cancer conditions and side effects (Campbell et al., 2019). These efforts, together with additional research, provide a good starting point for practitioners. Nonetheless, all cancer survivors should consult a trained health professional for guidance on physical activity that is appropriate for their condition.

**American Cancer Society (ACS) Guidelines on Nutrition and Physical Activity for Cancer Survivors**

- Achieve and maintain a healthy weight: If overweight or obese, limit consumption of high-calorie foods and beverages and increase physical activity to promote weight loss.
- Engage in regular physical activity: avoid inactivity and return to normal daily activities as soon as possible following diagnosis; aim to exercise at least 150 minutes per week; include strength training at least two days per week.
- Achieve a dietary pattern that is high in vegetables, fruit, and whole grains.

(Rock et al., 2012)

# What to Eat: Foods to Frequently Consume

### Apples

**Why Eat Apples:** Apples are rich in compounds called polyphenols, which are the largest class of phytochemicals found in nature. The polyphenols in apples can be divided into a few subdivisions, each with their unique set of cancer prevention capabilities. Some of the most important of these bioactive molecules are flavonoids (e.g., catechins, phloretin, procyanidins, and quercetin) or phenolic acids (e.g., chlorogenic acid), which have been shown to have antioxidant and anti-cancer activities, such as reducing blood flow to tumours (anti-angiogenesis), (Nezbedova et al., 2021; Zessner et al., 2008). In addition, as apples are readily available year-round, they can help you reach the recommended five servings a day of fruit and vegetables (WCRF & AICR, 2018a) as it has been found that 80 percent of cancer survivors are not reaching that target (Blanchard et al., 2008). Apples may also be beneficial for preventing cardiovascular disease, type 2 diabetes, and obesity (Nezbedova et al., 2021).

**How to Eat Apples:** As the amounts of different polyphenols differ among varieties, eat a range of different apple varieties to reap the most benefits (Nezbedova et al., 2021). Make sure to eat the skin to get the strongest dose of anticancer compounds (Nezbedova et al., 2021; Wolfe et al., 2003). Eat them whole as an easy portable snack or use them in your morning oatmeal or cereal, as a snack with unsweetened nut butter, as applesauce, or in a fruit crisp or crumble for dessert (minus the refined white sugar and flour of course).

**Nutritional Benefits for Specific Cancers:** Daily apple consumption was shown in one case-control study to significantly lower the odds of breast cancer, ovarian cancer, and colorectal cancer by 24 percent (Gallus et al., 2005). An analysis of 41 different epidemiological studies has provided evidence that apples may be protective against lung cancer, and possibly also against colorectal, breast, and digestive tract cancers (Fabiani et al., 2016).

Researchers have found a compound in the peels of organic apples that contain a reactive tumour suppressor gene called maspin, which is a compound that our body uses to keep breast cancer at bay. Typically, breast cancer cells find a way to turn off this gene, however, maspin in apple peels help to turn them back on (Regan-Shaw et al., 2010).

## Artichokes <<Back>>

**Why Eat Artichokes**: Artichokes are widely consumed as part of the health-promoting Mediterranean diet and are rich in polyphenols, minerals, inulin fibre, and fibre in general, making them a great choice for an anticancer diet (Lattanzio et al., 2009). They are rich in antioxidants (Béliveau & Gingras, 2006), and the polyphenolics in artichokes have been shown to induce cell death (apoptosis) in human breast cancer cells (Mileo et al., 2012). Additionally, artichoke extract contains apigenin, which may help increase sensitivity to chemotherapy treatments (Mileo et al., 2012; Torquato et al., 2017).

**How to Eat Artichokes:** After thoroughly washing your artichokes and removing the outer leaves, scoop out the fuzzy centre and they are ready to cook. For a healthier cooking method try roasting them with a little grapeseed oil and serve them with a squirt of lemon juice. Once cooked, they are a great way to increase fibre in your chowders, stews, or salads. Eat them whole with plant-based aioli or blended into a spinach artichoke dip!

**Nutritional Benefits for Specific Cancers:** Diets that are made up of foods high in fibre and antioxidants like artichokes have been shown to help reduce the risk of certain types of cancers (WCRF & AICR, 2007). The WCRF & AICR (2018a, 2018b) recommend eating foods that contain lots of dietary fibre as there is strong evidence that fibre helps to protect against colorectal cancer.

## Avocado <<Back>>

**Why Eat Avocado**: Avocados are an example of a fatty food that is also a rich source of phytochemicals with anti-carcinogenic properties (Dreher & Davenport, 2013). They also are a source of dietary fibre and antioxidants, have a very low sugar content, and are low in saturated fat and high in unsaturated fat (Dreher & Davenport, 2013). These properties provide a multitude of health benefits including supporting cardiovascular health, managing weight, and healthy aging (Dreher & Davenport, 2013; Pacheco et al., 2022).

**How to Eat Avocado:** Eat avocados once they have become a little soft. Use fresh or frozen avocado in smoothies, salads, sauces, dressings and on sandwiches. Spread it on toast, add it to a wrap, or use it to make a delicious key lime dessert. Have avocados as guacamole - when combined with salsa, it will increase absorption of lycopene and beta-carotene from the tomatoes (Unlu et al., 2005). Due to their fat content, eating avocados with other fruits and vegetables helps to improve the bioavailability of some healthy micronutrients such as carotenoids, which have also been shown to be a good component of an anti-cancer diet (Unlu et al., 2005).

**Nutritional Benefits for Specific Cancers:** Regular avocado consumption has been associated with improved diet quality and metabolic health markers such as lower body weight and smaller waist circumference (Fulgoni et al., 2013). Maintaining a healthy body weight is important for protecting against obesity-related cancers such as mouth, larynx, pharynx, stomach (cardia), gallbladder, ovary, and prostate (WCRF & AICR, 2018c). Moreover, avocados are a source of dietary fibre, which also helps to protect against colorectal cancer (WCRF & AICR, 2018a). Further, in one study, eating two or more servings of avocado per week was associated with a 21 percent reduced risk of coronary heart disease (Pacheco et al., 2022).

## Blueberries <<Back>>

**Why Eat Blueberries:** Blueberries are a nutrient-packed fruit containing anthocyanins, which are powerful antioxidants. Anthocyanins have been shown in cell culture models to help protect cells from damage caused by free radicals (Davidson et al., 2018). Blueberries are unique as they contain five of the major anthocyanidins (cyanidin, delphinidin, malvidin, peonidin, and petunidin) that are believed to work synergistically to prevent and slow cancer development (Jeyabalan et al., 2014).

**How to Eat Blueberries:** Adding blueberries to your diet is a great way to increase the amount of fruit you eat. It is best to buy organic or low spray berries to avoid pesticides that can remain on their thin skin. It is also important to thoroughly rinse all berries before eating them to remove any harmful bacteria that may be present (Baranski et al., 2014; Smith-Spangler et al., 2012). Use them in raw cheesecakes, smoothies, in a compote, and atop all your breakfast foods, including pancakes, waffles, cereal, yogurt, and oatmeal.

**Nutritional Benefits for Specific Cancers:** Research on the anticancer potential of anthocyanins is emerging, and thus far the results are showing that these molecules limit the growth of different cancerous cells (Wang & Stoner, 2008). More recent cell culture research has shown that blueberries specifically prevent the initiation stage of cancer formation, inhibit the growth of abnormal cells. Although there is compelling evidence for blueberries in cell culture studies (Davidson et al., 2018), few human studies have been undertaken, with observational studies yet to find conclusive evidence to support blueberries' superior anti-cancerous effects. That said, there is some evidence that they reduce the risk of recurrence for cancer survivors or those in remission (Davidson et al., 2018).

## Cacao <<Back>>

**Why Eat Cacao:** Cacao beans have one of the highest concentrations of flavonoids, specifically flavanols, of any food. Flavonoids are very strong antioxidants from the polyphenol family associated with a lowered risk of cancer. The flavanol class of flavonoids in cocoa, particularly catechins and procyanidins, have several chemopreventive properties, including controlling inflammation, inhibiting the initiation and proliferation of cancer cells, the development of blood vessels that feed tumours (angiogenesis), and inducing cancer cell death (apoptosis) (Goya et al., 2016; Maskarinec, 2009; Weisburger, 2001). Large observational studies have also shown that higher consumption of chocolate is associated with a reduced risk of coronary heart disease and stroke (Chareonrungrueangchai et al., 2020).

**How to Eat Cacao:** Eating 20 grams of dark chocolate every three days has been shown to lower inflammation levels, so this is a good amount to aim for (di Giuseppe et al., 2008). Use unsweetened cacao or cocoa in hot beverages, in your morning smoothie, in decadent whole food desserts, or in a spicy black bean chili.

**Nutritional Benefits for Specific Cancers:** Scientific studies using cell culture and animal models have noted that the flavonoids in cocoa are able to slow the development of certain cancers, particularly colon cancer (Goya et al., 2016) and flavonoids in general have been shown to reduce the risk of breast (Hui et al., 2013), lung (Tang et al., 2009), and ovarian cancers (Cassidy et al., 2014).

## Calcium <<Back>>

**Why Calcium:** Calcium is essential for bone and teeth health and as you age, the absorption of calcium tends to decline, making it crucial to consume enough through dietary means (Otten et al., 2006). In relation to cancer nutrition, calcium can improve signaling within cells which may cause cancer cells to differentiate or die instead of multiplying (Milner et al., 2001). There have been significant findings related to dietary calcium intake and a reduced risk of colorectal cancer, and possibly also breast cancer (WCRF & AICR, 2018d). However, higher dietary calcium may also be associated with an increased risk of prostate cancer.

**How to Acquire Calcium:** Plant-based diets are typically high in oxalate and phytate, both of which may inhibit calcium absorption. Therefore, to reap the benefits of a plant-based diet and get enough calcium from dietary means it is important to consume plant-based calcium-rich foods with vitamin C rich foods and/or vinegar and to consume a variety of different calcium-rich sources to reduce the effects of oxalates and phytates (Otten et al., 2006). Foods high in oxalates include almonds, beets, barley, bulgur, cashews, cocoa and cocoa products, corn meal, navy beans, potatoes, soy, and soy products (e.g., miso, tofu), rhubarb, spinach. Foods high in phytate include

legumes, nuts, seeds, and whole grains. It is not advised to reduce the consumption of such foods as they confer important health benefits as well. For example, foods higher in phytate may also inhibit tumour growth and have been shown to reduce the incidence of colon, breast, and prostate cancer in addition to potentially reducing the side effects of chemotherapy (Vucenik & Shamsuddin, 2006).

While dairy has the highest content of well-absorbed calcium, good sources of plant-based calcium include calcium-set tofu, and calcium fortified soy, almond, or oat milks. Although the soy and almond products are higher in oxalates, the larger amount of added calcium may overwhelm the oxalate present; calcium absorption from these fortified soy products was found to be equivalent to that from dairy products (Messina et al., 2022). Use plant milks in anything you use dairy milk in, like cereal, smoothies, soups, stews, and cream sauces. See '***Soy***' for uses of tofu. Vegetables like kale, mustard greens, Bok choy, broccoli, and Chinese cabbage also contribute calcium to the diet and are lower in oxalates than other calcium-rich vegetables (Theobald, 2005). These foods should therefore be included in your daily diet. Try them in coleslaws, salads, soups, stews, and chowders, or in your favourite morning smoothie.

**Nutritional Benefits for Specific Cancers:** An analysis has shown that for every 200 mg/day increase in calcium intake, the risk of colorectal cancer decreases by 6 percent (WCRF & AICR, 2018d). Calcium (and vitamin D) are important agents for the primary prevention of new, abnormal colorectal cell growth. It is important to note that some of the beneficial effect of calcium may be dependent or partially related to the simultaneous intake of vitamin D and that vitamin D has also been shown to reduce colon cancer risk without increased calcium intake. The protective effects of calcium against colorectal cancer hold whether calcium is obtained from the diet or supplements (WCRF & AICR, 2018e).

Some large population-based studies have demonstrated a protective effect of higher dietary calcium intake against both pre- and postmenopausal breast cancer with some showing a reduced risk of 20-34 percent (Larson et al., 2009; McCullough et al., 2005; Shin et al., 2002). However, other studies have demonstrated limited or non-significant benefits of a higher calcium diet and the evidence is still considered weak and limited (WCRF & AICR, 2018f).

There may be an increased risk of prostate cancer among men consuming higher amounts of dietary calcium, although the source of calcium may matter significantly. For example, the European Prospective Investigation into Cancer and Nutrition (EPIC) study analyzed the intakes of animal-based sources of calcium and protein in relation to prostate cancer risk in a group of 142,000 men (Allen et al., 2008). They found that a high intake of calcium (and protein) from dairy foods was positively associated with an increase in prostate cancer (Allen et al., 2008). However, calcium (and protein) from non-dairy sources was not associated with an increased risk of prostate cancer (Allen et al., 2008). This was also found to be true when examining several other studies

that looked separately at dairy and non-dairy sources of calcium (WCRF & AICR, 2018e). High levels of calcium may be a risk factor for prostate cancer and therefore excess calcium intake, particularly from dairy (Ahn et al., 2007; Allen et al., 2008), may not be beneficial (Rahmati et al., 2018). The WCRF & AICR (2018f) estimated that every 400 milligram increment in calcium intake may result in a 5 percent increased risk of prostate cancer, though evidence is not yet conclusive.

Additional cancer studies, particularly for prostate cancer, isolating the effect of plant-based sources of calcium from animal-based sources are required to provide more explicit recommendations for calcium intake.

## Citrus Fruit <<Back>>

**Why Eat Citrus:** Citrus fruits are not only a source of vitamin C, but they also contain high levels of flavonoids, which have been shown to interfere with tumour spreading and growth (Büchner et al., 2010; Kunimasa et al., 2010; Michaels et al., 2006).

**How to Eat Citrus:** Include all varieties of citrus fruit in your diet. Eat them raw and solo, drink them freshly pressed, as an addition to your water, or include them in salads, stews, chilis, curries and atop vegetables for a flavour and nutrition boost. Include some of the outer layer of the peel (zest) in sauces, dips, smoothies, salad dressings or baked goods whenever you can, as a lot of the cancer preventing and cancer fighting compounds are found in the peel (Hakim et al., 2000; Lorenzo et al., 2009; Miller et al., 2013). Even if you are not using zest in a particular recipe, still thoroughly wash and zest the fruit before juicing and then store the zest in a resealable bag in the freezer for future use.

**Nutritional Benefits for Specific Cancers:** Studies that have observed the dietary habits of large populations have found reduced incidence of lung cancer and colorectal cancer among people who eat citrus fruit on a regular basis (Büchner et al., 2010; Kunimasa et al., 2010; Michaels et al., 2006). When multiple cohort study results were grouped together in a meta-analysis the findings demonstrated an association between citrus consumption and a decreased risk of gastric cancers (Bae & Kim, 2016). To support these findings, a meta-analysis of three studies found that 100 grams of citrus fruit a day (equal to one small orange) lowered the risk of stomach (cardia) cancer by 24 percent (WCRF & AICR, 2018b). The benefits of citrus fruits are thought to be due to the phytochemical compounds in citrus (flavonoids included) which are anti-tumourigenic (Steinmetz & Potter, 1991). Additionally, citrus fruit consumption has been associated with lower risk of breast cancer (Song & Bae, 2013) and esophageal cancer (Zhao et al., 2018).

**Flavonoids and Nutritional Benefits for Specific Cancers**

**Ovarian Cancer Risk:** Evidence to date suggests that the intake of dietary flavonoids, including subclasses isoflavones and flavonols, have a protective effect against ovarian cancer, helping to reduce the risk of ovarian cancer and recurrence. More research is required on larger populations and among women undergoing ovarian cancer treatment, but current research, particularly for prevention, is promising (Hua et al., 2016).

**Thyroid Cancer Risk:** Significant data suggests that flavonoids may positively affect several parameters regarding thyroid cancer, including cell division, differentiation, and iodide uptake, which can be important during thyroid cancer therapy. Flavonoids have the potential to limit tumour growth and invasiveness, but more research is needed to determine possible side effects of pharmacological use or concentrated forms of these compounds. With that said, flavonoids found in whole foods are known to be safe for consumption and overall have shown health benefits in relation to cancer (Carlos et al., 2017).

## Cruciferous Vegetables <<Back>>

(Arugula, Bok choy, broccoli, broccoli sprouts, brussels sprouts, cabbage, cauliflower, collard greens, kale, kohlrabi, mustard greens, radish, turnips, watercress).

**Why Eat Cruciferous Vegetables:** Cruciferous vegetables contain a large variety of phytochemical compounds with anticancer activity (Chikara et al. 2018). Glucosinolates, which release isothiocyanates and indoles, are particularly known for their anti-cancer properties (Gingras et al., 2004; Verhoeven et al., 1996; Watson et al. 2013). Sulforaphane is a common type of isothiocyanate in cruciferous vegetables. This compound has been found to act as a protective antioxidant as well as play a role in cellular pathways relating to stress, cancer cell death (apoptosis), and cancer cell development and growth (Supic et al., 2013; Tortorella et al., 2015). Additionally, sulforaphane promotes the enzymes responsible for protecting cells from reactive metabolites (phase II enzymes) and inhibits the enzymes responsible for activating pro-carcinogens (phase I enzymes) (Tortorella et al., 2015). Sulforaphane may be effective against bladder, colorectal, gastric, kidney, lung, pancreatic, and prostate cancer (Chikara et al., 2018). In addition to the mechanistic research, observational studies have found that those who consume cruciferous vegetables regularly are less likely to develop cancer (Aune et al., 2017). Phenethyl isothiocyanate and indole-3-carbinol are other notable components in cruciferous vegetables with anti-cancer properties (Béliveau & Gingras, 2016).

**How to Eat Cruciferous Vegetables:** The formation of sulforaphane in cruciferous vegetables requires contact with an enzyme called myrosinase, which becomes inactivated with too much cooking. The amount of sulforaphane available in fresh broccoli is three times more than in steamed broccoli (Conaway et al. 2000). Therefore, raw, or light cooking techniques (e.g., steaming, stir-frying, microwaving) are ideal for maximizing the benefits of cruciferous vegetables (Béliveau & Gingras, 2016; Ferrarini et al., 2011; Vermeulen et al., 2008). One suggested technique is to chop the raw vegetable and let it sit for 30 minutes before lightly cooking. This allows the sulforaphane to develop and become heat resistant (Collins et al., 1988). This is another good reason to prepare ingredients ahead of time if possible. With that said, it is best to eat your cruciferous vegetables in a variety of raw or lightly cooked ways to preserve the cancer preventing and cancer fighting components (Higdon et al., 2007; Verkerk et al., 2009). Avoid boiling, blanching, or stewing, and chew your cruciferous vegetables very well to help with the release and absorption of sulforaphane (Béliveau & Gingras, 2016).

**Nutritional Benefits for Specific Cancers:** Overall, vegetable consumption has been found to reduce the risk of developing cancer (Chikara et al., 2018). Research suggests that cruciferous vegetables are a great component of the anti-cancer diet, particularly for the prevention and management of certain types of cancers (Higdon et al., 2007). In a large group of observational studies done in Italy and Switzerland, the consumption of cruciferous vegetables just once a week was found to be associated with a lower risk of many cancers (oral cavity/pharynx, esophagus, colorectum, breast, and kidney), when compared to occasional or no consumption of cruciferous vegetables (Bosetti et al., 2012).

A study of 51,928 African American women showed that those who ate two or more servings of vegetables a day (i.e., at least one cup of broccoli) had a significantly lower risk of breast cancer (estrogen and progesterone receptor negative). For premenopausal women, broccoli was shown to be the most protective, whereas collard green consumption was associated with a lower breast cancer risk at all ages (Boggs et al., 2010). Another study of five thousand Swedish women found that eating between one to two daily servings of cruciferous vegetables was linked to a 40 percent drop in the risk of developing breast cancer (Terry et al., 2001).

The Iowa Women's Health Study followed 35,000 women for decades and found that higher cruciferous vegetable intake was associated with lower risk of non-Hodgkin's lymphoma (Thompson et al., 2010).

An analysis pooling the results of 15 large international cohort studies did not find any significant preventative effect of cruciferous vegetables on prostate cancer (Pettimar et al., 2017). However, one study has shown that eating one serving of cruciferous vegetables per day was more effective than tomatoes at preventing the progression of prostate cancer after diagnosis (Richman et al., 2012).

Some scientists believe that *helicobacter pylori*, a common pathogenic bacterium in humans, can increase the risk of gastric cancers when combined with a high sodium diet (Gaddy et al., 2013). Sulforaphane from broccoli sprout extract has been shown to protect the stomach lining from oxidative damage and therefore other cruciferous vegetables high in sulforaphane may help to prevent stomach cancer caused by *helicobacter pylori* (Chang et al., 2015). A study compared stomach cancer patients to matched controls without cancer and found that those who ate more than one serving (1 cup) of raw cruciferous vegetables per week were almost 50 percent less likely to have stomach cancer than those who reported consuming between 0 to 0.4 servings per week (Morrison et al., 2019a). A similar case-control study found that every additional serving per week of cruciferous vegetables over the lowest reported weekly intakes resulted in an 8 percent lower risk of pancreatic cancer for cooked cruciferous vegetables and 15 percent lower risk for raw (Morrison et al., 2019b).

A meta-analysis combining results from 61 case-control and cohort studies indicated that a higher intake of cruciferous vegetables was associated with a 10 percent lower risk of colorectal cancer (Borgas et al., 2021). A similar meta-analysis found that higher cruciferous vegetable intake was associated with a 23 percent lower risk of lung cancer when looking at 13 case-control studies, though this was not found in the cohort studies (Lam et al., 2009). The benefit increased to 59 percent for individuals who were genetically predisposed to lung cancer (i.e., with the GSTT1 or GSTM1 genes).

Overall, there is a significant amount of evidence for the beneficial effect of cruciferous vegetables in preventing a variety of cancers.

## Fibre Rich Foods <<Back>>

(Legumes, whole grains, fibrous vegetables, and fruits)

**Why Eat Fibre:** Dietary fibre, both soluble and insoluble, is invaluable for chronic disease prevention, including cancer, cardiovascular disease, type 2 diabetes, and overweight and obesity (Evans, 2019; WCRF & AICR, 2018b). Fibre rich foods have been shown to reduce the risk of a variety of cancers and provide benefit while managing cancer during treatment. More specifically, when high fibre foods are broken down in our digestive tract, butyrate (a fatty acid) is generated by the colon, which is known to have cancer preventing activities (Supic et al., 2013). Several other mechanisms are likely at play depending on the type of cancer.

**How to Eat Fibre:** The WCRF & AICR (2018a) recommend eating minimally processed whole grains, legumes, vegetables, and fruits with every meal. Aim to get at least 30 grams of fibre per day in your diet (WCRF & AICR, 2018a). Use a healthy portion of fibre-rich foods in everything you make and eat. Use them in salads, soups, stews, curries, burritos, wraps, and all your favourite

baked goods. Choose whole grain products, such as brown rice, multi-grain or whole wheat bread, pasta, or crackers, over the standard refined grain or white flour products.

**Nutritional Benefits for Specific Cancers:** Individuals who eat a healthy plant-based diet have been shown to have a reduced risk of certain cancers (Chen et al., 2015). One of the major benefits of a plant-based diet is the high amount of fibre. There is strong evidence that consumption of whole grains and other foods rich in dietary fibre protect against colorectal cancer (WCRF & AICR, 2018b). A high fibre diet can impact the overall health of the colon as fibre increases transit rate of the bowels, thereby reducing carcinogens and their surface contact with the bowel wall (Marsh et al., 2012). When comparing colon environments between vegetarians and meat-rich diets, those with vegetarian diets had lower colonic cell proliferation, differing intestinal bacteria, and lower levels of fecal enzymes and mutagens (Marsh et al., 2012).

There is also evidence from meta-analyses combining data from multiple large population studies to suggest that higher whole grain intake combined with higher total dietary fibre intake result in a 22 percent decreased risk of ovarian cancer (Huang et al., 2018) and a 28 percent decreased risk of bladder cancer (Yu et al., 2020). Similar analyses with more limited numbers of available studies found modest but significant reductions in the risk of pancreatic cancer (47 percent), breast (7-15 percent) and kidney cancers (16 percent) as well (McCrae, 2018; Wang et al., 2015). Further population-based studies are needed to confirm these results.

For breast cancer, a meta-analysis was conducted with results from 16 studies following women and their fibre intake. The results showed that women who consumed the most fibre had a lower risk of breast cancer, regardless of other risk factors and importantly, it was fibre from whole grains that provided the greatest risk reduction (Aune et al., 2012). In addition, coloured rice (red, purple, and black rice) was shown to have anticancer effects against breast cancer and leukemia cells (Pintha et al., 2015; Suttiarporn et al., 2015).

A Yale University research study found that premenopausal women who ate more than six grams of soluble fibre per day had a 62 percent lower risk of breast cancer compared with women who consumed less than four grams per day (Li et al., 2013). Fibre benefits were found to be even stronger for estrogen receptor negative (ER-) breast tumours; premenopausal women who had more than six grams of soluble fibre a day were 85 percent less likely to develop ER- breast cancer (Li et al., 2013). This type of ER- breast cancer is less likely to respond to hormone therapy and is associated with poorer prognosis. Sources of soluble fibre include barley, oats, chia or flaxseed, apples, blackberries, figs, guavas, oranges, pears, prunes, avocado, garlic, onion, cooked dried beans, peas, soy and other legumes, and psyllium husk (Alberta Health Services, 2021).

In addition, diets high in fibre are normally less processed and more nutrient dense helping to regulate energy intake (calories in versus calories spent). These characteristics all help to maintain a healthy body weight, protecting against obesity, and 12 different obesity-related cancers (WCRF

& AICR, 2018b). Furthermore, scientists have found that being overweight reduces the likelihood of cancer survival compared to those of normal weight (Calle et al., 2003).

## Flaxseeds <<Back>>

**Why Eat Flaxseeds:** Flaxseeds are packed with nutrients providing a great source of vitamins, minerals, and fibre, as well as lignans and omega-3 fatty acids (Rock et al., 2012). Lignans are phytonutrients that have demonstrated antioxidant, anti-inflammatory, and chemopreventive properties (De Silva & Alcorn, 2019). Flaxseeds are one of the highest dietary sources of lignans - one teaspoon of flaxseed contains 13 mg of lignans (Thompson et al., 2006). Many observational studies have shown that flaxseed consumption is associated with a lower risk of breast cancer and overall better prognosis (Calado et al., 2018). Some limited clinical studies also suggest that flaxseed may help with the prevention and management of cardiovascular disease and type 2 diabetes (Parikh et al., 2019). However, more research is needed in human clinical studies.

**How to Eat Flaxseeds:** Freshly ground seeds are best or grinding and storing the flax in a dark area (such as the fridge or freezer) to maintain the freshness of oils for future use is recommended (Malcolmson et al., 2000). Ground flaxseeds are more easily digested and absorbed compared to whole seeds (Calado et al., 2018; Kuijsten et al., 2005). Use flax in baking in lieu of eggs. One tablespoon of ground flaxseed plus three tablespoons of water mixed together and allowed to sit for 7-10 minutes is equal to one egg when substituted in cakes, muffins, cookies, pancakes, waffles or French toast recipes. When baking with ground flaxseed, there is no need to worry about damaging the lignans or omega-3 fatty acids as baking does not damage its oils (Hyvarinen et al., 2006; Cunnane et al., 1995). Add them to all your baked goods, snack bars, smoothies, shakes, dressings, breadings, burgers and atop your favourite salads.

**Nutritional Benefits for Specific Cancers:** Lignans may function to prevent cancer and tumour development through a wide range of mechanisms (De Silva & Alcorn, 2019). One of these mechanisms is through their role as phytoestrogens. Phytoestrogens can play a role in hormone-dependent cancers such as breast cancer by minimizing the effects of the body's own estrogen on cancer development (Cotterchio et al., 2008; Smeds et al., 2007). Dietary lignans and other phytoestrogens have been found in observational studies to be associated with a reduced risk of certain cancers such as prostate, breast, and colorectal (Cotterchio et al., 2006). An observational study found that women who consumed 5.4 mg of lignans per day had a significantly lower risk of developing breast cancer (Cotterchio et al., 2008). Moreover, in a group of Canadian women, regular consumption of flaxseed (or flax bread) lowered their risk of breast cancer by 20-30 percent (Lowcock et al., 2013).

However, these effects may be limited to postmenopausal women. A meta-analysis of 21 prospective cohort and case-control studies did not find a general association between lignans and

breast cancer (Buck et al., 2010). Yet when the researchers looked at a subset of 13 studies that only included postmenopausal women, they found that there was a significant association between high lignan intake and a reduction in breast cancer risk (Buck et al., 2010). This protective effect of dietary lignans in postmenopausal women was also found by another group of researchers (Velentzis et al., 2009).

Dietary flaxseed consumption has the potential to reduce tumour growth in patients with breast cancer and may be a potential adjunct to currently used breast cancer drugs (Thompson, 2005). Among women with breast cancer, those who had high levels of lignans in their bloodstream appear to have a longer survival rate when compared to those who do not consume lignans or have lower levels measured in their blood (Buck et al., 2011; Guglielmini et al., 2012; McCann et al., 2010).

There is also evidence that flaxseed supplementation may slow the progression of prostate cancer after diagnosis. In a randomized trial, men with prostate cancer who were given 30 g per day of ground flaxseed for 30 days were found to have significantly less cancer cell growth when compared to those not provided with flaxseeds (Demark-Wahnefried et al., 2008).

Lignans may also have a protective effect on digestive cancers. In a meta-analysis that combined data from two case-control studies, dietary lignan intake was associated with a 40 percent lower risk of upper aero-digestive tract cancers (larynx, esophagus, and pharynx) (Grosso et al., 2017). Further, in an Ontario-based study, 0.26 mg or more per day of dietary lignans was found to be associated with a 27 percent reduction in colorectal cancer risk (Cotterchio et al., 2006).

Although current evidence is promising, more human research is still needed to expand on the beneficial effects that flaxseeds and their lignans compounds may have on breast, prostate, and digestive cancer (Grosso et al., 2017).

## Garlic <<Back>>

**Why Eat Garlic:** Garlic, an allium vegetable, is an essential food for dietary based chemopreventive strategies (Boivin et al., 2009). Allium vegetables have been shown to have beneficial effects at each stage of carcinogenesis and may affect many biological processes that modify cancer risk (Nicastro et al., 2015). The principal bioactives in garlic are the sulfur compounds allicin and its by-products, diallyl sulfide (DAS) and diallyl disulfide (DADS), although there are at least 17 others with anticancer activity (Béliveau & Gingras, 2016). These compounds inhibit the enzymes responsible for activating carcinogens while at the same time stimulating enzymes responsible for the elimination of carcinogens. As a result, the cells become less exposed to carcinogens and less susceptible to DNA damage that would otherwise lead to cancer development (Demeule et al., 2004). In addition to its anticancer activity, garlic may also

contribute to reducing cardiovascular disease, high blood pressure, and type 2 diabetes (Ansary et al., 2020).

**How to Eat Garlic:** Eating garlic raw is best in terms of its health benefits as heating lowers the amount of a cancer-protective compound. Heating results in the denaturation of the enzyme alliinase, which leads to decreased allicin and its bioactive by-products. For best results, use it raw in salad dressings, dips, hummus, salsa, and pesto. Alternatively, crushing the garlic and allowing it to rest for 10 minutes before cooking will allow the beneficial allicin to develop (Nicastro et al., 2015).

**Nutritional Benefits for Specific Cancers:** Observational research suggests that garlic may play an important role in the prevention or progression of digestive system cancers, particularly gastric, colon, stomach, and esophageal cancers (Béliveau & Gingras, 2016; Nicastro et al., 2015). Laboratory based research has shown that garlic is the choice food to suppress the growth of brain, lung, pancreatic, prostate, and stomach cancer cells (Chu et al., 2002). A meta-analysis combining results of multiple observational studies found an overall 35 percent reduced risk of gastric cancer and 25 percent reduced risk of colorectal cancer with higher vs. lower intake of garlic (Wang et al., 2022). Results tend to be more positive in Asian populations where garlic consumption is much higher than in Western populations, which may explain some of the inconsistent results observed between studies (Wang et al., 2022).

Another meta-analysis combining results from 11 case-control studies found a 26 percent reduced risk of upper aero-digestive squamous cell carcinoma (Guercio et al., 2015) and one combining results from nine observational studies found a 23 percent lower risk of prostate cancer with higher garlic consumption (Zhao et al., 2013). An analysis that pooled data from eight different studies found a 26 percent lower risk of head and neck cancers with higher garlic consumption (Galeone et al., 2015). It is noteworthy, however, that although this evidence is very suggestive of a protective role for garlic, it is still very limited and requires confirmation from additional studies.

## Ginger and Ginseng <<Back>>

**Why Eat Ginger:** The aromatic ingredient in ginger, gingerol, has anti-cancer activity in addition to other medicinal properties. A study showed that gingerol was found to strongly inhibit the development of blood vessels (angiogenesis) for tumours and their growth by blocking two key angiogenesis stimulating proteins (Kim et al., 2005). Ginger may also work as an anti-vomiting agent effective in countering nausea during chemotherapy, radiation and after surgery (Palatty et al., 2013).

**Why Eat Ginseng:** Ginseng is believed to have many anti-inflammatory actions in the human body caused by its bioactives known as ginsenosides (King & Murphy, 2007).

**How to Eat Ginger:** Ginger is great in both sweet and savoury recipes. Drink it as a tea (iced or hot), add it to smoothies, soups, salad dressings, marinades, your favourite stir fry, and all of the whole grain baked goods including fruit crisps, crumbles, cookies, muffins, and cakes. To maximize its benefits related to reducing nausea eat it with a plant-based protein.
**How to Eat Ginseng:** Ginseng has more of a bitter taste than ginger and is more commonly found in supplement form, but it can be used in cooking as well. Fresh ginseng can be boiled and made into a tea, or it can be incorporated into soups as well.

**Nutritional Benefits for Specific Cancers:** Ginger and its active components have anti-inflammatory and anti-mutagenic properties that have been shown to suppress the growth of cancer cells and induce cellular death (apoptosis) for a variety of cancers including skin, ovarian, colon, breast, cervical, oral, renal, prostate, gastric, pancreatic, liver, and brain (Prasad & Tyagi, 2015).

In addition to its anti-carcinogenic effects, ginger has been found to possibly improve nausea. A review of seven studies that tested the benefits of ginger for nausea and vomiting caused by chemotherapy found mixed results, with three of the studies demonstrating a beneficial effect of ginger, two studies indicating possible benefit, and two finding no effect (Marx et al., 2013).

Ginger has also been found to improve the severity of acute chemotherapy-induced nausea in breast cancer patients (Totmaj et al., 2019).

Ginseng has been found to improve fatigue in cancer patients (Barton et al., 2013). In a randomized control trial, 2000 mg per day of American ginseng was supplemented to cancer patients and was found to significantly improve cancer-related fatigue after eight weeks of supplementation when compared to a placebo (Barton et al., 2013). Other studies in patients with colon cancer also found beneficial effects of ginseng for cancer-related fatigue (Pourmohamadi et al., 2018).

## Grapefruit <<Back>>

**Why Eat Grapefruit:** Grapefruit has a high content of the flavonoid apigenin, which has been shown to contain antioxidant and anti-inflammatory activity and may aid in reducing cancer cell growth without affecting normal cells (Cirmi et al., 2016). Two other flavonoids found in grapefruit, naringin and naringenin, are anti-carcinogenic and may reduce the risk of cancer cell initiation, promotion, and progression (Cirmi et al., 2016). Another phytonutrient, bergapten, reduces cancer cell proliferation and induces death (apoptosis) in breast cancer cells, and reduces the viability of colon, colorectal, and lung cancer cells (Quetglas-Llabres et al., 2022).

Additionally, grapefruit is a source of lycopene (also found in tomatoes, papaya, and watermelon), which has been noted as a powerful antioxidant and for its potential in reducing prostate cancer

risk (Rowles et al., 2017; Seren et al., 2008). Evidence suggests that lycopene may assist in various mechanisms related to mutagenesis, carcinogenesis, cell differentiation, and proliferation, thus potentially preventing cancer (Seren et al., 2008).

**How to Eat Grapefruit:** It is recommended to eat grapefruit in its whole food form more often than juice, as the fibre present in the whole food is also beneficial to health. Add slices to your smoothies, fruit or vegetable salads, parfaits, and baked goods. Enjoy it on its own or placed briefly under a broiler to brown and caramelize its natural sugars.

**Nutritional Benefits for Specific Cancers**: Grapefruit falls under the class of citrus fruits that have been shown to be protective against gastric cancer; overall, evidence is considered to be limited but suggestive of decreased risk (WCRF & AICR, 2018b). Specific to grapefruit, studies have shown that apigenin can induce cell death (apoptosis) in breast cancer cells and leads to cell cycle arrest in cancers including breast, ovarian, prostate, colon, and thyroid (Cirmi et al., 2016).

A study using an animal model found that consumption of grapefruit or its flavonoids may help to control the development of colon cancer (Cirmi et al., 2016).

However, one cohort study has shown an increased risk of breast cancer among post-menopausal women who were the highest consumers of grapefruit, and this may have been associated with an increase in circulating estrogen (Monroe et al., 2007) possibly when combined with certain medications. More research in humans is needed to better understand the relationship between grapefruit and different types of cancers.

*Those who are concerned about breast cancer may choose to avoid or limit their intake of grapefruit. Otherwise, grapefruit may be included as one of a wide variety of citrus and other fruits that contribute to health.*

*Note: Some cancer medications cannot be taken with grapefruit as it may interfere with their function. Please ask your health care team if grapefruit is safe for you to consume.*

**Things that Affect Flavonoids in General**

When selecting and preparing flavonoid rich foods, selecting ripe or near ripe produce, storing them appropriately, and when the time comes applying healthier cooking methods, are all important ways to retain or influence the concentration of the flavonoids present (Holland et al., 1995; Robards and Antolovich 1997; Pascual-Teresa et al., 2000; Modak et al., 2011). Cooking methods such as boiling or frying may decrease the amount of the flavonoids present in the food. However, methods like sautéing do not seem to affect the flavonoid content (Ioku et al, 2001). Other factors to note that may decrease flavonoid content in food include: purchasing fresh, not-local, produce out of season, have been stored for a prolonged period, heating flavonoid rich foods at high temperatures for long periods of time, and discarding the flavonoid rich peels of fruits and vegetables (Harnly et al., 2006).

## Green Tea <<Back>>

**Why Drink Green Tea:** Green tea is high in epigallocatechin gallate (EGCG), a type of catechin from the flavonoid family and has been shown to inhibit tumour growth, development of blood vessels for tumour growth (angiogenesis) and promote cancer cell death (apoptosis). Studies conducted in laboratories, and in humans in clinical and observational studies have reported that drinking green tea may decrease cancer risk in addition to reducing inflammation in the body in general (Ohishi et al., 2016; Suganuma et al., 2016; Supic et al., 2013; Yang et al., 2008).

**How to Drink Green Tea:** How green tea is prepared can significantly affect the amount of catechins present. When drinking green tea, allow the tea leaves to steep in boiling water for five minutes to aid in the extraction of the catechins present in the tea leaves and increase the concentration of catechins in the tea (Shishikura & Khokhar, 2005). Whether or not the tea is decaffeinated may affect its catechin content. In a study analyzing 18 different teas, decaffeinated green tea appeared to contain less catechins than a regular caffeinated tea. This may have to do with the processing needed to remove the caffeine and not the caffeine itself (Henning et al., 2003). Remember also to drink your tea one to two hours prior to or after eating, as the caffeine and tannins present may inhibit nutrient absorption, particularly iron and zinc and to a lesser extent calcium. Ensure that the tea is not too hot upon drinking though as high-temperature green tea may be a factor in higher gastric cancer risk (Huang et al, 2017).

**Nutritional Benefits for Specific Cancers:** EGCG has been shown to induce histone modifications in human melanoma cells (Supic et al., 2013). In animal studies, catechins in green tea have been shown to inhibit the growth of skin, lung, oral, esophagus, stomach, small intestine, colon, bladder, liver, pancreas, prostate, and breast cancer (Yang et al., 2008).

A systematic review and meta-analysis of observational, population-based studies by Guo et al. (2017) found that a higher daily intake, seven cups or more of green tea significantly lowered the risk of prostate cancer. Another similar review and analysis found that drinking six cups of green tea per day was associated with a lower risk of gastric cancer, especially for those who drank high amounts long term (Huang et al, 2017). There have also been significant associations made in regard to green tea and ovarian cancer prevention and treatment supporting the use of green tea and its components in a clinical environment (Trudel et al., 2012). A study in China researching green tea and ovarian cancer showed that a high intake of green tea after diagnosis is associated with an increased chance of survival (Zhang et al., 2004).

However, another large meta-analysis of studies covering 26 different forms of cancer did not find any convincing evidence of a preventative effect of green tea (Zhou et al., 2021). The exception was for lymphoid neoplasm for which risk was reduced by 28 percent with the highest tea consumption, or 5 percent reduction for every one cup of green tea (Zhou et al., 2021).

Although there is much evidence for a benefit of green tea, more population-based research is needed to confirm this finding for various cancer types.

## Healthy Plant-based Oils <<Back>>

(Used sparingly)

**Why to Eat Plant-based Oils:** Contrary to popular belief, fats are not the primary reason for obesity, and dietary fats are an essential and beneficial component of the diet, in appropriate amounts. They can be incorporated into a healthful diet to reduce the risk of cancer and other diseases. Specifically, plant-based vegetable oils, used in moderation, have been shown to have some health benefits related to cancer. The Mediterranean diet is an example of a diet rich in healthy fats, particularly olive oil, which has been shown to have health benefits including protective effects against cancer (Han et al., 2015). Moreover, plant-based fats are good sources of vitamin E, an important nutrient and antioxidant to include in an anti-cancer diet.

**How to Eat Plant-based Oils**: Healthy fats should be used sparingly as part of an anti-cancer diet. Plant-based fats can be added to salad dressings, used in cooking, in baked goods, or lightly drizzled over roasted vegetables. Ensure that the oils used for cooking have higher smoke points to avoid creating free radicals when heating them. Oils like avocado, coconut, grapeseed, and sesame are best for higher temperature cooking. Avocados and nut butters can be used instead of butter or margarine on toast, and they add additional flavour, fibre, and protein as well as healthy fats.

**Nutritional Benefits for Specific Cancers:** A meta-analysis of observational studies on different types of dietary fat intake found an inverse relationship between polyunsaturated fat, vegetable fat

consumption, and risk of gastric cancer, and that saturated fat may increase the risk of gastric cancer (Han et al., 2015). Polyunsaturated fat sources were associated with a reduced risk of ovarian cancer (Merritt et al., 2014) and monounsaturated fat was associated with a 27 percent lower risk of bladder cancer among women (Dianatinasab et al., 2022).

Two large cohort studies, the Nurses' Health Study I and II, both found that women who consumed higher amounts of vegetable fat were less likely to develop breast cancer later in life (Frazier et al., 2003; 2004). In the Nurses' Health Study I, butter consumption was associated with an increased risk of breast cancer (Frazier et al., 2003). Moreover, there is research that suggests olive oil or other sources of monounsaturated fatty acids may modestly decrease breast cancer risk and that higher intake of vegetable oils is not associated with a higher risk of breast cancer (Kushi & Giovannucci, 2002; Xin et al., 2015). However, a recent meta-analysis of 44 observational studies did not find any protective effect of mono- or poly-unsaturated fats on breast cancer risk but did find some evidence for an increased risk of breast cancer associated with higher saturated fat intakes among post-menopausal, but not premenopausal, women (Lodi et al., 2022).

On the flip side, a meta-analysis of multiple studies has shown that total dietary fat derived from animal sources was associated with an increased risk of non-Hodgkin's lymphoma (Han et al., 2017). Similarly, decreasing the amount of unhealthy fats, such as from red and processed meats, has been shown to decrease the risk of colon, prostate and potentially breast cancer (Kushi & Giovannucci, 2002; Xin et al., 2015). Saturated and trans fats were also associated with an increased risk of ovarian cancer risk in a meta-analysis of population-based studies (Qui et al., 2016). In an analysis that pooled data from 11 cohort studies, animal fat intake was associated with dramatically increased risk of bladder cancer, and cholesterol intake was associated with an increased risk of bladder cancer among men (Dianatinasab et al., 2022). When assessing available observational studies in a meta-analysis, the WCRF & AICR (2018d) have found some limited evidence for an increased risk of pancreatic cancer with higher intakes of saturated fat.

Overall, while results are somewhat limited, there is a general tendency towards evidence for saturated or animal source fats to be associated with an increased risk of some cancers, and unsaturated fats to have a protective effect on risk of some cancers.

## Herbs <<Back>>

(Fenugreek, oregano, thyme, basil, mint, cilantro, rosemary, and parsley)

**Why Eat Herbs:** Aside from increasing flavour without additional salt, sugar or unhealthy fat, herbs are full of beneficial phytochemicals that are key to include in an anti-cancer diet. They are particularly rich in beta-carotene and a variety of flavonoids (Craig, 1999). Peppermint leaf was shown to be one of the most common herbs highest in antioxidants (Carlsen et al., 2010).

Apigenin, a flavonoid with a high content in parsley, has been shown to have anti-cancer effects,

specifically in promoting cancer cell death (apoptosis) and inhibiting cancer cell motility and invasion (metastasis) for a variety of cancers including colorectal, breast, liver, lung, melanoma, prostate, and osteosarcoma (Yan et al., 2017).

Luteolin is another flavonoid found in herbs such as mint, parsley, and thyme, that has demonstrated it can inhibit cancer cell proliferation, blood vessel development for tumours (angiogenesis), and metastasis, and can induce cancer cell death (apoptosis) (Dei Cas & Ghidoni, 2018).

Oregano and thyme are shown to contain high levels of an antioxidant phenolic compound called rosmaricin that suppresses the growth of tumour blood vessels (angiogenesis) (Huang & Zheng, 2006; Kruma, et al., 2008; Viuda-Martos, et al., 2010). Rosmarinic acid is also found in other dietary spices such as mint, sweet basil, rosemary, and sage (Huang et al., 2010).

Rosemary contains three other key components that have been associated with cancer prevention in pre-clinical studies including carnosic acid, carnosol and rosmanol (Zheng et al., 2016). Fenugreek leaves and seeds contain diosgenin, which has demonstrated anti-cancer activities, particularly in colorectal cancer cells (Hossain et al., 2022).

**How to Eat Herbs:** Raw or cooked, herbs are excellent nutrition- and flavour-packed additions to all sorts of foods: soups, salads, sandwiches, smoothies (try adding basil, cilantro, or mint to your next smoothie), marinades, dressings, etc. Basil pesto is an easy and flavourful way to get a large dose of fresh herbs in your diet. Try adding chopped fresh herbs like parsley, mint, or basil to mixed salads for 'next level' flavour and freshness.

**Nutritional Benefits for Specific Cancers:** Oregano can help to combat the DNA damage that is caused by radiation therapy used for thyroid cancer, thereby acting as a potent radioprotective herb (Arami et al., 2013).

One case-control study showed that higher intakes of apigenin from any plant source was marginally associated with decreased risk of ovarian cancer (Gates et al., 2009). Another similar study conducted in Italy found that a high intake of sage was associated with a lower occurrence of lung cancer (Fortes et al., 2003). Evidence for the protective effect of herbs from population studies like these are very limited and will need to be confirmed by additional studies.

Note: Other Chinese herbs such as berberine and nigella sativa also contain anti-cancer compounds for which current research appears promising. However, more studies need to be done in humans to conclusively confirm their benefits (Khan et al., 2011; Ortiz et al., 2014).

## Hot Peppers <<Back>>

**Why Eat Hot Peppers:** People who eat red hot chili peppers are more likely to live for longer (Chopan & Littenberg, 2017). The heat producing chemical in hot peppers, capsaicin, has been shown to have pain modulation and cancer preventing properties (Bley et al., 2012). Capsaicin has several anti-cancer properties including inducing cell death (apoptosis), inhibition of tumour blood vessel development (angiogenesis) and metastasis and cell growth arrest (Adetunji et al., 2022; Clark & Lee, 2016). A study showed that capsaicin suppresses angiogenesis by acting on the cellular pathways involved in the production of nitric oxide by endothelial cells (cells that line blood vessel walls) (Min et al., 2004).

**How to Eat Hot Peppers:** Eat them raw, cooked in your favourite dishes or pickled! Hot peppers are a great addition to curries, stews, chilis, gumbos or on sandwiches, salads, and whole grain pizza!

**Nutritional Benefits for Specific Cancers:** The anti-cancer activities of capsaicin have been observed in various cancer cells including those of the pancreas, colon, prostate, liver, esophagus, bladder, skin, leukemia, lung, and endothelial cells (Clark & Lee, 2016).

A small meta-analysis including three prospective cohort studies found that consumption of chili or black pepper, compared to no or rare consumption, was associated with a 26 percent lower rate of death attributed to cancer (Kaur et al., 2022). Yet, other findings have been less clear (Bley et al., 2012) with much debate over the role of capsaicin and cancer (Bode & Dong, 2011). Research from Mexico found high chili pepper consumption was related to an increased risk of gastric cancer (López-Carrillo et al., 1994) and research from Chile found an increased risk for gallbladder cancer (Serra et al., 2002). In contrast, a large cohort study from China of more than half a million adults found that the consumption of chili in various forms six or seven days per week was associated with a decreased risk of esophageal and stomach cancers, while the effect on colorectal cancer was marginal (Chan et al., 2021). Chili peppers may interact with *Helicobacter pylori* infections, and certain high-risk genes, to increase the risk of some gastrointestinal cancers and this could potentially explain some of the very different outcomes in different populations (Lopez-Carillo et al., 2012).

If you suspect you have a *Helicobacter pylori* infection or live in an endemic area, you may wish to avoid or limit your intake of hot chili peppers to reduce the risk of certain types of cancers. Otherwise, the potential benefits of hot chili peppers may be enjoyed as one of a wide variety of vegetables consumed.

Chili peppers are not just useful as food but can also be used topically (on the skin) as capsaicin cream. Topical application of capsaicin has been shown to help relieve various types of pain,

although the effectiveness and safety is still debated (Mason et al., 2004). In a group of 99 cancer survivors with postsurgical neuropathic pain who were treated with capsaicin (0.075 percent) four times per day, the capsaicin treatment was more effective compared to placebo (Ellison et al., 1997). Specifically, the capsaicin-treated site was found to have an average pain reduction of 53 percent, compared to 17 percent on the placebo treatment (Ellison et al., 1997). Further, a systematic review and meta-analysis that looked at six randomized control trials (including the one mentioned previously) found that although topical capsaicin was statistically better than placebo for the treatment of both neuropathic and musculoskeletal pain, the extent of the effectiveness was quite low (Mason et al., 2004). Moreover, the use of topical capsaicin was also found to have side effects with one third of patients experiencing local adverse events. In addition, the safety of long-term use of capsaicin for chronic pain has not been well researched. The reviewers concluded that topical capsaicin should not be generally recommended. However, it may be useful for some who are not responsive to or unable to use other treatments (Mason et al., 2004).

## Low Glycemic Whole Foods <<Back>>

(Includes most fruits, nuts, seeds, legumes, and whole grains, as well as green vegetables like broccoli, collard greens, kale, and spinach, and other vegetables like cauliflower, celery, and zucchini)

**Why Low Glycemic Whole Foods:** Low glycemic foods (which are made up of mostly whole, unprocessed plant-based foods) help to regulate blood sugar levels keeping us satiated for longer and without dips and spikes in our blood sugar and insulin levels. This is important to our health and risk of cancer as studies have shown an association between high glycemic loads, insulin spikes, and the occurrence of cancer (Donaldson, 2004). Higher glycemic load, resulting in larger spikes in blood sugar, has also been strongly associated with the development of type 2 diabetes (Livesey et al., 2019) and coronary heart disease (Fan et al., 2012).

**How to Eat a Low Glycemic Diet:** A low glycemic diet is very consistent with the general recommendations for chronic disease prevention, including cancer (see '**Introduction**'). Eat plenty of fruits and vegetables, whole grains, healthy sources of protein and fats, and limit refined carbohydrates and sweets (Harvard Medical School, 2014).

**Nutritional Benefits for Specific Cancers:** A meta-analysis combined the results from 88 observational studies on glycemic index or glycemic load of the diet and risk of several different cancer types (Turati et al., 2019). The researchers concluded that higher *vs.* lower glycemic index of the diet was associated with a 20 percent increased risk of colorectal cancer, a 25 percent increased risk of bladder cancer, and a 16 percent increased risk of kidney cancer. These results likewise suggest that diets with low glycemic index are protective against these types of cancer. The WCRF & AICR (2018d) also concluded from their meta-analyses that for every 50 unit increase in glycemic load, the risk of endometrial cancer increased by 15 percent.

There have been some inconsistencies in the results of meta-analyses looking at other forms of cancer, as some individual studies have shown associations between high glycemic index or load and elevated risk of breast, ovarian, gastric or lung cancers but the overall result is not significant. However, this may be related to differences in the methods of analysis used and additional studies may lead to a more consistent picture (Turati et al., 2019).

## Mixed and Leafy Greens <<Back>>

**Why Eat Greens:** Individuals who eat green leafy vegetables and salads are more likely to live longer (Aune et al., 2017). Research shows that salad greens (a variety of lettuces) are important polyphenol sources. In laboratory-based studies, polyphenols inhibit the growth of tumour blood vessels (angiogenesis) (Heimler et al., 2007; Steevens et al., 2011) and provide interceptor molecules that prevent some of the mutations that can cause cancer (Benaron et al., 1997). Red leaf lettuce extracts were shown to have anti-tumour activities in lung, hepatoma, colon, and colorectal adenoma cancer cell lines (Qin et al., 2018).

**How to Eat Greens:** Chicory has the highest content of polyphenols, however, all lettuce varieties including spinach, red and green leaf lettuce, Boston lettuce, frisée, romaine, iceberg and arugula have been shown to contain quercetin, another antiangiogenic polyphenol. Therefore, select a variety of lettuce greens for overall chemopreventive health (Heimler et al., 2007; Steevens et al., 2011). Enjoy these in your favourite mixed salads.

**Nutritional Benefits for Specific Cancers:** A meta-analysis combining data from six studies found that every one serving of green leafy vegetables was associated with a 10 percent reduction in risk of bladder cancer (Xu et al., 2015). A large epidemiological study showed that daily lettuce intake was associated with a reduced incidence of a type of esophageal cancer (Steevens et al., 2011). A Mayo Clinic study showed that those who ate five or more servings of green leafy vegetables per week had half the odds of getting lymphoma, compared to those who ate less than one serving per week (Holtan et al., 2012).

The Iowa Women's Health Study found that individuals who ate more than six servings of leafy greens such as spinach per week were almost half as likely to develop lung cancer when compared to individuals who ate few leafy greens (Steinmetz et al., 1993). Another study suggested that a diet rich in fruits and vegetables, particularly leafy greens such as spinach, could lower the risk of a common skin cancer called squamous cell carcinoma by 54 percent (Ibiebele et al., 2007). While very encouraging, further observational studies are needed to confirm these results.

## Mushrooms <<Back>>

**Why Eat Mushrooms:** Mushrooms are used in complementary and alternative medicine as part of treatment for diseases, including certain cancers (Ayeka, 2018). They are rich in dietary fibres and other important anticancer compounds, thereby playing a role in a cancer preventative diet (Akramiene et al., 2007; Manzi et al., 2004). In addition, sun-dried or UV radiation exposed mushrooms are a plant-based source of vitamin D (Cardwell et al., 2018), an important vitamin for overall health and possibly protection against some cancers (Hossein-nezhad & Holick, 2013). The cell walls of mushrooms are made up of complex sugars. Beta-glucans are among the complex sugars that have been shown in laboratory studies to regulate immune function, suppress growth of tumour blood vessels (angiogenesis), and stop tumour growth (Chan et al., 2009). Lectins are another bioactive compound found in mushrooms that exhibit promising anticancer properties by deterring cancer cell growth and angiogenesis as well as promoting cancer cell death (apoptosis) (Novaes et al., 2011).

**How to Eat Mushrooms:** Studies show that the amount of beta-glucans in mushrooms vary and seem to be impacted more by the life stage of the mushroom than the variety or method of preparation (Akramiene et al., 2007; Manzi et al., 2004). Ongoing studies are being conducted to determine life stage of mushrooms and beta-glucan content, so eating a variety of edible mushrooms (fresh or dry) is recommended (Akramiene et al., 2007; Manzi et al., 2004).

Mushrooms also contain ergosterol, which is converted to a bioactive form of vitamin D when exposed to UV light (Cardwell et al., 2018). As vitamin D may also have anti-cancer properties (see '***Vitamin D***'), it is recommended to slice your mushrooms, then leave them exposed to sunlight for 15 minutes to 1 hour prior to cooking.

For health and safety purposes, it is best to eat mushrooms cooked (Nguyen et al., 2012). Try them in a mushroom stroganoff or bourguignon, in soups, chowders, pastas, veggie meatballs and burgers or simply sauteed with garlic and eaten on whole grain toast.

**Nutritional Benefits for Specific Cancers:** Many studies have been undertaken looking at the role of mushrooms, and their extracts, in cancer prevention and treatment. Nowakowski et al. (2021) summarized results from laboratory, animal, and human clinical studies using extracts from 92 different species and 38 cancer types. They concluded that extracts demonstrate anti-cancer activity such as inhibiting cancer cell proliferation and inducing cancer cell death by apoptosis or autophagocytosis (i.e., breakdown of components in the cell). A cell model (*in vitro*) study looking at intake of isolated polysaccharides from white button mushrooms demonstrated their ability to inhibit the growth of certain breast cancer cells (Jeong et al., 2012). Research exploring the benefits of Chaga mushrooms, which grow on birch trees, found that a water extract of chaga inhibited the growth and differentiation of melanoma cells in cell and animal model studies (Youn et al., 2009).

A meta-analysis of 10 observational studies indicated that a higher *vs.* lower consumption of mushrooms was associated with a 34 percent lower risk of cancer (all types combined) and a 35 percent lower risk of developing breast cancer (Ba et al., 2021). Results were not significant for prostate, ovarian, stomach, liver, or colorectal cancer but the number of available studies for those outcomes was limited.

Further, a meta-analysis looking at 13 randomized controlled trials found that a mushroom and herbal preparation called Yun Zhi taken along with conventional anti-cancer treatments resulted in an increased chance of survival compared to the conventional cancer treatment alone for breast, colorectal, and gastric cancers (Eliza et al., 2012). Studies have shown that the inclusion of the Yun Zhi preparation allows for better control of cancer, especially in chemotherapy (Eliza et al., 2012).

A review of various types of mushrooms or fungi (e.g., *Agaricus blazei* Murill, *Agaricus silvaticus*, *Coriolus versicolor* extract) given with conventional cancer therapies indicates they may help reduce side effects and result in improved immune function, sleep, emotional, and physical state, and counter the effects of fatigue, loss of appetite, anxiety, hair loss, and nausea (Plácido et al., 2022). Nonetheless, the quality of studies to date is poor and improved protocols are recommended for these promising adjuvant therapies.

## Nuts <<Back>>

**Why Eat Nuts:** Nuts are full of healthy nutrients including dietary fibre, unsaturated fats, vitamin E, and magnesium. These nutrients are all associated with a lower risk of cardiovascular disease and some cancers (Aune et al., 2016a). Vitamin E is a powerful antioxidant and bioactive compound that is associated with multiple anti-cancer properties including inhibition of carcinogenesis and tumour growth, as well as death (apoptosis) of cancerous cells (Cui et al., 2018; Nieuwenhuis & Brandt, 2018).

Ellagic acid is a type of polyphenol found in nuts that increases the cell's capacity to defend itself against toxic aggression by stimulating its ability to eliminate carcinogens (Labreque et al., 2005). Research has shown that some of the most important cancer fighting nutrients are in the skins of nuts (Chen et al., 2005). Flavanoids, for example, have been shown to help inhibit tumour blood vessel development (angiogenesis) and to protect cells from damage by environmental toxins (Chen et al., 2005).

***Walnuts:*** Although all nuts are recommended for a cancer-preventive diet, walnuts are commonly studied for cancer (Toner, 2014). Walnuts have high amounts of α-linolenic acid (ALA), polyphenols, and phytochemicals that have anti-inflammatory and antioxidant properties. On a serving size basis, walnuts are one of the highest sources of polyphenols in the human diet (Vinson

& Cai, 2012).

Laboratory studies using cell and animal models have found that walnuts are chemoprotective (Toner, 2014), preventing cancer cell growth (Carvalho et al., 2010). They also contain a broad range of other potentially protective compounds called elligitannins, which are broken down to ellagic acid. Bacteria in our digestive tract convert ellagic acid into compounds called urolithins. Urolithins have been found to have antioxidant and anti-inflammatory properties (Espín et al., 2013) and walnut urolithins have been found to have direct cancer-inhibiting effects (Sánchez-González et al., 2014).

***Brazil nuts**:* Brazil nuts contain extremely high levels of selenium. Selenium has been shown to be associated with many anti-cancer properties and a reduction in cancer risk (Cai et al., 2016). The consumption of two Brazil nuts a day was found to significantly raise selenium levels in the blood of 59 adults (Thomson et al., 2008).

**How to Eat Nuts:** Buy nuts with their skins on and roast them to make the flavonoids more potent and concentrated (Monagas et al., 2009). Store nuts in the refrigerator or in the freezer to preserve the quality of healthy oils. If you prefer them at room temperature, store them in a cool, dry, and dark place (Lee et al., 2011). Use them to make nut cheeses, healthy baked goods like muffins, energy bars, and cookies, as a quick and crunchy snack, or add them atop your salads, stir-fries, curries, and pancakes. Nuts are also fantastic in sauces like pesto or roasted red pepper. Raw or roasted, store nuts in the fridge or freezer to keep them fresh and prevent mould.

**Nutritional Benefits for Specific Cancers:** A meta-analysis combining the results of 31 prospective, observational cohort or case-control studies found an overall reduction in cancer risk of 15 percent with higher *vs.* lower nut consumption (Wu et al., 2015). Specific cancers for which significant reduction in risk were observed in this analysis were colon, colorectal, endometrial, and pancreatic. The number of studies of nut consumption and risk of specific cancers are still limited, and results should be confirmed with further studies.

***Walnuts*:** For specific cancers, walnut extract was found to inhibit the growth of colon cancer cells in laboratory (*in vitro*) studies (Carvalho et al., 2010). Further, urolithins from walnuts were found to induce cell death (apoptosis) in prostate cancer cells (Sánchez-González et al., 2014). Experimental models using mice have demonstrated a substantial reduction in the growth of several forms of cancer, which may be attributed to reduction in the formation of tumour-feeding blood vessels (angiogenesis) and proliferation of cancer cells (Hardman, 2014).

In one of the largest interventional dietary trials called PREDIMED, researchers used baseline data of participants to undertake an observational study to investigate the relationship between nut consumption and mortality. Walnuts were found to have a clear benefit for preventing cancer

mortality. People who ate more than three servings of walnuts (84 grams) per week appeared to cut their risk of dying from cancer in half (Guasch-Ferre et al., 2013).

***Brazil nuts*:** In the 1940's, selenium was seen as a potential carcinogen. Then, between the 1960's-2000's, research suggested it may have anti-cancer properties, possibly depending on the source of selenium (Vinceti, et al., 2013). A recent meta-analysis looking at results from 69 studies on selenium and cancer risk found that high selenium intake was associated with a lower total cancer risk (Cai et al., 2016). There was a decrease in risk of several cancers including breast, lung, esophageal, gastric, and prostate. Although the reduction in risk varied between cancers, there was no gender difference in terms of protective effects (Cai et al., 2016).

Within this meta-analysis, a sub-analysis of 14 studies showed a high selenium intake was associated with a reduced risk of breast cancer (Cai et al., 2016). The association between prostate cancer and selenium intake showed a reduction in risk with increased selenium intake in a sub-analysis of 25 studies (Cai et al., 2016). Moreover, a high selenium intake was associated with a reduction in risk of lung cancer in a sub-analysis of 13 studies (Cai et al., 2016). However, a recent review highlighted that selenium supplements taken when blood levels of selenium were already high may contribute to increased risk of lung cancer (Fritz et al., 2011). As per the WCRF & AICR (2018a) recommendations, it is best to obtain adequate selenium from the diet and avoid using supplemental sources for the prevention of cancer.

## Omega-3 Fatty Acids <<Back>>

(Found in walnuts, flax seeds, chia seeds, hemp seeds, pumpkin seeds, soybeans, and tofu)

**Why Omega-3 Fatty Acids:** Omega-3 polyunsaturated fatty acids, or n-3 PUFAs, have many roles in the human body, with potential preventative and therapeutic benefits. Omega-3 fatty acids are used in the synthesis of anti-inflammatory molecules that decrease the production of inflammatory molecules that disrupt the immune system, in turn decreasing cancer development. They are known to improve mental health and related diseases such as depression (Bigornia et al., 2016; Sublette et al., 2011). In addition to these benefits, omega-3 fatty acids also work directly on cancerous cells by enhancing tumour-suppression activities, modifying their ability to avoid cell death (apoptosis) and preventing the development of new blood vessels for tumour growth (angiogenesis) (Andrade-Vieira et al., 2013; Larsson et al., 2004; Rose & Connolly, 1999).

The three types of omega-3 fatty acids most widely studied include: α-linolenic acid (ALA), which is found in plant foods like nuts and seeds, and eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which are mostly found in fish, other marine sources, and algae. ALA is an essential fatty acid as the human body cannot make it. ALA can be converted into EPA and DHA within the body.

Originally, the conversion was believed to be very low (Lands, 1992), inferring the importance of getting EPA and DHA from the diet. This led to more scientific research being focused on EPA and DHA in supplemental form. However, recent evidence suggests that the conversion of ALA into EPA and DHA in humans may be higher than previously thought (Welch et al., 2010).

An additional factor to consider is the ratio of omega-6 fatty acids to omega-3 fatty acids in the diet (Simopoulos, 2008). The amount of omega-6 fatty acids is increasing in the western diet (i.e., from poultry, eggs, and some vegetable oils), while the amount of omega-3 fatty acids is less (Simopoulos, 2009). The ratio of these omega-6 and -3 fatty acids is very important as they both compete for the same enzyme for elongation; thus, the excessive consumption of omega-6 fatty acids reduces the already low conversion rate of ALA to EPA and DHA (Simopoulos, 2016). Further, by increasing omega-3 fatty acids in the diet it is possible to decrease the production of omega-6 metabolites which are known to contribute to inflammation and other various carcinogenic processes (Lupulescu, 1996).

**How to Acquire Omega-3 Fatty Acids:** Sprinkle ground flax seeds, chia seeds, hemp seeds, sunflower seeds, pumpkin seeds, and walnuts onto or into your favourite baked goods or morning meals including pancakes, oatmeal, granola, or avocado toast, or add a generous helping into your morning smoothie. Incorporate edamame and nuts or seeds into your favourite salad and tofu into an easy stir fry.

So far, fish oil has been the major commercial source of EPA and DHA. However other sources, such as from algae or seaweeds, are available (Robertson et al., 2015).

**Nutritional Benefits for Specific Cancers:** Dietary fats play an important role in a healthy diet (Simopoulos, 2008). While saturated fatty acids and trans fatty acids are associated with harm, omega-3 fatty acids are indicated to have anticarcinogenic effects in breast, prostate, and colorectal cancers (Demark-Wahnefried et al., 2008; Saadatian-Elahi et al., 2004; Yang et al., 2014, 2019).

In a meta-analysis of three cohort studies, higher amounts of omega-3 fatty acids measured from blood and tissue samples of participants were found to be associated with a lower risk of breast cancer (Saadatian-Elahi et al., 2004). In contrast, a higher composition of saturated fatty acids was associated with an increased breast cancer risk for postmenopausal women (Saadatian-Elahi et al., 2004). Another meta-analysis of multiple observational study results looking at digestive tract cancers found that higher *vs.* lower omega-3 fatty acid intake was associated with decreased risk of colorectal cancer by 11 percent, oral/pharyngeal cancer and esophageal cancers by 50 percent each, and large bowel cancer by 30 percent (Wang et al., 2020).

In a group of 161 men with prostate cancer, treatment with 30 grams (~3 tablespoons) per day of ground flaxseed, which contains around seven grams of ALA (Rodriguez-Leyva et al., 2010), was

found to reduce prostate cancer growth over four weeks (Demark-Wahnefried et al., 2008). Further, those taking the flaxseed were found to have increased EPA levels and a decreased omega-6:omega-3 fatty acid ratio in the prostate tissue (Demark-Wahnefried et al., 2008), suggesting that ALA from flaxseed was converted into EPA within the body.

Further, there is some evidence that higher intakes of omega-3 fatty acids among colorectal cancer patients results in decreased risk of death and greater disease-free survival rates (Vulpato & Hull, 2018). There is also some evidence for better outcomes among colorectal cancer patients when supplemental omega-3 fatty acids are given during the pre- and post-operative treatment periods, but more research is needed to confirm these findings and establish optimal doses.

## Onions <<Back>>

(Shallots, leeks, scallions, and chives)

**Why to Eat Onions:** Onions are a rich source of fibre, potassium, iron, and vitamin C (Nicastro et al., 2015). Similar to garlic and other Allium vegetables, onions have sulfur-containing compounds that are believed to play a role in cancer prevention (Nicastro et al., 2015). They also contain high levels of flavonoids, specifically quercetin, and anthocyanins, which have been shown to inhibit cancer cell proliferation and blood vessel development for tumours (angiogenesis) (Herman-Antosiewicz & Singh, 2004; Slimestad et al., 2007).

**How to Eat Onions:** Select red and pink onions for the highest levels of flavonoids, followed by yellow (Slimestad et al., 2007). Eat frequently - one meal a day should include a form of onion, as research has shown that frequent consumption (more than seven times per week) of garlic or onions is associated with a lowered risk of several cancers (Galeone et al., 2006). Onions can be eaten raw or cooked (Oude Griep et al., 2010). Add them to soups, stews, chilis, curries, stir-fries, or prepare caramelized onions as a delicious topping for your salads, sandwiches, or pizzas.

**Nutritional Benefits for Specific Cancers:** Allium vegetables have been found to be protective against many different types of cancers including breast and pancreatic cancer (Challier et al., 1998; Chan et al., 2005; Zhang & Yang, 2022). A meta-analysis combining the results of seven observational studies found that higher consumption of onion was associated with a 25 percent lower risk of breast cancer, though there was a lot of variation in results between studies (Zhang & Yang, 2022). A high intake of onions has also been found to be associated with a lower risk of colorectal, ovarian, and laryngeal cancers (Galeone et al., 2006). Another analysis pooling data from eight different case-control studies found that consuming more than three portions per week of onions, compared to lesser amounts, was associated with a 31 percent lower risk of laryngeal cancer, but not other types of head and neck cancers (Galeone et al., 2015).

In another case-control study, onion consumption was associated with a lower risk of Benign

Prostatic Hyperplasia (BPH; enlarged prostate) when compared to those who do not eat them (Galeone et al., 2007), although there is no link between BPH and prostate cancer.

## Orange Fleshed Vegetables and Fruits <<Back>>

(Carrots, sweet potatoes, winter squash, and papaya)

**Why Eat Orange Fleshed Vegetables and Fruits:** The colour of these types of vegetables and fruits is imparted by carotenoids. Alpha-carotene, beta-carotene, and beta-cryptoxanthin, are carotenoids that are converted to vitamin A in the body and used for immune support and maintaining healthy cells. These phytonutrients also activate carcinogen-metabolizing enzymes. Lab research has shown that both alpha-carotene and beta-carotene act as antioxidants that promote cell-to-cell communication, thereby controlling cell growth (Fiedor & Burda, 2014). Carotenoids also play a role in reducing blood vessel development of tumours (antiangiogenic) and have been shown to lower the risk of certain cancers in laboratory studies (Irwig et al., 2002; Li et al., 2012; Pandey & Shukla, 2002; Tamimi et al., 2009; Yuan et al., 2003; Zhang et al., 2009).

In addition to high amounts of alpha- and beta-carotene, carrots also contain luteolin, a flavonoid that exhibits antioxidant, anti-inflammatory, and anti-cancer effects in laboratory studies. Orange vegetables like carrots, winter squash, and sweet potato also contain dietary fibre that contributes to lower cancer risk in many ways (WCRF & AICR, 2018b). Papaya is another very high source of carotenoids, especially beta-cryptoxanthin. A Costa Rican study confirmed that beta-cryptoxanthin is well absorbed by the body (Irwig et al., 2002), therefore the high levels in papaya make it an excellent fruit to consume for its cancer fighting and prevention potential (Li et al., 2011; Yuan et al., 2003).

**How to Eat Orange Fleshed Vegetables and Fruits:**

***Carrots:*** Carrots can be eaten raw or cooked any which way, and still manage to hold onto their exceptional nutritional profile (even boiled!) (Jimenez-Montreal et al., 2009). So, eat them raw as a snack dipped with your favourite bean dip. Use them in soups, shredded into salads or try roasting them.

***Winter Squash & Orange Sweet Potato*:** Winter squash and sweet potatoes are very versatile foods that you can incorporate into your diet in many ways. These can be eaten steamed or roasted, tossed into vegetable salads, blended into soups, or spiralized and pan-fried as a pasta substitute.

***Papaya*:** Eat the fruit as is for a quick snack or get creative with papaya salads, papaya chutneys, or toss a few frozen papaya pieces into your smoothie for a creamy treat.

**Nutritional Benefits for Specific Cancers:** As a source of dietary fibre, orange-fleshed vegetables contribute to lowering the risk of colorectal cancer (WCRF & AICR, 2018a). Carrots

are a non-starchy vegetable, for which there is somewhat limited but suggestive evidence for reducing the risk of mouth, larynx, and pharynx cancers (WCRF & AICR, 2018b). There is also limited, but consistent suggestive evidence that foods containing carotenoids lower the risk of breast and lung cancer, and foods containing specifically beta-carotene contribute to lower risk of lung cancer (WCRF & AICR, 2018b).

***Carrots*:** A meta-analysis that combined the results of 10 observational studies found that higher intake of carrots was tied to a 21 percent lower risk of breast cancer (Chen et al., 2018). A similar analysis found that higher intake of carrots was associated with an 18 percent lower risk of prostate cancer, equating to a 5 percent lower risk with each serving of carrots per week (Xu et al., 2014). A limited analysis of just five observational studies indicated a 26 percent lower risk of gastric cancer (cardio and non-cardio) with higher carrot consumption (Fallahzadeh et al., 2015). Another analysis of nine observational studies found a 37 percent lower risk of urothelial cancers, which include bladder cancer, among those consuming higher amounts of carrots (Luo et al., 2017). While these findings are encouraging, confirmation of these benefits from additional studies is warranted.

***Winter Squash & Orange Sweet Potato*:** Lutein and zeaxanthin are two major types of carotenoids found in winter squash that may help decrease the development of skin cancer related to sun exposure (Evans & Johnson, 2010).

***Papaya*:** Laboratory studies have shown that extracts of papaya fruit inhibit the viability of liver and leukemia cancer cells and inhibit the proliferation of breast cancer cells (Omara et al., 2020).

One study found that the intake of high levels of carotenoids from papaya was associated with a 50 percent risk reduction of breast cancer (Zhang et al., 2009). Two studies examining Human Papillomavirus (HPV) infection and women's diets showed that consumption of foods high in beta-cryptoxanthin is associated with lower HPV infection rates and lower risks of cervical lesions (Giuliano et al., 2003; Siegel et al., 2010). A large epidemiological study in China found that a high level of beta-cryptoxanthin in the body was associated with a significantly lower risk of lung cancer (Yuan et al., 2003).

## Plant-based Protein <<Back>>

(Legumes such as black beans, kidney beans, white beans, chickpeas, lentils, chickpeas, soybeans and soy products such as tofu, and tempeh, split peas, as well as nuts, seeds, nut and seed butters, whole grains, and even some vegetables)

**Why Eat Plant-based Protein:** Research has convincingly shown that eating a diet rich in foods of plant origin is the best for overall health and cancer prevention (WCRF & AICR, 2018a).

Those undergoing cancer treatments require extra calories and protein to support organ function, muscle repair, and daily activities (Arends et al., 2017) as well as to prevent malnutrition (Edington et al., 1996). Extra calories and protein help to heal tissues and fight infections, making it crucial for those with cancer to include protein daily (Cleveland Clinic, nd). Sufficient protein can be obtained from nuts, seeds, legumes, and whole cereal-grain products (Doyle et al., 2006).

As nuts, whole grains, and soy have been addressed specifically in other sections, this section will focus on evidence specific to other legumes and general plant protein sources. See, '***Nuts***', **'*Soy*', and '*Whole Grains*'** for more information on the benefits of these plant protein sources.

Legumes are an affordable source of plant protein and there are several ways in which legumes may act to prevent cancer. Legumes have a great nutritional profile as they are a rich source of folate and dietary fibre; just one serving (half a cup) provides at least 20 percent of the recommended amounts of both (Rebello et al., 2014). Folate plays a key role in DNA stability (Duthie, 1999) and therefore cancer prevention (Pieroth et al., 2018). Dietary fibre is key in reducing risk of cancer as it helps to manage weight and prevent obesity-related cancers (WCRF & AICR, 2018a). Legumes are also a good source of B vitamins, vitamin E, selenium and lignans, all of which are associated with anti-cancer effects (Messina, 1999).

Dry beans, split peas and other legumes also contain a variety of phytochemicals that scientists are studying for their antioxidant, anti-inflammatory, and antimicrobial effects (Kalogeropoulos et al., 2010). Lentils, chickpeas, and white lupin legumes have some of the highest amounts of flavonoids among common legumes (Rebello et al., 2014).

**How to Eat Plant-based Protein:** There are so many kinds of plant-based proteins, you don't have to stick to just one. Aim to eat low processed plant protein sources that are high in dietary fibre and low in saturated fat. Switch it up so that you don't get bored and buy your beans and whole grains in larger quantities to save money. Add them in whole or pureed form to your dips, dressings, sauces, smoothies, soups, stews, chilis, salads, and baked goods!

***Beans*:** Cook from scratch or save time by purchasing canned beans (look for low sodium or no salt added, and BPA free cans). If you have leftovers, ensure to always remove them from the can once opened and store them in an airtight container in the fridge. There are many different types of beans, so try them all!

***Lentils*:** Half a cup of cooked lentils gives you about 18 percent (3.3 mg) of your iron, 32 percent (eight grams) of your daily fibre, and nine grams of plant protein. Start by adding them to soups or salads, or let your creativity run wild by using them in Shepherd's pie, cabbage rolls, burgers, or stuffed peppers.

***Seeds*:** Pumpkin and hemp seeds are particularly rich sources of plant protein, providing more than eight and nine grams per ounce (about three tablespoons), respectively. This amount also contributes about 5-7 percent of the Daily Value for fibre. Add seeds to baked goods like muffins or energy bars, to smoothies, or as a topper for salads or grain bowls. Raw or roasted, store seeds in the fridge or freezer to keep them fresh and prevent mould.

**Nutritional Benefits for Specific Cancers:** In a prospective observational study in Spain looking at 7216 participants, researchers found that high legume consumption including dry beans, chickpeas, lentils, and fresh peas (average of 28.1 grams per day) was associated with a 50 percent lower risk of cancer mortality when compared to the lowest intake of legumes (Papandreou et al., 2018).

Human studies focusing on legumes or plant proteins and cancer risk have yielded some positive results but are somewhat inconsistent. Several studies have linked higher consumption of legumes with lower risk of colon cancer or the benign adenomas (polyps) that are the precursor to most colon cancer (Wang et al., 2013; Zhu et al., 2015). Research has also linked regular plant protein and legume consumption with a possible reduced risk of breast cancer (Berkey et al., 2013), prostate cancer (Park et al., 2008), and cancer mortality (Papandreou et al., 2018). According to findings from an extension of the Nurses' Health Study II, where dietary information from the daughters of the original participants was assessed yearly from 1996 to 2001, adolescent women who consumed 10 grams per day of vegetable-based proteins (nuts, beans, lentils, soybeans, and corn) had a significantly lower risk for benign breast disease than those who did not (Berkey et al., 2013). Having benign breast disease is a risk factor for breast cancer later in life (Berkey et al., 2013). Also, the Ontario Women's Diet and Health Study found that intake of dietary fibre, plant-based protein, and nuts were all associated with lower risk of breast cancer (Liu et al., 2014). Compared to the lowest intake of each of these foods, higher intakes were associated with a 34 percent, 20 percent, and 24 percent reduction in risk, respectively (Liu et al., 2014).

A meta-analysis combining results from 10 observational studies did not find any association between plant protein intake and risk of death from cancer (all types) (Naghshi et al., 2020). Another meta-analysis of 14 prospective cohort studies looking at legume consumption found that higher legume consumption led to decreased risk of colorectal cancer (Zhu et al., 2015). But when they looked at subgroups, the association was only statistically significant among studies in Asian populations, while no association was found in the studies among US and European populations. The disparity in results may be related to Asia's higher overall consumption of legumes (Zhu et al., 2015). Legume consumption in the common Western diet is irregular and average amounts consumed are relatively small. This means the difference between higher and lower amounts of beans in these populations is very small and difficult to detect differences in health outcomes in observational studies.

Several studies have tried to model the effects of substituting plant protein for animal protein using available databases from observational studies. A review of these analyses found different results depending on the sources of animal proteins being replaced (Zheng et al., 2022). For example, a hypothetical reduction in cancer mortality resulted when red meat protein was substituted for plant protein, but not when dairy or white meat were substituted. This highlights the difficulty in separating the effects of plant protein from other dietary components, such as lower red meat consumption, and may also explain the inconsistency in results. Regardless, the general recommendations to make plant foods the central part of the diet and to reduce intake of red or processed meats remain valid (WCRF & AICR, 2018a).

Information on cancer risk related specifically to soy consumption is summarized under '***Soy***'.

**Protein Needs During Cancer Treatment**

During cancer treatment your protein needs may increase. Currently the protein recommendation for the average healthy adult is 0.8 grams per kilogram of body weight per day, which should account for 10 to 35 percent of your daily calories (Health Canada, 2005). However, for adults who have cancer or other chronic diseases, the protein recommendations increase (depending upon their nutritional status, which should be determined by their doctor or Registered Dietitian) particularly for older patients. The most recent clinical guidelines recommend 1.2 to 1.5 grams of protein per kilogram body weight per day as this makes it easier to obtain all essential amino acids and maintain muscle mass.

- Eat protein rich foods at every meal and snack, particularly during treatment.
- Post exercise (within an hour after completion) is the best time to eat a protein-rich snack to help with the rebuilding and repairing of muscles.

## Pomegranate <<Back>>

**Why Eat Pomegranate:** Fruit is an important part of a healthy cancer preventative diet (WCRF & AICR, 2018a). Pomegranate boasts high levels of polyphenols, specifically ellagitannins, ellagic acid, luteolin, other flavonoids, and punicic acid, which are known to have anti-cancer activities (Moga et al., 2021; Seeram et al., 2005). Pomegranate has been shown to inhibit cell cycle progression, tumour blood vessel development (angiogenesis), and metastasis of cancer cells, promote cancer cell death (apoptosis), and demonstrate antioxidant and anti-estrogenic effects (Moga et al., 2021; Turrini et al., 2015). Most of the polyphenols are found in the skin of the pomegranate, which is released when juice is made from pressing the whole pomegranate (Gil et al., 2000). In one study, commercial pomegranate juices obtained from the whole fruit were shown

to exhibit antioxidant activity three times higher than that of red wine and green tea (Gil et al., 2000).

**How to Eat Pomegranate:** Pomegranate juice is great, however, be mindful of portion sizes as juice consumption can equal a lot of sugar consumption. Make sure to look for sugar-free versions of pomegranate juice. Eating the juicy pomegranate seeds are a much better option, as you can get the benefits of the antioxidant-rich juice, as well as the bonus of fibre (called pomegranate arils). Snack on them as is, or toss them onto oatmeal, into smoothies, or into a savoury salad for a bright and beautiful garnish.

**Nutritional Benefits for Specific Cancers:** Pomegranate has been shown in cell culture and animal studies to exhibit beneficial effects for cancer prevention through various mechanisms (Moga et al., 2021). Few studies in humans have been undertaken looking at pomegranate consumption and cancer. However, one area of great interest is pomegranate for both the prevention and treatment of prostate cancer (Turrini et al., 2015).

One of the first clinical studies provided men, who had a history of recurrent prostate cancer, with one cup of pomegranate juice per day (Pantuck et al., 2006). They found that these men had a longer PSA (prostate specific antigen) doubling time and therefore a lower risk of cancer recurrence compared to doubling times measured before pomegranate juice was given (Pantuck et al., 2006). However, this study design did not include a control and therefore the findings are not conclusive. Since then, a total of five additional studies testing pomegranate juice and extracts in men with prostate cancer have been undertaken. While the studies consistently found that pomegranate juice and extract are safe for those with prostate cancer, the anti-cancer effects were not consistent; overall, when the six studies were looked at collectively, they did not find strong evidence to support pomegranate's therapeutic effects for prostate cancer (Paller et al., 2017). One finding from this review that merits further confirmation is that men with the manganese superoxide-dismutase (MnSOD) AA genotype appear more likely to experience therapeutic benefits of pomegranate.

Currently no human clinical trials have been done to assess the protective effects of pomegranate on colon cancer (Jaganathan et al., 2014). Yet, many cell culture studies have found promising results demonstrating that pomegranate may help modulate cancer cell death (apoptosis) and proliferation in colon cancer (Turrini et al., 2015). Polyphenols found in pomegranate, including ellagitannins and urolithins, were shown to induce apoptosis in human colon cancer cells (Kasimsetty et al., 2010).

## Raspberries <<Back>>

**Why Eat Raspberries:** Berries are rich in cancer-fighting anthocyanins and raspberries are specifically rich in cyanidin (Kristo et al., 2016)**.** The WCRF & AICR (2018a) recommend that fruit is consumed every day to reduce the risk of cancer. Raspberries can be incorporated as part of an anti-cancer diet. Like strawberries, raspberries contain ellagic acid, an anti-cancer phytochemical compound, and are a rich source of antioxidants (Stoner, 2009). Research on freeze-dried black raspberry extract has shown anti-cancer effects (Stoner et al., 2007) including anti-proliferation activities and red and black raspberry extracts have been shown to induce cell death (apoptosis) of various cancer types (Golovinskaia et al., 2021).

**How to Eat Raspberries:** When raspberries are in season they are bursting with flavour and appealing to the eye with their rich red appearance. They are great enjoyed on their own, after being thoroughly rinsed, or can be thrown into baked goods, smoothies, made into a jam, or added to sparkling water. They also make a great addition to mixed salads. Raspberries store well frozen when picked at the peak of their season and can be accessible year-round.

**Nutritional Benefits for Specific Cancers:** Cell culture studies have shown that anthocyanins have many anticancer activities acting as strong antioxidants, and reducing cancer cell growth, inflammation, and development of blood vessels that feed tumours (angiogenesis) (Wang & Stoner, 2008). While research indicates fruit consumption is linked to reductions in cancers of the esophagus, lung, stomach, colorectum, and bladder (WCRF & AICR, 2018b), there are few studies on raspberries alone (Stoner, 2009) with only small trials being undertaken.

In one such study with 10 patients who were at risk of esophageal cancer, black raspberries were found to improve markers of cancer development (Kresty et al., 2006). However, it is important to note that further research in larger groups of 20 patients did not find conclusive evidence for black raspberries and esophageal cancer (Kresty et al., 2016). In another study of 25 colon cancer patients, those provided with black raspberry powder for two to four weeks prior to having a biopsy were found to have reduced cancer proliferation and increased apoptosis (Wang et al., 2008).

## Red Vegetables and Fruits <<Back>>

(Acai berry, beets, blackberries, blueberries, eggplant, pomegranate, raspberries, red cabbage red grapes, red lettuce, red onion, red peppers, red or black plums, tomatoes, watermelon)

**Why Eat Red Vegetables and Fruits:** In addition to containing fibre and a host of vitamins, vegetables and fruits that are red in colour contain phytonutrients such as anthocyanins and carotenoids like lycopene (Chung et al., 2022). Lycopene-rich fruits and vegetables (i.e., see '***Tomatoes***', and '***Watermelon***') and some anthocyanin-rich fruits (i.e., see '***Blueberries***', ***Raspberries***', and '***Pomegranate***') have been included in this guide for their individual benefits.

However, red vegetables and fruits can be considered as a category of produce that should be consumed on a regular basis as part of an anti-cancer diet. These have been shown to have potent anti-cancer activity in cell culture models. In addition to the activities of lycopene and anthocyanins, other components in different red fruits and vegetables include betacyanins (e.g., beets) and quercetin (e.g., blueberries, cherries, cranberries), which have also demonstrated anti-cancer activities (Chung et al., 2022; Tan & Hamid, 2021). The health benefits of these compounds extend beyond cancer prevention. For example, anthocyanins and anthocyanin-rich foods are strong antioxidants, anti-inflammatory, and demonstrate activities associated with maintaining cardiovascular health, neurological health, a healthy gut microflora, and blood glucose management (Panchal et al., 2022).

**How to Eat Red Vegetables and Fruits:** Red vegetables are very versatile as many can be eaten raw, roasted, or grilled. They can be incorporated into very colorful smoothies (e.g., beets, berries, watermelon), added to salads (e.g., berries, grapes, pomegranate, red lettuce, red pepper, watermelon) or shredded and used in slaws (e.g., fresh grated beets or red cabbage).

**Nutritional Benefits for Specific Cancers:** It is likely that many of the different phytonutrients in red fruits and vegetables contribute to the anti-cancer activities observed in cell culture studies and animal studies (Chung et al., 2022). These activities include all major mechanisms for preventing or regressing tumor formation including preventing mutagenesis, angiogenesis, proliferation, and metastasis, and inducing apoptosis and cell differentiation, as well as increasing sensitivity to chemotherapy drugs or preventing resistance to drugs (Chung et al., 2022; Lin et al., 2017).

A few observational studies provide support for the role of red fruits or vegetables in cancer prevention. A case-control study including over 1000 colorectal patients in China found that higher consumption of red/purple fruits and vegetables, including berries, grapes, tomatoes, and watermelon, was associated with a significantly lower risk of colorectal cancer (Luo et al., 2015). A case-control study in Korea that included more than 900 male and female colorectal cancer patients also found that the consumption of red/purple fruits and vegetables (including grapes, plum, red cabbage, red pepper, strawberries, tomato, watermelon) was associated with a lower risk among women, though not men (Lee et al., 2017).

Large observational studies on the potential protective effect of red fruits and vegetables as a group are still very limited. Nonetheless, including these on regular basis is consistent with general advice to include a wide range of fruits and vegetables as part of a healthy diet.

## Sea Vegetables <<Back>>

**Why Eat Sea Vegetables:** Sea vegetables contain many key nutrients including fibre, protein, and unsaturated fat, as well as lignans and sulfated polysaccharides (Kim & Li, 2011; Teas et al., 2013). They also contain vitamins and minerals including B-vitamins, vitamin C, calcium, iodine, iron, and magnesium (Kumar et al., 2008), all of which are important for overall health. The lower incidence of certain cancers in Asia, where sea vegetables are a diet staple, compared to North America suggests that sea vegetables, among other differences in dietary trends, may have protective effects against cancer (Brown et al., 2014). There is also some evidence from Japan that those who eat seaweed almost every day are protected against cardiovascular disease (Kishida et al., 2020).

**How to Eat Sea Vegetables:** Sea vegetables are great in soups and stews to add depth of flavour. Try making homemade sushi with nori topped with a whole grain rice and your favourite fruits and vegetables! Roasted seaweed is a great snack for on the go and can be purchased in single serving packs.

**Nutritional Benefits for Specific Cancers:** There are several phytonutrients in red seaweeds that have demonstrated anti-cancer activities in cell culture and animal models, including anti-proliferation and inducing death of cancer cells (apoptosis) (Ismail et al., 2020). Fucoidan is a specific sulfated polysaccharide found in brown seaweed that has been shown in laboratory studies to have multiple anti-cancer activities. This includes reducing proliferation and metastasis and promoting apoptosis of a wide range of cancer cell types (Reyes et al., 2020; van Weelden et al., 2019).

Seaweed may have a role to play in breast cancer prevention and treatment. A cell culture study comparing the use of a common chemotherapy agent with a solution made using mekabu seaweed (the flowering part of wakame) found that the mekabu solution had stronger effects on human breast cancer cells (Funahashi et al., 2001). Fucoidan from brown seaweed has also demonstrated anti-estrogenic activity important in the suppression of breast and ovarian cancers, and in laboratory studies it seems to amplify the effect of standard breast cancer treatments (van Weelden et al., 2019). Moreover, a study looking at the amounts of bioavailable lignan from a variety of foods found that dried seaweeds ranked second on the list, just behind flaxseed (Thompson et al., 1991). Lignans are known for their anticancer properties so including some dried seaweeds may be protective against certain cancers such as breast (Cotterchio et al., 2008).

A small study of 15 American post-menopausal women found that supplementation of five grams per day of brown seaweed for seven weeks lowered serum estrogens and increased favourable estrogen metabolism (Teas et al., 2009). When researchers retrospectively compared the diets of 362 Korean women who had a history of breast cancer with healthy aged-matched controls, daily

consumption of seaweed, specifically *gim,* was associated with a reduction in breast cancer risk (Yang et al., 2010).

In a small placebo-controlled trial, American women were provided five grams of Undaria seaweed over four weeks (Teas et al., 2013). The researchers found that these women had significantly lower urine concentrations of urokinase-type plasminogen activator receptor (uPAR) (Teas et al., 2013). This is favourable as higher levels of uPAR are associated with cancer progression.

Observational research is still quite limited and not all investigations have found sea vegetables to have protective effects against cancer (Shigihara et al., 2014). Also, as sea vegetables are not consumed in significant quantities in North America, it is challenging to determine the applicability of the evidence from Asian countries (Shigihara et al., 2014).

Several clinical studies in breast and colorectal cancer patients have also indicated that fucoidan, from brown seaweed, may be a useful adjuvant to standard therapies by improving outcomes, quality of life after treatment, and tolerance to treatments (Reyes et al., 2020).

## Soy <<Back>>

(Emphasis on whole soy and fermented sources)

**Why Eat Soy**: Soy foods are a source of high-quality plant protein and are believed to have a variety of health benefits related to chronic disease prevention, including cancer and type 2 diabetes (Tang et al., 2020). Much research has been undertaken to investigate the health benefits of soy foods (Messina, 2016). The main phytochemicals in soy foods are isoflavones, of which genistein and daidzein have been shown to have chemopreventive characteristics (Béliveau & Gingras, 2016; Supic et al., 2013). However, researchers believe their main anti-cancer activity occurs after they have been broken down by gut microbiota to other, more potent compounds. Daidzein is converted in the gut to equol, which is easily absorbed into the body and demonstrates the strongest estrogenic activity of all isoflavones and derived compounds (Mayo et al., 2019; WCRF & AICR, 2018b). The ability of humans to benefit from these isoflavones in soy may be dependent on whether they have the right types of gut bacteria present, and this may explain some of the inconsistency in study results, as highlighted below.

**How to Eat Soy:** The highest concentrations of isoflavones are found in soy flour, soybeans (e.g., soy nuts and edamame, which is available fresh or frozen), and fermented soy products (e.g., miso, tempeh, and natto) (Rizzo & Baroni, 2018). Frequent consumption of miso soup (3 cups per day) in Japanese women was associated with a 30 percent lower risk of breast cancer (Yamamoto et al., 2003). As with all foods, soy is best eaten as whole foods rather than in overly processed or supplemental forms (Messina & Messina, 2010). Try making tofu or tempeh fries, add grilled marinated tofu or tempeh to stir fries or grain bowls, add edamame to salads, wraps or sandwiches

for a pop of colour. Grilled or baked seasoned tofu can be used as a substitute for chicken or fried or scrambled eggs. Seasoning sliced or crumbled firm tofu with black salt (known as *kala namak*) imparts the characteristic sulfur-like taste of eggs and makes for a satisfying egg substitute. Crumbled and seasoned tempeh can be used as a substitute for ground beef (e.g., Bolognese sauce).

**Nutritional Benefits for Specific Cancers:** Among all legumes, soybeans are unique in that they have a concentrated source of phytoestrogens that are structurally similar to the estrogen hormone found in humans. This similarity allows phytoestrogens to bind to estrogen receptors in the body, blocking estrogen from binding – this is the proposed mechanism for how they reduce hormone-dependent cancers (Patisaul & Jefferson, 2010).

A meta-analysis combining the results of 47 cohort studies found that higher soy intake from all sources was associated with a 10 percent decreased risk of cancer incidence (all forms of cancer combined), and every 25 g/day increase in soy intake was associated with a 4 percent decreased risk (Fan et al., 2022). A similar association was observed from the same study when the intake of soy isoflavones was calculated (Fan et al., 2022). Regarding colorectal cancer, one meta-analysis of 17 cohort and case-control studies found a 23 percent lower risk associated with higher soy intake (Yu et al., 2016). However, an analysis that pooled data from four large cohort studies in Asian populations did not find an overall reduction in risk of colorectal cancer with higher intake of soy isoflavones or soy protein (Khankari et al., 2020). Another meta-analysis found a similar null result for risk of colorectal cancer and higher soy intake using primarily cohort studies, but the analysis did find a 15 percent lower risk of gastric cancer (Lu et al., 2017). It is not uncommon to find positive results when case-control studies are used but null results when cohort studies are used, and this might explain some of the differences in results.

Although isoflavones act to reduce the growth of cancer cells in several ways, much focus has been on their role in preventing hormone-dependent cancers (e.g., breast, endometrial, prostate, and possibly lung). Isoflavones can bind to estrogen receptors and cause either weak estrogenic or anti-estrogenic activity. The ability of isoflavones and their by-products to act on hormone receptors infers that soybean consumption may be particularly useful in the prevention of hormone-dependent cancers (for example, breast and prostate cancer) (Béliveau & Gingras, 2016; Shu et al., 2009). The risk of lung cancer, which may also be affected through hormonal pathways, was shown to be 33 percent lower among people with a higher *vs.* lower intake of soy in an analysis of four different cohort studies (Fan et al., 2022). The WCRF & AICR (2018b) also concluded that there is limited suggestive evidence of a lower risk of lung cancer among non-smokers who have higher intakes of isoflavones.

Information on the potential benefits of soy foods on cancers affecting women and men is summarized in the text boxes below.

**Soy and Women's Health**

Low incidence rates of breast cancer in Japan and other East Asian countries fuelled interest in the role of soy in breast cancer.

***Epidemiology***

Many epidemiological (population-based) studies in the scientific literature have examined the relationship between soy foods in women's diets and their risk of developing breast cancer (Lee et al., 2009; Chen et al., 2014) although the results are inconclusive (Trock et al., 2006). While a recent meta-analysis of 10 studies of either cohort or case-control study designs found that increasing amounts of soy intake resulted in a lower risk of breast cancer (i.e., 3.5 percent lower risk for every 30 g/day increase in intake) (Kazemi et al., 2021), a meta-analysis that included just eight studies of only cohort study designs did not find a significant effect of higher soy intake on breast cancer risk (Fan et al., 2022).

In a meta-analysis of 35 observational studies, higher consumption of soy isoflavones was found to be associated with a lower risk of breast cancer in both pre- and post-menopausal women in Asian countries but this protective effect was not found in Western countries (Chen et al., 2014). It is thought that this inconsistency in findings is because soy consumption is much lower in Western countries compared to Asian ones (Zhang et al., 2017). Per capita isoflavone intake in the US and in Europe is typically less than 3 mg per day, and this usually comes from foods that contain small amounts of soy protein that have been added to the food. In contrast, intake of soy isoflavones in Japan and China is approximately 25 to 50 mg per day (Messina & Wu, 2009).

A meta-analysis of 10 studies on the effects of soy intake was found to reduce the risk of endometrial cancer by 19 percent (Zhang et al., 2015). This study found similar results for the five studies from Asian populations as the five studies from non-Asian populations.

***Exposure time (early intake)***

For prevention of breast cancer, timing may mean more than intake amounts with early exposure providing maximum protection (Messina & Wu, 2009). Results from studies show that women consuming moderate amounts of soy throughout their life have lower breast cancer risk than women who do not consume soy. This protective effect likely originates from soy intake early in life (Hilakivi-Clarke et al., 2010).

**Soy and Women's Health Continued**

***Exposure time (early intake) Continued***

A recent study in 70,000 women found that high intake of soy during both adolescence and adulthood was almost as protective for breast cancer as only having a high intake during adolescence (but a low intake during adulthood) (Baglia et al., 2016). This finding is consistent with other large observational research (Wu et al., 2009) and with the current scientific evidence that links what children and adolescents are exposed to (such as soy) to cancer risk as adults.

**Soy and Men's Health**

The relationship between diet and prostate cancer is of great interest. A large prospective observational study in North American men found that those consuming a vegan diet had a 35 percent lower risk of developing prostate cancer (Tantamango-Bartley et al., 2016); higher soy consumption along with fibre were considered major components of this protective vegan diet. Further research has looked at soy individually as a protective food.

A meta-analysis of 14 observational studies of men showed soy food consumption to be associated with a 30 percent lower risk of prostate cancer (Yan & Spitznagel, 2009). However, the protective effect of this analysis was mostly driven by results from Asian populations rather than Western populations (Yan & Spitznagel, 2009). Again, this lack of effect in Western populations may be due to the very low consumption of soy when compared to Asian populations (Yan & Spitznagel, 2009). Another meta-analysis in Asian populations showed that increased amounts of total and non-fermented soy foods were also associated with a lower risk of prostate cancer (Hwang et al., 2009). Intake of non-fermented soy foods including tofu and soy milk was associated with a lower risk of prostate cancer, whereas fermented soy foods were not (Hwang et al., 2009; Yan & Spitznagel, 2009). A recent meta-analysis of four cohort studies found that higher intake of total soy or soy isoflavones was associated with a 12 percent lower risk of prostate cancer (Fan et al., 2022). Another recent meta-analysis of 16 studies that included both cohort and case-control study designs also found a 29 percent lower risk of prostate cancer associated with higher soy intakes (Applegate et al., 2018). Further analyses looking at various soy food products suggested that the lower risk of prostate cancer was associated with consumption of tofu specifically (Hwang et al., 2009; Applegate et al., 2018).

These results suggest a relatively consistent protective effect for soy products against prostate cancer.

## Spices <<Back>>

**Why Eat Spices:** Using spices in cooking allows you to add layers of flavour in a healthy way, compared to adding ingredients high in salt, refined sugar, or saturated fats. Due to their antioxidant, anti-inflammatory, and immunomodulatory properties, many spices may be associated with cancer treatment and prevention (Zheng et al., 2016), as well as being used as chemopreventive agents (Butt et al., 2013). Including a variety of spices in your diet is a great way to reap the varying health benefits of different spices. Many spices contain phytochemicals and other bioactive components, which has led to much interest in researching their cancer protective effects (Kaefer & Milner, 2008). Yet research on spices is quite limited as the type, quantity, and forms they are consumed in differ across cultures (Kaefer & Milner, 2008). Most of the research available on spices and cancer is from laboratory-based cell culture (*in vitro*) studies.

**How to Eat Spices:** Toasting spices in a dry pan is a great way to bring out their deeper flavours. Get creative and don't be afraid to experiment with different spices in familiar dishes to take an old recipe to a new level! Try adding a couple new-to-you spices into your daily repertoire. A little can go a long way depending on the spice, so add little by little and be sure to taste as you go. Store your spices in sealed jars, in a dry, cool place and replace every two years to ensure freshness. Buying small amounts at the bulk store is a good way to ensure that they stay fresh and full of flavour.

**Nutritional Benefits for Specific Cancers:** Spices are known to have antioxidant properties (Kaefer & Milner, 2008) which can protect against cancer development (Devasagayam et al., 2004). Spices with the highest amounts of antioxidants are ground cloves, dried oregano, ground ginger, ground cinnamon, and turmeric powder (Halvorsen et al., 2006). Consuming a diet that is high in antioxidants has been found to reduce the risk of gastric cancer (Serafini et al., 2002), breast cancer (Pantavos et al., 2015), and possibly others (Zheng et al., 2016). However, research in humans specifically focused on the relationship between spices and cancer is very limited.

Saffron contains compounds called crocin and crocetin, both of which have shown anticancer effects in cell culture models (Zheng et al., 2016) including inhibiting leukemic cells through various mechanisms (Moradzadeh et al., 2019). In addition, saffron is unique as there is evidence that it may have antidepressant effects for those with mild-to-moderate depression (Lopresti & Drummond, 2014). In a meta-analysis of six clinical studies, saffron extract (30 mg per day) was found to be efficacious for the treatment of adults diagnosed with depression (Lopresti & Drummond, 2014). In a prospective cohort study of >50,000 participants in Iran, higher saffron intake was found to be associated with a reduced risk of death from cardiovascular disease, but not cancer (Hashemian et al., 2019).

Piperine, found in black pepper, has shown antitumour effects in various cancer cell models

including breast cancer, prostate cancer, colorectal cancer as well as in melanoma cells and in the treatment of osteosarcoma (Zheng et al., 2016). In the Iranian cohort study mentioned above, higher black pepper intake was associated with a lower risk of death (any cause) during follow-up, but not associated specifically with death from cardiovascular disease or cancer (Hashemian et al., 2019).

Cloves contain eugenol, a plant phenol that has demonstrated anti-cancer effects in a wide range of cancer cell models, including breast, cervical, colon, gastric, lung, and melanoma (Zari et al., 2021). It can diminish cancer cell proliferation, development of blood vessels that feed tumours (angiogenesis), cell migration, and metastasis, and enhance cell death (apoptosis).

Cinnamon also contains eugenol, as well as cinnamaldehyde and beta-caryophyllene, which have also demonstrated anti-cancer activities. Collectively, either cinnamon extracts or these individual compounds have demonstrated decreased proliferation, inhibition of angiogenesis, and stimulated apoptosis of cancer cell lines including breast, cervical, hematological, liver, and melanoma (Dutta & Chakraborty, 2019). High cinnamon intake was not associated with a decreased risk of mortality from cancer in the Iranian cohort study (Hashemian et al., 2019).

Other spices such as chili, ginger, and turmeric have been found to have anticancer effects and have been covered in separate sections (see '***Hot Peppers***', '***Ginger and Ginseng***', and '***Turmeric***').

## Strawberries <<Back>>

**Why Eat Strawberries:** The World Cancer Research Fund recommends that fruit is consumed every day to reduce the risk of cancer (2018). Strawberries are a great option as they are not only high in vitamin C, but also contain ellagic acid, one of the most potent anticancer phytochemical compounds. Ellagic acid prevents the activation of carcinogenic substances into cellular toxins thereby inhibiting DNA mutations which can trigger cancer (Ceci et al., 2018). Strawberries are also the most concentrated source of the flavonol fisetin, for which cell culture and animal studies have demonstrated anti-cancer activity such as reducing proliferation and blood vessel development that feed tumours (angiogenesis) and inducing cell death (apoptosis) in many cancer types (Imran et al., 2021). Anthocyanidins (polyphenols that contribute to the vivid hues of berries) and proanthocyanidins (a complex chain of polyphenols) are another reason one should consume strawberries (and other berries) in their cancer preventative diet (Hannum, 2004).

**How to Eat Strawberries:** Nothing is more delicious than a freshly picked strawberry. That is often hard to come by, so if you can't get your hands on fresh strawberries, frozen strawberries are great too. Toss them into smoothies or warm them up into a strawberry sauce/compote to put on top of a bowl of oatmeal. Jam is not the best way to get all the benefits from strawberries as

much of the cancer productive components, such as ellagic acid and flavonols, are lost during standard processing (Flores & Ruiz Del Castillo, 2016).

Lastly, while not as readily available, freeze-dried strawberries exhibit the most antioxidant and anticancer properties (Chen et al., 2012). You can look for freeze dried strawberries at health food stores or online if you are curious to try them out. They have a delicious, concentrated strawberry flavour and are perfect to toss into a trail mix with nuts and seeds.

**Nutritional Benefits for Specific Cancers:** While research indicates fruit consumption is linked to reductions in cancers of the esophagus, lung, stomach, colorectum, and bladder (WCRF & AICR, 2018b), research on strawberries alone is lacking (Stoner, 2009) with only small trials being undertaken. In a randomized clinical trial of freeze-dried strawberries and 75 participants with precancerous esophageal cancer lesions, the progression of the disease was reduced in almost 80 percent of the patients in the high dose (two ounces freeze-dried strawberries, daily for six months) group (Chen et al., 2012).

## Tomatoes <<Back>>

**Why Eat Tomatoes:** Tomatoes are a great vegetable to include in a healthy cancer protective diet. They are readily available and contain high amounts of vitamins A and C, which are both important vitamins, but are also free radical fighting antioxidants. They are an easy way to increase dietary carotenoids, a class of phytochemicals. Lycopene is a red carotenoid abundant in tomatoes that has been shown to have significant potential for cancer prevention (Giovannucci et al., 2002) and possibly for cardiovascular disease as well (Xu et al., 2021).

**How to Eat Tomatoes:** Consume them in every form possible - fresh, cooked, roasted, on whole grain toast with fresh herbs and olive oil, in soups, stews, spicy chilis, eggplant moussaka, and in all tomato-based products like tomato sauce and tomato paste. Cooked tomatoes have a significantly higher available lycopene content than raw tomatoes - up to 164 percent higher when cooked for 30 minutes, although vitamin C amounts decrease slightly (Dewanto et al., 2002). During cooking, the tomato's cell walls rupture, allowing lycopene to be released and more easily absorbed (Dewanto et al., 2002). To boost absorption even more, eat tomato-based products with a healthy fat, such as olive oil, as lycopene is lipophilic (likes fats) and thus is more easily absorbed in the intestine (Fielding et al., 2005).

**Nutritional Benefits for Specific Cancers:** The WCRF & AICR (2018b) concluded there is some evidence that food sources of carotenoids reduce the risk of lung and breast cancer and that food sources of vitamin C reduce the risk of lung cancer among smokers, and colon cancer, although this is considered as 'limited suggestive' evidence. Tomatoes are a common contributor to the intake of these nutrients.

The mechanisms of how lycopene reduces the development of cancer are still being studied (Gajowik & Dobrzyńska, 2014). Because lycopene can act as an antioxidant it can scavenge and neutralize free radicals that in turn prevent them from causing damage and inflammation within our body (Gajowik & Dobrzyńska, 2014). When compared to other carotenoids, lycopene is an extremely potent antioxidant and is thought to not only decrease the risk of developing cancer, but also reduce the growth rate of tumours (Gajowik & Dobrzyńska, 2014). One cohort study in the U.S. that followed more than 100,000 participants found that moderate (but not higher) intake of lycopene was associated with a lower risk of death from cancer (Xu et al., 2021). The consumption of tomatoes and tomato products has been found to be associated with a reduced risk for cancers of the prostate, lung, and stomach (Giovannucci., 1999).

Findings have shown that lycopene may slow down the development of prostate cancer by acting directly on certain enzymes responsible for cell tissue growth in the prostate area, as lycopene is preferentially absorbed in the prostate as well as in the adrenal glands, testicles, and liver (Gajowik & Dobrzyńska, 2014; Wertz, 2009; Wertz et al., 2004).

Observational research has shown that men whose diets are high in lycopene have a lower risk of developing prostate cancer (Story et al., 2010). Just one meal per week containing tomato sauce may have protective effects in men for prostate cancer (Giovannucci et al., 2002). Further, in a small study of men with early-stage prostate cancer, consuming tomato sauce once every day as part of a meal for three weeks was found to reduce markers of cancer progression and increase the amount of lycopene in the prostate (Chen et al., 2001). Evidence from the Health Professionals Follow-up Study with 47,365 men, one of the largest prospective epidemiological studies, showed that high lycopene intake lowered the risk of prostate cancer by 16 percent. Moreover, eating a serving of tomato sauce (1/2 cup) twice per week lowered the risk of prostate cancer by 23 percent when compared to those who only consumed tomato sauce once a month or less (Giovannucci et al., 2002). Adding to the evidence, a meta-analysis of 42 observational studies found that consuming a diet high in lycopene was associated with a lower risk of prostate cancer (Rowles et al., 2017). However, a more recent meta-analysis that was restricted to 10 prospective cohort studies and did not include any case-control studies did not find a statistically significant decrease in risk of prostate cancer with higher tomato consumption (Luo et al., 2021), nor did a study that pooled data from 15 prospective cohort studies (Petimar et al., 2017), so the evidence remains mixed.

In addition to prostate cancer, tomatoes may also help to decrease the risk of skin cancer **(**Rizwan et al., 2011). In a study examining the effects of lycopene rich foods on skin cancer showed that women who consumed 55 g tomato paste with olive oil (to help with lycopene absorption) daily, had a significant reduction in indicators of sun damaged skin, including a decrease in angiogenesis. These results suggest that regular intake of high lycopene foods can prevent sun damage, a precursor to skin cancer **(**Rizwan et al., 2011).

## Turmeric <<Back>>

**Why Eat Turmeric:** Turmeric contains more than 300 different bioactives (Gupta et al., 2013), including both turmerones and curcumin. These compounds have been shown to have anticancer and anti-inflammatory activities (Greger, 2022; Supic et al., 2013). Curcumin has been researched highly and its safety at high doses has been well established in clinical studies of cancer patients (Dhillon et al., 2008; Gupta et al., 2013). Further, curcumin shows promise among the polyphenols to be protective against cancer (Torquato et al., 2017) and possibly cardiovascular disease (Hashemian et al., 2019).

**How to Eat Turmeric:** In its raw form (turmeric root looks similar to ginger root) or in dried/powdered and cooked form, both are excellent choices for using turmeric. Raw turmeric has been shown to have greater anti-inflammatory effects while dried/powdered has better DNA protection (Percival et al., 2012).

To enhance the absorption of curcumin from turmeric, it is best to consume it in food form (fresh or dried) rather than as a supplement. This is because turmeric root contains natural oils that can enhance the bioavailability of curcumin by eight times! Cooking with oil adds even more of a boost, helping your body absorb the beneficial properties of turmeric into the bloodstream through the lymphatic system (bypassing the liver which would try to remove it through urine) (Greger, 2022). Another way to enhance the absorption of curcumin is to add black pepper to the dish you are making with turmeric due to the presence of a molecule called piperine (Shoba et al., 1998).

**Nutritional Benefits for Specific Cancers**: Working through multiple cellular pathways, curcumin has been found to be a promising therapeutic agent against many types of cancers, including colorectal, breast, prostate, and pancreatic (Devassy et al., 2015).

Specifically, curcumin has shown much promise in colorectal cancer as it is able to come in direct contact with the gastrointestinal lining, compared to other cancers where it needs to be absorbed into the blood and transported throughout the body becoming diluted and quickly metabolized and thus weakening the effect (Carroll et al., 2011). Curcumin was found in a clinical trial to have anticarcinogenic effects by decreasing the progression of abnormal cells in the rectum (Carroll et al., 2011). Over 30 days, curcumin supplementation (4 grams per day) in a small sample of smokers was able to significantly reduce the number of abnormal cells located in the rectum (aberrant crypt foci) by 40 percent (Carroll et al., 2011). No effect was found for those who were only supplemented two grams per day of curcumin. However, a longer duration may have allowed for benefits to be measured (Carroll et al., 2011).

Research in other cancers has been more difficult as the bioavailability of curcumin is low (Anand et al., 2007). This characteristic of curcumin makes it challenging for researchers to provide a

large enough dose to cause a measurable effect in clinical trials. In order to get significant effects some researchers have combined curcumin with other bioactives, hoping the compounds will work synergistically for a stronger, more measurable effect. A treatment combining isoflavones (from soy) and curcumin was found over six months to significantly decrease prostate specific antigen (PSA) levels in men who had elevated levels of PSA (Ide et al., 2010). Elevated PSA is a risk factor for developing prostate cancer (Gaudreau et al., 2016).

When looking at cell culture studies, curcumin combined with piperine was found to have cancer preventative actions in breast cancer cells (Kakarala et al., 2010). In laboratory studies, curcumin has been shown to be effective in decreasing cell proliferation, tumour blood vessel formation (angiogenesis), and metastasis, and in stimulating cancer cell death (apoptosis), in hormone-independent breast cancer models (Farghadani & Naidu, 2021). It is also being studied in clinical trials as an adjuvant to standard breast cancer therapies (chemotherapy and radiation) to improve outcomes, noting a reduction in a protein involved in metastasis and reduced side effects such as fatigue (Farghadani & Naidu, 2021).

Turmeric has been found to be a cholecystokinetic agent, which means that it facilitates the gallbladder to keep bile moving out, thereby reducing the risk of gallbladder cancer (Goel et al., 2008; Rasyid & Lelo, 1999).

More clinical and observational studies are needed to further elucidate the impact of turmeric consumption on the prevention of various forms of cancer.

Regarding potential benefits of turmeric and cancer treatment side effects, a meta-analysis of nine human clinical studies reported on the benefits of turmeric/curcumin supplements and mouthwashes on reducing the impact of oral mucositis following radiation or chemotherapy treatment of head and neck cancers (Dharman et al., 2021). The analysis demonstrated a significant effect on delaying the onset and reducing the severity of oral mucositis, as well as reducing weight loss by patients as a side effect of cancer treatment. The mouthwash formulations were more effective than the oral supplements.

## Vitamin D Supplements <<Back>>

**Why Vitamin D:** In addition to playing a role in bone metabolism and mineralization, some recent studies have shown that vitamin D may exhibit anti-cancer activities (Scaranti et al., 2016). Although it is recommended to obtain nutrients directly from food whenever possible instead of taking supplements (WCRF & AICR, 2018a), vitamin D is unique in that not many foods provide a sufficient amount, and the majority of vitamin D that we get is actually through exposure of our skin to the sun (Scaranti et al., 2016). In the winter months, however, vitamin D levels can drop significantly, and supplementation can help counteract the lack of sunshine exposure. In addition

to supplements, in Canada some brands of orange juice and nut milks (soy, cashew, almond etc.) are voluntarily fortified with vitamin D and other nutrients, and these can also be included in the diet on a daily basis to ensure adequate vitamin D levels are being achieved (Davis & Milner, 2011; Otten et al, 2006). Other, common non-plant sources of vitamin D include fish, egg yolks, and vitamin D fortified cow's milk and margarine.

**How to Take Vitamin D:** Vitamin D supplements are recommended to be taken on a daily basis, especially in the winter months. The Recommended Dietary Allowance for healthy adults is 600 IU (15 μg) per day, and the tolerable upper limit is 4000 IU (100 μg) (Health Canada, 2010). Vitamin D is available from animal sources (e.g., butter, eggs, fatty fish) and fortified dairy (e.g., margarine, milk). For a plant-based diet, including fortified plant-based milks and fortified orange juice can help to reach the daily recommended amount (Davis & Milner, 2011; Otten et al., 2006). Mushrooms exposed to UV rays through sunlight are also a great source of vitamin D (see '***Mushrooms***'). Although vitamin D toxicity is rare, individuals who consume lots of fortified foods, fish, and take supplements in tandem, may be at risk of adverse effects (Otten et al., 2006).

**Nutritional Benefits for Specific Cancers:** Much research on vitamin D has been undertaken. However, a clear signal within the literature for cancer prevention is lacking. In observational research, vitamin D exposure can be measured in two ways: either through circulating levels in the blood (i.e., serum vitamin D) or through assessing dietary and supplement intake.

When looking at specific cancers, some observational research has shown protective effects of higher amounts of vitamin D in the blood or serum (colorectal and bladder cancer). However, some research has found mixed results (prostate) or no effect (breast and ovary cancer) (Mondul et al., 2017). A more recent meta-analysis of five case-control studies found that vitamin D deficiency, based on serum vitamin D, was associated with a greater risk of breast cancer (Hossain et al., 2019). One of the more consistent associations for higher serum vitamin D is a reduction in colorectal cancer risk. In the Physicians' Health Study, those with the highest levels of serum vitamin D were found to have a 35 percent lower risk of colorectal cancer when compared to those with the lowest levels (Lee et al., 2011). Moreover, a meta-analysis of five studies found higher circulating vitamin D to be associated with lower risk of colorectal cancer (Gorham et al., 2007).

When looking at trials where vitamin D was taken as a supplement, no clear benefits for cancer prevention have been identified. For example, in a meta-analysis of 18 clinical studies, researchers found no beneficial effect for general cancer prevention or specific cancers in those supplemented with vitamin D (Bjelakovic et al., 2014). However, most of the participants in these trials were elderly women because most of the current clinical evidence for vitamin D supplementation comes from osteoporosis prevention research. When looking at research in men, a meta-analysis of three randomized trials in patients with advanced prostate cancer and supplemented with vitamin D, no significant benefit (or harm) was found (Buttigliero et al., 2011).

The WCRF & AICR (2018d) concluded there is only limited suggestive evidence for a decrease in colorectal cancer with vitamin D supplementation. A review of meta-analyses found that although the evidence for prevention of specific cancer types is inconsistent, there is good evidence that vitamin D supplementation decreases the risk of cancer mortality (all types combined) (Sluyter et al., 2021). The authors suggest that trials with longer follow up periods and larger numbers of participants are needed to provide more conclusive evidence.

It is important to note that the WCRF & AICR (2018a) do not recommend using supplements for cancer prevention, especially at high doses (e.g., above 600 IU), nor does any other official institution (Mondul et al., 2017). Rather, it is recommended to eat a healthy diet to best protect against cancer. Nonetheless, vitamin D is important for overall health and obtaining the age-specific recommended daily intake from either food or a supplement is recommended for Canadians 2-50 years of age; for Canadians 51 years and older, a daily supplement (400 IU or 10 µg) in addition to any vitamin D food sources is recommended as the ability to produce vitamin D diminishes with age (Health Canada, 2022).

## Watermelon <<Back>>

**Why Eat Watermelon:** Fruit is an important part of a health and cancer preventative diet (WCRF & AICR, 2018a). Although 92 percent is water, watermelon is a source of natural antioxidants, specifically lycopene, asc orbic acid, and citruline (Naz et al., 2014). Red fleshed watermelon contains a significant amount of lycopene and when compared to tomato juice, both were found to significantly increase lycopene concentrations in the blood of human volunteers compared to controls (Edwards et al., 2003).

**How to Eat Watermelon:** Watermelon is best enjoyed in season and freshly sliced! It is also great blended with a bit of mint, lime, and ice cubes for a refreshing beverage, grilled on the barbecue or cut into chunks and enjoyed with mint, lime, and other seasonal vegetables in a cold salad.

**Nutritional Benefits for Specific Cancers**: Research has found that a diet high in lycopene is associated with a lower risk of prostate cancer in men (Rowles et al., 2017). Watermelon juice (360 ml) has been shown to increase circulating lycopene levels by three times (Ellis et al., 2019).

A cohort study conducted in Shanghai, China that followed more than 60,000 people found that higher watermelon consumption (as well as green leafy vegetables, carotenoid, and vitamin A intakes) was associated with a decreased risk of lung cancer (Takata et al., 2013).

When two cups per day of fresh watermelon were provided to 33 overweight and obese subjects over four weeks, it reduced markers of oxidative stress and improved total antioxidant capacity (Lum et al., 2019). It was also found to reduce hunger and improve body weight management

(Lum et al., 2019). Watermelon is known to have possible metabolic health benefits (Figueroa et al., 2011, 2012, 2017). Maintaining a healthy body weight is important for protecting against obesity-related cancers such as breast, colorectal, endometrial, esophageal, kidney, and pancreatic, among others (WCRF & AICR, 2018c).

More information on the specific potential benefits of lycopene for cancer prevention is found in the section '***Tomatoes***'.

## Whole Grains <<Back>>

**Why Eat Whole Grains:** Whole grains provide many nutrients including dietary fibre, vitamins, minerals, and phytochemicals, all of which have anticancer effects (Aune et al., 2011; WCRF & AICR, 2018b). Other anti-cancer compounds found in whole grains include vitamin E, selenium, copper, zinc, phytoestrogens, and lignans (WCRF & AICR, 2018b). Lignans are a group of polyphenols found in whole grains and other plants. They are shown to have chemopreventive benefits and whole grains are an easy way to incorporate lignans into the diet (Slavin, 2000).

Whole grains are a major contributor to dietary fibre intake, which has a strong protective role against some forms of cancer (see '***Fibre-rich foods***'). Whole grains also have a lower glycemic index, compared to more processed grains, which has been shown to be protective for cancer (Donaldson, 2004), as well as type 2 diabetes and coronary heart disease (see '***Low Glycemic Index***'). Consumption of whole grains has also been directly shown as protective against type 2 diabetes and cardiovascular disease (Aune et al., 2016b; Hu et al., 2020).

**How to Eat Whole Grains:** Look for whole grains and whole grain products made from the entire grain as most of the anti-carcinogenic compounds are found in the bran and germ of the grain (WCRF & AICR, 2018b). When selecting grain products, use colour as a guide. For example, red quinoa is more nutrient dense than white quinoa. Brown and black rice are more nutrient dense than white rice (Goufo & Trindade, 2014). Blue corn flour is more nutrient dense than yellow corn flour. Try preparing meals with whole grains such as pot barley, millet or farro, such as grain-based salads or as part of a multi-component 'bowl' style meal.

**Nutritional Benefits for Specific Cancers:** A systematic review was conducted of meta-analyses with observational studies on the association between whole grain consumption and cancer (Gaesser, 2020). The review indicated that seven of eight meta-analyses found an overall reduced risk of death from cancer with higher *vs.* lower consumption of whole grains. Likewise, all included meta-analyses found a reduced incidence of colorectal, colon, gastric, pancreatic, esophageal, brain, endometrial, and non-Hodkin's lymphoma (Gaesser, 2020). One of two meta-analyses found a reduced risk of breast cancer, while no reduced risk was found in a meta-analysis of rectal or prostate cancers (Gaesser, 2020). Overall, the evidence for a protective effect of whole

grains is very strong and consistent.

The WCRF & AICR (2018b) also concluded there is strong evidence that eating whole grains lowers the risk of colorectal cancer. When looking at the scientific evidence through a dose-response meta-analysis of six studies, they found that consuming 90 grams of whole grains per day lowered the risk of colorectal cancer by 17 percent (WCRF & AICR, 2018b). Further, an inverse relationship between intake of dietary fibre, cereal fibre, whole grains, and risk of colorectal cancer was found in a meta-analysis looking at 25 prospective studies (Aune et al., 2011).

Oats, either eaten or used topically, have been found to contain anti-inflammatory compounds called avenanthramides, which are soothing for certain chemotherapy induced skin rashes (Alexandrescu et al., 2007) as well as being anti-inflammatory for the gastrointestinal tract (Guo et al., 2010).

# Summary Chart of Foods to Frequently Consume and Supporting Research

<<Back>>

| What | Why | References |
|---|---|---|
| **Apples** (including their peels) | • Rich in polyphenols which have anticancer and antiangiogenic properties | Zessner et al., 2008 |
| | • Rich in flavonoids which have anti-cancer and antiangiogenic properties | Nezbedova et al., 2021, Zessner et al., 2008 |
| | • May also help prevent cardiovascular disease, diabetes, and obesity | Nezbedova et al., 2021 |
| **Artichokes** | • Part of the health-promoting Mediterranean diet | Lattanzio et al., 2009 |
| | • Rich in polyphenols, inulin, fibre, minerals, antioxidants | Béliveau & Gingras, 2006 Lattanzio et al., 2009 |
| | • Polyphenolic action shown to induce cell death in human breast cancer cells | Mileo et al., 2012 |
| **Avocado** | • Rich in phytochemicals, dietary fibre, antioxidants, and healthy fats | Dreher & Davenport, 2013 |
| | • Multitude of health benefits, i.e., supporting cardiovascular health, managing weight, and healthy aging | Dreher & Davenport, 2013 Pacheco et al., 2022 |
| **Blueberries** | • Contain anthocyanidins that are powerful antioxidants protecting cells from free radicals | Davidson et al., 2018 |
| | • Unique as they contain five of the major anthocyanidins that may work synergistically to prevent and slow cancer development | Jeyabalan et al., 2014 |

| What | Why | References |
|---|---|---|
| **Cacao** | • Very rich in flavanols | Weisburger, 2001 |
| | • Specifically, the flavanols catechins and procyanidins have shown to reduce inflammatory markers, angiogenesis, initiation, and proliferation of cancer cells | Maskarinec, 2009<br>Goya et al., 2016<br>Weisburger, 2001 |
| **Calcium** - (from plant-based sources) | • Calcium is essential for bone health | Otten et al., 2006 |
| | • Vegetarian diets are high in oxalic and phytic acid, both of which inhibit calcium absorption, so calcium from a variety of different foods is essential, including tofu and calcium-fortified plant-based milks | Otten et al., 2006<br>Messina et al., 2022 |
| | • Higher dietary calcium intake may be protective against colorectal and possibly breast cancer | Larsson et al., 2009<br>WCRF & AICR, 2018f |
| | • Higher calcium intake may increase the risk of prostate cancer (i.e., every 400 gram increment in calcium intake results in a 5 percent increased risk) | WCRF & AICR, 2018f |
| **Citrus fruit** (including zest) | • Contain high levels of flavonoids, shown to interfere with tumour spreading and growth | Büchner et al., 2010<br>Kunimasa et al., 2010<br>Michaels et al., 2006 |
| | • 100 g/day reduces the risk of stomach cancer | WCRF & AICR, 2018b |
| | • Associated with decreased breast and esophageal cancer risk | Song & Bae, 2013<br>Zhao et al., 2018 |

| What | Why | References |
|---|---|---|
| **Cruciferous vegetables** (e.g., Arugula, Bok choy, broccoli, broccoli sprouts, Brussel sprouts, cabbage, cauliflower, collard greens, kale, kohlrabi, mustard greens, radish, turnips) | • Contain a large variety of phytochemical compounds with anticancer activity | Gingras et al., 2004<br>Verhoeven et al., 1996<br>Watson et al. 2013 |
| | • In particular, glucosinolates are known for their strong anti-cancer properties | Supic et al., 2013 |
| | • Sulforaphane has shown to inhibit activity in human stomach, colon, bladder, prostate, kidney, pancreas, and breast cancer cells | Chikara et al., 2018 |
| | • Regular consumption is associated with a lower cancer risk | Aune et al., 2017 |
| **Fibre rich foods** (e.g., legumes, whole grains, fibrous vegetables and fruits) | • Invaluable for chronic disease prevention, particularly cancer prevention, as well as cardiovascular disease, type 2 diabetes, and weight maintenance | Evans, 2019<br>WCRF & AICR, 2018b |
| | • Associated with lower bladder, breast, colon, and ovarian cancer risk | Aune et al., 2012<br>Huang et al., 2018<br>Li et al., 2013<br>Yu et al., 2020 |

| What | Why | References |
|---|---|---|
| **Flaxseeds** (freshly ground) | • Great source of fibre and omega-3 fatty acids | Rock et al., 2012 |
| | • One of the highest sources of lignans, which have anti-cancer and phytoestrogen activities, and may protect against breast, colorectal, and prostate cancers | Cotterchio et al., 2006<br>De Silva & Alcorn, 2019<br>Smeds et al., 2007 |
| | • May decrease risk of digestive tract cancers | Grosso et al., 2017 |
| **Garlic** | • The principal compounds in garlic, diallyl sulfide (DAS) and diallyl disulfide (DADS), inhibit the enzymes responsible for activating carcinogens and stimulate enzymes responsible for elimination of carcinogens | Béliveau & Gingras, 2016<br>Demeule et al., 2004 |
| | • May play a role in the prevention of several cancer types, especially digestive system cancers | Guercio et al., 2015<br>Wang et al., 2022 |
| | • May also help reduce cardiovascular disease and type 2 diabetes | Ansary et al., 2020 |
| **Ginger & Ginseng** | • The aromatic ingredient in ginger, called gingerol, has anti-cancer activity in addition to other medicinal properties | Kim et al., 2005<br>Prasad & Tyagi, 2015 |
| | • Improves nausea severity caused by chemotherapy | Palatty et al., 2013<br>Totmaj et al., 2019 |
| | • Ginseng's bioactives, ginsenosides, have anti-inflammatory properties | King & Murphy, 2007 |

| What | Why | References |
|---|---|---|
| **Grapefruit** | • Contains high levels of flavonoids | Cirmi et al., 2016 |
| | • High in apigenin, which has antioxidative and anti-inflammatory activities | Cirmi et al., 2016 |
| | • Source of lycopene, a powerful antioxidant known to decrease prostate cancer risk | Rowles et al., 2017<br>Seren et al., 2008 |
| | • Contains bergapten, which reduces cancer cell proliferation and increases cancer cell death | Quetglas-Llabres et al., 2022 |
| **Green tea** | • High in EGCG, a catechin polyphenol compound in green tea, has been shown to inhibit tumour growth, angiogenesis, and promote cancer cell death | Ohishi et al., 2016<br>Suganuma et al., 2016<br>Supic et al., 2013<br>Yang et al., 2008 |
| | • Anti-inflammatory | Ohishi et al., 2016 |
| | • Some evidence for lower risk for some cancers, but not consistent | Guo et al., 2017<br>Huang et al., 2017<br>Zhou et al., 2021 |
| **Healthy plant-based oils** | • Essential component of a healthy diet and can be incorporated into a healthful diet to reduce the risk of cancer and other diseases | Dreher & Davenport, 2013<br>Han et al., 2015 |
| | • Healthy alternative to animal-source or saturated fats that are linked to increased risk of some cancers | WCRF & AICR, 2018d |

| What | Why | References |
|---|---|---|
| **Herbs** | • Rich in beta-carotene and flavonoids | Craig, 1999 |
| | • Apigenin, a flavonoid found in parsley has shown to have anti-cancer effects | Xianohui et al., 2017 |
| | • Peppermint was shown to be one of the most common herbs highest in antioxidants | Carlsen et al., 2010 |
| | • Luteolin, in mint, parsley & thyme, has anti-cancer activities | Dei Cas & Ghidoni, 2018 |
| | • Oregano and thyme were shown to contain high levels of an antioxidant (rosmarinic) that suppress the growth of tumour blood vessels | Huang & Zheng, 2006<br>Kruma, et al., 2008<br>Viuda-Martos et al., 2010 |
| | • Linked to lower cancer risk in some studies, but evidence still limited | Gates et al., 2009<br>Fortes et al., 2003 |
| **Hot peppers** | • The heat producing chemical in hot peppers, capsaicin, has been shown to have cancer preventing properties | Adetunji et al., 2022<br>Bley et al., 2012<br>Clark & Lee, 2016 |
| | • Population studies are conflicting in terms of cancer prevention | Lopez Carillo et al., 1994; 2012 |
| | • Topically applied capsaicin may also have pain modulation effects | Mason et al., 2004 |

| What | Why | References |
|---|---|---|
| **Low Glycemic Whole Foods** | • Help to regulate blood sugar levels which can help to reduce cancer risk | Donaldson, 2004 |
| | • High glycemic load is associated with higher risk of bladder, colorectal, kidney, and endometrial cancers | Turati et al., 2019<br>WCRF & AICR, 2018d |
| | • High glycemic load associated with greater risk of type 2 diabetes and coronary heart disease | Fan et al., 2012<br>Livesey et al., 2019 |
| **Mixed and Leafy Greens** | • Associated with living longer | Aune et al., 2017 |
| | • Important polyphenol sources for cancer risk reduction | Heimler et al., 2007<br>Steevens et al., 2011 |
| | • Associated with reduced risk of some types of cancer | Xu et al., 2015 |
| **Mushrooms** | • They are rich in dietary fibres and other important anticancer compounds | Akramiene et al., 2007<br>Manzi et al., 2004 |
| | • Extracts demonstrate anti-cancer activities in several cancer cell types | Nowakowski et al., 2021 |
| | • If UV exposed, are a great source of plant-based vitamin D | Cardwell et al., 2018 |
| | • Associated with a reduced incidence of cancer | Ba et al., 2021 |
| **Nuts** | • Great source of dietary fibre, unsaturated fats, vitamin E, and magnesium | Aune et al., 2016<br>a |
| | • Reduce the risk of several types of cancer | Wu et al., 2015 |

| What | Why | References |
|---|---|---|
| **Walnuts** | • Great source of α-linolenic acid (ALA), polyphenols, and phytochemicals that have anti-inflammatory and antioxidant properties | Vinson & Cai, 2012 |
| | • On a serving size basis, are one of the highest sources of polyphenols in the human diet | Vinson & Cai, 2012 |
| | • Elagitannins in walnuts are metabolized to urolithins, with anti-cancer properties | Espin et al., 2013<br>Sanchez-Gonzalez et al., 2014 |
| **Brazil Nuts** | • Contain extremely high levels of selenium which has shown many anti-cancer properties and a reduction in cancer risk | Cai et al., 2016 |
| **Omega-3 fatty acids** (e.g., plant-based sources are chia seeds, flax seeds, hemp seeds, soybeans, tofu, walnuts) | • Used in the synthesis of anti-inflammatory molecules that in turn decrease cancer development | Larsson et al., 2004<br>Rose & Connolly, 1999 |
| | • Work directly on cancerous cells by modifying their ability to avoid apoptosis (cell death)<br>• Prevent the development of new blood vessels for cancer growth (angiogenesis) | Andrade-Vieira et al., 2013<br>Larsson et al., 2004<br>Rose & Connolly, 1999 |
| | • Improve mental health | Sublette et al., 2011<br>Bigornia et al., 2016 |
| | • Associated with a lower risk of some cancers, including breast and digestive tract | Saadatian-Elahi et al., 2004<br>Wang et al., 2020 |

| What | Why | References |
|---|---|---|
| **Onions** (including shallots, leeks, scallions, and chives) | • Similar to garlic and other Allium vegetables, onions contain sulfur-containing compounds that are believed to play a role in cancer prevention | Nicastro et al., 2015 |
| | • Also contain high levels of flavonoids, specifically quercetin and anthocyanins that have been shown to inhibit cancer cell proliferation and angiogenesis | Slimestad et al., 2007<br>Herman-Antosiewicz & Singh, 2004 |
| | • Linked to lower risk of some cancers, including breast and laryngeal | Galeone et al., 2015<br>Zhang & Yang, 2022 |
| **Orange vegetables & fruit (**e.g.**,** carrots, squash, sweet potato, orange peppers, papaya, mango) | • Very high sources of carotenoids, which have antiangiogenic properties | Irwig et al., 2002<br>Li et al., 2011<br>Pandey & Shukla, 2002<br>Tamimi et al., 2009<br>Yuan et al., 2003<br>Zhang et al., 2009 |
| | • High in fibre, which helps to lower the risk of colorectal cancer | WCRF & AICR, 2018b |
| | • Higher intakes of dietary carotenoids or beta-carotene may reduce the risk of some cancers | WCRF & AICR, 2018b |

| What | Why | References |
|---|---|---|
| **Plant-based protein** (e.g., legumes such as black beans, chickpeas, kidney beans, lentils, soybeans, split peas, white beans, etc. as well as nuts and seeds/nut and seed butters, whole grains such as quinoa) | • Sources are high in fibre, folate, protein and phytochemicals | Rebello et al., 2014 |
| | • Protein helps to heal tissues and fight infections | Cleveland Clinic, nd |
| | • Lentils, chickpeas, and white lupin legumes have some of the highest amounts of flavonoids among common legumes | Rebello et al., 2014 |
| | • Legumes provide a healthy alternative to red and processed meats that increase risk of colorectal and possibly several other cancers | WCRF & AICR, 2018b<br>Zheng et al., 2022 |
| **Pomegranate** | • High levels of polyphenols such as ellagitannins, ellagic acid and other flavonoids | Moga et al., 2021<br>Seeram et al., 2005 |
| | • Inhibit cell cycle arrest and metastasis and induction of apoptosis and angiogenesis | Moga et al., 2021<br>Turrini et al., 2015 |
| | • Exhibit anti-estrogenic effects | Turrini et al., 2015 |
| **Raspberries** | • Contain ellagic acid, an anti-cancer phytochemical compound | Stoner, 2009 |
| | • Rich in cancer-fighting anthocyanins, which are strong antioxidants and reduce angiogenesis | Kristo et al., 2016<br>Wang & Stoner, 2008 |

| What | Why | References |
|---|---|---|
| **Red Vegetables and Fruits** | • Contain anthocyanins and carotenoids like lycopene, beta-cyanins, and quercetin, all with anti-cancer properties | Chung et al., 2022<br>Tan & Hamid, 2021 |
| | • Anti-cancer activities of the phytonutrients in red vegetables and fruits demonstrate all major mechanisms for preventing or regressing tumor formation | Chung et al., 2022<br>Lin et al., 2017 |
| **Sea Vegetables** | • Contain key nutrients including fibre, protein, unsaturated fat, lignans and sulfated polysaccharides | Kim & Li, 2011<br>Teas et al., 2013 |
| | • Contain fucoidan, a sulfated polysaccharide, that has anti-cancer and anti-estrogenic activity | Ismail et al., 2020<br>Reyes et al., 2020<br>van Weelden et al., 2019 |
| | • Source of vitamins and minerals including vitamin C, vitamin B, calcium, iron, iodine, and magnesium | Kumar et al., 2008 |
| **Soy** (non-processed soy, such as soybeans, miso paste, tofu, tempeh. NOT soy protein isolates) | • Source of high-quality plant protein | |
| | • Main phytochemicals in soy foods are polyphenols called isoflavones (more specifically genistein & daidzein) that have chemopreventive actions | Béliveau & Gingras, 2016<br>Supic et al., 2013 |
| | • Associated with reductions in colorectal, prostate, and possibly breast and other cancers though with some variability in results | Baglia et al., 2016<br>Fan et al., 2022<br>Mayo et al., 2019<br>Yan & Spitznagel, 2009<br>WCRF & AICR, 2018b |

| What | Why | References |
|---|---|---|
| **Spices** | • Antioxidant, anti-inflammatory and immunomodulatory properties | Zheng et al., 2016 |
| | • Spices with the highest amounts of antioxidants are ground cloves, dried oregano, ground ginger, ground cinnamon, turmeric powder | Halvorsen et al., 2006 |
| | • Cloves and cinnamon contain eugenol, saffron contains crocin & crocetin, and black pepper contains piperine, all with anti-cancer activities | Dutta & Chakraborty, 2019<br>Zari et al., 2021<br>Zheng et al., 2016 |
| **Strawberries** | • Contains ellagic acid, which prevents the activation of carcinogenic substances into cellular toxins thereby inhibiting DNA mutations which can trigger cancer | Ceci et al., 2018 |
| | • High in anthocyanidins | Hannum, 2004 |
| | • Most concentrated source of fisetin, a flavonol with anti-cancer activity | Imran et al., 2021 |
| **Tomatoes** (cooked with good quality oil, such as olive oil to increase lycopene absorption) | • High in vitamins A and C | Story et al., 2010 |
| | • Abundant in lycopene, a carotenoid that has been shown to have great potential for cancer prevention and possibly cardiovascular disease | Giovannucci et al., 2002<br>Xu et al., 2021 |
| | • Just one meal per week containing tomato sauce may have protective effects for prostate cancer, though evidence is mixed | Giovannucci et al., 2002<br>Luo et al., 2021<br>Petimar et al., 2017<br>Rowles et al., 2017 |

| What | Why | References |
|---|---|---|
| **Turmeric** | • More than 300 different bioactives | Gupta et al., 2013 |
| | • Containing both turmerones and curcumin, these compounds in turmeric show anticancer and anti-inflammatory activities | Greger, 2022<br>Supic et al., 2013 |
| | • Promising agent against colorectal, breast, prostate and pancreatic cancers, and possibly cardiovascular disease | Devassy et al., 2015<br>Hashemian et al., 2019 |
| | • Reduces oral mucositis, a side effect of head and neck cancer treatments | Dharman et al., 2021 |
| **Vitamin D** | • Major role in bone metabolism and mineralization | Scaranti et al., 2016 |
| | • May play a role in cancer prevention, including colorectal cancer | Scaranti et al., 2016<br>WCRF & AICR, 2018d |
| **Watermelon** | • Rich source of lycopene | Naz et al., 2014 |
| | • Diets high in lycopene have been associated with reduced prostate and lung cancer risk | Rowles et al., 2017<br>Takata et al., 2013 |
| **Whole Grains** | • Rich in dietary fibre, vitamins, minerals, and phytochemicals with anti-cancer effects | Aune et al., 2011<br>WCRF & AICR, 2018b |
| | • Protect against some types of cancers, cardiovascular disease and type 2 diabetes, due to high fibre content | Aune et al., 2016b<br>Hu et al., 2020 |
| | • Rich in lignans which are a group of polyphenols known to have chemopreventive benefits | Slavin, 2000 |
| | • Low glycemic index | Donaldson, 2004 |
| | • Protective effect against colorectal, and possibly other cancer types | Gaesser, 2020<br>WCRF/AICR, 2018b |

# Cancer and Common Food Myths: Truth Revealed

<<Back>>

Following a cancer diagnosis, many diet-related questions concerning "foods-to-avoid" tend to surface. For example, "If I have cancer, should I avoid meat, soy, dairy, carbohydrates and sugar?" is a question of concern for many. Cancer nutrition and what to consume for optimal health can seem scary, daunting, and unattainable, particularly when hearing conflicting advice or warnings about foods that "feed" cancer. A few of these common myths are discussed below.

## Meat

Physiologically, meat can have several potential nutritional benefits that include providing rich sources of protein, iron, zinc, and B vitamins, as well as vitamin A (Rohrmann et al., 2013). Specifically, iron, zinc and folate are more bioavailable from meat products compared to plant-based sources (Rohrmann et al., 2013). However, animal-based foods also have potential adverse effects including increasing LDL cholesterol and saturated fatty acids in the blood. Moreover, the nutrients found in these foods that are potentially beneficial are easily obtained from whole, health promoting, plant-based foods (Rohrmann et al., 2013). For example, current research suggests that a diet higher in plant-based protein and lower in red and processed meats reduces risk for chronic diseases, including cancer, and that those with a diet high in red and processed meat are at increased risk of premature death due to cardiovascular disease and cancer (Rohrmann et al., 2013; Thomson, 2015). Since red and processed meat consumption is a modifiable risk factor for chronic disease, advice should be, and now often is, given within health promotion guidelines to reduce or eliminate consumption (Rohrmann et al., 2013).

When comparing colon environments between vegetarians and meat-rich diets, those with vegetarian diets had lower colonic cell proliferation, differing intestinal bacteria, and lower levels of fecal enzymes and mutagens (Marsh et al., 2012).

On the flip side, decreasing the amount of unhealthy fat sources, like red and processed meats, has been shown to also decrease the risk of colon, prostate and potentially breast cancer (Kushi & Giovannucci, 2002; Xin et al., 2015). Saturated and trans fats were also associated with an increased risk of ovarian cancer risk in a meta-analysis of epidemiological studies relating to dietary fat intake (Qiu et al., 2016) and polyunsaturated fat sources were associated with a reduced risk of ovarian cancer (Merritt et al., 2014).

## Soy <<Back>>

Estrogen is a category of sex hormone responsible for the development and regulation of the female reproductive system and secondary sex characteristics. Such hormones are also produced artificially for use in oral contraceptives or to treat menopausal and menstrual disorders.

A *phytoestrogen* is a compound that is found in plant foods and has a similar chemical structure to the estrogen produced by animals and humans. Phytoestrogens have been shown to have health benefits relating to heart health and cancer prevention. Phytoestrogens are found in flaxseed, soybeans, and soy products.

Research indicates that:

- Consuming soy products during adolescence has been shown to reduce the risk of breast and prostate cancer in adulthood and to reduce the risk of recurrence and mortality for women previously treated for breast cancer (Gonzales et al., 2014)
- Among all legumes, soybeans are unique in that they have a concentrated source of phytoestrogens that are structurally similar to the estrogen hormone found in humans. This similarity in structure allows them to bind to estrogen receptors in humans and therefore may have a role in reducing hormone-dependent cancers (Patisaul & Jefferson, 2010)
- Soy contains omega-3 fatty acids, another nutrient with anti-cancer and anti-inflammatory properties
- Soy is a functional food that also helps to reduce the risk of heart disease

**Soy and post-diagnosis cancer survival:** As for women who have been diagnosed with breast cancer, studies have shown that breast cancer survivors can safely incorporate soy products (such as edamame or tofu) in their diets and that soy may have a protective effect (Nechuta et al., 2012). It is important to note that although the WCRF believes that current research indicates a relationship between consuming soy foods and better survival, the evidence is not substantial enough for them to make specific guidelines for breast cancer survivors (WCRF & AICR, 2018b). This conclusion may be due to there being too few studies in this area as they were only able to consider the evidence from three trials.

**How to consume soy:** Fermented is best, like miso or tempeh or in its whole form like edamame, which can be found fresh or frozen. Try making tofu or tempeh fries, or marinated tempeh strips, tofu feta, tofu cheesecake, and add edamame to salads, wraps or sandwiches for a pop of colour.

## Dairy <<Back>>

Whether dairy is beneficial or not depends on the type of cancer. The EPIC study analyzed the intakes of animal-based sources of calcium and protein in relation to prostate cancer risk in a group of 142,000 men (Allen et al., 2008). They found that a high intake of calcium (and protein) from dairy foods was positively associated with an increased risk of prostate cancer (Allen et al., 2008). Moreover, calcium (and protein) from non-dairy sources was not associated with an increased risk of prostate cancer (Allen et al., 2008). High levels of calcium may be a risk factor for prostate cancer and therefore excess calcium intake, particularly from dairy (Ahn et al., 2007; Allen et al., 2008), may not be beneficial (Rahmati et al., 2018). This was also the conclusion of the WCRF & AICR (2018f).

However, there is also strong evidence that dairy and high calcium intakes including calcium from supplements, are associated with a reduced risk of colorectal cancer (WCRF & AICR, 2018f). Dairy likely shows up as a protective food in this case as it is often the main source of calcium in the studies looked at. But since total dietary calcium and supplemental calcium seem to demonstrate the same protective effect against colorectal cancer, it may not be necessary to rely on dairy.

Because of the opposing effects of dairy on different types of cancers, the WCRF & AICR (2018f) abstained from giving any specific recommendation on the consumption of dairy products.

## Carbohydrates <<Back>>

Carbohydrates come in many forms and are broadly categorized as complex or simple. Complex carbohydrates are made up of longer chains that digest and release sugar more slowly. They are found in whole foods like whole grains, legumes, fruits, and vegetables and generally have a higher fibre content. Simple carbohydrates are shorter chains that digest and release sugar into the bloodstream more quickly. They are more abundant in refined foods like sugars, refined grain products, as well as fruit, vegetables, and dairy. The advice is to increase consumption of complex carbohydrates and to reduce consumption of unhealthy sources of simple carbohydrates (i.e., candy, table sugar, juice concentrates, sugar-sweetened beverages, and sweet baked goods), which provide no or much less fibre or additional nutrients. They tend to spike blood sugar levels leaving the consumer feeling fatigued, mentally fuzzy, and increasing their risk of impaired glucose metabolism.

Do they cause cancer? **NO, at least not directly…**

Can a surplus of glucose from overconsumption of simple carbohydrates lead to or contribute to impaired glucose metabolism, increasing the risk of chronic diseases like obesity, type 2 diabetes, heart disease, and cancer? **YES**.

Overall, eating foods lower on the glycemic index (think legumes, vegetables, whole grains, and protein that tend to contain more complex carbohydrates) has been shown to regulate blood sugar levels, which can help to reduce cancer risk (Donaldson, 2004). Indeed, some meta-analyses have shown that eating foods with a lower glycemic index is associated with a reduced risk of several cancers, including bladder, colorectal, endometrial, and kidney cancers (Turati et al., 2019; WCRF & AICR, 2018d). In contrast, fibre and whole foods containing complex carbohydrates are protective against cancer occurrence (WCRF & AICR, 2018b).

Multiple studies have also found a correlation between a diet high in refined sugars and impaired brain function — and even a worsening of symptoms of mood disorders, such as depression, which are common side effects of cancer diagnosis and treatment.

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# Anti-cancer Grocery Reference List

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## Grocery Items to Reduce

- Alcohol
- Bacon, sausage, hotdogs, and red meat in general
- Deli meats or prepackaged meats that contain nitrites
- Foods containing high levels of fructose corn syrup
- Foods containing high levels of sodium (500 mg or less per entrée is ideal)
- Foods or beverages that are overly processed or that contains a long ingredients list of additives or chemicals
- Fried food
- High sugar containing condiments like ketchup (homemade ketchup is encouraged)
- Non-BPA free canned beans and/or tomatoes (glass jarred tomatoes are preferred)
- Refined white sugar
- Simple, refined carbohydrates: white flour, white bread, soda crackers etc.
- Trans fats, hydrogenated oils, and food containing trans fatty acids

## Grocery Items to Increase <<Back>>

- ✓ Citrus fruit (e.g., lemons, limes, oranges, or grapefruit (unless they conflict with medication), etc.)
- ✓ Fermented food to aid in a healthy gastrointestinal tract (e.g., miso, sauerkraut, kimchi, tempeh, etc., choosing lower sodium varieties where possible)
- ✓ Fresh and dried herbs (e.g., cilantro, mint, oregano, parsley, rosemary, thyme) and spices (e.g., basil, black pepper, chili flakes, cinnamon, coriander, cumin, paprika, turmeric, etc.)
- ✓ Fruits – all types – the more colourful the better – eat the rainbow
- ✓ Healthy fats (e.g., avocado, nuts, seeds, olive oil, grapeseed oil)
- ✓ Healthy/good quality protein (e.g., soy foods such as edamame, miso, tempeh, and tofu, other legumes, nuts, and seeds)
- ✓ Homemade vegetable stock
- ✓ Legumes (e.g., adzuki beans, black beans, black eyed peas, cannellini beans, chickpeas, kidney beans, lentils, lima beans, pinto beans, etc.)
- ✓ Nuts and nut butters (e.g., almonds, Brazil nuts, cashews, hazelnuts, pecans, pistachios, walnuts, etc.)
- ✓ Seeds and seed butters (e.g., chia seeds, flaxseeds, hemp seeds, pumpkin seeds, sesame seeds/tahini, sunflower seeds, etc.)
- ✓ Vegetables of all kinds, particularly:
    - dark leafy greens (e.g., spinach, Swiss chard)
    - cruciferous vegetables (e.g., broccoli, Brussel's sprouts, cauliflower, kale)
    - orange vegetables (e.g., carrot, sweet potato, winter squash)
    - red vegetables (e.g., beets, red cabbage, red onion, red pepper)
- ✓ Whole grains (e.g., barley, brown rice, farro, freekeh, kamut, millet, quinoa, spelt, whole grain flours, whole rolled oats, etc.)

## General Tips for Healthy Eating <<Back>>

- ✓ Eat healthy fats (e.g., avocados; almonds and walnuts; chia seeds, flaxseed, hemp seeds, pumpkin seeds, and sunflower seeds; canola oil, extra virgin olive oil, and grapeseed oil)
- ✓ Eat more beans (e.g., use them in soups, stews, chilis, dressings, dips, and desserts)
- ✓ Eat more fibre-rich foods than not (animal-based foods contain no fibre and plant-based foods contain fibre)
- ✓ Eat WHOLE grains not refined, for example:
    - Choose brown rice or other whole grains like barley, farro, quinoa, or millet instead of white rice
    - Choose whole wheat, or multigrain products, stoneground spelt, wholewheat, or whole rye products instead of refined/white wheat products when buying flour, bread, crackers, pasta, or other baked goods
    - Choose whole rolled or steel cut oats instead of processed ready-to-eat cereals
- ✓ Focus on a whole foods diet that is mainly based on fruits, vegetables, whole grains, nuts, seeds, legumes, and good quality proteins (e.g., protein foods, alone or in combination, that contain close to or all the essential amino acids)

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# Tips and Techniques for Managing Side Effects of Cancer and Cancer Treatment

# Eating Related Side Effects and Diet <<Back>>

## Overview

Most types of cancers and cancer treatments increase needs for calories and protein to fight infections, heal tissues, and support muscle repair and organ functions, in addition to everyday activities. Cancer and cancer treatments can reduce the appetite and enjoyment of food and challenge the body's ability to store or assimilate nutrients. Certain cancers (e.g., head and neck or digestive system) and cancer treatments can also make it particularly difficult to eat and eat well. With cancer and treatments, weight loss and poor appetite are common, but it is important to eat more to keep yourself from becoming malnourished as this can lead to lower tolerance for treatments and poorer prognosis.

Malnutrition occurs when someone becomes underweight or develops specific nutrient deficiencies. Some reasons for decreasing the amount or quality of food eaten are loss of appetite, changes in taste or smell, dry mouth, sore mouth, sore throat and trouble swallowing, and nausea. In addition, vomiting and diarrhea prevent food that has been eaten from being assimilated by the body. Constipation and bloating may also cause a reduced appetite. This section highlights some of these common eating-related side effects of cancer and cancer treatments and suggestions to manage them.

## Malnutrition (General) <<Back>>

- ✓ Aim to eat three to six times per day, including a source of protein with each meal
- ✓ Drink ample amounts of water - staying hydrated is important
- ✓ Eat whatever you can tolerate - aim for healthy foods, however, the most important aspect is to eat enough to maintain your weight and muscle mass
- ✓ Everyone's body is different, and every cancer and treatment plan should be individualized, so speak to your treatment team about meeting with a Registered Dietitian to assess and tailor your nutrition plan and goals

## Loss of Appetite <<Back>>

To minimize the effects of poor appetite:

- ✓ Try not to miss meals
- ✓ Eat smaller meals throughout the day, such as five to six if you can manage, rather than three large meals
- ✓ Timing of food — take advantage of the times of day you most feel like eating

- ✓ Keep high calorie/high protein snacks readily available, such as cheese, crackers, nuts, nut butters, and rich smoothies
- ✓ Stay hydrated — drink smaller amounts of fluids more frequently throughout the day and after and between meals to avoid feeling full before mealtime, and include more nutrient-rich fluids such as milk, or fresh fruit and vegetable juices
- ✓ During meals, have smaller amounts of liquids rather than a big drink, to prevent feeling full too soon
- ✓ Exercise regularly to promote and improve your appetite
- ✓ Try (homemade) nutrient-dense, liquid, or powdered meal replacements
- ✓ Treat yourself to your favourite foods
- ✓ Choose a variety of different foods to help increase appeal and appetite
- ✓ Make small portions of visually appealing food using a variety of colours
- ✓ Make eating a social occasion by sharing meals with family, friends, or neighbours, or by eating while watching television

## Changes in Taste or Smell

<<Back>>

Changes to your sense of taste or smell can occur because of cancer itself, a side effect of treatment, or related oral and dental problems. Certain smells or tastes may change and become very unpleasant and overwhelming. A bitter or metallic taste in the mouth might develop, or foods may taste too salty or too sweet. For others, their sense of taste or smell may be greatly reduced. These side effects may cause you to lose your appetite and its important to avoid under eating. Some practical tips to manage these changes are:

- ✓ For odour sensitivities:
  - use a kitchen fan when cooking to help quickly eliminate strong odours
  - when cooking, lift lids away from you to prevent direct contact with the smell from the cooking food
  - cook outdoors if you can
- ✓ Drink beverages using a straw or from a travel mug with a lid
- ✓ Food eaten at room temperature, or cold, may be more tolerable
- ✓ Chilled food may help numb your taste buds. Keep drinks and meals cold/chilled if that's the only way you can tolerate the taste. For example, add ice to your drinks, make frosty smoothies, or chill your food in the fridge or freezer before eating
- ✓ If you have a metallic taste in your mouth:
  - try eating with plastic utensils or chopsticks
  - cook food in glass pots and pans rather than metal ones

- try eating sour foods - try adding lemon, lime, or grapefruit juice to dressings; try desserts with cranberry, lemon, rhubarb, or sour cherry fillings (caution: don't eat sour foods if your mouth is sore)

- ✓ If you have bitter, salty, or acidic tastes in your mouth, try eating sweeter foods; add honey or maple syrup to dressings, use sweet condiments like ketchup, relish, or sweet chili sauce, and make sauces using sweet fruits
- ✓ Keep up with oral hygiene to keep food tasting better – brush your teeth at least twice a day and rinse your mouth out with water between meals
- ✓ If your sense of taste has diminished, try adding more herbs, spices, or flavourful sauces or condiments; use marinades for meats for increased flavour
- × Avoid foods that are unpleasant and find substitutes that are more palatable

## Dry Mouth (Xerostomia) <<Back>>

***Foods and Eating Suggestions***

- ✓ Stay hydrated!
  - Drink plenty of water, fresh pressed juice, and herbal teas
  - Ice chips, popsicles, and slushies, are great hydrating options
  - Include plenty of water-rich fruits and vegetables in your diet
  - Smoothies are a great option. They are energy dense and help with dry mouth due to the high fruit content
- ✓ Stimulate saliva by:
  - chewing gum, sucking on hard candies, ice chips, popsicles, or frozen fruit
  - consume tart foods or drinks like lemonade, hibiscus tea, or green apples (caution: avoid tart foods or drinks if you have a sore mouth)
- ✓ Keep your food moist with sauces, dressings, and dips to make it easier to swallow
- ✓ Try blended or pureed foods for easy swallowing
- ✓ Take small sips of a liquid before chewing food to help moisten and break down the food
- × Avoid alcohol, and mouthwashes that contain alcohol (try a homemade mouthwash instead with water and baking soda)
- × Avoid foods that are too spicy, sour, salty, hard, or crunchy
- × Avoid tobacco use or exposure to second-hand smoke

***Other Tips***

- ✓ Carry a water bottle with you and sip water throughout the day
- ✓ Keep up with oral hygiene - and brush your tongue!
- ✓ Use a moisturizing lip balm

## Sore Mouth <<Back>>

- ✓ Eat soft, tender, easily chewable food
- ✓ Choose pureed or other blended foods
- ✓ Use sauces, gravy, or dressings to add moisture and softness to food
- ✓ Take smaller bites of food, or try using a smaller spoon
- ✓ Drink through a straw to avoid contact with sore parts of the mouth
- ✓ Eat cold or room temperature food - avoid very hot foods
- ✓ Ice can be soothing - sucking on ice chips may help
- ✓ Eat frozen foods (for example: frozen banana pieces or smoothie popsicles) that can help numb or sooth the mouth. Eating something like this first before taking a few bites of an energy dense food, may help you tolerate them more
- × Avoid foods or drinks that are: acidic (including citrus fruit or tomato products), salty, spicy, too hard or crunchy (e.g., granola, hard crackers or chips, raw vegetables)
- × Avoid alcohol, including mouthwashes that contain alcohol, and tobacco

## Sore Throat and Trouble Swallowing <<Back>>

- ✓ Eat smaller meals throughout the day (five or six) rather than three large meals
- ✓ Select easy to swallow foods such as smoothies, smooth peanut butter, soft-cooked cereals (e.g., cream of wheat), soups, and salmon salad
- ✓ Cook foods until they are soft and tender
- ✓ Cut food into small pieces, or puree foods
- ✓ Drink through a straw
- ✓ Moisten foods with broths, dips, dressings, gravy, or sauces
- × Do not eat or drink items that can burn or scrape your throat such as: very hot food and drinks, spicy foods, high acid foods (citrus or tomato), sharp and crunchy foods (granola, hard chips and crackers, raw vegetables), and alcohol

## Constipation <<Back>>

- ✓ Eat fibre rich foods daily (this includes soluble and insoluble fibre) (caution: patients with certain types of cancer may need to limit fiber so speak with your doctor)
- ✓ Eat prebiotic-rich foods such as: apples, asparagus, bananas, beans, chickpeas, dandelion greens, garlic, Jerusalem artichokes (sunchokes), jicama, leeks, mushrooms, oats, onions, soybeans, and whole grains

- ✓ Eat probiotic-rich foods such as: dairy-free cultured yogurt and kefir, kimchi, sauerkraut, and tempeh.
- ✓ Incorporate warm liquids into your routine (e.g., tea, broths) to relieve constipation
- ✓ Stay active, to the best of your abilities
- ✓ Stay hydrated by drinking plenty of fluids throughout the day – at least eight cups (two liters)

## Diarrhea <<Back>>

- ✓ Drink plenty of fluids to replace what is lost and avoid dehydration, including water, broths, and sports drinks; if drinking carbonated drinks, stir to remove the bubbles first.
- ✓ Include liquids or foods that contain sodium or potassium to maintain electrolyte balance, including bouillon or soup broths, coconut water, dried apricots, bananas, butternut squash, soy milk, spinach, and sweet potato.
- ✓ Eat more frequent smaller meals (five to six) instead of three large meals per day
- ✗ Avoid the following foods and beverages:
    - alcohol
    - apple juice as it is naturally high in sorbitol
    - artificially sweetened drinks, gums, and candies, especially those containing xylitol or sorbitol
    - caffeinated drinks
    - milk products, unless they are low-lactose or lactose-free
    - raw vegetables
    - spicy foods such as hot peppers, hot sauce, chili, and salsa
    - very greasy, fatty, or fried foods
    - very high fibre foods (particularly those containing insoluble fibre), especially legumes and whole grains
    - very hot or cold foods or drinks
    - very sugary drinks (sodas, fruit juices)

## Bloating <<Back>>

- ✓ Choose a lower fibre diet and omit gas producing foods such as cabbage, cauliflower, and beans (temporarily omit, as these foods are health promoting)
- ✓ Adding in herbs to your meal may help, such as fennel, ginger, and peppermint (if you don't have gastro-esophageal reflux disorder)
- ✓ Try walking between meals to help release gas and increase flow through the gastrointestinal tract
- ✗ Avoid carbonated beverages

- ✗ Avoid dairy unless they are low-lactose or lactose-free (some people get temporary lactose intolerance)
- ✗ Avoid talking while eating (which causes more air swallowing)
- ✗ Avoid the use of straws (also causes more air swallowing)

**Constipation, Bloating, Diarrhea, and Irregular Bowel Issues**

Restoring bowel health following chemotherapy and/or radiation can be both frustrating and challenging.

**Reasons for Issues**

- Pain medicines can slow the muscular action of the bowels that helps food move through the system.
- Some drugs that treat nausea and vomiting, seizures, depression, diarrhea, or blood pressure can cause these side effects.
- Some cancer treatments can cause constipation. These include some cancer drugs and having surgery to your tummy (abdomen).
- Cancer itself can cause an obstruction or affect nerve supply to the bowel.
- A lack of water, fiber, fruits and vegetables, probiotic and prebiotic foods, and exercise may also contribute.

## Nausea

<<Back>>

**Food and Eating Suggestions**

- ✓ Choose foods that appeal to you, but don't eat your favourite foods during nausea as you may form negative associations and will no longer enjoy those foods
- ✓ Choose foods that are easy on your stomach. These might include avocado, banana, dairy products (e.g., custards, hard and soft cheeses), hot cooked or ready-to-eat breakfast cereals from refined grains (e.g., cream of wheat, popped rice or corn flakes), peanut butter, potatoes, well-cooked vegetables, and white bread, rice, or pasta
- ✓ Consume foods and beverages at room temperature or cold
- ✓ Drink liquids throughout the day, but only sip small amounts during a meal to avoid bloating
- ✓ Eat five to six smaller meals throughout the day; try to eat meals and snacks even if you don't have much appetite due to nausea

- ✓ Sour foods can sometimes relieve nausea, such as lemon or lime water, pickles, or sour candies
- ✓ Try snacking on dry, bland foods like crackers, toast, cereal, or breadsticks, especially in the morning
- ✓ To ensure getting enough calories each day, don't shy away from foods with a higher healthy fat content (e.g., avocado, nuts, seeds) unless they upset your stomach or cause other problems.
- × Avoid greasy or fried foods, on the other hand, as they may cause stomach upset

**Other Tips**

- ✓ Distract yourself with music, a favourite TV program, and/or the company of others while you're eating
- ✓ Fresh air often relieves nausea - open windows and spend time outdoors
- ✓ It is important to figure out what triggers your nausea and avoid these triggers
- ✓ Maintaining proper oral hygiene is very important! Keep your mouth clean by brushing your teeth at least twice a day
- ✓ Sit quietly after a meal – do not lie down for one or two hours after eating
- × Don't brush your teeth soon after eating

## Vomiting <<Back>>

- × Do not eat or drink until vomiting stops
- ✓ Once vomiting has stopped, drink small amounts of clear liquids (water and broth). Sip slowly and take little sips
- ✓ Once you are able to drink clear liquids, try full liquids such as smoothies, pureed soups, and vegetable juice. Then slowly reintroduce solid foods
- ✓ Once you can start eating solid foods again, start with five to six small meals per day, rather than three large meals, choosing foods that are easy on your stomach (see '***Nausea***')
- ✓ If vomiting ensues consult with your healthcare team. In the meantime, ensure that you stay hydrated and replenish your electrolytes

**Foods and Beverages that Help with Nausea and Vomiting**

- ✓ Apples, bananas, grapes, watermelon, or BPA-free canned peaches or pears
- ✓ Cold clear liquids such as apple or cranberry juice, broth, or caffeine-free sodas with the fizz stirred out, flavoured gelatin, lemonade, or sports drinks
- ✓ Fennel and fennel seeds

- ✓ Food served cold or at room temperature, rather than hot, to decrease odors and taste
- ✓ Fruit smoothies
- ✓ Homemade fruit popsicles
- ✓ Lemon, ginger, or peppermint herbal teas (caffeine-free) served lukewarm or cold, not hot
- ✓ Ginger in other forms such as crystallized ginger, ginger candies, or ginger ale
- ✓ Mint leaves
- ✓ Oatmeal, chia puddings, and/or brown rice
- ✓ Plain crackers or toast; add nut butter or avocado if tolerated
- ✓ Plain unsalted nuts
- ✓ Water, miso soup, and/or vegetable broths

## To Minimize Weight Loss

<<Back>>

- ✓ Drink your calories, if need be, in smoothies, juices, and soups
- ✓ Eat five to six smaller meals per day
- ✓ Eat at scheduled times, rather than waiting until you're feeling hungry
- ✓ Eat foods that are high in calories and proteins:
  - add foods like nuts, seeds, and granola as toppings for cereals and fruits
  - add dried fruits in salads, grain-based dishes, stuffings, and cooked vegetables
  - use nut butters liberally as a spread
- ✓ If not well-managed, the eating and appetite related side effects noted above might lead to unwanted weight loss. Try to minimize their effects on how much you eat by following the recommendations specific to side effects and consult your doctor for additional assistance in their management

## To Minimize Weight Gain

<<Back>>

- ✓ Be mindful of your portion sizes, particularly if eating out
- ✓ Choose lean proteins
- ✓ Cook with healthier cooking methods such as broiling, steaming, grilling and roasting rather than frying in fat
- ✓ Eat high fibre foods
- ✓ Eat plenty of fruits of vegetables
- ✓ Exercise daily
- ✓ Moderate your salt intake

- Avoid sugar-sweetened beverages and fast foods (e.g., burgers, fries, shakes, fried chicken pieces)

**Nutrient Deficiencies Due to Appetite Loss, Nausea, and Vomiting**

Cancer patients often suffer from substantial weight and energy loss. To prevent the onset of these side effects it is very important to stay well nourished.

- Protein is the macronutrient that needs the most attention when undergoing various cancer treatments as it builds strength and preserves lean body mass
- Electrolytes (calcium, chloride, magnesium, potassium, sodium)
    - In addition to getting inadequate amounts in the diet due to poor appetite, prolonged vomiting and diarrhea can also lead to depletion and electrolyte imbalance. Minor imbalances can be corrected through diet.
- Iron – needed to support red blood cells and their function and reduce the risk of anemia.

# Headaches <<Back>>

Not all headaches are the same. They may have different symptoms and causes, and pinpointing the symptoms may help your healthcare team offer more appropriate treatments and recommendations.
If you have headaches, take note of their:

• Timing • Duration • Frequency • Location in your head • Triggers
• Quality (e.g., throbbing, stabbing, or dull) • Severity (mild to severe)

Nonetheless, there are a few general suggestions to aid with headaches.

**Food and eating suggestions:**

- ✓ Eat electrolyte rich foods (e.g., bouillon or soup broths, coconut water, dried apricots, bananas, butternut squash, soy milk, spinach, and sweet potato)
- ✓ Eat regular, healthy meals rather than waiting until you feel hungry
- ✓ Increase water intake and ensure that you are always properly hydrated
- × Decrease caffeine intake if necessary
- × Avoid alcohol
- × Avoid any foods that may be triggering for you (e.g., artificial sweeteners, chocolate, cold foods or drinks, fried foods)
- × Minimize or eliminate the consumption of high sugar processed foods

**Other tips**

- ✓ Engage in regular, mild to moderate exercise
- ✓ Get a massage, if recommended by your healthcare team
- ✓ Meditate quietly or use other relaxation methods (e.g., body scan, breathing exercises)
- ✓ Place cold or hot compresses on the back of your neck
- ✓ Take a cold or hot bath with the lights out
- ✓ Keep a headache diary to pinpoint triggers like time of day, foods, etc.

# Health-Related Side Effects and Diet <<Back>>

## Supporting Brain Health

Many suffer from "brain fog" post chemotherapy, radiation therapy and hormonal therapy. This can often lead to difficulties thinking and communicating as well as increased memory loss.

**Side Effects of "Chemo" Brain**

- Confusion or mental fogginess
- Difficulty concentrating, thinking, and communicating
- Difficulty multitasking, and learning and completing tasks
- Difficulty learning new skills
- Feeling disorganized
- Memory loss
- Short attention span

**Fuel Foods to Support Your Brain**

- ✓ Mediterranean Diet
  - characterized by a high intake of monounsaturated fat (e.g., olive oil), fruits, vegetables, plant proteins, whole grains, and fish, and a relatively low intake of red meat, refined grains, and sweets
  - has been associated with less cognitive decline
- ✓ Dark coloured fruit
  - includes blueberries, raspberries, and blackberries
  - contain anthocyanins that have anti-inflammatory and antioxidant properties
  - may help with communication between brain cells
- ✓ Turmeric
  - has been shown to benefit brain health, reduce depression and help with new brain cell growth
- ✓ Foods rich in:
  - B vitamins, specifically, B6, folate, B12
    - these include foods like whole grains, fruits, legumes, nuts, herbs, and nutritional yeast
  - Carotenoids, specifically lutein and zeaxanthin

- these include foods like kale, green peas, parsley, pistachios, spinach, and Swiss chard
- have been shown to promote cognitive function by enhancing neural efficiency

o Iron

•plant-based sources include beans, dried fruits, leafy greens, lentils, nuts, seeds, tofu, tempeh, and whole grains

•helps to reduce brain fog and impaired brain function

o Magnesium

•sources include cacao, cocoa powder, or dark chocolate, nuts like almonds, cashews, and peanuts, pumpkin seeds, and spinach

•important for memory and learning

o Omega-3 fatty acids

•include plant foods like algae, chia seeds, flaxseeds, hemp seeds, and walnuts, as well as fatty fish like salmon or trout

•needed to build brain and nerve cells that are essential for memory and learning

•may aid in slowing age related mental decline

•has been shown to potentially reduce the risk of anxiety and depression

•foods rich in omega-3 fatty acids are also rich in vitamin E, which is an important antioxidant

o Prebiotics and probiotics

- plant-based sources of probiotics (i.e., beneficial bacteria) include kimchi, miso, sauerkraut, tempeh, and cultured yogurts including plant-based ones
- sources of prebiotics (i.e., non-digestible carbohydrates that stimulate beneficial bacteria in the gut) include apples, asparagus, bananas, beans, chickpeas, dandelion greens, garlic, Jerusalem artichokes (sunchokes), jicama, leeks, mushrooms, oats, onions, soybeans, and whole grains
- improve the gut microbiome by increasing beneficial bacterial species and decreasing non-beneficial gut bacteria that negatively affect cognitive performance and sleep, and promote fatigue

o Vitamin C

- good sources include fruits like cantaloupe, citrus fruit, kiwi, and strawberries and vegetables like broccoli, Brussels sprouts, green hot chili peppers, red cabbage, red or green sweet peppers, potatoes, and tomatoes

        - is an important antioxidant that has been shown to protect against mental decline
    - Vitamin D
        - plant sources include fortified plant-based milks and orange juice and mushrooms that are chopped and exposed to daylight; fish, like sardines or salmon, are healthy animal sources of vitamin D
        - low levels in the blood are linked to memory deficits and dementia
        - a meta-analysis showed that lower serum vitamin D concentrations are associated with poorer cognitive function
    - Vitamin K
        - good sources include broccoli, Brussels sprouts, cabbage, collard greens, kale, lettuce, spinach, turnip greens, as well as canola and soybean oil
        - essential for forming sphingolipids, a type of fat that's densely packed into brain cells
    - Water and electrolytes (calcium, chloride, magnesium, potassium, sodium)
        - your brain is made up of 75 percent water
        - include liquids and foods rich in water and electrolytes such as bouillon or soup broths, coconut water, dried apricots, bananas, butternut squash, soy milk, spinach, and sweet potato

**Foods to Avoid**

- Alcohol may increase the loss of brain cells in general
- Foods rich in simple carbohydrates (i.e., white processed sugar, brown sugar, cane sugar, high-fructose corn syrup, etc.) as they can spike blood sugar levels leaving fatigue and mental fuzziness once blood sugar levels drop
- Highly caffeinated drinks – colas, energy drinks, and/or too much coffee or tea
- Salty foods – dehydrate our bodies and create an imbalance in our electrolytes

**Additional Tips**

- Get a good night's sleep (for adults 18-64 years, seven to nine hours or 65+ years, seven to eight hours)
- Exercise – studies have shown that an active body equals an active brain
- Exercise your brain – try doing crossword puzzles, sudoku, Wordle, or other brain teasers
- Stay hydrated!
- Do not skip meals
    - maintaining stable blood sugar levels will help with keeping mental clarity
    - plan ahead! Pack nuts or whole fruits for an energy dense, easy, and quick snack on the go

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## Mood Altering Edibles!

<<Back>>

Many suffer from a variety of mood changes during and after cancer treatment including anxiety, depression, and mood swings. This can often lead to increased stress and unnecessary inflammation in the body. Emerging science is revealing that mood and mental health are modulated by diet through different mechanisms – these are mediated through effects on inflammation in the body, interactions with the immune system, and interactions with the gut microbiome and its by-products (Firth et al., 2020). Below you will find tips, tricks, and food suggestions related to improving your mood, minimizing anxiety and mood swings, and reducing the risk of depression.

> *"Depression (and anxiety) is more typically thought of as strictly biochemical-based or emotionally rooted. On the contrary, nutrition can play a key role in the onset as well as severity and duration of depression. Many of the easily noticeable food patterns that precede depression are the same as those that occur during depression. These may include poor appetite, skipping meals, and a dominant desire for sweet foods. Nutritional neuroscience is an emerging discipline shedding light on the fact that nutritional factors are intertwined with human cognition, behavior, and emotions (Rao et al., 2008)."*

### Mood Related Side Effects of Cancer Treatment

- Anxiety
- Depression
- Fatigue
- Irritability
- Mood swings

### Fuel Foods to Boost Your Mood

- ✓ Plant based foods in general have been linked to a reduced risk of depression and anxiety, particularly whole grains, nuts, seeds, beans/legumes, fruits, and vegetables (Akbaraly et al., 2009). The Mediterranean diet, which includes all the above, and other similarly defined healthy diets, have been directly linked to a reduced risk of depression (Lai et al., 2014; Lassale et al., 2019; Sanchez-Villegas et al., 2009).

**Consume Foods Rich in:**

- ✓ B vitamins, particularly folate, B6, and B12
  - sources include fruits, herbs, legumes, nuts, nutritional yeast, and whole grains
  - associated with reduced feelings of stress (Young et al., 2019)
  - vitamin B6 is associated with the production of serotonin and other neurotransmitters (Aly & Engman, 2020)
- ✓ Fibre
  - choose whole, complex carbohydrates (i.e., whole grains, fruits, vegetables, and legumes), which also contribute important nutrients
  - tryptophan is found in carbohydrates and increases the amount of serotonin (a neurotransmitter that contributes to feelings of well-being and happiness) produced and released in the brain
  - a meta-analysis found that higher fiber intake was associated with a lower risk of depression (Fatahi et al., 2021)
- ✓ Iron
  - sources of iron include beans, dried fruits, leafy greens, lentils, nuts, seeds, tempeh, tofu, whole grains
  - iron deficiency and anemia are associated with impaired brain function and irritability that can lead to depression and anxiety (Lomagno et al., 2014)
  - remember to consume these non-heme sources of iron with vitamin C rich foods to improve iron's bioavailability
- ✓ Omega-3 fatty acids
  - plant sources include algae, chia seeds, flaxseeds, hemp seeds, and walnuts
  - helps to fight depression and anxiety (Arab et al., 2019).
  - are needed to build brain and nerve cells that are essential for memory and learning
  - appear to affect neurotransmitter pathways in the brain
- ✓ Selenium
  - plant sources include beans and other legumes, nuts (particularly Brazil nuts), seeds, and whole grains
  - has been linked to a reduction in depression
  - low selenium intake has been associated with poorer moods
  - if selenium status is low, there may be benefit to getting more in the diet. However, if selenium status is adequate, taking additional selenium may be counterproductive as high selenium may increase the risk of depression (Colangelo et al., 2014). If your diet is very poor due to side effects of cancer or

cancer treatment, eating just one Brazil nut a day, and not more, will cover the daily requirement and avoid excess.

- ✓ Vitamin D
  - plant sources include fortified beverages like orange juice or plant-based milks (check labels), and chopped mushrooms exposed to daylight; fish, like sardines or salmon, are healthy animal sources of vitamin D; other sources are supplements and exposure to sunlight.
  - linked to a decrease in negative emotions and improved quality of life, particularly in those with low vitamin D levels in the blood and depression (Cheng et al., 2020)
  - supplementation may not be effective over the long term for improving mood or quality of life – there is some evidence that food sources may be more effective, especially when combined with exercise (Guzek et al., 2021)
- ✓ Prebiotics and probiotic rich foods
  - good sources of probiotics include kimchi, miso, sauerkraut, tempeh, and cultured yogurts including plant-based ones
  - good sources of prebiotics include apples, bananas, beans, chickpeas, garlic, Jerusalem artichokes (sunchokes), mushrooms, oats, and onions soybeans, and whole grains
  - beneficial gut bacteria are associated with better mental quality of life (Valles-Colomer et al., 2019)
  - studies have shown that when people take probiotics (supplements containing good bacteria) or eat probiotic rich foods, their anxiety levels, perception of stress, and mental outlook improve, compared with people who do not take probiotics (Ansari et al., 2020); a review of several clinical studies concluded that probiotics have a positive effect on mood and reduce anxiety (Wallace & Milev, 2017)

**Foods to Avoid**

- × Foods rich in simple carbohydrates (i.e., white processed sugar, brown sugar, cane sugar, high-fructose corn syrup, etc.)
  - they can spike blood sugar levels leaving us fatigued and mentally fuzzy once blood sugar levels drop, indirectly affecting one's mood
  - multiple studies have found a correlation between a diet high in refined sugars and a worsening of symptoms of mood disorders, or higher risk of common mental disorders and depression (Gangwisch et al., 2015; Knüppel et al., 2017)
- × Highly caffeinated drinks – sodas, energy drinks, and/or too much coffee or tea

    - high caffeine consumption may interfere with your sleep patterns and thus negatively affect the amount of sleep you get and consequently leaving you tired and irritable
- Reduce or eliminate alcohol consumption, as alcohol:
    - can increase anxiety and depression even though it temporarily relieves it
    - is a depressant and alters your brain's delicate balance of chemical reactions and processes
    - negatively affects our brain's neurotransmitters that are needed for good mental health
- Unhealthy fats
    - a high consumption of trans fats may be linked to increased depression (Sanchez-Villegas et al., 2011)

**Additional Tips**

- Get a good night's sleep (for adults 18-64 years, seven to nine hours or 65+ years, seven to eight hours)
- Exercise – studies have shown that an active body = a happy body and brain
- Eat with a friend or two – eating together provides social and emotional support and reduces social isolation and the negative influence it has over our mood
- Do not skip meals
    - maintaining stable blood sugar levels will help with keeping moods stable and reducing fatigue and anxiety
    - plan ahead – pack nuts or whole fruits for an energy dense, easy and quick snack on the go

## Beating Fatigue: Eating for Everyday Energy <<Back>>

Are your cancer and cancer treatments often leaving you feeling sluggish and lethargic? Cancer-related fatigue (CRF) is one of the most common and distressing symptoms reported by cancer survivors (Brown et al., 2010). It is characterized by feelings of physical, mental, and emotional exhaustion that interfere with the quality of life and do not resolve with rest (American Society of Clinical Oncology, 2022). CRF affects nearly all cancer survivors and can persist for years post treatment (Brown et al., 2010). It can begin with the onset of cancer, occur throughout treatment, and can persist beyond treatment. Below are summarized some of the causes of CRF, side-effects, and some tips on foods to consume to help optimize your energy levels and manage CRF.

### Causes of Fatigue

- Cancer and cancer treatment effects such as hormone imbalance, inflammation, and oxidative stress
- Cancer-related side effects such as anemia, dehydration, and loss of appetite
- Anxiety, depression, or stress
- Insomnia
- Lack of B vitamins
- Medication
- Pain
- Sedentary lifestyle

### Side Effects of Fatigue

- Coordination is diminished, or more accident prone
- Irritability
- Loss of appetite
- Memory loss
- Mental fuzziness
- Reduced quality of life

### Everyday Foods to Fuel Your Body and Increase Your Energy

- Follow dietary patterns that are rich in fibre, fruits, vegetables, and plant foods
    - research is still limited but available evidence suggests that healthy, plant-forward diets may help reduce CRF

    - Mediterranean diets, which include a higher consumption of fruit, vegetables, legumes, nuts, seeds, whole grains, and healthy fats, with a moderate consumption of fish and dairy, and low intake of red meat and highly processed foods, have been shown to reduce CRF in patients undergoing chemotherapy (Inglis et al., 2019; Kleckner et al., 2022)
    - a similar review also concluded that interventions prescribing increases in the intake of fruits and vegetables in particular show the greatest promise for reducing CRF and improving quality of life, but more clinical trials of this type are needed (Baguley et al., 2019)

- Consume foods rich in:
    - B vitamins – whole grains, fruits, legumes, nuts, herbs, nutritional yeast
    - Electrolytes (calcium, potassium, chloride, magnesium, sodium) – bouillon or soup broths, coconut water, dried apricots, bananas, butternut squash, soy milk, spinach, and sweet potato
    - Iron – beans, leafy greens, lentils, tofu, tempeh, nuts, seeds, whole grains, dried fruits (see your doctor for appropriate treatment if anemia is diagnosed)
    - Vitamin C – fruits like cantaloupe, citrus fruit, kiwi, and strawberries and vegetables like broccoli, Brussels sprouts, green hot chili peppers, red cabbage, red or green sweet peppers, potatoes, and tomatoes

**Foods to Avoid**

- ✗ Foods rich in simple carbohydrates – white processed sugar, brown sugar, cane sugar, high-fructose corn syrup, etc.
- ✗ Highly caffeinated drinks – sodas, energy drinks, and/or too much coffee or tea
- ✗ Alcohol
- ✗ Salty foods – dehydrate our bodies and create an imbalance in our electrolytes

**Tips for More Energy**

- ✓ Get a good night's sleep (for adults 18-64 years, seven to nine hours or 65+ years, seven to eight hours)
- ✓ Getting adequate exercise is an effective way to reduce fatigue
- ✓ Plan ahead! Bring healthy snacks with you everywhere you go to avoid dips in blood sugar levels. For example, pack nuts or whole fruits for an energy dense, quick and easy snack on the go.
- ✓ Do not skip meals!

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## Supporting Your Immune System with Diet <<Back>>

No one food or action has been shown to completely protect us from succumbing to illness. However, there are several foods and actions that can be taken to ensure that your chances of becoming ill are significantly reduced.

**Immune Function Facts (Adapted from Childs et al., 2019)**

- "Increasingly there is concern that modern lifestyle changes have resulted in the promotion of ongoing, low-grade, whole-body (systemic) inflammation caused by immune and other cells… Such exposures may include diet quality and quantity." (Childs et al., 2019)
- Cells of the immune system have nutritional requirements to support their optimal function. Requirements for energy are also increased during an active infection.
- Good nutrition is thus needed to allow immune cells to achieve optimal function in responding to immune system challenges. This entails the correct response to a pathogen and addressing associated inflammation.
- Specific nutrients have very particular roles in supporting immune cells in their functions and reducing inflammation. One example is of vitamin A and zinc, both of which are necessary for rapid cell division and thus are critical for the appropriate immune cells to multiply and respond to a challenge.
- The digestive system is one of the main routes for potential invading pathogens. In fact, most of the immune cells in our bodies are located in the gut-associated lymphoid tissue (GALT). The GALT plays an important role in deciphering what is good and should be allowed in (e.g., nutrients or healthy gut bacteria) and what should be halted (e.g., harmful pathogens).
- The gut microbiota also have the potential to interact with the immune system. Plant-based diets may help to support the gut microbiome – their high content of indigestible fibre drags nutrients through the digestive tract to reach the lower areas where gut microbes thrive. Plant-based diets also help manage inflammation in the body.
- The development of the immune system in infants is influenced both by feeding practices (e.g., breastfeeding and complementary foods given) as well as environmental exposures.
- As we age our immune function tends to decline and an increase in inflammation is seen.
- Obesity and over nutrition, as well as Western style diets, are strongly associated with chronic inflammation. Mediterranean diets and other diets rich in fruits, vegetables, and plant polyphenols appear to counter chronic inflammation.

**Foods to Strengthen Your Immune System**

- ✓ A diet rich in fruits and vegetables, whole grains, nuts, seeds, legumes, and good quality protein
- ✓ Citrus fruit (ensure that they do not interfere with medication)– oranges, limes, lemons, and grapefruit
- ✓ Echinacea
- ✓ Foods rich in:
    - the amino acid arginine (nuts, seaweed, seeds, soy)
    - the amino acid glutamine, which is utilized at the same or greater rate by the brain as glucose during infection (rich in beans, beets, cabbage, carrots, parsley, spinach, vegetable juices, and also found in Brussels sprouts, celery, kale, papaya, wheat and fermented foods like miso)
    - the minerals selenium and zinc
    - B vitamins, vitamin A, vitamin C, vitamin D, and vitamin E (almonds, avocado, seeds, walnuts)
- ✓ Garlic
- ✓ Ginger
- ✓ Green tea
- ✓ Hot peppers
- ✓ Leafy greens
- ✓ Orange fruits and vegetables
- ✓ Prebiotic rich foods like garlic, onions, asparagus, whole grains
- ✓ Probiotic rich foods such as kimchi, miso, sauerkraut, tempeh, and cultured yogurts including plant-based ones
- ✓ Turmeric

**Tips for Staying Healthy During Cold and Flu Season**

- ✓ Drink plenty of fluids
- ✓ Eat a healthy, balanced, and fruit/veggie focused diet
- ✓ Ensure your vaccinations are up to date
- ✓ Exercise regularly
- ✓ Keep alcoholic beverages to a minimum
- ✓ Keep your home clean and free from harmful bacteria
- ✓ Relax – minimize stress using deep breathing exercises, stretching, yoga, or meditation

- ✓ Sleep enough, and ensure your sleep is uninterrupted
- ✓ Take your vitamin D – particularly during the winter months when skin exposure to natural sunlight is scarce
- ✓ Wash fresh produce before eating
- ✓ Wash hands regularly with soap and water particularly after washroom use, use of tissues, before and after touching your face, physical contact with others, and before and after handling food
- ✗ Avoid contact with others who are sick

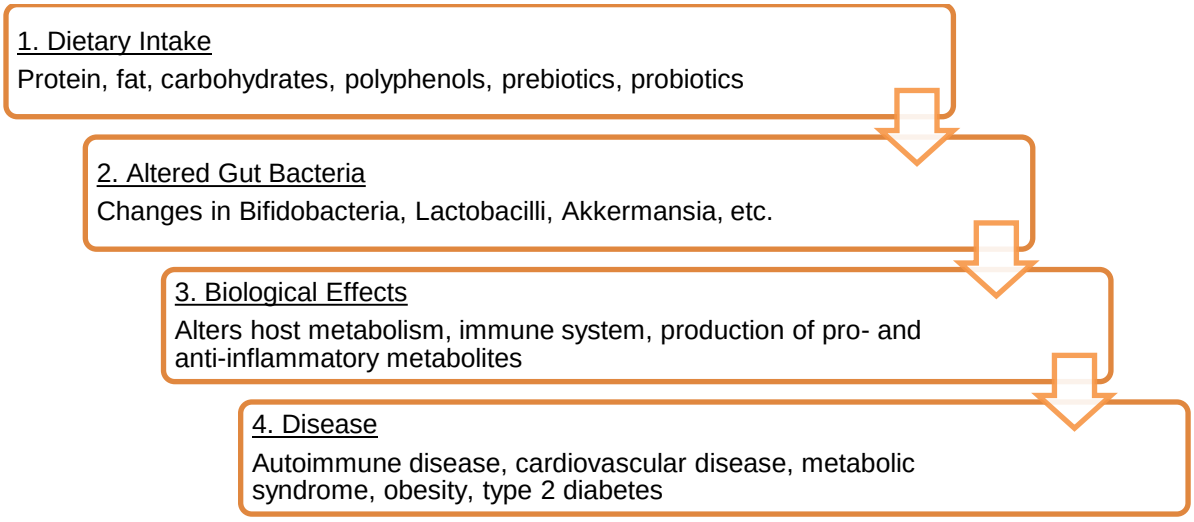
## Gut Health: A Critical Link to Overall Health <<Back>>

### The Gut Microbiome

The human gut microbiome encompasses trillions of resident microorganisms, including bacteria, viruses, fungi, and protozoa, that are commensal with the human intestinal tract. What we eat directly affects this gut microbiome and consequently our health. Studies have linked poor gut health to chronic diseases like inflammatory bowel disease (IBD), obesity, type 2 diabetes, cardiovascular disease, cancer, and mental illness (Singh et al., 2017). A poor diet, high in processed foods, unhealthy fats, sugar, and excess sodium will negatively impact the beneficial bacteria present in the gut and increase the risk of major chronic diseases. For example, in several studies, a Western diet (high in animal protein and fat, low in fiber) led to a marked decrease in numbers of total bacteria and beneficial bacteria. In contrast, diets rich in whole, plant-based foods, which are functional foods high in fibre and nutrients, have been linked to increased microbial diversity and gut health (Singh et al., 2017).

Although research is still limited, cancer treatments have been shown to negatively impact the gut microbiome (Jordan et al., 2018). Chemotherapy and antibiotics given to reduce side effects are implicated in reducing healthy gut bacteria, and this may be a cause of many of the common side effects, particularly gastrointestinal disturbances.

**How it Works**




(Adapted from Singh et al., 2017)

**Side Effects of Poor Gut Health and Reduced Beneficial Bacteria**

- Bowel issues and discomfort
- Dermatological conditions like psoriasis and dermatitis
- Anxiety and depression
- Increased overall inflammation
- Reduced immunity
- Chronic disease

**Benefits of Good Gut Health**

By increasing the beneficial bacteria that exists in your gut, you will improve your overall digestion and bowel motility, aid in the absorption of vitamins and minerals, and support good immune function (Singh et al., 2017).

Research indicates a strong connection between the gut microbiome, gut health, and mental health and its symptoms like anxiety, depression, bipolar disorder, and schizophrenia (Dawson et al., 2016). Current research even addresses the potential of probiotics to ease the symptoms of autism.

Following a whole food, plant-based diet ensures that high amounts of fibre, phytochemicals and nutrients are being consumed, which consequently increases microbial diversity and improves gut health. Bacteria in the intestines produce many chemicals, including neurotransmitters such as

serotonin, melatonin, and acetylcholine. These may directly impact brain function and help explain the benefits of probiotics to mental health.
The gut microbiome is modifiable through diet. Dietary modulators can include specific foods, macronutrients, polyphenols, as well as prebiotics and probiotics.

***Prebiotics:*** These are indigestible food components that promote beneficial bacteria growth in the intestine. When eaten they help to feed and grow the existing beneficial bacteria or probiotics present in the gut.

***Probiotics***: These are live beneficial bacteria that have the potential to provide health benefits upon consumption. Probiotics live in the gut and could have been originally obtained by infants through during birth via contact with the vaginal canal or through breast milk, then through diet. In addition to helping with gut health and improved immunity, they may play a role in protecting DNA from oxidative stress which may aid in cancer prevention.

There are many types of probiotic supplements available. It is recommended to use those containing *Lactobacillus*, *Bifidobacterium,* or *Saccharomyces boulardii* that contain at least one billion colony forming units (CFU) (Cleveland Clinic, 2022).

**Foods to Consume**

- ✓ A wide variety of fruits and vegetables
- ✓ Citrus fruit – oranges, limes, lemons, grapefruit
- ✓ Leafy Greens
- ✓ Polyphenol rich foods – cocoa, dark berries, green tea
- ✓ Prebiotic rich foods such as apples, asparagus, bananas, beans, chickpeas, dandelion greens, garlic, Jerusalem artichokes (sunchokes), jicama, leeks, mushrooms, oats, onions, soybeans, and whole grains
- ✓ Probiotic rich (fermented) foods such as kimchi, miso, sauerkraut, tempeh, and cultured yogurts including plant-based ones
- ✓ Turmeric and other anti-inflammatory foods
- ✓ Vitamin E rich foods – almonds, walnuts, avocado, and seeds
- ✓ Whole grains – high in fibre and are also prebiotic

**Foods to Avoid**

- × Alcohol
- × Processed foods
- × Sugar sweetened beverages
- × Red and processed meats

**Tips for Boosting Gut Health**

- Focus on a plant-based diet including fruits, veg, nuts, seeds, legumes, & whole grains
- Drink plenty of fluids, focusing on water as your main hydration source
- Exercise regularly
- Relax – minimize stress using deep breathing exercises, stretching, yoga, meditation
- Sleep enough and ensure that your sleep is uninterrupted

# Glossary of Terms <<Back>>

**Allium**: the allium family is a pungent smelling species of flowering plants that includes leeks, onions, garlic, and chives. They have been studied for their chemopreventive properties and contain organosulfur compounds which have been shown to provide a number of health benefits (see '***organosulfur compounds***').

**Angiogenesis**: the formation of new blood vessels. Specific to cancer is tumoral angiogenesis which is when a malignant tumour induces surrounding blood vessels to grow, providing oxygen and nutrients to feed the malignant tumour allowing it to reproduce at an unusually high rate (Kerbel 2000).

**Anthocyanin**: a flavonoid that with a red-purple hue that is often found in a variety of berries, red cabbage, and red onions. It has been associated with lowering risk factors for type 2 diabetes.

**Antiangiogenic Foods**: food that when eaten daily can block the progression of tumours by attacking new blood vessels from forming and preventing them from reaching maturity (Béliveau & Gingras, 2016).

**Anti-inflammatory Foods**: foods that reduce levels of inflammation in the body, an immune system response that occurs from injury, illness, or foreign substances. Chronic inflammation is a precursor for disease, so it is important to incorporate anti-inflammatory foods like leafy greens, vitamin-E rich nuts, vitamin-C rich fruit, and high-quality oils.

**Antioxidants**: also known as free radical scavengers, antioxidants are chemicals that interact with and neutralize free radicals which in turn prevent them from causing damage which could potentially lead to inflammation and chronic disease. Examples of antioxidants include vitamin A, C, and E, selenium, carotenoids, flavonoids, etc.

**Anti-proliferation:** blocking the multiplication of cancer cells, resulting in the prevention or slowing of the growth of a tumour.

**Apoptosis**: the process of programmed cell death. Cancer cells resist this process, allowing them to proliferate.

**Beta-glucan**: a type of soluble fibre that is found in the cell walls of fungi (mushrooms), yeasts, and cereal grains like oats and barley. They have been associated with being a chemopreventive agent and protectant against metabolic syndrome and obesity.

**Carotenoids**: are responsible for the yellow, red, and orange pigments of fruits and vegetables. Beta-carotene, lutein, and lycopene are all subclasses of carotenoids. Carotenoids can be further categorized as being provitamin A and can be converted into vitamin A in the body, or non-provitamin A which cannot be converted. They have been associated with being a chemopreventive agent and are beneficial for eye health. Also known as carotenes.

**Case-control Studies:** population-based observational studies that identify participants diagnosed with a disease of interest (cases) and match them with others who are healthy (controls). In the context of nutrition and cancer, their past dietary intakes are typically assessed retrospectively, and rely on memory. Differences in dietary patterns between the cases and controls are compared to see what patterns might be associated with cancer risk. Sometimes cases-control studies are nested in a large **cohort study**, in which case dietary intakes may be assessed on recruitment and thereafter.

**Chemopreventive**: natural or synthetic compounds that interfere with the development of cancer cells.

**Cholesterol**: an oily-waxy substance found in fat in the bloodstream. Cholesterol can be produced by the body or taken in through the diet. It can be further categorized as HDL (high density lipoprotein) "good" cholesterol, which transports excess cholesterol to the liver and LDL (low density lipoprotein) "bad" cholesterol, which build up in arteries causing heart disease like atherosclerosis. The body needs cholesterol to function properly, but the body can produce all that it needs and consuming excess LDL cholesterol in our diet is a major risk factor for cardiovascular disease.

**Cohort Studies:** observational, population-based studies that follow a large number of participants over time. In the context of determining nutrition and cancer risk, they estimate usual dietary intakes and monitor the population over a long term to identify the incidence of cancer or other health outcomes. Dietary intake data are analyzed to find patterns associated with higher risk of disease.

**Cruciferous Vegetables**: vegetables that belong to the brassica family, including cabbage, cauliflower, broccoli, Brussel sprouts and kale. They have been studied as a dietary chemopreventive agent and protectant against cardiovascular disease.

**Danger Zone for Foods**: the optimal temperatures harmful pathogens best grow in. Bacteria will grow most rapidly in the range of temperatures between 40°F (4˚C) and 140°F (60˚C) and can double in number in as few as 20 minutes.

**Dietary Fibre**: indigestible plant material that is found in all varieties of plant-based foods. Dietary fibre includes non-starch polysaccharides, such as cellulose, dextrins, pectins, beta-glucans (like oats and barley) and lignins. Fibre has been shown to provide the following health benefits:

- Improvements in glucose tolerance and insulin response
- Improvements in gastrointestinal health
- Reduction of cardiovascular disease risk factors (i.e., high cholesterol levels, hypertension)
- Reduction in risk of developing certain types of cancers
- Increased satiety and aids in weight management
- Increased beneficial bacteria in the large intestine (with insoluble fibre)

**Flavonoids**: a type of antioxidant from a large group of plant pigments, with over 5000 naturally occurring flavonoids being classified in numerous plants. Flavonol, flavone, isoflavones are sub-classes of flavonoids. An example of flavonoids is anthocyanins, which have a deep blue colour that may appear red, blue, or purple. Fruits and vegetables, tea, and cacao and/or cocoa in general are rich natural sources of flavonoids.

**Free Radicals**: highly reactive chemicals with the potential to cause damage. They are formed naturally within the body and play an important role in normal cellular processes. However, at high concentrations they can be hazardous, increase oxidative stress within the body and subsequently cause damage to cells, which may play a role in cancer development, cardiovascular disease, diabetes, Alzheimer's disease, and arthritis. Common sources of free radicals include cigarette smoke, UV rays, strenuous work or intense exercise, and pollution. Antioxidants have the properties to neutralize unstable free radicals. Thus, it is important that a balance between free radicals and antioxidants is present to encourage proper physiological function in the body.

**Functional Foods**: any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains.

**Lutein**: an antioxidant carotenoid that aids in maintaining healthy vision. Commonly found in spinach, corn, and citrus.

**Lycopene**: an antioxidant carotenoid found in red and pink hued vegetables and fruits that is attributed to maintaining good prostate health. Commonly found in tomatoes and its products, watermelon, and red/pink grapefruit.

**Meta-analysis**: a study combining results from multiple studies to identify an overall effect. It has the advantage of increasing the sample size and the statistical power to detect effects of the topic being studied.

**Metastasis:** the process where cancer cells from one tissue spread to other tissues and create additional tumours.

**Monounsaturated Fats**: a type of dietary fat with one carbon double bond. Historically associated with being a "healthy fat" due to its role in promoting cardiovascular health and cholesterol management. Food sources include avocados, almonds, cashews, pecans, and olive oil.

**Nutraceuticals**: any food (fruit, vegetable, beverage, or product of fermentation) that contains a large quantity of one-or-more molecules that are health promoting (Das et al., 2011).

**Organosulfur Compounds**: organic compounds that contains sulfur, have anti-inflammatory, antibacterial, and antiviral properties and when consumed have been shown to aid in reducing oxidative stress and minimize the risk of cardiovascular diseases, cancer, neurodegenerative disorders, and diabetes. Organosulfur compounds are often found in allium and cruciferous vegetables. For example: allicin, which is present in garlic, is what gives crushed garlic its pungent aroma.

**Phytoestrogen**: a compound that is found in plant foods and has a similar chemical structure to estrogen found in animal and human bodies. Phytoestrogen has been shown to have health benefits relating to heart health and cancer prevention. Often found in flaxseed, soybeans, and soy products.

**Phytochemicals/Phytonutrients**: chemical compounds that are often produced by plants that provide potential health benefits. Antioxidants are often found in phytochemical/phytonutrient rich foods.

**Plant-based Food**: whole foods that are primarily derived from plant sources and exclude animal products. This includes fruits, vegetables, whole grains, nuts, seeds, beans, legumes, and oils.

**Plant Stanols and Sterols**: substances that are chemically similar to cholesterol and may help to reduce the risk of cardiovascular disease (CVD) by inhibiting the uptake of LDL cholesterol by the intestinal cells and enhance cholesterol excretion back into the intestinal lumen. Food sources include nuts, seeds, whole grains, corn, and soy.

**Prebiotics**: indigestible food ingredients that promote beneficial bacteria growth in the intestine. When eaten they help to grow the existing beneficial bacteria or probiotics present in the gut. Food sources include garlic, onions, leeks, asparagus, and whole grains.

**Probiotics:** live beneficial bacteria that have the potential to provide health benefits upon consumption. Probiotics live in the gut and could have been originally obtained through the vaginal

canal during birth or via breast milk, but food sources of probiotics include fermented foods like yogurt, miso, kimchi, and sauerkraut. In addition to helping with gut health and improved immunity, they may play a role in protecting DNA from oxidative stress which may aid in cancer prevention.

**Proliferation:** the process of the multiplication of cancer cells. The growth of a tumour is determined by its rate of proliferation.

**Polyphenols**: a type of phytochemical and antioxidant that give plants their colour and flavour. They may provide health benefits relating to heart health, cancer, and chronic inflammation in general. They can be further broken down into groups according to the amount of phenol rings that they contain. Some examples include: anthocyanins, flavonoids, lignans, and phenolic acids.

**Polyunsaturated Fat**: a type of dietary fat with two or more carbon double bonds. They are considered to be a "healthy fat" due to their positive association for management of cholesterol as well as their promising chemopreventive properties that may alter cancer cell growth. Types of food with polyunsaturated fat include walnuts, chia seeds, hemp seeds, and flaxseed.

**Triglycerides**: a type of fat found in the blood of humans and animals. High triglyceride levels can lead to high cholesterol, metabolic syndrome, and cardiovascular disease.

**Whole Grain**: a grain or grain product which contains the three components that make up a grain seed, specifically the bran, germ, and endosperm.

# References <<Back>>


Ahn, J., Albanes, D., Peters, U., Schatzkin, A., Lim, U., Freedman, M., Chatterjee, N., Andriole, G. L., Leitzmann, M. F., Hayes, R. B., & Prostate, Lung, Colorectal, and Ovarian Trial Project Team (2007). Dairy products, calcium intake, and risk of prostate cancer in the prostate, lung, colorectal, and ovarian cancer screening trial. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *16*(12), 2623–2630. https://doi.org/10.1158/1055-9965.EPI-07-0601

Akbaraly, T. N., Brunner, E. J., Ferrie, J. E., Marmot, M. G., Kivimaki, M., & Singh-Manoux, A. (2009). Dietary pattern and depressive symptoms in middle age. *The British journal of psychiatry : the journal of mental science*, *195*(5), 408–413. https://doi.org/10.1192/bjp.bp.108.058925

Akramiene, D., Kondrotas, A., Didziapetriene, J., & Kevelaitis, E. (2007). Effects of beta-glucans on the immune system. *Medicina (Kaunas, Lithuania)*, *43*(8), 597–606. https://doi:10.3390/medicina43080076

Alberta Health Services. (2021, August). Eat more soluble fibre. 04276-NFS. Alberta Health Services, Nutrition Services. https://www.albertahealthservices.ca/assets/info/nutrition/if-nfs-eat-more-soluble-fibre.pdf

Alexandrescu, D. T., Vaillant, J. G., & Dasanu, C. A. (2007). Effect of treatment with a colloidal oatmeal lotion on the acneform eruption induced by epidermal growth factor receptor and multiple tyrosine-kinase inhibitors. *Clinical and experimental dermatology*, *32*(1), 71–74. https://doi.org/10.1111/j.1365-2230.2006.02285.x

Allen, N. E., Key, T. J., Appleby, P. N., Travis, R. C., Roddam, A. W., Tjønneland, A., Johnsen, N. F., Overvad, K., Linseisen, J., Rohrmann, S., Boeing, H., Pischon, T., Bueno-de-Mesquita, H. B., Kiemeney, L., Tagliabue, G., Palli, D., Vineis, P., Tumino, R., Trichopoulou, A., Kassapa, C., … Riboli, E. (2008). Animal foods, protein, calcium and prostate cancer risk: the European Prospective Investigation into Cancer and Nutrition. *British journal of cancer*, *98*(9), 1574–1581. https://doi.org/10.1038/sj.bjc.6604331

Aly, J., & Engmann, O. (2020). The Way to a Human's Brain Goes Through Their Stomach: Dietary Factors in Major Depressive Disorder. *Frontiers in neuroscience*, *14*, 582853. https://doi.org/10.3389/fnins.2020.582853

American Society of Clinical Oncology. (2022). *ASCO answers. Cancer-related fatigue*. ASCO, Inc. https://www.cancer.net/sites/cancer.net/files/asco_answers_fatigue.pdf

Anand, P., Kunnumakkara, A. B., Newman, R. A., & Aggarwal, B. B. (2007). Bioavailability of curcumin: problems and promises. *Molecular pharmaceutics*, *4*(6), 807–818. https://doi.org/10.1021/mp700113r

Andrade-Vieira, R., Han, J. H., & Marignani, P. A. (2013). Omega-3 polyunsaturated fatty acid promotes the inhibition of glycolytic enzymes and mTOR signaling by regulating the tumor suppressor LKB1. *Cancer biology & therapy*, *14*(11), 1050–1058. https://doi.org/10.4161/cbt.26206

Ansari, F., Pourjafar, H., Tabrizi, A., & Homayouni, A. (2020). The effects of probiotics and prebiotics on mental disorders: a review on depression, anxiety, alzheimer, and autism spectrum disorders. *Current pharmaceutical biotechnology*, *21*(7), 555–565. https://doi.org/10.2174/1389201021666200107113812

Ansary, J., Forbes-Hernández, T. Y., Gil, E., Cianciosi, D., Zhang, J., Elexpuru-Zabaleta, M., Simal-Gandara, J., Giampieri, F., & Battino, M. (2020). Potential health benefit of garlic based on human intervention studies: a brief overview. *Antioxidants (Basel, Switzerland)*, *9*(7), 619. https://doi.org/10.3390/antiox9070619

Applegate, C. C., Rowles, J. L., Ranard, K. M., Jeon, S., & Erdman, J. W. (2018). Soy consumption and the risk of prostate cancer: an updated systematic review and meta-analysis. *Nutrients*, *10*(1), 40. https://doi.org/10.3390/nu10010040

Arab, L., Guo, R., & Elashoff, D. (2019). Lower Depression Scores among Walnut Consumers in NHANES. *Nutrients*, *11*(2), 275. https://doi.org/10.3390/nu11020275

Arami, S., Ahmadi, A., & Haeri, S. A. (2013). The radioprotective effects of Origanum vulgare extract against genotoxicity induced by (131)I in human blood lymphocyte. *Cancer biotherapy & radiopharmaceuticals*, *28*(3), 201–206. https://doi.org/10.1089/cbr.2012.1284

Arends, J., Bachmann, P., Baracos, V., Barthelemy, N., Bertz, H., Bozzetti, F., Fearon, K., Hütterer, E., Isenring, E.,

Kaasa, S., Krznaric, Z., Laird, B., Larsson, M., Laviano, A., Mühlebach, S., Muscaritoli, M., Oldervoll, L., Ravasco, P., Solheim, T., Strasser, F., … Preiser, J. C. (2017). ESPEN guidelines on nutrition in cancer patients. *Clinical nutrition (Edinburgh, Scotland)*, *36*(1), 11–48. https://doi.org/10.1016/j.clnu.2016.07.015

Arts, I. C., Hollman, P. C., Bueno De Mesquita, H. B., Feskens, E. J., & Kromhout, D. (2001). Dietary catechins and epithelial cancer incidence: the Zutphen elderly study. *International journal of cancer*, *92*(2), 298–302. https://doi.org/10.1002/1097-0215(200102)9999:9999<::aid-ijc1187>3.0.co;2-8

Aune, D., Chan, D. S., Lau, R., Vieira, R., Greenwood, D. C., Kampman, E., & Norat, T. (2011). Dietary fibre, whole grains, and risk of colorectal cancer: systematic review and dose-response meta-analysis of prospective studies. *BMJ (Clinical research ed.)*, *343*, d6617. https://doi.org/10.1136/bmj.d6617

Aune, D., Chan, D. S., Greenwood, D. C., Vieira, A. R., Rosenblatt, D. A., Vieira, R., & Norat, T. (2012). Dietary fiber and breast cancer risk: a systematic review and meta-analysis of prospective studies. *Annals of oncology : official journal of the European Society for Medical Oncology*, *23*(6), 1394–1402. https://doi.org/10.1093/annonc/mdr589

Aune, D., Keum, N., Giovannucci, E., Fadnes, L. T., Boffetta, P., Greenwood, D. C., Tonstad, S., Vatten, L. J., Riboli, E., & Norat, T. (2016a). Nut consumption and risk of cardiovascular disease, total cancer, all-cause and cause-specific mortality: a systematic review and dose-response meta-analysis of prospective studies. *BMC medicine*, *14*(1), 207. https://doi.org/10.1186/s12916-016-0730-3

Aune, D., Keum, N., Giovannucci, E., Fadnes, L. T., Boffetta, P., Greenwood, D. C., Tonstad, S., Vatten, L. J., Riboli, E., & Norat, T. (2016b). Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. *BMJ (Clinical research ed.)*, *353*, i2716. https://doi.org/10.1136/bmj.i2716

Aune, D., Giovannucci, E., Boffetta, P., Fadnes, L. T., Keum, N., Norat, T., Greenwood, D. C., Riboli, E., Vatten, L. J., & Tonstad, S. (2017). Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality-a systematic review and dose-response meta-analysis of prospective studies. *International journal of epidemiology*, *46*(3), 1029–1056. https://doi.org/10.1093/ije/dyw31

Ayeka P. A. (2018). Potential of mushroom compounds as immunomodulators in cancer immunotherapy: a review. *Evidence-based complementary and alternative medicine : eCAM*, *2018*, 7271509. https://doi.org/10.1155/2018/7271509

Ba, D. M., Ssentongo, P., Beelman, R. B., Muscat, J., Gao, X., & Richie, J. P. (2021). Higher mushroom consumption is associated with lower risk of cancer: a systematic review and meta-analysis of observational studies. *Advances in nutrition (Bethesda, Md.)*, *12*(5), 1691–1704. https://doi.org/10.1093/advances/nmab015

Bae, J. M., & Kim, E. H. (2016). Dietary intakes of citrus fruit and risk of gastric cancer incidence: an adaptive meta-analysis of cohort studies. *Epidemiology and health*, *38*, e2016034. https://doi.org/10.4178/epih.e2016034

Baglia, M. L., Zheng, W., Li, H., Yang, G., Gao, J., Gao, Y. T., & Shu, X. O. (2016). The association of soy food consumption with the risk of subtype of breast cancers defined by hormone receptor and HER2 status. *International journal of cancer*, *139*(4), 742–748. https://doi.org/10.1002/ijc.30117

Barański, M., Srednicka-Tober, D., Volakakis, N., Seal, C., Sanderson, R., Stewart, G. B., Benbrook, C., Biavati, B., Markellou, E., Giotis, C., Gromadzka-Ostrowska, J., Rembiałkowska, E., Skwarło-Sońta, K., Tahvonen, R., Janovská, D., Niggli, U., Nicot, P., & Leifert, C. (2014). Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses. *The British journal of nutrition*, *112*(5), 794–811. https://doi.org/10.1017/S0007114514001366

Barton, D. L., Liu, H., Dakhil, S. R., Linquist, B., Sloan, J. A., Nichols, C. R., McGinn, T. W., Stella, P. J., Seeger, G. R., Sood, A., & Loprinzi, C. L. (2013). Wisconsin Ginseng (Panax quinquefolius) to improve cancer-related fatigue: a randomized, double-blind trial, N07C2. *Journal of the National Cancer Institute*, *105*(16), 1230–1238. https://doi.org/10.1093/jnci/djt181

Béliveau, R., & Gingras, D. (2006). *Foods that fight cancer: Preventing and treating cancer through diet*. Allen & Unwin.

Béliveau, R., & Gingras, D. (2007). Role of nutrition in preventing cancer. *Canadian family physician Medecin de famille canadien*, *53*(11), 1905–1911.

Beliveau, R., & Gingras, D. (2016). *Foods that fight cancer. Preventing cancer through diet* (Rev. ed.). Firefly Books.

Benaron, D. A., Cheong, W. F., & Stevenson, D. K. (1997). Tissue optics. *Science (New York, N.Y.)*, *276*(5321), 2002–2003. https://doi.org/10.1126/science.276.5321.2002

Berkey, C. S., Willett, W. C., Tamimi, R. M., Rosner, B., Frazier, A. L., & Colditz, G. A. (2013). Vegetable protein and vegetable fat intakes in pre-adolescent and adolescent girls, and risk for benign breast disease in young women. *Breast cancer research and treatment*, *141*(2), 299–306. https://doi.org/10.1007/s10549-013-2686-8

Bigornia, S. J., Harris, W. S., Falcón, L. M., Ordovás, J. M., Lai, C. Q., & Tucker, K. L. (2016). The Omega-3 Index Is Inversely Associated with Depressive Symptoms among Individuals with Elevated Oxidative Stress Biomarkers. *The Journal of nutrition*, *146*(4), 758–766. https://doi.org/10.3945/jn.115.222562

Bjelakovic, G., Gluud, L. L., Nikolova, D., Whitfield, K., Krstic, G., Wetterslev, J., & Gluud, C. (2014). Vitamin D supplementation for prevention of cancer in adults. *The Cochrane database of systematic reviews*, (6), CD007469. https://doi.org/10.1002/14651858.CD007469.pub2

Blanchard, C. M., Courneya, K. S., Stein, K., & American Cancer Society's SCS-II (2008). Cancer survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*, *26*(13), 2198–2204. https://doi.org/10.1200/JCO.2007.14.6217

Bley, K., Boorman, G., Mohammad, B., McKenzie, D., & Babbar, S. (2012). A comprehensive review of the carcinogenic and anticarcinogenic potential of capsaicin. *Toxicologic pathology*, *40*(6), 847–873. https://doi.org/10.1177/0192623312444471

Block, K. I., Koch, A. C., Mead, M. N., Tothy, P. K., Newman, R. A., & Gyllenhaal, C. (2007). Impact of antioxidant supplementation on chemotherapeutic efficacy: a systematic review of the evidence from randomized controlled trials. *Cancer treatment reviews*, *33*(5), 407–418. https://doi.org/10.1016/j.ctrv.2007.01.005

Block, K. I., Koch, A. C., Mead, M. N., Tothy, P. K., Newman, R. A., & Gyllenhaal, C. (2008). Impact of antioxidant supplementation on chemotherapeutic toxicity: a systematic review of the evidence from randomized controlled trials. *International journal of cancer*, *123*(6), 1227–1239. https://doi.org/10.1002/ijc.23754

Bode, A. M., & Dong, Z. (2011). The two faces of capsaicin. *Cancer research*, *71*(8), 2809–2814. https://doi.org/10.1158/0008-5472.CAN-10-3756

Boggs, D. A., Palmer, J. R., Wise, L. A., Spiegelman, D., Stampfer, M. J., Adams-Campbell, L. L., & Rosenberg, L. (2010). Fruit and vegetable intake in relation to risk of breast cancer in the Black Women's Health Study. *American journal of epidemiology*, *172*(11), 1268–1279. https://doi.org/10.1093/aje/kwq293

Boivin, D., Lamy, S., Lord-Dufour, S., Jackson, J., Beaulieu, E., Côté, M., Moghrabi, A., Barrette, S., Gingras, D, & Béliveau, R. (2009). Antiproliferative and antioxidant activities of common vegetables: a comparative study. *Food Chemistry, 112*(2), 374-380. https://doi:10.1016/j.foodchem.2008.05.084

Borgas, P., Gonzalez, G., Veselkov, K., & Mirnezami, R. (2021). Phytochemically rich dietary components and the risk of colorectal cancer: A systematic review and meta-analysis of observational studies. *World journal of clinical oncology*, *12*(6), 482–499. https://doi.org/10.5306/wjco.v12.i6.482

Bosetti, C., Filomeno, M., Riso, P., Polesel, J., Levi, F., Talamini, R., Montella, M., Negri, E., Franceschi, S., & La Vecchia, C. (2012). Cruciferous vegetables and cancer risk in a network of case-control studies. *Annals of oncology : official journal of the European Society for Medical Oncology*, *23*(8), 2198–2203. https://doi.org/10.1093/annonc/mdr604

Brown, E. S., Allsopp, P. J., Magee, P. J., Gill, C. I., Nitecki, S., Strain, C. R., & McSorley, E. M. (2014). Seaweed and human health. *Nutrition reviews*, *72*(3), 205–216. https://doi.org/10.1111/nure.12091

Brown, J. C., Huedo-Medina, T. B., Pescatello, L. S., Pescatello, S. M., Ferrer, R. A., & Johnson, B. T. (2011). Efficacy of exercise interventions in modulating cancer-related fatigue among adult cancer survivors: a meta-analysis. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research,*

*cosponsored by the American Society of Preventive Oncology*, *20*(1), 123–133. https://doi.org/10.1158/1055-9965.EPI-10-0988

Büchner, F. L., Bueno-de-Mesquita, H. B., Linseisen, J., Boshuizen, H. C., Kiemeney, L. A., Ros, M. M., Overvad, K., Hansen, L., Tjonneland, A., Raaschou-Nielsen, O., Clavel-Chapelon, F., Boutron-Ruault, M. C., Touillaud, M., Kaaks, R., Rohrmann, S., Boeing, H., Nöthlings, U., Trichopoulou, A., Zylis, D., Dilis, V., … Riboli, E. (2010). Fruits and vegetables consumption and the risk of histological subtypes of lung cancer in the European Prospective Investigation into Cancer and Nutrition (EPIC). *Cancer causes & control : CCC*, *21*(3), 357–371. https://doi.org/10.1007/s10552-009-9468-y

Buck, K., Vrieling, A., Zaineddin, A. K., Becker, S., Hüsing, A., Kaaks, R., Linseisen, J., Flesch-Janys, D., & Chang-Claude, J. (2011). Serum enterolactone and prognosis of postmenopausal breast cancer. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*, *29*(28), 3730–3738. https://doi.org/10.1200

Buck, K., Zaineddin, A. K., Vrieling, A., Linseisen, J., & Chang-Claude, J. (2010). Meta-analyses of lignans and enterolignans in relation to breast cancer risk. *The American journal of clinical nutrition*, *92*(1), 141–153. https://doi.org/10.3945/ajcn.2009.28573

Buffart, L. M., Kalter, J., Sweegers, M. G., Courneya, K. S., Newton, R. U., Aaronson, N. K., Jacobsen, P. B., May, A. M., Galvão, D. A., Chinapaw, M. J., Steindorf, K., Irwin, M. L., Stuiver, M. M., Hayes, S., Griffith, K. A., Lucia, A., Mesters, I., van Weert, E., Knoop, H., Goedendorp, M. M., … Brug, J. (2017). Effects and moderators of exercise on quality of life and physical function in patients with cancer: An individual patient data meta-analysis of 34 RCTs. *Cancer treatment reviews*, *52*, 91–104. https://doi.org/10.1016/j.ctrv.2016.11.010

Butt, M. S., Naz, A., Sultan, M. T., & Qayyum, M. M. (2013). Anti-oncogenic perspectives of spices/herbs: A comprehensive review. *EXCLI journal*, *12*, 1043–1065.

Buttigliero, C., Monagheddu, C., Petroni, P., Saini, A., Dogliotti, L., Ciccone, G., & Berruti, A. (2011). Prognostic role of vitamin d status and efficacy of vitamin D supplementation in cancer patients: a systematic review. *The oncologist*, *16*(9), 1215–1227. https://doi.org/10.1634/theoncologist.2011-0098

Caan, B. J., Natarajan, L., Parker, B., Gold, E. B., Thomson, C., Newman, V., Rock, C. L., Pu, M., Al-Delaimy, W., & Pierce, J. P. (2011). Soy food consumption and breast cancer prognosis. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *20*(5), 854–858. https://doi.org/10.1158/1055-9965.EPI-10-1041

Cai, X., Wang, C., Yu, W., Fan, W., Wang, S., Shen, N., Wu, P., Li, X., & Wang, F. (2016). Selenium Exposure and Cancer Risk: an Updated Meta-analysis and Meta-regression. *Scientific reports*, *6*, 19213. https://doi.org/10.1038/srep19213

Calado, A., Neves, P. M., Santos, T., & Ravasco, P. (2018). The Effect of Flaxseed in Breast Cancer: A Literature Review. *Frontiers in nutrition*, *5*, 4. https://doi.org/10.3389/fnut.2018.00004

Calle, E. E., Rodriguez, C., Walker-Thurmond, K., & Thun, M. J. (2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *The New England journal of medicine*, *348*(17), 1625–1638. https://doi.org/10.1056/NEJMoa021423

Campbell, K. L., Winters-Stone, K. M., Wiskemann, J., May, A. M., Schwartz, A. L., Courneya, K. S., Zucker, D. S., Matthews, C. E., Ligibel, J. A., Gerber, L. H., Morris, G. S., Patel, A. V., Hue, T. F., Perna, F. M., & Schmitz, K. H. (2019). Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable. *Medicine and science in sports and exercise*, *51*(11), 2375–2390. https://doi.org/10.1249/MSS.0000000000002116

Canadian Cancer Statistics Advisory Committee, Canadian Cancer Society, Statistics Canada, and Public Health Agency of Canada. (2021) *Canadian Cancer Statistics 2021*. https://cdn.cancer.ca/-/media/files/research/cancer-statistics/2021-statistics/2021-pdf-en-final.pdf?rev=2b9d2be7a2d34c1dab6a01c6b0a6a32d&hash=01DE85401DBF0217F8B64F2B7DF43986&_gl=1*18rtzmz*_ga*NjU2ODQ4MTUuMTY2ODE3NzA1NA..*_ga_23YMKBE2C3*MTY2ODYzMzUzNC40LjEuMTY2ODYzNDgzNi4zMi4wLjA.

Canadian Society for Exercise Physiology. (2021a). *24-Hour Movement Guidelines. Canadian 24-hour movement*

*guidelines for adults 18-64 years: an integration of physical activity, sedentary behaviour, and sleep*. https://csepguidelines.ca/guidelines/adults-18-64/

Canadian Society for Exercise Physiology. (2021b). *24-Hour Movement Guidelines. Canadian 24-hour movement guidelines for adults aged 65 years and older: an integration of physical activity, sedentary behaviour, and sleep*. https://csepguidelines.ca/guidelines/adults-65/

Cardwell, G., Bornman, J. F., James, A. P., & Black, L. J. (2018). A Review of Mushrooms as a Potential Source of Dietary Vitamin D. *Nutrients*, *10*(10), 1498. https://doi.org/10.3390/nu10101498

Cardwell, G., Bornman, J. F., James, A. P., & Black, L. J. (2018). A review of mushrooms as a potential source of dietary vitamin D. *Nutrients*, *10*(10), 1498. https://doi.org/10.3390/nu10101498

Carlsen, M. H., Halvorsen, B. L., Holte, K., Bøhn, S. K., Dragland, S., Sampson, L., Willey, C., Senoo, H., Umezono, Y., Sanada, C., Barikmo, I., Berhe, N., Willett, W. C., Phillips, K. M., Jacobs, D. R., Jr, & Blomhoff, R. (2010). The total antioxidant content of more than 3100 foods, beverages, spices, herbs and supplements used worldwide. *Nutrition journal*, *9*, 3. https://doi.org/10.1186/1475-2891-9-3

Carroll, R. E., Benya, R. V., Turgeon, D. K., Vareed, S., Neuman, M., Rodriguez, L., Kakarala, M., Carpenter, P. M., McLaren, C., Meyskens, F. L., Jr, & Brenner, D. E. (2011). Phase IIa clinical trial of curcumin for the prevention of colorectal neoplasia. *Cancer prevention research (Philadelphia, Pa.)*, *4*(3), 354–364. https://doi.org/10.1158/1940-6207.CAPR-10-0098

Carvalho, M., Ferreira, P. J., Mendes, V. S., Silva, R., Pereira, J. A., Jerónimo, C., & Silva, B. M. (2010). Human cancer cell antiproliferative and antioxidant activities of Juglans regia L. *Food and chemical toxicology : an international journal published for the British Industrial Biological Research Association*, *48*(1), 441–447. https://doi.org/10.1016/j.fct.2009.10.043

Cassidy, A., Huang, T., Rice, M. S., Rimm, E. B., & Tworoger, S. S. (2014). Intake of dietary flavonoids and risk of epithelial ovarian cancer. *The American journal of clinical nutrition*, *100*(5), 1344–1351. https://doi.org/10.3945/ajcn.114.088708

Ceci, C., Lacal, P. M., Tentori, L., De Martino, M. G., Miano, R., & Graziani, G. (2018). Experimental evidence of the antitumor, antimetastatic and antiangiogenic activity of ellagic acid. *Nutrients*, *10*(11), 1756. https://doi.org/10.3390/nu10111756

Challier, B., Perarnau, J. M., & Viel, J. F. (1998). Garlic, onion and cereal fibre as protective factors for breast cancer: a French case-control study. *European journal of epidemiology*, *14*(8), 737–747. https://doi.org/10.1023/a:1007512825851

Chan, G. C., Chan, W. K., & Sze, D. M. (2009). The effects of beta-glucan on human immune and cancer cells. *Journal of hematology & oncology*, *2*, 25. https://doi.org/10.1186/1756-8722-2-25

Chan, J. M., Wang, F., & Holly, E. A. (2005). Vegetable and fruit intake and pancreatic cancer in a population-based case-control study in the San Francisco bay area. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *14*(9), 2093–2097. https://doi.org/10.1158/1055-9965.EPI-05-0226

Chan, W. C., Millwood, I. Y., Kartsonaki, C., Du, H., Guo, Y., Chen, Y., Bian, Z., Walters, R. G., Lv, J., He, P., Hu, C., Li, L., Yang, L., Chen, Z., & China Kadoorie Biobank (CKB) Collaborative Group (2021). Spicy food consumption and risk of gastrointestinal-tract cancers: findings from the China Kadoorie Biobank. *International journal of epidemiology*, *50*(1), 199–211. https://doi.org/10.1093/ije/dyaa275

Chang, Y. W., Jang, J. Y., Kim, Y. H., Kim, J. W., & Shim, J. J. (2015). The Effects of Broccoli Sprout Extract Containing Sulforaphane on Lipid Peroxidation and Helicobacter pylori Infection in the Gastric Mucosa. *Gut and liver*, *9*(4), 486–493. https://doi.org/10.5009/gnl14040

Chareonrungrueangchai, K., Wongkawinwoot, K., Anothaisintawee, T., & Reutrakul, S. (2020). Dietary factors and risks of cardiovascular diseases: an umbrella review. *Nutrients*, *12*(4), 1088. https://doi.org/10.3390/nu12041088

Chen C.Y., Milbury P.E., Lapsley K., Blumberg J.B. 2005. Flavonoids from Almond Skins Are Bioavailable and Act Synergistically with Vitamins C and E to Enhance Hamster and Human LDL Resistance to Oxidation. *J.*

*Nutr;135*(6):1366–1373. https://doi: 10.1093/jn/135.6.1366

Chen, H., Shao, F., Zhang, F., & Miao, Q. (2018). Association between dietary carrot intake and breast cancer: A meta-analysis. *Medicine*, *97*(37), e12164. https://doi.org/10.1097/MD.0000000000012164

Chen, L., Stacewicz-Sapuntzakis, M., Duncan, C., Sharifi, R., Ghosh, L., van Breemen, R., Ashton, D., & Bowen, P. E. (2001). Oxidative DNA damage in prostate cancer patients consuming tomato sauce-based entrees as a whole-food intervention. *Journal of the National Cancer Institute*, *93*(24), 1872–1879. https://doi.org/10.1093/jnci/93.24.1872

Chen, M., Rao, Y., Zheng, Y., Wei, S., Li, Y., Guo, T., & Yin, P. (2014). Association between soy isoflavone intake and breast cancer risk for pre- and post-menopausal women: a meta-analysis of epidemiological studies. *PloS one*, *9*(2), e89288. https://doi.org/10.1371/journal.pone.0089288

Chen, T., Yan, F., Qian, J., Guo, M., Zhang, H., Tang, X., Chen, F., Stoner, G. D., & Wang, X. (2012). Randomized phase II trial of lyophilized strawberries in patients with dysplastic precancerous lesions of the esophagus. *Cancer prevention research (Philadelphia, Pa.)*, *5*(1), 41–50. https://doi.org/10.1158/1940-6207.CAPR-11-0469

Chen, Z., Wang, P. P., Woodrow, J., Zhu, Y., Roebothan, B., Mclaughlin, J. R., & Parfrey, P. S. (2015). Dietary patterns and colorectal cancer: results from a Canadian population-based study. *Nutrition journal*, *14*, 8. https://doi.org/10.1186/1475-2891-14-8

Cheng, Y. C., Huang, Y. C., & Huang, W. L. (2020). The effect of vitamin D supplement on negative emotions: A systematic review and meta-analysis. *Depression and anxiety*, *37*(6), 549–564. https://doi.org/10.1002/da.23025

Chikara, S., Nagaprashantha, L. D., Singhal, J., Horne, D., Awasthi, S., & Singhal, S. S. (2018). Oxidative stress and dietary phytochemicals: Role in cancer chemoprevention and treatment. *Cancer letters*, *413*, 122–134. https://doi.org/10.1016/j.canlet.2017.11.002

Childs, C. E., Calder, P. C., & Miles, E. A. (2019). Diet and Immune Function. *Nutrients*, *11*(8), 1933. https://doi.org/10.3390/nu11081933

Chopan, M., & Littenberg, B. (2017). The Association of Hot Red Chili Pepper Consumption and Mortality: A Large Population-Based Cohort Study. *PloS one*, *12*(1), e0169876. https://doi.org/10.1371/journal.pone.0169876

Chung, M.-Y., Hwang, J.-T., Lee, J., & Choi, H.-K. (2022). The anti-cancer effects of red-pigmented foods: biomarker modulation and mechanisms underlying cancer progression. *Applied Sciences*, *12*(5), 2584. https://doi.org/10.3390/app12052584

Cirmi, S., Ferlazzo, N., Lombardo, G. E., Maugeri, A., Calapai, G., Gangemi, S., & Navarra, M. (2016). Chemopreventive Agents and Inhibitors of Cancer Hallmarks: May Citrus Offer New Perspectives?. *Nutrients*, *8*(11), 698. https://doi.org/10.3390/nu8110698

Clark, R., & Lee, S. H. (2016). Anticancer Properties of Capsaicin Against Human Cancer. *Anticancer research*, *36*(3), 837–843.

Cleveland Clinic, (n.d.). *Managing Nutrition during Cancer and Treatment*. Chemocare. https://chemocare.com/chemotherapy/health-wellness/managing-nutrition-during-cancer-and-treatment.aspx

Cleveland Clinic. (2022, Oct 13). *How to pick the best probiotic.* Health Essentials. https://health.clevelandclinic.org/how-to-pick-the-best-probiotic-for-you/

Colangelo, L. A., He, K., Whooley, M. A., Daviglus, M. L., Morris, S., & Liu, K. (2014). Selenium exposure and depressive symptoms: the Coronary Artery Risk Development in Young Adults Trace Element Study. *Neurotoxicology*, *41*, 167–174. https://doi.org/10.1016/j.neuro.2014.02.003

Collins, P. J., Horowitz, M., & Chatterton, B. E. (1988). Proximal, distal and total stomach emptying of a digestible solid meal in normal subjects. *The British journal of radiology*, *61*(721), 12–18. https://doi.org/10.1259/0007-1285-61-721-12

Conaway, C. C., Getahun, S. M., Liebes, L. L., Pusateri, D. J., Topham, D. K., Botero-Omary, M., & Chung, F. L. (2000). Disposition of glucosinolates and sulforaphane in humans after ingestion of steamed and fresh broccoli. *Nutrition and cancer*, *38*(2), 168–178. https://doi.org/10.1207/S15327914NC382_5

Conklin, K. A. (2000). Dietary antioxidants during cancer chemotherapy: impact on chemotherapeutic effectiveness and development of side effects. *Nutrition and cancer*, *37*(1), 1–18. https://doi.org/10.1207/S15327914NC3701_1

Cotterchio, M., Boucher, B. A., Kreiger, N., Mills, C. A., & Thompson, L. U. (2008). Dietary phytoestrogen intake--lignans and isoflavones--and breast cancer risk (Canada). *Cancer causes & control : CCC*, *19*(3), 259–272. https://doi.org/10.1007/s10552-007-9089-2

Cotterchio, M., Boucher, B. A., Manno, M., Gallinger, S., Okey, A., & Harper, P. (2006). Dietary phytoestrogen intake is associated with reduced colorectal cancer risk. *The Journal of nutrition*, *136*(12), 3046–3053. https://doi.org/10.1093/jn/136.12.3046

Craig W. J. (1999). Health-promoting properties of common herbs. *The American journal of clinical nutrition*, *70*(3 Suppl), 491S–499S. https://doi.org/10.1093/ajcn/70.3.491s

Cui, L., Li, L., Tian, Y., Xu, F., & Qiao, T. (2018). Association between dietary vitamin E intake and esophageal cancer risk: an updated meta-analysis. *Nutrients*, *10*(7), 801. https://doi.org/10.3390/nu10070801

Cunnane, S. C., Hamadeh, M. J., Liede, A. C., Thompson, L. U., Wolever, T. M., & Jenkins, D. J. (1995). Nutritional attributes of traditional flaxseed in healthy young adults. *The American journal of clinical nutrition*, *61*(1), 62–68. https://doi.org/10.1093/ajcn/61.1.62

Das, L., Bhaumik, E., Raychaudhuri, U., & Chakraborty, R. (2012). Role of nutraceuticals in human health. *Journal of food science and technology*, *49*(2), 173–183. https://doi.org/10.1007/s13197-011-0269-4

Davidson, K. T., Zhu, Z., Balabanov, D., Zhao, L., Wakefield, M. R., Bai, Q., & Fang, Y. (2018). Beyond conventional medicine - a look at blueberry, a cancer-fighting superfruit. *Pathology oncology research : POR*, *24*(4), 733–738. https://doi.org/10.1007/s12253-017-0376-2

Davis, C. D., & Milner, J. A. (2011). Nutrigenomics, vitamin D and cancer prevention. *Journal of nutrigenetics and nutrigenomics*, *4*(1), 1–11. https://doi.org/10.1159/000324175

Dawson, S. L., Dash, S. R., & Jacka, F. N. (2016). The Importance of Diet and Gut Health to the Treatment and Prevention of Mental Disorders. *International review of neurobiology*, *131*, 325–346. https://doi.org/10.1016/bs.irn.2016.08.009

de Pascual-Teresa, S., Santos-Buelga, C., & Rivas-Gonzalo, J. C. (2000). Quantitative analysis of flavan-3-ols in Spanish foodstuffs and beverages. *Journal of agricultural and food chemistry*, *48*(11), 5331–5337. https://doi.org/10.1021/jf000549h

De Silva, S. F., & Alcorn, J. (2019). Flaxseed Lignans as Important Dietary Polyphenols for Cancer Prevention and Treatment: Chemistry, Pharmacokinetics, and Molecular Targets. *Pharmaceuticals (Basel, Switzerland)*, *12*(2), 68. https://doi.org/10.3390/ph12020068

Dei Cas M, Ghidoni R. Cancer prevention and therapy with polyphenols: sphingolipid-mediated mechanisms. nutrients. 2018 Jul 21;10(7):940. https://doi:10.3390/nu10070940

Demark-Wahnefried, W., Polascik, T. J., George, S. L., Switzer, B. R., Madden, J. F., Ruffin, M. T., 4th, Snyder, D. C., Owzar, K., Hars, V., Albala, D. M., Walther, P. J., Robertson, C. N., Moul, J. W., Dunn, B. K., Brenner, D., Minasian, L., Stella, P., & Vollmer, R. T. (2008). Flaxseed supplementation (not dietary fat restriction) reduces prostate cancer proliferation rates in men presurgery. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *17*(12), 3577–3587. https://doi.org/10.1158/1055-9965.EPI-08-0008

Demeule, M., Brossard, M., Turcotte, S., Regina, A., Jodoin, J., & Béliveau, R. (2004). Diallyl disulfide, a chemopreventive agent in garlic, induces multidrug resistance-associated protein 2 expression. *Biochemical and biophysical research communications*, *324*(2), 937–945. https://doi.org/10.1016/j.bbrc.2004.09.141

Devasagayam, T. P., Tilak, J. C., Boloor, K. K., Sane, K. S., Ghaskadbi, S. S., & Lele, R. D. (2004). Free radicals and

antioxidants in human health: current status and future prospects. *The Journal of the Association of Physicians of India*, *52*, 794–804.

Dewanto, V., Wu, X., Adom, K. K., & Liu, R. H. (2002). Thermal processing enhances the nutritional value of tomatoes by increasing total antioxidant activity. *Journal of agricultural and food chemistry*, *50*(10), 3010–3014. https://doi.org/10.1021/jf0115589

Dharman, S., G, M., Shanmugasundaram, K., & Sampath, R. K. (2021). A systematic review and meta-analysis on the efficacy of curcumin/turmeric for the prevention and amelioration of radiotherapy/radiochemotherapy induced oral mucositis in head and neck cancer patients. *Asian Pacific journal of cancer prevention : APJCP*, *22*(6), 1671–1684. https://doi.org/10.31557/APJCP.2021.22.6.1671

Dhillon, N., Aggarwal, B. B., Newman, R. A., Wolff, R. A., Kunnumakkara, A. B., Abbruzzese, J. L., Ng, C. S., Badmaev, V., & Kurzrock, R. (2008). Phase II trial of curcumin in patients with advanced pancreatic cancer. *Clinical cancer research : an official journal of the American Association for Cancer Research*, *14*(14), 4491–4499. https://doi.org/10.1158/1078-0432.CCR-08-0024

di Giuseppe, R., Di Castelnuovo, A., Centritto, F., Zito, F., De Curtis, A., Costanzo, S., Vohnout, B., Sieri, S., Krogh, V., Donati, M. B., de Gaetano, G., & Iacoviello, L. (2008). Regular consumption of dark chocolate is associated with low serum concentrations of C-reactive protein in a healthy Italian population. *The Journal of nutrition*, *138*(10), 1939–1945. https://doi.org/10.1093/jn/138.10.1939

Dianatinasab, M., Wesselius, A., Salehi-Abargouei, A., Yu, E. Y. W., Fararouei, M., Brinkman, M., van den Brandt, P., White, E., Weiderpass, E., Le Calvez-Kelm, F., Gunter, M. J., Huybrechts, I., & Zeegers, M. P. (2022). Dietary fats and their sources in association with the risk of bladder cancer: a pooled analysis of 11 prospective cohort studies. *International journal of cancer*, *151*(1), 44–55. https://doi.org/10.1002/ijc.33970

Donaldson M. S. (2004). Nutrition and cancer: a review of the evidence for an anti-cancer diet. *Nutrition journal*, *3*, 19. https://doi.org/10.1186/1475-2891-3-19

Doyle, C., Kushi, L. H., Byers, T., Courneya, K. S., Demark-Wahnefried, W., Grant, B., McTiernan, A., Rock, C. L., Thompson, C., Gansler, T., Andrews, K. S., 2006 Nutrition, Physical Activity and Cancer Survivorship Advisory Committee, & American Cancer Society (2006). Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA: a cancer journal for clinicians*, *56*(6), 323–353. https://doi.org/10.3322/canjclin.56.6.323

Dreher, M. L., & Davenport, A. J. (2013). Hass avocado composition and potential health effects. *Critical Reviews in Food Science and Nutrition, 53*(7), 738-750. https://doi:10.1080/10408398.2011.556759

Duthie S. J. (1999). Folic acid deficiency and cancer: mechanisms of DNA instability. *British medical bulletin*, *55*(3), 578–592. https://doi.org/10.1258/0007142991902646

Dutta, A., & Chakraborty, A. (2018). Cinnamon in anticancer armamentarium: a molecular approach. *Journal of toxicology*, *2018*, 8978731. https://doi.org/10.1155/2018/8978731

Edington, J., Kon, P., & Martyn, C. N. (1996). Prevalence of malnutrition in patients in general practice. *Clinical nutrition (Edinburgh, Scotland)*, *15*(2), 60–63. https://doi.org/10.1016/s0261-5614(96)80020-3

Edwards, A. J., Vinyard, B. T., Wiley, E. R., Brown, E. D., Collins, J. K., Perkins-Veazie, P., Baker, R. A., & Clevidence, B. A. (2003). Consumption of watermelon juice increases plasma concentrations of lycopene and beta-carotene in humans. *The Journal of nutrition*, *133*(4), 1043–1050. https://doi.org/10.1093/jn/133.4.1043

Ekstrand, B., Scheers, N., Rasmussen, M. K., Young, J. F., Ross, A. B., & Landberg, R. (2021). Brain foods - the role of diet in brain performance and health. *Nutrition reviews*, *79*(6), 693–708. https://doi.org/10.1093/nutrit/nuaa091

Eliza, W. L., Fai, C. K., & Chung, L. P. (2012). Efficacy of Yun Zhi (Coriolus versicolor) on survival in cancer patients: systematic review and meta-analysis. *Recent patents on inflammation & allergy drug discovery*, *6*(1), 78–87. https://doi.org/10.2174/187221312798889310

Ellis, A. C., Dudenbostel, T., & Crowe-White, K. (2019). Watermelon juice: a novel functional food to increase circulating lycopene in older adult women. *Plant foods for human nutrition (Dordrecht, Netherlands)*, *74*(2), 200–203. https://doi.org/10.1007/s11130-019-00719-9

Ellison, L.F. (2021, Sept 15). The cancer survival index: measuring progress in cancer survival to help evaluate cancer control efforts in Canada. Health Reports. Statistics Canada. https://www150.statcan.gc.ca/n1/pub/82-003-x/2021009/article/00002-eng.htm

Ellison, N., Loprinzi, C. L., Kugler, J., Hatfield, A. K., Miser, A., Sloan, J. A., Wender, D. B., Rowland, K. M., Molina, R., Cascino, T. L., Vukov, A. M., Dhaliwal, H. S., & Ghosh, C. (1997). Phase III placebo-controlled trial of capsaicin cream in the management of surgical neuropathic pain in cancer patients. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*, *15*(8), 2974–2980. https://doi.org/10.1200/JCO.1997.15.8.2974

Espín, J. C., Larrosa, M., García-Conesa, M. T., & Tomás-Barberán, F. (2013). Biological significance of urolithins, the gut microbial ellagic Acid-derived metabolites: the evidence so far. *Evidence-based complementary and alternative medicine : eCAM*, *2013*, 270418. https://doi.org/10.1155/2013/270418

Evans C. E. L. (2020). Dietary fibre and cardiovascular health: a review of current evidence and policy. *The Proceedings of the Nutrition Society*, *79*(1), 61–67. https://doi.org/10.1017/S0029665119000673

Evans, J. A., & Johnson, E. J. (2010). The role of phytonutrients in skin health. *Nutrients*, *2*(8), 903–928. https://doi.org/10.3390/nu2080903

Fabiani, R., Minelli, L., & Rosignoli, P. (2016). Apple intake and cancer risk: a systematic review and meta-analysis of observational studies. *Public health nutrition*, *19*(14), 2603–2617. https://doi.org/10.1017/S136898001600032X

Fahey, J. W., Stephenson, K. K., Wade, K. L., & Talalay, P. (2013). Urease from Helicobacter pylori is inactivated by sulforaphane and other isothiocyanates. *Biochemical and biophysical research communications*, *435*(1), 1–7. https://doi.org/10.1016/j.bbrc.2013.03.126

Fallahzadeh, H., Jalali, A., Momayyezi, M., & Bazm, S. (2015). Effect of carrot intake in the prevention of gastric cancer: a meta-analysis. *Journal of gastric cancer*, *15*(4), 256–261. https://doi.org/10.5230/jgc.2015.15.4.256

Fan, J., Song, Y., Wang, Y., Hui, R., & Zhang, W. (2012). Dietary glycemic index, glycemic load, and risk of coronary heart disease, stroke, and stroke mortality: a systematic review with meta-analysis. *PloS one*, *7*(12), e52182. https://doi.org/10.1371/journal.pone.0052182

Farghadani, R., & Naidu, R. (2021). Curcumin: modulator of key molecular signaling pathways in hormone-independent breast cancer. *Cancers*, *13*(14), 3427. https://doi.org/10.3390/cancers13143427

Fatahi, S., Matin, S. S., Sohouli, M. H., Găman, M. A., Raee, P., Olang, B., Kathirgamathamby, V., Santos, H. O., Guimarães, N. S., & Shidfar, F. (2021). Association of dietary fiber and depression symptom: a systematic review and meta-analysis of observational studies. *Complementary therapies in medicine*, *56*, 102621. https://doi.org/10.1016/j.ctim.2020.102621

Ferrarini, L., Pellegrini, N., Mazzeo, T., Miglio, C., Galati, S., Milano, F., Rossi, C., & Buschini, A. (2012). Anti-proliferative activity and chemoprotective effects towards DNA oxidative damage of fresh and cooked Brassicaceae. *The British journal of nutrition*, *107*(9), 1324–1332. https://doi.org/10.1017/S0007114511004272

Ferrer, R. A., Huedo-Medina, T. B., Johnson, B. T., Ryan, S., & Pescatello, L. S. (2011). Exercise interventions for cancer survivors: a meta-analysis of quality of life outcomes. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*, *41*(1), 32–47. https://doi.org/10.1007/s12160-010-9225-1

Feskanich, D., Ziegler, R. G., Michaud, D. S., Giovannucci, E. L., Speizer, F. E., Willett, W. C., & Colditz, G. A. (2000). Prospective study of fruit and vegetable consumption and risk of lung cancer among men and women. *Journal of the National Cancer Institute*, *92*(22), 1812–1823. https://doi.org/10.1093/jnci/92.22.1812

Fiedor, J., & Burda, K. (2014). Potential role of carotenoids as antioxidants in human health and disease. *Nutrients*, *6*(2), 466–488. https://doi.org/10.3390/nu6020466

Fielding, J. M., Rowley, K. G., Cooper, P., & O' Dea, K. (2005). Increases in plasma lycopene concentration after consumption of tomatoes cooked with olive oil. *Asia Pacific journal of clinical nutrition*, *14*(2), 131–136.

Figueroa, A., Sanchez-Gonzalez, M. A., Perkins-Veazie, P. M., & Arjmandi, B. H. (2011). Effects of watermelon supplementation on aortic blood pressure and wave reflection in individuals with prehypertension: a pilot study. *American journal of hypertension*, *24*(1), 40–44. https://doi.org/10.1038/ajh.2010.142

Figueroa, A., Sanchez-Gonzalez, M. A., Wong, A., & Arjmandi, B. H. (2012). Watermelon extract supplementation reduces ankle blood pressure and carotid augmentation index in obese adults with prehypertension or hypertension. *American journal of hypertension*, *25*(6), 640–643. https://doi.org/10.1038/ajh.2012.20

Figueroa, A., Wong, A., Jaime, S. J., & Gonzales, J. U. (2017). Influence of L-citrulline and watermelon supplementation on vascular function and exercise performance. *Current opinion in clinical nutrition and metabolic care*, *20*(1), 92–98. https://doi.org/10.1097/MCO.0000000000000340

Firth, J., Gangwisch, J. E., Borisini, A., Wootton, R. E., & Mayer, E. A. (2020). Food and mood: how do diet and nutrition affect mental wellbeing?. *BMJ (Clinical research ed.)*, *369*, m2382. https://doi.org/10.1136/bmj.m2382

Flores, G., & Ruiz Del Castillo, M. L. (2016). Cancer-Related Constituents of Strawberry Jam as Compared with Fresh Fruit. *Cancers*, *8*(1), 16. https://doi.org/10.3390/cancers8010016

Fortes, C., Forastiere, F., Farchi, S., Mallone, S., Trequattrinni, T., Anatra, F., Schmid, G., & Perucci, C. A. (2003). The protective effect of the Mediterranean diet on lung cancer. *Nutrition and cancer*, *46*(1), 30–37. https://doi.org/10.1207/S15327914NC4601_04

Frazier, A. L., Ryan, C. T., Rockett, H., Willett, W. C., & Colditz, G. A. (2003). Adolescent diet and risk of breast cancer. *Breast cancer research : BCR*, *5*(3), R59–R64. https://doi.org/10.1186/bcr583

Frazier, A. L., Li, L., Cho, E., Willett, W. C., & Colditz, G. A. (2004). Adolescent diet and risk of breast cancer. *Cancer causes & control : CCC*, *15*(1), 73–82. https://doi.org/10.1023/B:CACO.0000016617.57120.df

Friedenreich, C. M., Stone, C. R., Cheung, W. Y., & Hayes, S. C. (2019). Physical activity and mortality in cancer survivors: a systematic review and meta-analysis. *JNCI cancer spectrum*, *4*(1), pkz080. https://doi.org/10.1093/jncics/pkz080

Fritz, H., Kennedy, D., Fergusson, D., Fernandes, R., Cooley, K., Seely, A., Sagar, S., Wong, R., & Seely, D. (2011). Selenium and lung cancer: a systematic review and meta analysis. *PloS one*, *6*(11), e26259. https://doi.org/10.1371/journal.pone.0026259

Fulgoni, V. L., 3rd, Dreher, M., & Davenport, A. J. (2013). Avocado consumption is associated with better diet quality and nutrient intake, and lower metabolic syndrome risk in US adults: results from the National Health and Nutrition Examination Survey (NHANES) 2001-2008. *Nutrition journal*, *12*, 1. https://doi.org/10.1186/1475-2891-12-1

Funahashi, H., Imai, T., Mase, T., Sekiya, M., Yokoi, K., Hayashi, H., Shibata, A., Hayashi, T., Nishikawa, M., Suda, N., Hibi, Y., Mizuno, Y., Tsukamura, K., Hayakawa, A., & Tanuma, S. (2001). Seaweed prevents breast cancer?. *Japanese journal of cancer research : Gann*, *92*(5), 483–487. https://doi.org/10.1111/j.1349-7006.2001.tb01119.x

Gaddy, J. A., Radin, J. N., Loh, J. T., Zhang, F., Washington, M. K., Peek, R. M., Jr, Algood, H. M., & Cover, T. L. (2013). High dietary salt intake exacerbates Helicobacter pylori-induced gastric carcinogenesis. *Infection and immunity*, *81*(6), 2258–2267. https://doi.org/10.1128/IAI.01271-12

Gaesser G. A. (2020). Whole grains, refined grains, and cancer risk: a systematic review of meta-analyses of observational studies. *Nutrients*, *12*(12), 3756. https://doi.org/10.3390/nu12123756

Gajowik, A., & Dobrzyńska, M. M. (2014). Lycopene - antioxidant with radioprotective and anticancer properties. A review. *Roczniki Panstwowego Zakladu Higieny*, *65*(4), 263–271.

Galeone, C., Pelucchi, C., Levi, F., Negri, E., Franceschi, S., Talamini, R., Giacosa, A., & La Vecchia, C. (2006). Onion and garlic use and human cancer. *The American journal of clinical nutrition*, *84*(5), 1027–1032. https://doi.org/10.1093/ajcn/84.5.1027

Galeone, C., Pelucchi, C., Talamini, R., Negri, E., Dal Maso, L., Montella, M., Ramazzotti, V., Franceschi, S., & La Vecchia, C. (2007). Onion and garlic intake and the odds of benign prostatic hyperplasia. *Urology*, *70*(4), 672–

676. https://doi.org/10.1016/j.urology.2007.06.1099

Galeone, C., Turati, F., Zhang, Z. F., Guercio, V., Tavani, A., Serraino, D., Brennan, P., Fabianova, E., Lissowska, J., Mates, D., Rudnai, P., Shangina, O., Szeszenia-Dabrowska, N., Vaughan, T. L., Kelsey, K., McClean, M., Levi, F., Hayes, R. B., Purdue, M. P., Bosetti, C., … La Vecchia, C. (2015). Relation of allium vegetables intake with head and neck cancers: evidence from the INHANCE consortium. *Molecular nutrition & food research*, *59*(9), 1641–1650. https://doi.org/10.1002/mnfr.201500042

Gallus, S., Talamini, R., Giacosa, A., Montella, M., Ramazzotti, V., Franceschi, S., Negri, E., & La Vecchia, C. (2005). Does an apple a day keep the oncologist away?. *Annals of oncology : official journal of the European Society for Medical Oncology*, *16*(11), 1841–1844. https://doi.org/10.1093/annonc/mdi361

Gangwisch, J. E., Hale, L., Garcia, L., Malaspina, D., Opler, M. G., Payne, M. E., Rossom, R. C., & Lane, D. (2015). High glycemic index diet as a risk factor for depression: analyses from the Women's Health Initiative. *The American journal of clinical nutrition*, *102*(2), 454–463. https://doi.org/10.3945/ajcn.114.103846

Gates, M. A., Vitonis, A. F., Tworoger, S. S., Rosner, B., Titus-Ernstoff, L., Hankinson, S. E. & Cramer, D. W. (2009), Flavonoid intake and ovarian cancer risk in a population-based case-control study. *International Journal of Cancer, 124(8)*, 1918-1925. https://doi.org/10.1002/ijc.24151

Gaudreau, P. O., Stagg, J., Soulières, D., & Saad, F. (2016). The present and future of biomarkers in prostate cancer: proteomics, genomics, and immunology advancements. *Biomarkers in cancer*, *8*(Suppl 2), 15–33. https://doi.org/10.4137/BIC.S31802

Gil, M. I., Tomás-Barberán, F. A., Hess-Pierce, B., Holcroft, D. M., & Kader, A. A. (2000). Antioxidant activity of pomegranate juice and its relationship with phenolic composition and processing. *Journal of agricultural and food chemistry*, *48*(10), 4581–4589. https://doi.org/10.1021/jf000404a

Gingras, D., Gendron, M., Boivin, D., Moghrabi, A., Théorêt, Y., & Béliveau, R. (2004). Induction of medulloblastoma cell apoptosis by sulforaphane, a dietary anticarcinogen from Brassica vegetables. *Cancer letters*, *203*(1), 35–43. https://doi.org/10.1016/j.canlet.2003.08.025

Giovannucci E. (1999). Tomatoes, tomato-based products, lycopene, and cancer: review of the epidemiologic literature. *Journal of the National Cancer Institute*, *91*(4), 317–331. https://doi.org/10.1093/jnci/91.4.317

Giovannucci, E., Rimm, E. B., Liu, Y., Stampfer, M. J., & Willett, W. C. (2002). A prospective study of tomato products, lycopene, and prostate cancer risk. *Journal of the National Cancer Institute*, *94*(5), 391–398. https://doi.org/10.1093/jnci/94.5.391

Giuliano, A. R., Siegel, E. M., Roe, D. J., Ferreira, S., Baggio, M. L., Galan, L., Duarte-Franco, E., Villa, L. L., Rohan, T. E., Marshall, J. R., Franco, E. L., & Ludwig-McGill HPV Natural History Study (2003). Dietary intake and risk of persistent human papillomavirus (HPV) infection: the Ludwig-McGill HPV Natural History Study. *The Journal of infectious diseases*, *188*(10), 1508–1516. https://doi.org/10.1086/379197

Goel, A., Kunnumakkara, A. B., & Aggarwal, B. B. (2008). Curcumin as "Curecumin": from kitchen to clinic. *Biochemical pharmacology*, *75*(4), 787–809. https://doi.org/10.1016/j.bcp.2007.08.016

Golovinskaia, O., & Wang, C. K. (2021). Review of Functional and Pharmacological Activities of Berries. *Molecules (Basel, Switzerland)*, *26*(13), 3904. https://doi.org/10.3390/molecules26133904

Gonçalves, C. F. L., de Freitas, M. L., & Ferreira, A. C. F. (2017). Flavonoids, thyroid iodide uptake and thyroid cancer-a review. *International journal of molecular sciences*, *18*(6), 1247. https://doi.org/10.3390/ijms18061247

Gonzales, J. F., Barnard, N. D., Jenkins, D. J., Lanou, A. J., Davis, B., Saxe, G., & Levin, S. (2014). Applying the precautionary principle to nutrition and cancer. *Journal of the American College of Nutrition*, *33*(3), 239–246. https://doi.org/10.1080/07315724.2013.866527

Gorham, E. D., Garland, C. F., Garland, F. C., Grant, W. B., Mohr, S. B., Lipkin, M., Newmark, H. L., Giovannucci, E., Wei, M., & Holick, M. F. (2007). Optimal vitamin D status for colorectal cancer prevention: a quantitative meta analysis. *American journal of preventive medicine*, *32*(3), 210–216. https://doi.org/10.1016/j.amepre.2006.11.004

Goufo, P., & Trindade, H. (2014). Rice antioxidants: phenolic acids, flavonoids, anthocyanins, proanthocyanidins, tocopherols, tocotrienols, γ-oryzanol, and phytic acid. *Food science & nutrition*, *2*(2), 75–104. https://doi.org/10.1002/fsn3.86

Greenlee, H., Hershman, D. L., & Jacobson, J. S. (2009). Use of antioxidant supplements during breast cancer treatment: a comprehensive review. *Breast cancer research and treatment*, *115*(3), 437–452. https://doi.org/10.1007/s10549-008-0193-0

Greenlee, H., Kwan, M. L., Kushi, L. H., Song, J., Castillo, A., Weltzien, E., Quesenberry, C. P., Jr, & Caan, B. J. (2012). Antioxidant supplement use after breast cancer diagnosis and mortality in the Life After Cancer Epidemiology (LACE) cohort. *Cancer*, *118*(8), 2048–2058. https://doi.org/10.1002/cncr.26526

Greger, M. (2022, December 19). *Turmeric with black pepper: what it's good for and how to take it.* NutritionFacts.org https://nutritionfacts.org/2015/02/05/why-pepper-boosts-turmeric-blood-levels/

Grosso, G., Godos, J., Lamuela-Raventos, R., Ray, S., Micek, A., Pajak, A., Sciacca, S., D'Orazio, N., Del Rio, D., & Galvano, F. (2017). A comprehensive meta-analysis on dietary flavonoid and lignan intake and cancer risk: level of evidence and limitations. *Molecular nutrition & food research*, *61*(4), 10.1002/mnfr.201600930. https://doi.org/10.1002/mnfr.201600930

Guasch-Ferré, M., Bulló, M., Martínez-González, M. Á., Ros, E., Corella, D., Estruch, R., Fitó, M., Arós, F., Wärnberg, J., Fiol, M., Lapetra, J., Vinyoles, E., Lamuela-Raventós, R. M., Serra-Majem, L., Pintó, X., Ruiz-Gutiérrez, V., Basora, J., Salas-Salvadó, J., & PREDIMED study group (2013). Frequency of nut consumption and mortality risk in the PREDIMED nutrition intervention trial. *BMC medicine*, *11*, 164. https://doi.org/10.1186/1741-7015-11-164

Guercio, V., Turati, F., La Vecchia, C., Galeone, C., & Tavani, A. (2016). Allium vegetables and upper aerodigestive tract cancers: a meta-analysis of observational studies. *Molecular nutrition & food research*, *60*(1), 212–222. https://doi.org/10.1002/mnfr.201500587

Guglielmini, P., Rubagotti, A., & Boccardo, F. (2012). Serum enterolactone levels and mortality outcome in women with early breast cancer: a retrospective cohort study. *Breast cancer research and treatment*, *132*(2), 661–668. https://doi.org/10.1007/s10549-011-1881-8

Guha, N., Kwan, M. L., Quesenberry, C. P., Jr, Weltzien, E. K., Castillo, A. L., & Caan, B. J. (2009). Soy isoflavones and risk of cancer recurrence in a cohort of breast cancer survivors: the Life After Cancer Epidemiology study. *Breast cancer research and treatment*, *118*(2), 395–405. https://doi.org/10.1007/s10549-009-0321-5

Guo, W., Nie, L., Wu, D., Wise, M. L., Collins, F. W., Meydani, S. N., & Meydani, M. (2010). Avenanthramides inhibit proliferation of human colon cancer cell lines in vitro. *Nutrition and cancer*, *62*(8), 1007–1016. https://doi.org/10.1080/01635581.2010.492090

Guo, Y., Zhi, F., Chen, P., Zhao, K., Xiang, H., Mao, Q., Wang, X., & Zhang, X. (2017). Green tea and the risk of prostate cancer: a systematic review and meta-analysis. *Medicine*, *96*(13), e6426. https://doi.org/10.1097/MD.0000000000006426

Gupta, S. C., Sung, B., Kim, J. H., Prasad, S., Li, S., & Aggarwal, B. B. (2013). Multitargeting by turmeric, the golden spice: from kitchen to clinic. *Molecular nutrition & food research*, *57*(9), 1510–1528. https://doi.org/10.1002/mnfr.201100741

Guzek, D., Kołota, A., Lachowicz, K., Skolmowska, D., Stachoń, M., & Głąbska, D. (2021). Association between vitamin D supplementation and mental health in healthy adults: a systematic review. *Journal of clinical medicine*, *10*(21), 5156. https://doi.org/10.3390/jcm10215156

Hager K. K. (2016). Management of weight loss in people with cancer. *Journal of the advanced practitioner in oncology*, *7*(3), 336–338.

Hakim, I. A., Harris, R. B., & Ritenbaugh, C. (2000). Citrus peel use is associated with reduced risk of squamous cell carcinoma of the skin. *Nutrition and cancer*, *37*(2), 161–168. https://doi.org/10.1207/S15327914NC372_7

Halvorsen, B. L., Carlsen, M. H., Phillips, K. M., Bøhn, S. K., Holte, K., Jacobs, D. R., Jr, & Blomhoff, R. (2006). Content of redox-active compounds (ie, antioxidants) in foods consumed in the United States. *The American*

*journal of clinical nutrition*, *84*(1), 95–135. https://doi.org/10.1093/ajcn/84.1.95

Han, J., Jiang, Y., Liu, X., Meng, Q., Xi, Q., Zhuang, Q., Han, Y., Gao, Y., Ding, Q., & Wu, G. (2015). Dietary fat intake and risk of gastric cancer: a meta-analysis of observational studies. *PloS one*, *10*(9), e0138580. https://doi.org/10.1371/journal.pone.0138580

Han, T. J., Li, J. S., Luan, X. T., Wang, L., & Xu, H. Z. (2017). Dietary fat consumption and non-Hodgkin's lymphoma risk: a meta-analysis. *Nutrition and cancer*, *69*(2), 221–228. https://doi.org/10.1080/01635581.2017.1263753

Hardman W. E. (2014). Walnuts have potential for cancer prevention and treatment in mice. *The Journal of nutrition*, *144*(4 Suppl), 555S–560S. https://doi.org/10.3945/jn.113.188466

Harnly, J. M., Doherty, R. F., Beecher, G. R., Holden, J. M., Haytowitz, D. B., Bhagwat, S., & Gebhardt, S. (2006). Flavonoid content of U.S. fruits, vegetables, and nuts. *Journal of agricultural and food chemistry*, *54*(26), 9966–9977. https://doi.org/10.1021/jf061478a

Harvard Health Publishing. (2021, Feb 15). *How to boost your immune system*. Harvard Medical School. https://www.health.harvard.edu/staying-healthy/how-to-boost-your-immune-system

Harvard Medical School. (2014, February 15). 8 *Principles of low glycemic eating*. Harvard Health Publishing. https://www.health.harvard.edu/healthbeat/8-principles-of-low-glycemic-eating

Hashemian, M., Poustchi, H., Murphy, G., Etemadi, A., Kamangar, F., Pourshams, A., Khoshnia, M., Gharavi, A., Brennan, P. J., Boffetta, P., Dawsey, S. M., Abnet, C. C., & Malekzadeh, R. (2019). Turmeric, pepper, cinnamon, and saffron consumption and mortality. *Journal of the American Heart Association: Cardiovascular and Cerebrovascular Disease*, *8*(18), e012240. https://doi.org/10.1161/JAHA.119.012240

Health Canada. (2006, June 29). *Dietary Reference Intakes. Reference values for macronutrients.* Government of Canada. https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/dietary-reference-intakes/tables/reference-values-macronutrients-dietary-reference-intakes-tables-2005.html

Health Canada. (2020, July 28). *Vitamin D and calcium: updated Dietary Reference Intakes.* Government of Canada. https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/ vitamins-minerals/vitamin-calcium-updated-dietary-reference-intakes-nutrition.html

Health Canada. (2022, May 2). *Vitamin D*. Government of Canada. https://www.canada.ca/en/health-canada/services/nutrients/vitamin-d.html

Heimler, D., Isolani, L., Vignolini, P., Tombelli, S., & Romani, A. (2007). Polyphenol content and antioxidative activity in some species of freshly consumed salads. *Journal of agricultural and food chemistry*, *55*(5), 1724–1729. https://doi.org/10.1021/jf0628983

Henning, S. M., Fajardo-Lira, C., Lee, H. W., Youssefian, A. A., Go, V. L., & Heber, D. (2003). Catechin content of 18 teas and a green tea extract supplement correlates with the antioxidant capacity. *Nutrition and cancer*, *45*(2), 226–235. https://doi.org/10.1207/S15327914NC4502_13

Higdon, J. V., Delage, B., Williams, D. E., & Dashwood, R. H. (2007). Cruciferous vegetables and human cancer risk: epidemiologic evidence and mechanistic basis. *Pharmacological research*, *55*(3), 224–236. https://doi.org/10.1016/j.phrs.2007.01.009

Hilakivi-Clarke, L., Andrade, J. E., & Helferich, W. (2010). Is soy consumption good or bad for the breast?. *The Journal of nutrition*, *140*(12), 2326S–2334S. https://doi.org/10.3945/jn.110.124230

Holland, B., Welch, A. A., Unwin, I. D., Buss, D. H., Paul, A. A., & Southgate, D.A.T. (1995). *McCance and Widdowson's the composition of foods* (5th ed.). Royal Society of Chemistry.

Holtan, S. G., O'Connor, H. M., Fredericksen, Z. S., Liebow, M., Thompson, C. A., Macon, W. R., Micallef, I. N., Wang, A. H., Slager, S. L., Habermann, T. M., Call, T. G., & Cerhan, J. R. (2012). Food-frequency questionnaire-based estimates of total antioxidant capacity and risk of non-Hodgkin lymphoma. *International journal of cancer*, *131*(5), 1158–1168. https://doi.org/10.1002/ijc.26491

Hossain, M. S., Kader, M. A., Goh, K. W., Islam, M., Khan, M. S., Harun-Ar Rashid, M., Ooi, J., Melo Coutinho, H. D., Al-Worafi, Y. M., Moshawih, S., Lim, Y. C., Kibria, K. M. K., & Ming, L. C. (2022). Herb and spices in

colorectal cancer prevention and treatment: a narrative review. *Frontiers in pharmacology*, *13*, 865801. https://doi.org/10.3389/fphar.2022.865801

Hossain, S., Beydoun, M. A., Beydoun, H. A., Chen, X., Zonderman, A. B., & Wood, R. J. (2019). Vitamin D and breast cancer: a systematic review and meta-analysis of observational studies. *Clinical nutrition ESPEN*, *30*, 170–184. https://doi.org/10.1016/j.clnesp.2018.12.085

Hossein-nezhad, A., & Holick, M. F. (2013). Vitamin D for health: a global perspective. *Mayo Clinic proceedings*, *88*(7), 720–755. https://doi.org/10.1016/j.mayocp.2013.05.011

Hu, Y., Ding, M., Sampson, L., Willett, W. C., Manson, J. E., Wang, M., Rosner, B., Hu, F. B., & Sun, Q. (2020). Intake of whole grain foods and risk of type 2 diabetes: results from three prospective cohort studies. *BMJ (Clinical research ed.)*, *370*, m2206. https://doi.org/10.1136/bmj.m2206

Hua, X., Yu, L., You, R., Yang, Y., Liao, J., Chen, D., & Yu, L. (2016). Association among dietary flavonoids, flavonoid subclasses and ovarian cancer risk: a meta-analysis. *PloS one*, *11*(3), e0151134. https://doi.org/10.1371/journal.pone.0151134

Huang, S. S., & Zheng, R. L. (2006). Rosmarinic acid inhibits angiogenesis and its mechanism of action in vitro. *Cancer letters*, *239*(2), 271–280. https://doi.org/10.1016/j.canlet.2005.08.025

Huang, T., Yang, B., Zheng, J., Li, G., Wahlqvist, M. L., & Li, D. (2012). Cardiovascular disease mortality and cancer incidence in vegetarians: a meta-analysis and systematic review. *Annals of nutrition & metabolism*, *60*(4), 233–240. https://doi.org/10.1159/000337301

Huang, W. Y., Cai, Y. Z., & Zhang, Y. (2010). Natural phenolic compounds from medicinal herbs and dietary plants: potential use for cancer prevention. *Nutrition and cancer*, *62*(1), 1–20. https://doi.org/10.1080/01635580903191585

Huang, X., Wang, X., Shang, J., Lin, Y., Yang, Y., Song, Y., & Yu, S. (2018). Association between dietary fiber intake and risk of ovarian cancer: a meta-analysis of observational studies. *The Journal of international medical research*, *46*(10), 3995–4005. https://doi.org/10.1177/0300060518792801

Huang, Y., Chen, H., Zhou, L., Li, G., Yi, D., Zhang, Y., Wu, Y., Liu, X., Wu, X., Song, Q., Liu, L., & Yi, D. (2017). Association between green tea intake and risk of gastric cancer: a systematic review and dose-response meta-analysis of observational studies. *Public health nutrition*, *20*(17), 3183–3192. https://doi.org/10.1017/S1368980017002208

Hui, C., Qi, X., Qianyong, Z., Xiaoli, P., Jundong, Z., & Mantian, M. (2013). Flavonoids, flavonoid subclasses and breast cancer risk: a meta-analysis of epidemiologic studies. *PloS one*, *8*(1), e54318. https://doi.org/10.1371/journal.pone.0054318

Hwang, Y. W., Kim, S. Y., Jee, S. H., Kim, Y. N., & Nam, C. M. (2009). Soy food consumption and risk of prostate cancer: a meta-analysis of observational studies. *Nutrition and cancer*, *61*(5), 598–606. https://doi.org/10.1080/01635580902825639

Hyvärinen, H. K., Pihlava, J. M., Hiidenhovi, J. A., Hietaniemi, V., Korhonen, H. J., & Ryhänen, E. L. (2006). Effect of processing and storage on the stability of flaxseed lignan added to bakery products. *Journal of agricultural and food chemistry*, *54*(1), 48–53. https://doi.org/10.1021/jf0507590

Ibiebele, T. I., van der Pols, J. C., Hughes, M. C., Marks, G. C., Williams, G. M., & Green, A. C. (2007). Dietary pattern in association with squamous cell carcinoma of the skin: a prospective study. *The American journal of clinical nutrition*, *85*(5), 1401–1408. https://doi.org/10.1093/ajcn/85.5.1401

Ide, H., Tokiwa, S., Sakamaki, K., Nishio, K., Isotani, S., Muto, S., Hama, T., Masuda, H., & Horie, S. (2010). Combined inhibitory effects of soy isoflavones and curcumin on the production of prostate-specific antigen. *The Prostate*, *70*(10), 1127–1133. https://doi.org/10.1002/pros.21147

Imran, M., Saeed, F., Gilani, S. A., Shariati, M. A., Imran, A., Afzaal, M., Atif, M., Tufail, T., & Anjum, F. M. (2020). Fisetin: an anticancer perspective. *Food science & nutrition*, *9*(1), 3–16. https://doi.org/10.1002/fsn3.1872

Inglis, J. E., Lin, P. J., Kerns, S. L., Kleckner, I. R., Kleckner, A. S., Castillo, D. A., Mustian, K. M., & Peppone, L.

J. (2019). Nutritional interventions for treating cancer-related fatigue: a qualitative review. *Nutrition and cancer*, *71*(1), 21–40. https://doi.org/10.1080/01635581.2018.1513046

Ioku, K., Aoyama, Y., Tokuno, A., Terao, J., Nakatani, N., & Takei, Y. (2001). Various cooking methods and the flavonoid content in onion. *Journal of nutritional science and vitaminology*, *47*(1), 78–83. https://doi.org/10.3177/jnsv.47.78

Irwig, M. S., El-Sohemy, A., Baylin, A., Rifai, N., & Campos, H. (2002). Frequent intake of tropical fruits that are rich in beta-cryptoxanthin is associated with higher plasma beta-cryptoxanthin concentrations in Costa Rican adolescents. *The Journal of nutrition*, *132*(10), 3161–3167. https://doi.org/10.1093/jn/131.10.3161

Ismail, M. M., Alotaibi, B. S., & El-Sheekh, M. M. (2020). Therapeutic uses of red macroalgae. *Molecules (Basel, Switzerland)*, *25*(19), 4411. https://doi.org/10.3390/molecules25194411

Jaganathan, S. K., Vellayappan, M. V., Narasimhan, G., & Supriyanto, E. (2014). Role of pomegranate and citrus fruit juices in colon cancer prevention. *World journal of gastroenterology*, *20*(16), 4618–4625. https://doi.org/10.3748/wjg.v20.i16.4618

Jeong, S. C., Koyyalamudi, S. R., Jeong, Y. T., Song, C. H., & Pang, G. (2012). Macrophage immunomodulating and antitumor activities of polysaccharides isolated from Agaricus bisporus white button mushrooms. *Journal of medicinal food*, *15*(1), 58–65. https://doi.org/10.1089/jmf.2011.1704

Jeyabalan, J., Aqil, F., Munagala, R., Annamalai, L., Vadhanam, M. V., & Gupta, R. C. (2014). Chemopreventive and therapeutic activity of dietary blueberry against estrogen-mediated breast cancer. *Journal of agricultural and food chemistry*, *62*(18), 3963–3971. https://doi.org/10.1021/jf403734j

Jiménez-Monreal, A. M., García-Diz, L., Martínez-Tomé, M., Mariscal, M., & Murcia, M. A. (2009). Influence of cooking methods on antioxidant activity of vegetables. *Journal of food science*, *74*(3), H97–H103. https://doi.org/10.1111/j.1750-3841.2009.01091.x

Jordan, K. R., Loman, B. R., Bailey, M. T., & Pyter, L. M. (2018). Gut microbiota-immune-brain interactions in chemotherapy-associated behavioral comorbidities. *Cancer*, *124*(20), 3990–3999. https://doi.org/10.1002/cncr.31584

Kaefer, C. M., & Milner, J. A. (2008). The role of herbs and spices in cancer prevention. *The Journal of nutritional biochemistry*, *19*(6), 347–361. https://doi.org/10.1016/j.jnutbio.2007.11.003

Kakarala, M., Brenner, D. E., Korkaya, H., Cheng, C., Tazi, K., Ginestier, C., Liu, S., Dontu, G., & Wicha, M. S. (2010). Targeting breast stem cells with the cancer preventive compounds curcumin and piperine. *Breast cancer research and treatment*, *122*(3), 777–785. https://doi.org/10.1007/s10549-009-0612-x

Kasimsetty, S. G., Bialonska, D., Reddy, M. K., Ma, G., Khan, S. I., & Ferreira, D. (2010). Colon cancer chemopreventive activities of pomegranate ellagitannins and urolithins. *Journal of agricultural and food chemistry*, *58*(4), 2180–2187. https://doi.org/10.1021/jf903762h

Kaur, M., Verma, B. R., Zhou, L., Lak, H. M., Kaur, S., Sammour, Y. M., Kapadia, S. R., Grimm, R. A., Griffin, B. P., & Xu, B. (2021). Association of pepper intake with all-cause and specific cause mortality - A systematic review and meta-analysis. *American journal of preventive cardiology*, *9*, 100301. https://doi.org/10.1016/j.ajpc.2021.100301

Kazemi, A., Barati-Boldaji, R., Soltani, S., Mohammadipoor, N., Esmaeilinezhad, Z., Clark, C. C. T., Babajafari, S., & Akbarzadeh, M. (2021). Intake of various food groups and risk of breast cancer: A systematic review and dose-response meta-analysis of prospective studies. *Advances in nutrition (Bethesda, Md.)*, *12*(3), 809–849. https://doi.org/10.1093/advances/nmaa147

Kerbel R. S. (2000). Tumor angiogenesis: past, present and the near future. *Carcinogenesis*, *21*(3), 505–515. https://doi.org/10.1093/carcin/21.3.505

Khan, M. A., Chen, H. C., Tania, M., & Zhang, D. Z. (2011). Anticancer activities of Nigella sativa (black cumin). *African journal of traditional, complementary, and alternative medicines : AJTCAM*, *8*(5 Suppl), 226–232. https://doi.org/10.4314/ajtcam.v8i5S.10

Khankari, N. K., Yang, J. J., Sawada, N., Wen, W., Yamaji, T., Gao, J., Goto, A., Li, H. L., Iwasaki, M., Yang, G., Shimazu, T., Xiang, Y. B., Inoue, M., Shu, X. O., Tsugane, S., & Zheng, W. (2020). Soy intake and colorectal cancer risk: results from a pooled analysis of prospective cohort studies conducted in China and Japan. *The Journal of nutrition*, *150*(9), 2442–2450. https://doi.org/10.1093/jn/nxaa194

Kim, E. C., Min, J. K., Kim, T. Y., Lee, S. J., Yang, H. O., Han, S., Kim, Y. M., & Kwon, Y. G. (2005). [6]-Gingerol, a pungent ingredient of ginger, inhibits angiogenesis in vitro and in vivo. *Biochemical and biophysical research communications*, *335*(2), 300–308. https://doi.org/10.1016/j.bbrc.2005.07.076

Kim, S. K., & Li, Y. X. (2011). Medicinal benefits of sulfated polysaccharides from sea vegetables. *Advances in food and nutrition research*, *64*, 391–402. https://doi.org/10.1016/B978-0-12-387669-0.00030-2

King, M. L., & Murphy, L. L. (2007). American ginseng (Panax quinquefolius L.) extract alters mitogen-activated protein kinase cell signaling and inhibits proliferation of MCF-7 cells. *Journal of experimental therapeutics & oncology*, *6*(2), 147–155.

Kishida, R., Yamagishi, K., Muraki, I., Sata, M., Tamakoshi, A., Iso, H., & JACC Study Group (2020). Frequency of seaweed intake and its association with cardiovascular disease mortality: the JACC Study. *Journal of atherosclerosis and thrombosis*, *27*(12), 1340–1347. https://doi.org/10.5551/jat.53447

Kleckner, A. S., Reschke, J. E., Kleckner, I. R., Magnuson, A., Amitrano, A. M., Culakova, E., Shayne, M., Netherby-Winslow, C. S., Czap, S., Janelsins, M. C., Mustian, K. M., & Peppone, L. J. (2022). The effects of a Mediterranean diet intervention on cancer-related fatigue for patients undergoing chemotherapy: a pilot randomized controlled trial. *Cancers*, *14*(17), 4202. https://doi.org/10.3390/cancers14174202

Knüppel, A., Shipley, M. J., Llewellyn, C. H., & Brunner, E. J. (2017). Sugar intake from sweet food and beverages, common mental disorder and depression: prospective findings from the Whitehall II study. *Scientific reports*, *7*(1), 6287. https://doi.org/10.1038/s41598-017-05649-7

Kresty, L. A., Frankel, W. L., Hammond, C. D., Baird, M. E., Mele, J. M., Stoner, G. D., & Fromkes, J. J. (2006). Transitioning from preclinical to clinical chemopreventive assessments of lyophilized black raspberries: interim results show berries modulate markers of oxidative stress in Barrett's esophagus patients. *Nutrition and cancer*, *54*(1), 148–156. https://doi.org/10.1207/s15327914nc5401_15

Kresty, L. A., Fromkes, J. J., Frankel, W. L., Hammond, C. D., Seeram, N. P., Baird, M., & Stoner, G. D. (2016). A phase I pilot study evaluating the beneficial effects of black raspberries in patients with Barrett's esophagus. *Oncotarget*, *9*(82), 35356–35372. https://doi.org/10.18632/oncotarget.10457

Kristo, A. S., Klimis-Zacas, D., & Sikalidis, A. K. (2016). Protective role of dietary berries in cancer. *Antioxidants (Basel, Switzerland)*, *5*(4), 37. https://doi.org/10.3390/antiox5040037

Kruma, Z., Andjelkovic, M., Verhe, R., & Kreicbergs, K. (2008). Phenolic compounds in basil, oregano and thyme. *3rd Baltic Conference on Food Science and Technology Foodbalt-2008 Conference Proceedings* (pp. 99-103). https://llufb.llu.lv/conference/foodbalt/2008/Foodbalt-Proceedings-2008-99-103.pdf

Kuijsten, A., Arts, I. C., van't Veer, P., & Hollman, P. C. (2005). The relative bioavailability of enterolignans in humans is enhanced by milling and crushing of flaxseed. *The Journal of nutrition*, *135*(12), 2812–2816. https://doi.org/10.1093/jn/135.12.2812

Kumar C.S., Ganesan P., Suresh P.V., & Bhaskar N. (2008). Seaweeds as a source of nutritionally beneficial compounds—A review. *Journal of Food Science and Technology, 45*(1), 1–13.

Kunimasa, K., Ikekita, M., Sato, M., Ohta, T., Yamori, Y., Ikeda, M., Kuranuki, S., & Oikawa, T. (2010). Nobiletin, a citrus polymethoxyflavonoid, suppresses multiple angiogenesis-related endothelial cell functions and angiogenesis in vivo. *Cancer science*, *101*(11), 2462–2469. https://doi.org/10.1111/j.1349-7006.2010.01668.x

Kushi, L., & Giovannucci, E. (2002). Dietary fat and cancer. *The American journal of medicine*, *113 Suppl 9B*, 63S–70S. https://doi.org/10.1016/s0002-9343(01)00994-9

Kushi, L. H., Doyle, C., McCullough, M., Rock, C. L., Demark-Wahnefried, W., Bandera, E. V., Gapstur, S., Patel, A. V., Andrews, K., Gansler, T., & American Cancer Society 2010 Nutrition and Physical Activity Guidelines Advisory Committee (2012). American Cancer Society Guidelines on nutrition and physical activity for cancer

prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA: a cancer journal for clinicians*, *62*(1), 30–67. https://doi.org/10.3322/caac.20140

Ladas, E., & Kelly, K. M. (2010). The antioxidant debate. *Explore (New York, N.Y.)*, *6*(2), 75–85. https://doi.org/10.1016/j.explore.2009.12.008

Lai, J. S., Hiles, S., Bisquera, A., Hure, A. J., McEvoy, M., & Attia, J. (2014). A systematic review and meta-analysis of dietary patterns and depression in community-dwelling adults. *The American journal of clinical nutrition*, *99*(1), 181–197. https://doi.org/10.3945/ajcn.113.069880

Lam, T. K., Gallicchio, L., Lindsley, K., Shiels, M., Hammond, E., Tao, X. G., Chen, L., Robinson, K. A., Caulfield, L. E., Herman, J. G., Guallar, E., & Alberg, A. J. (2009). Cruciferous vegetable consumption and lung cancer risk: a systematic review. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *18*(1), 184–195. https://doi.org/10.1158/1055-9965.EPI-08-0710

Lands W. E. (1992). Biochemistry and physiology of n-3 fatty acids. *FASEB journal : official publication of the Federation of American Societies for Experimental Biology*, *6*(8), 2530–2536. https://doi.org/10.1096/fasebj.6.8.1592205

Larsson, S. C., Kumlin, M., Ingelman-Sundberg, M., & Wolk, A. (2004). Dietary long-chain n-3 fatty acids for the prevention of cancer: a review of potential mechanisms. *The American journal of clinical nutrition*, *79*(6), 935–945. https://doi.org/10.1093/ajcn/79.6.935

Larsson, S. C., Bergkvist, L., & Wolk, A. (2009). Long-term dietary calcium intake and breast cancer risk in a prospective cohort of women. *The American journal of clinical nutrition*, *89*(1), 277–282. https://doi.org/10.3945/ajcn.2008.26704

Lassale, C., Batty, G. D., Baghdadli, A., Jacka, F., Sánchez-Villegas, A., Kivimäki, M., & Akbaraly, T. (2019). Healthy dietary indices and risk of depressive outcomes: a systematic review and meta-analysis of observational studies. *Molecular psychiatry*, *24*(7), 965–986. https://doi.org/10.1038/s41380-018-0237-8

Lattanzio, V., Kroon, P. A., Linsalata, V., & Cardinali, A. (2009). Globe artichoke: a functional food and source of nutraceutical ingredients. *Journal of Functional Foods, 1*(2), 131-144. https://doi:10.1016/j.jff.2009.01.002

Lawenda, B. D., Kelly, K. M., Ladas, E. J., Sagar, S. M., Vickers, A., & Blumberg, J. B. (2008). Should supplemental antioxidant administration be avoided during chemotherapy and radiation therapy?. *Journal of the National Cancer Institute*, *100*(11), 773–783. https://doi.org/10.1093/jnci/djn148

Le Marchand, L., Murphy, S. P., Hankin, J. H., Wilkens, L. R., & Kolonel, L. N. (2000). Intake of flavonoids and lung cancer. *Journal of the National Cancer Institute*, *92*(2), 154–160. https://doi.org/10.1093/jnci/92.2.154

Lee, J., Shin, A., Oh, J. H., & Kim, J. (2017). Colors of vegetables and fruits and the risks of colorectal cancer. *World journal of gastroenterology*, *23*(14), 2527–2538. https://doi.org/10.3748/wjg.v23.i14.2527

Lee, J. E., Li, H., Chan, A. T., Hollis, B. W., Lee, I. M., Stampfer, M. J., Wu, K., Giovannucci, E., & Ma, J. (2011). Circulating levels of vitamin D and colon and rectal cancer: the Physicians' Health Study and a meta-analysis of prospective studies. *Cancer prevention research (Philadelphia, Pa.)*, *4*(5), 735–743. https://doi.org/10.1158/1940-6207.CAPR-10-0289

Lee, L. E., Metz, D., Giovanni, M., & Bruhn, C. M. (2011). Consumer knowledge and handling of tree nuts: food safety implications. *Food Protection Trends, 31*(1), 18–27.

Lee, S. A., Shu, X. O., Li, H., Yang, G., Cai, H., Wen, W., Ji, B. T., Gao, J., Gao, Y. T., & Zheng, W. (2009). Adolescent and adult soy food intake and breast cancer risk: results from the Shanghai Women's Health Study. *The American journal of clinical nutrition*, *89*(6), 1920–1926. https://doi.org/10.3945/ajcn.2008.27361

Li, Q., Holford, T. R., Zhang, Y., Boyle, P., Mayne, S. T., Dai, M., & Zheng, T. (2013). Dietary fiber intake and risk of breast cancer by menopausal and estrogen receptor status. *European journal of nutrition*, *52*(1), 217–223. https://doi.org/10.1007/s00394-012-0305-9

Li, W. W., Li, V. W., Hutnik, M., & Chiou, A. S. (2012). Tumor angiogenesis as a target for dietary cancer prevention. *Journal of oncology*, *2012*, 879623. https://doi.org/10.1155/2012/879623

Ligibel, J. A., Bohlke, K., May, A. M., Clinton, S. K., Demark-Wahnefried, W., Gilchrist, S. C., Irwin, M. L., Late, M., Mansfield, S., Marshall, T. F., Meyerhardt, J. A., Thomson, C. A., Wood, W. A., & Alfano, C. M. (2022). Exercise, Diet, and Weight Management During Cancer Treatment: ASCO Guideline. *Journal of clinical oncology : official journal of the American Society of Clinical Oncology*, *40*(22), 2491–2507. https://doi.org/10.1200/JCO.22.00687

Lin, B., Gong, C., Song, H., & Cui, Y. (2017). Effects of anthocyanins on the prevention and treatment of cancer. *British Journal of Pharmacology*, *174*(11), 1226–1243. https://doi.org/10.1111/bph.13627

Livesey, G., Taylor, R., Livesey, H. F., Buyken, A. E., Jenkins, D. J. A., Augustin, L. S. A., Sievenpiper, J. L., Barclay, A. W., Liu, S., Wolever, T. M. S., Willett, W. C., Brighenti, F., Salas-Salvadó, J., Björck, I., Rizkalla, S. W., Riccardi, G., Vecchia, C. L., Ceriello, A., Trichopoulou, A., Poli, A., … Brand-Miller, J. C. (2019). Dietary glycemic index and load and the risk of type 2 diabetes: a systematic review and updated meta-analyses of prospective cohort studies. *Nutrients*, *11*(6), 1280. https://doi.org/10.3390/nu11061280

Lodi, M., Kiehl, A., Qu, F. L., Gabriele, V., Tomasetto, C., & Mathelin, C. (2022). Lipid intake and breast cancer risk: is there a link? A New Focus and Meta-Analysis. *European journal of breast health*, *18*(2), 108–126. https://doi.org/10.4274/ejbh.galenos.2021.2021-11-2

Lomagno, K. A., Hu, F., Riddell, L. J., Booth, A. O., Szymlek-Gay, E. A., Nowson, C. A., & Byrne, L. K. (2014). Increasing iron and zinc in pre-menopausal women and its effects on mood and cognition: a systematic review. *Nutrients*, *6*(11), 5117–5141. https://doi.org/10.3390/nu6115117

López-Carrillo, L., Hernández Avila, M., & Dubrow, R. (1994). Chili pepper consumption and gastric cancer in Mexico: a case-control study. *American journal of epidemiology*, *139*(3), 263–271. https://doi.org/10.1093/oxfordjournals.aje.a116993

López-Carrillo, L., Camargo, M. C., Schneider, B. G., Sicinschi, L. A., Hernández-Ramírez, R. U., Correa, P., & Cebrian, M. E. (2012). Capsaicin consumption, Helicobacter pylori CagA status and IL1B-31C>T genotypes: a host and environment interaction in gastric cancer. *Food and chemical toxicology : an international journal published for the British Industrial Biological Research Association*, *50*(6), 2118–2122. https://doi.org/10.1016/j.fct.2012.02.043

Lopresti, A. L., & Drummond, P. D. (2014). Saffron (Crocus sativus) for depression: a systematic review of clinical studies and examination of underlying antidepressant mechanisms of action. *Human psychopharmacology*, *29*(6), 517–527. https://doi.org/10.1002/hup.2434

Lorenzo, Y., Azqueta, A., Luna, L., Bonilla, F., Domínguez, G., & Collins, A. R. (2009). The carotenoid beta-cryptoxanthin stimulates the repair of DNA oxidation damage in addition to acting as an antioxidant in human cells. *Carcinogenesis*, *30*(2), 308–314. https://doi.org/10.1093/carcin/bgn270

Lowcock, E. C., Cotterchio, M., & Boucher, B. A. (2013). Consumption of flaxseed, a rich source of lignans, is associated with reduced breast cancer risk. *Cancer causes & control : CCC*, *24*(4), 813–816. https://doi.org/10.1007/s10552-013-0155-7

Lu, D., Pan, C., Ye, C., Duan, H., Xu, F., Yin, L., Tian, W., & Zhang, S. (2017). Meta-analysis of soy consumption and gastrointestinal cancer risk. *Scientific reports*, *7*(1), 4048. https://doi.org/10.1038/s41598-017-03692-y

Lum, T., Connolly, M., Marx, A., Beidler, J., Hooshmand, S., Kern, M., Liu, C., & Hong, M. Y. (2019). Effects of fresh watermelon consumption on the acute satiety response and cardiometabolic risk factors in overweight and obese adults. *Nutrients*, *11*(3), 595. https://doi.org/10.3390/nu11030595

Luo, J., Ke, D., & He, Q. (2021). Dietary tomato Consumption and the risk of prostate cancer: a meta-analysis. *Frontiers in nutrition*, *8*, 625185. https://doi.org/10.3389/fnut.2021.625185

Luo, W. P., Fang, Y. J., Lu, M. S., Zhong, X., Chen, Y. M., & Zhang, C. X. (2015). High consumption of vegetable and fruit colour groups is inversely associated with the risk of colorectal cancer: a case-control study. *The British journal of nutrition*, *113*(7), 1129–1138. https://doi.org/10.1017/S0007114515000331

Luo, X., Lu, H., Li, Y., & Wang, S. (2017). Carrot intake and incidence of urothelial cancer: a systematic review and meta-analysis. *Oncotarget*, *8*(44), 77957–77962. https://doi.org/10.18632/oncotarget.19832

Lupulescu A. (1996). Prostaglandins, their inhibitors and cancer. *Prostaglandins, leukotrienes, and essential fatty acids*, *54*(2), 83–94. https://doi.org/10.1016/s0952-3278(96)90064-2

Malcolmson, L.J., Przybylski, R. & Daun, J.K. (2000). Storage stability of milled flaxseed. *Journal of the American Oil Chemists' Society, 77*(3), 235-238. https://doi.org/10.1007/s11746-000-0038-0

Manzi, P., Marconi, S., Aguzzi, A., & Pizzoferrato, L. (2004). Commercial mushrooms: nutritional quality and effect of cooking. *Food Chemistry, 84*(2), 201-206. https://doi:10.1016/s0308-8146(03)00202-4

Marsh, K., Zeuschner, C., & Saunders, A. (2012). Health implications of a vegetarian diet: a review. *American Journal of Lifestyle Medicine, 6*(3), 250-267. https://doi:10.1177/1559827611425762

Martín, M. A., Goya, L., & Ramos, S. (2016). Preventive Effects of Cocoa and Cocoa Antioxidants in Colon Cancer. *Diseases (Basel, Switzerland)*, *4*(1), 6. https://doi.org/10.3390/diseases4010006

Marx, W. M., Teleni, L., McCarthy, A. L., Vitetta, L., McKavanagh, D., Thomson, D., & Isenring, E. (2013). Ginger (Zingiber officinale) and chemotherapy-induced nausea and vomiting: a systematic literature review. *Nutrition reviews*, *71*(4), 245–254. https://doi.org/10.1111/nure.12016

Maskarinec G. (2009). Cancer protective properties of cocoa: a review of the epidemiologic evidence. *Nutrition and cancer*, *61*(5), 573–579. https://doi.org/10.1080/01635580902825662

Mason, L., Moore, R. A., Derry, S., Edwards, J. E., & McQuay, H. J. (2004). Systematic review of topical capsaicin for the treatment of chronic pain. *BMJ (Clinical research ed.)*, *328*(7446), 991. https://doi.org/10.1136/bmj.38042.506748.EE

Mazidi, M., Katsiki, N., George, E. S., & Banach, M. (2020). Tomato and lycopene consumption is inversely associated with total and cause-specific mortality: a population-based cohort study, on behalf of the International Lipid Expert Panel (ILEP). *The British journal of nutrition*, *124*(12), 1303–1310. https://doi.org/10.1017/S0007114519002150

McCann, S. E., Thompson, L. U., Nie, J., Dorn, J., Trevisan, M., Shields, P. G., Ambrosone, C. B., Edge, S. B., Li, H. F., Kasprzak, C., & Freudenheim, J. L. (2010). Dietary lignan intakes in relation to survival among women with breast cancer: the Western New York Exposures and Breast Cancer (WEB) Study. *Breast cancer research and treatment*, *122*(1), 229–235. https://doi.org/10.1007/s10549-009-0681-x

McCullough, M. L., Rodriguez, C., Diver, W. R., Feigelson, H. S., Stevens, V. L., Thun, M. J., & Calle, E. E. (2005). Dairy, calcium, and vitamin D intake and postmenopausal breast cancer risk in the Cancer Prevention Study II Nutrition Cohort. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *14*(12), 2898–2904. https://doi.org/10.1158/1055-9965.EPI-05-0611

McRae M. P. (2018). The benefits of dietary fiber intake on reducing the risk of cancer: an umbrella review of meta-analyses. *Journal of chiropractic medicine*, *17*(2), 90–96. https://doi.org/10.1016/j.jcm.2017.12.001

Merritt, M. A., Cramer, D. W., Missmer, S. A., Vitonis, A. F., Titus, L. J., & Terry, K. L. (2014). Dietary fat intake and risk of epithelial ovarian cancer by tumour histology. *British journal of cancer*, *110*(5), 1392–1401. https://doi.org/10.1038/bjc.2014.16

Messina, M. (2016). Soy and health update: evaluation of the clinical and epidemiologic literature. *Nutrients, 8*(12), 754. https://doi:10.3390/nu8120754

Messina, M. & Messina, V. (2010). The role of soy in vegetarian diets. *Nutrients, 2*(8), 855–888. https://doi:10.3390/nu2080855

Messina, M., & Wu, A. H. (2009). Perspectives on the soy–breast cancer relation. *The American Journal of Clinical Nutrition, 89*(5), 1673S-1679S. https://doi:10.3945/ajcn.2009.26736v

Messina, M., Duncan, A., Messina, V., Lynch, H., Kiel, J., & Erdman, J. W. Jr. (2022). The health effects of soy: a reference guide for health professionals. *Frontiers in Nutrition 9*, 970364. https://doi:10.3389/fnut.2022.970364

Messina, M. J. (1999). Legumes and soybeans: Overview of their nutritional profiles and health effects. *The American Journal of Clinical Nutrition,70*(3), 439–450. https://doi:10.1093/ajcn/70.3.439s.

Michaud, D. S., Spiegelman, D., Clinton, S. K., Rimm, E. B., Willett, W. C., & Giovannucci, E. L. (1999). Fruit and vegetable intake and incidence of bladder cancer in a male prospective cohort. *Journal of the National Cancer Institute*, *91*(7), 605–613. https://doi.org/10.1093/jnci/91.7.605

Mileo, A. M., Di Venere, D., Linsalata, V., Fraioli, R., & Miccadei, S. (2012). Artichoke polyphenols induce apoptosis and decrease the invasive potential of the human breast cancer cell line MDA-MB231. *Journal of cellular physiology*, *227*(9), 3301–3309. https://doi.org/10.1002/jcp.24029

Miller, J. A., Lang, J. E., Ley, M., Nagle, R., Hsu, C. H., Thompson, P. A., Cordova, C., Waer, A., & Chow, H. H. (2013). Human breast tissue disposition and bioactivity of limonene in women with early-stage breast cancer. *Cancer prevention research (Philadelphia, Pa.)*, *6*(6), 577–584. https://doi.org/10.1158/1940-6207.CAPR-12-0452

Milner, J. A., McDonald, S. S., Anderson, D. E., & Greenwald, P. (2001). Molecular targets for nutrients involved with cancer prevention. *Nutrition and cancer*, *41*(1-2), 1–16. https://doi.org/10.1080/01635581.2001.9680606

Min, J. K., Han, K. Y., Kim, E. C., Kim, Y. M., Lee, S. W., Kim, O. H., Kim, K. W., Gho, Y. S., & Kwon, Y. G. (2004). Capsaicin inhibits in vitro and in vivo angiogenesis. *Cancer research*, *64*(2), 644–651. https://doi.org/10.1158/0008-5472.can-03-3250

Modak, B., Torres, R., & Urzúa, A. (2011). Seasonal variation of the flavonoids pinocembrin and 3-O-methylgalangin, in the surface component mixture (resinous exudates and waxy coating) of Heliotropium stenophyllum. *Journal of the Chilean Chemical Society, 56*(1), 532–534. https://doi:10.4067/S0717-97072011000100002

Moga, M. A., Dimienescu, O. G., Bălan, A., Dima, L., Toma, S. I., Bîgiu, N. F., & Blidaru, A. (2021). Pharmacological and therapeutic properties of *Punica granatum* phytochemicals: possible roles in breast cancer. *Molecules (Basel, Switzerland)*, *26*(4), 1054. https://doi.org/10.3390/molecules26041054

Monagas, M., Garrido,I., Lebrón-Aguilar, R., Gómez-Cordovés, M. C., Rybarczyk, A., Amarowicz, R., & Bartolomé, B. (2009). Comparative flavan-3-ol profile and antioxidant capacity of roasted peanut, hazelnut, and almond skins. *Journal of Agricultural and Food Chemistry, 57*(22), 10590-9. https://doi:10.1021/jf901391a

Mondul, A. M., Weinstein, S. J., Layne, T. M., & Albanes, D. (2017). Vitamin D and cancer risk and mortality: state of the science, gaps, and challenges. *Epidemiologic reviews, 39*(1), 28–48. https://doi:10.1093/epirev/mxx005

Monroe, K. R., Murphy, S. P., Kolonel, L. N., & Pike, M. C. (2007). Prospective study of grapefruit intake and risk of breast cancer in postmenopausal women: the Multiethnic Cohort Study. *British journal of cancer*, *97*(3), 440–445. https://doi.org/10.1038/sj.bjc.6603880

Moradzadeh, M., Kalani, M. R., & Avan, A. (2019). The antileukemic effects of saffron (Crocus sativus L.) and its related molecular targets: a mini review. *Journal of cellular biochemistry*, *120*(4), 4732–4738. https://doi.org/10.1002/jcb.27525

Morrison, M. E. W., Joseph, J. M., McCann, S. E., Tang, L., Almohanna, H. M., & Moysich, K. B. (2020). Cruciferous vegetable consumption and stomach cancer: a case-control study. *Nutrition and cancer*, *72*(1), 52–61. https://doi.org/10.1080/01635581.2019.1615100

Morrison, M. E. W., Hobika, E. G., Joseph, J. M., Stenzel, A. E., Mongiovi, J. M., Tang, L., McCann, S. E., Marshall, J., Fountzilas, C., & Moysich, K. B. (2021). Cruciferous vegetable consumption and pancreatic cancer: a case-control study. *Cancer epidemiology*, *72*, 101924. https://doi.org/10.1016/j.canep.2021.101924

Morze, J., Danielewicz, A., Hoffmann, G., & Schwingshackl, L. (2020). Diet quality as assessed by the Healthy Eating Index, Alternate Healthy Eating Index, Dietary Approaches to Stop Hypertension Score, and health outcomes: a second update of a systematic review and meta-analysis of cohort studies. *Journal of the Academy of Nutrition and Dietetics*, *120*(12), 1998–2031.e15. https://doi.org/10.1016/j.jand.2020.08.076

Naghshi, S., Sadeghi, O., Willett, W. C., & Esmaillzadeh, A. (2020). Dietary intake of total, animal, and plant proteins and risk of all cause, cardiovascular, and cancer mortality: systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ (Clinical research ed.)*, *370*, m2412. https://doi.org/10.1136/bmj.m2412

Naz, A., Butt, M. S., Sultan, M. T., Qayyum, M. M., & Niaz, R. S. (2014). Watermelon lycopene and allied health claims. *EXCLI journal*, *13*, 650–660.

Nechuta, S. J., Caan, B. J., Chen, W. Y., Lu, W., Chen, Z., Kwan, M. L., Flatt, S. W., Zheng, Y., Zheng, W., Pierce, J. P., & Shu, X. O. (2012). Soy food intake after diagnosis of breast cancer and survival: an in-depth analysis of combined evidence from cohort studies of US and Chinese women. *The American journal of clinical nutrition*, *96*(1), 123–132. https://doi.org/10.3945/ajcn.112.035972

Nezbedova, L., McGhie, T., Christensen, M., Heyes, J., Nasef, N. A., & Mehta, S. (2021). Onco-preventive and chemo-protective effects of apple bioactive compounds. *Nutrients*, *13*(11), 4025. https://doi.org/10.3390/nu13114025

Nguyen, T.H., Nagasaka, R., & Ohshima, T. (2012). Effects of extraction solvents, cooking procedures and storage conditions on the contents of ergothioneine and phenolic compounds and antioxidative capacity of the cultivated mushroom Flammulina velutipes. *International Journal of Food Science and Technology, 47*(6), 1193-1205. https://doi:10.1111/j.1365-2621.2012.02959.x

Nicastro, H. L., Ross, S. A., & Milner, J. A. (2015). Garlic and onions: their cancer prevention properties. *Cancer prevention research (Philadelphia, Pa.)*, *8*(3), 181–189. https://doi.org/10.1158/1940-6207.CAPR-14-0172

Nieuwenhuis, L., & van den Brandt, P. A. (2018). Total nut, tree nut, peanut, and peanut butter consumption and the risk of pancreatic cancer in the Netherlands Cohort Study. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *27*(3), 274–284. https://doi.org/10.1158/1055-9965.EPI-17-0448

Norman, H. A., Butrum, R. R., Feldman, E., Heber, D., Nixon, D., Picciano, M. F., Rivlin, R., Simopoulos, A., Wargovich, M. J., Weisburger, E. K., & Zeisel, S. H. (2003). The role of dietary supplements during cancer therapy. *The Journal of nutrition*, *133*(11 Suppl 1), 3794S–3799S. https://doi.org/10.1093/jn/133.11.3794S

Novaes, M. R., Valadares, F., Reis, M. C., Gonçalves, D. R., & Menezes, M.daC. (2011). The effects of dietary supplementation with Agaricales mushrooms and other medicinal fungi on breast cancer: evidence-based medicine. *Clinics (Sao Paulo, Brazil)*, *66*(12), 2133–2139. https://doi.org/10.1590/s1807-59322011001200021

Nowakowski, P., Markiewicz-Żukowska, R., Bielecka, J., Mielcarek, K., Grabia, M., & Socha, K. (2021). Treasures from the forest: evaluation of mushroom extracts as anti-cancer agents. *Biomedicine & pharmacotherapy = Biomedecine & pharmacotherapie*, *143*, 112106. https://doi.org/10.1016/j.biopha.2021.112106

Ohishi, T., Goto, S., Monira, P., Isemura, M., & Nakamura, Y. (2016). Anti-inflammatory Action of Green Tea. *Anti-inflammatory & anti-allergy agents in medicinal chemistry*, *15*(2), 74–90. https://doi.org/10.2174/1871523015666160915154443

Omara, T., Kiprop, A. K., Ramkat, R. C., Cherutoi, J., Kagoya, S., Moraa Nyangena, D., Azeze Tebo, T., Nteziyaremye, P., Nyambura Karanja, L., Jepchirchir, A., Maiyo, A., Jematia Kiptui, B., Mbabazi, I., Kiwanuka Nakiguli, C., Nakabuye, B. V., & Chepkemoi Koske, M. (2020). Medicinal plants used in traditional management of cancer in Uganda: a review of ethnobotanical surveys, phytochemistry, and anticancer studies. *Evidence-based complementary and alternative medicine : eCAM*, *2020*, 3529081. https://doi.org/10.1155/2020/3529081

Ortiz, L. M., Lombardi, P., Tillhon, M., & Scovassi, A. I. (2014). Berberine, an epiphany against cancer. *Molecules, 19*(8), 12349–12367. https://doi:10.3390/molecules19081234

Otten, J. J., Hellwig, J. P., & Meyers, L. D. (2006). *Dietary reference intakes: the essential guide to nutrient requirements*. The National Academies Press.

Oude Griep, L. M., Geleijnse, J. M., Kromhout, D., Ocké, M. C., & Verschuren, W. M. (2010). Raw and processed fruit and vegetable consumption and 10-year coronary heart disease incidence in a population-based cohort study in the Netherlands. *PloS one*, *5*(10), e13609. https://doi.org/10.1371/journal.pone.0013609

Pacheco, L. S., Li, Y., Rimm, E. B., Manson, J. E., Sun, Q., Rexrode, K., Hu, F. B., & Guasch-Ferré, M. (2022). Avocado consumption and risk of cardiovascular disease in US adults. *Journal of the American Heart Association*, *11*(7), e024014. https://doi.org/10.1161/JAHA.121.024014

Palatty, P. L., Haniadka, R., Valder, B., Arora, R, & Baliga, M. S. (2013). Ginger in the prevention of nausea and vomiting: a review. *Critical Reviews in Food Science and Nutrition, 53*(7), 659-69. https://doi:10.1080/10408398.2011.553751

Paller, C. J., Pantuck, A., & Carducci, M. A. (2017). A review of pomegranate in prostate cancer. *Prostate cancer and prostatic diseases*, *20*(3), 265–270. https://doi.org/10.1038/pcan.2017.19

Panchal, S. K., John, O. D., Mathai, M. L., & Brown, L. (2022). Anthocyanins in chronic diseases: the power of purple. *Nutrients*, *14*(10), 2161. https://doi.org/10.3390/nu14102161

Pandey, M., & Shukla, V. K. (2002). Diet and gallbladder cancer: a case-control study. *European journal of cancer prevention : the official journal of the European Cancer Prevention Organisation (ECP)*, *11*(4), 365–368. https://doi.org/10.1097/00008469-200208000-00008

Pantavos, A., Ruiter, R., Feskens, E. F., de Keyser, C. E., Hofman, A., Stricker, B. H., Franco, O. H., & Kiefte-de Jong, J. C. (2015). Total dietary antioxidant capacity, individual antioxidant intake and breast cancer risk: the Rotterdam Study. *International journal of cancer*, *136*(9), 2178–2186. https://doi.org/10.1002/ijc.29249

Pantuck, A. J., Leppert, J. T., Zomorodian, N., Aronson, W., Hong, J., Barnard, R. J., Seeram, N., Liker, H., Wang, H., Elashoff, R., Heber, D., Aviram, M., Ignarro, L., & Belldegrun, A. (2006). Phase II study of pomegranate juice for men with rising prostate-specific antigen following surgery or radiation for prostate cancer. *Clinical cancer research : an official journal of the American Association for Cancer Research*, *12*(13), 4018–4026. https://doi.org/10.1158/1078-0432.CCR-05-2290

Parikh, M., Maddaford, T. G., Austria, J. A., Aliani, M., Netticadan, T., & Pierce, G. N. (2019). Dietary flaxseed as a strategy for improving human health. *Nutrients*, *11*(5), 1171. https://doi.org/10.3390/nu11051171

Park, S. Y., Murphy, S. P., Wilkens, L. R., Henderson, B. E., Kolonel, L. N., & Multiethnic Cohort Study (2008). Legume and isoflavone intake and prostate cancer risk: the Multiethnic Cohort Study. *International journal of cancer*, *123*(4), 927–932. https://doi.org/10.1002/ijc.23594

Parra-Soto, S., Ahumada, D., Petermann-Rocha, F., Boonpoor, J., Gallegos, J. L., Anderson, J., Sharp, L., Malcomson, F. C., Livingstone, K. M., Mathers, J. C., Pell, J. P., Ho, F. K., & Celis-Morales, C. (2022). Association of meat, vegetarian, pescatarian and fish-poultry diets with risk of 19 cancer sites and all cancer: findings from the UK Biobank prospective cohort study and meta-analysis. *BMC medicine*, *20*(1), 79. https://doi.org/10.1186/s12916-022-02257-9

Patisaul, H. B., & Jefferson, W. (2010). The pros and cons of phytoestrogens. *Frontiers in neuroendocrinology*, *31*(4), 400–419. https://doi.org/10.1016/j.yfrne.2010.03.003

Percival, S. S., Vanden Heuvel, J. P., Nieves, C. J., Montero, C., Migliaccio, A. J., & Meadors, J. (2012). Bioavailability of herbs and spices in humans as determined by ex vivo inflammatory suppression and DNA strand breaks. *Journal of the American College of Nutrition*, *31*(4), 288–294. https://doi.org/10.1080/07315724.2012.10720438

Petimar, J., Wilson, K. M., Wu, K., Wang, M., Albanes, D., van den Brandt, P. A., Cook, M. B., Giles, G. G., Giovannucci, E. L., Goodman, G. E., Goodman, P. J., Håkansson, N., Helzlsouer, K., Key, T. J., Kolonel, L. N., Liao, L. M., Männistö, S., McCullough, M. L., Milne, R. L., Neuhouser, M. L., … Smith-Warner, S. A. (2017). A pooled analysis of 15 prospective cohort studies on the association between fruit, vegetable, and mature bean consumption and risk of prostate cancer. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *26*(8), 1276–1287. https://doi.org/10.1158/1055-9965.EPI-16-1006

Pieroth, R., Paver, S., Day, S., & Lammersfeld, C. (2018). Folate and its impact on cancer risk. *Current nutrition reports*, *7*(3), 70–84. https://doi:10.1007/s13668-018-0237-y

Pintha, K., Yodkeeree, S., & Limtrakul, P. (2015). Proanthocyanidin in red rice inhibits MDA-MB-231 breast cancer cell invasion via the expression control of invasive proteins. *Biological & pharmaceutical bulletin*, *38*(4), 571–581. https://doi.org/10.1248/bpb.b14-00719

Plácido, A. I., Roque, F., & Morgado, M. (2022). The promising role of mushrooms as a therapeutic adjuvant of conventional cancer therapies. *Biologics*, *2*(1), 58–68. MDPI AG. https://dx.doi.org/10.3390/biologics2010005

Pourmohamadi, K., Ahmadzadeh, A., & Latifi, M. (2018). Investigating the effects of oral ginseng on the cancer-related fatigue and quality of life in patients with non-metastatic cancer. *International journal of hematology-oncology and stem cell research*, *12*(4), 313–317.

Prasad, S., & Tyagi, A. K. (2015). Ginger and its constituents: role in prevention and treatment of gastrointestinal cancer. *Gastroenterology research and practice*, *2015*, 142979. https://doi.org/10.1155/2015/142979

Qin, X. X., Zhang, M. Y., Han, Y. Y., Hao, J. H., Liu, C. J., & Fan, S. X. (2018). Beneficial phytochemicals with anti-tumor potential revealed through metabolic profiling of new red pigmented lettuces (Lactuca sativa L.). *International journal of molecular sciences*, *19*(4), 1165. https://doi.org/10.3390/ijms19041165

Qiu, W., Lu, H., Qi, Y., & Wang, X. (2016). Dietary fat intake and ovarian cancer risk: a meta-analysis of epidemiological studies. *Oncotarget*, *7*(24), 37390–37406. https://doi.org/10.18632/oncotarget.8940

Quetglas-Llabrés, M. M., Quispe, C., Herrera-Bravo, J., Catarino, M. D., Pereira, O. R., Cardoso, S. M., Dua, K., Chellappan, D. K., Pabreja, K., Satija, S., Mehta, M., Sureda, A., Martorell, M., Satmbekova, D., Yeskaliyeva, B., Sharifi-Rad, J., Rasool, N., Butnariu, M., Bagiu, I. C., Bagiu, R. V., … Cho, W. C. (2022). Pharmacological properties of bergapten: mechanistic and therapeutic aspects. *Oxidative medicine and cellular longevity*, *2022*, 8615242. https://doi.org/10.1155/2022/8615242

Rahmati, S., Azami, M., Delpisheh, A., Hafezi Ahmadi, M. R., & Sayehmiri, K. (2018). Total calcium (dietary and supplementary) intake and prostate cancer: a systematic review and meta-analysis. *Asian Pacific journal of cancer prevention : APJCP*, *19*(6), 1449–1456. https://doi.org/10.22034/APJCP.2018.19.6.1449

Rao, T. S., Asha, M. R., Ramesh, B. N., & Rao, K. S. (2008). Understanding nutrition, depression and mental illnesses. *Indian journal of psychiatry*, *50*(2), 77–82. https://doi.org/10.4103/0019-5545.42391

Rasyid, A., & Lelo, A. (1999). The effect of curcumin and placebo on human gall-bladder function: an ultrasound study. *Alimentary pharmacology & therapeutics*, *13*(2), 245–249. https://doi.org/10.1046/j.1365-2036.1999.00464.x

Ravasco P. (2019). Nutrition in Cancer Patients. *Journal of clinical medicine*, *8*(8), 1211. https://doi.org/10.3390/jcm8081211

Reagan-Shaw, S., Eggert, D., Mukhtar, H., & Ahmad, N. (2010). Antiproliferative effects of apple peel extract against cancer cells. *Nutrition and cancer*, *62*(4), 517–524. https://doi.org/10.1080/01635580903441253

Rebello, C. J., Greenway, F. L., & Finley, J. W. (2014). A review of the nutritional value of legumes and their effects on obesity and its related co-morbidities. *Obesity reviews : an official journal of the International Association for the Study of Obesity*, *15*(5), 392–407. https://doi.org/10.1111/obr.12144

Reyes, M. E., Riquelme, I., Salvo, T., Zanella, L., Letelier, P., & Brebi, P. (2020). Brown seaweed fucoidan in cancer: implications in metastasis and drug resistance. *Marine drugs*, *18*(5), 232. https://doi.org/10.3390/md18050232

Richman, E. L., Carroll, P. R., & Chan, J. M. (2012). Vegetable and fruit intake after diagnosis and risk of prostate cancer progression. *International journal of cancer*, *131*(1), 201–210. https://doi.org/10.1002/ijc.26348

Rizwan, M., Rodriguez-Blanco, I., Harbottle, A., Birch-Machin, M. A., Watson, R. E., & Rhodes, L. E. (2011). Tomato paste rich in lycopene protects against cutaneous photodamage in humans in vivo: a randomized controlled trial. *The British journal of dermatology*, *164*(1), 154–162. https://doi.org/10.1111/j.1365-2133.2010.10057.x

Rizzo, G., & Baroni, L. (2018). Soy, Soy Foods and Their Role in Vegetarian Diets. *Nutrients*, *10*(1), 43. https://doi.org/10.3390/nu10010043

Robards, K., & Antolovich, M. (1997). Analytical chemistry of fruit bioflavonoids. *Analyst*, *122*, 11R–34R. https://doi:10.1039/a606499j

Robertson, R. C., Guihéneuf, F., Bahar, B., Schmid, M., Stengel, D. B., Fitzgerald, G. F., Ross, R. P., & Stanton, C. (2015). The Anti-Inflammatory Effect of Algae-Derived Lipid Extracts on Lipopolysaccharide (LPS)-Stimulated Human THP-1 Macrophages. *Marine drugs*, *13*(8), 5402–5424. https://doi.org/10.3390/md13085402

Rock, C. L., Doyle, C., Demark-Wahnefried, W., Meyerhardt, J., Courneya, K. S., Schwartz, A. L., Bandera, E. V., Hamilton, K. K., Grant, B., McCullough, M., Byers, T., & Gansler, T. (2012). Nutrition and physical activity guidelines for cancer survivors. *CA: a cancer journal for clinicians*, *62*(4), 243–274. https://doi.org/10.3322/caac.21142

Rock, C. L., Thomson, C. A., Sullivan, K. R., Howe, C. L., Kushi, L. H., Caan, B. J., Neuhouser, M. L., Bandera, E. V., Wang, Y., Robien, K., Basen-Engquist, K. M., Brown, J. C., Courneya, K. S., Crane, T. E., Garcia, D. O., Grant, B. L., Hamilton, K. K., Hartman, S. J., Kenfield, S. A., Martinez, M. E., … McCullough, M. L. (2022). American Cancer Society nutrition and physical activity guideline for cancer survivors. *CA: a cancer journal for clinicians*, *72*(3), 230–262. https://doi.org/10.3322/caac.21719

Rodriguez-Leyva, D., Dupasquier, C. M., McCullough, R., & Pierce, G. N. (2010). The cardiovascular effects of flaxseed and its omega-3 fatty acid, alpha-linolenic acid. *The Canadian journal of cardiology*, *26*(9), 489–496. https://doi.org/10.1016/s0828-282x(10)70455-4

Rohrmann, S., Overvad, K., Bueno-de-Mesquita, H. B., Jakobsen, M. U., Egeberg, R., Tjønneland, A., Nailler, L., Boutron-Ruault, M. C., Clavel-Chapelon, F., Krogh, V., Palli, D., Panico, S., Tumino, R., Ricceri, F., Bergmann, M. M., Boeing, H., Li, K., Kaaks, R., Khaw, K. T., Wareham, N. J., … Linseisen, J. (2013). Meat consumption and mortality--results from the European Prospective Investigation into Cancer and Nutrition. *BMC medicine*, *11*, 63. https://doi.org/10.1186/1741-7015-11-63

Rose, D. P., & Connolly, J. M. (1999). Omega-3 fatty acids as cancer chemopreventive agents. *Pharmacology & therapeutics*, *83*(3), 217–244. https://doi.org/10.1016/s0163-7258(99)00026-1

Ross, P. J., Ashley, S., Norton, A., Priest, K., Waters, J. S., Eisen, T., Smith, I. E., & O'Brien, M. E. (2004). Do patients with weight loss have a worse outcome when undergoing chemotherapy for lung cancers?. *British journal of cancer*, *90*(10), 1905–1911. https://doi.org/10.1038/sj.bjc.6601781

Rowles, J. L., 3rd, Ranard, K. M., Smith, J. W., An, R., & Erdman, J. W., Jr (2017). Increased dietary and circulating lycopene are associated with reduced prostate cancer risk: a systematic review and meta-analysis. *Prostate cancer and prostatic diseases*, *20*(4), 361–377. https://doi.org/10.1038/pcan.2017.25

Saadatian-Elahi, M., Norat, T., Goudable, J., & Riboli, E. (2004). Biomarkers of dietary fatty acid intake and the risk of breast cancer: a meta-analysis. *International journal of cancer*, *111*(4), 584–591. https://doi.org/10.1002/ijc.20284

Sánchez-González C., Ciudad C.J., Noé V., Izquierdo-Pulido M., 2014. Walnut polyphenol metabolites, urolithins A and B, inhibit the expression of the prostate-specific antigen and the androgen receptor in prostate cancer cells. *Food Funct.;5*(11):2922–30. https://doi:10.1039/C4FO00542B

Sánchez-Villegas, A., Delgado-Rodríguez, M., Alonso, A., Schlatter, J., Lahortiga, F., Serra Majem, L., & Martínez-González, M. A. (2009). Association of the Mediterranean dietary pattern with the incidence of depression: the Seguimiento Universidad de Navarra/University of Navarra follow-up (SUN) cohort. *Archives of general psychiatry*, *66*(10), 1090–1098. https://doi.org/10.1001/archgenpsychiatry.2009.129

Sánchez-Villegas, A., Verberne, L., De Irala, J., Ruíz-Canela, M., Toledo, E., Serra-Majem, L., & Martínez-González, M. A. (2011). Dietary fat intake and the risk of depression: the SUN Project. *PloS one*, *6*(1), e16268. https://doi.org/10.1371/journal.pone.0016268

Scaranti, M., Júnior, G.deC., & Hoff, A. O. (2016). Vitamin D and cancer: does it really matter?. *Current opinion in oncology*, *28*(3), 205–209. https://doi.org/10.1097/CCO.0000000000000282

Schwedhelm, C., Boeing, H., Hoffmann, G., Aleksandrova, K., & Schwingshackl, L. (2016). Effect of diet on mortality and cancer recurrence among cancer survivors: a systematic review and meta-analysis of cohort studies. *Nutrition reviews*, *74*(12), 737–748. https://doi.org/10.1093/nutrit/nuw045

Seeram, N. P., Adams, L. S., Henning, S. M., Niu, Y., Zhang, Y., Nair, M. G., & Heber, D. (2005). In vitro antiproliferative, apoptotic and antioxidant activities of punicalagin, ellagic acid and a total pomegranate tannin extract are enhanced in combination with other polyphenols as found in pomegranate juice. *The Journal of nutritional biochemistry*, *16*(6), 360–367. https://doi.org/10.1016/j.jnutbio.2005.01.006

Serafini, M., Bellocco, R., Wolk, A., & Ekström, A. M. (2002). Total antioxidant potential of fruit and vegetables and risk of gastric cancer. *Gastroenterology*, *123*(4), 985–991. https://doi.org/10.1053/gast.2002.35957

Seren, S., Lieberman, R., Bayraktar, U. D., Heath, E., Sahin, K., Andic, F., & Kucuk, O. (2008). Lycopene in cancer prevention and treatment. *American journal of therapeutics*, *15*(1), 66–81. https://doi.org/10.1097/MJT.0b013e31804c7120

Serra, I., Yamamoto, M., Calvo, A., Cavada, G., Báez, S., Endoh, K., Watanabe, H., & Tajima, K. (2002). Association of chili pepper consumption, low socioeconomic status and longstanding gallstones with gallbladder cancer in a Chilean population. *International journal of cancer*, *102*(4), 407–411. https://doi.org/10.1002/ijc.10716

Shigihara, M., Obara, T., Nagai, M., Sugawara, Y., Watanabe, T., Kakizaki, M., Nishino, Y., Kuriyama, S., & Tsuji, I. (2014). Consumption of fruits, vegetables, and seaweeds (sea vegetables) and pancreatic cancer risk: the Ohsaki Cohort Study. *Cancer epidemiology*, *38*(2), 129–136. https://doi.org/10.1016/j.canep.2014.01.001

Shin, M. H., Holmes, M. D., Hankinson, S. E., Wu, K., Colditz, G. A., & Willett, W. C. (2002). Intake of dairy products, calcium, and vitamin d and risk of breast cancer. *Journal of the National Cancer Institute*, *94*(17), 1301–1311. https://doi.org/10.1093/jnci/94.17.1301

Shishikura, Y. & Khokhar, S. (2005). Factors affecting the levels of catechins and caffeine in tea beverage: estimated daily intakes and antioxidant activity. *Journal of the Science of Food and Agriculture, 85*(12), 2125-2133. https://doi.org/10.1002/jsfa.2206

Shoba, G., Joy, D., Joseph, T., Majeed, M., Rajendran, R., & Srinivas, P. S. (1998). Influence of piperine on the pharmacokinetics of curcumin in animals and human volunteers. *Planta medica*, *64*(4), 353–356. https://doi.org/10.1055/s-2006-957450

Shu, X. O., Zheng, Y., Cai, H., Gu, K., Chen, Z., Zheng, W., & Lu, W. (2009). Soy food intake and breast cancer survival. *JAMA*, *302*(22), 2437–2443. https://doi.org/10.1001/jama.2009.1783

Siegel, E. M., Salemi, J. L., Villa, L. L., Ferenczy, A., Franco, E. L., & Giuliano, A. R. (2010). Dietary consumption of antioxidant nutrients and risk of incident cervical intraepithelial neoplasia. *Gynecologic oncology*, *118*(3), 289–294. https://doi.org/10.1016/j.ygyno.2010.05.022

Simopoulos A. P. (2008). The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. *Experimental biology and medicine (Maywood, N.J.)*, *233*(6), 674–688. https://doi.org/10.3181/0711-MR-311

Simopoulos A. P. (2009). Evolutionary aspects of the dietary omega-6:omega-3 fatty acid ratio: medical implications. *World review of nutrition and dietetics*, *100*, 1–21. https://doi.org/10.1159/000235706

Simopoulos A. P. (2016). An increase in the omega-6/omega-3 fatty acid ratio increases the risk for obesity. *Nutrients*, *8*(3), 128. https://doi.org/10.3390/nu8030128

Singh, R. K., Chang, H. W., Yan, D., Lee, K. M., Ucmak, D., Wong, K., Abrouk, M., Farahnik, B., Nakamura, M., Zhu, T. H., Bhutani, T., & Liao, W. (2017). Influence of diet on the gut microbiome and implications for human health. *Journal of translational medicine*, *15*(1), 73. https://doi.org/10.1186/s12967-017-1175-y

Slavin J. L. (2000). Mechanisms for the impact of whole grain foods on cancer risk. *Journal of the American College of Nutrition*, *19*(3 Suppl), 300S–307S. https://doi.org/10.1080/07315724.2000.10718964

Slimestad, R., Fossen, T., & Vågen, I. M. (2007). Onions: a source of unique dietary flavonoids. *Journal of agricultural and food chemistry*, *55*(25), 10067–10080. https://doi.org/10.1021/jf0712503

Sluyter, J. D., Manson, J. E., & Scragg, R. (2020). Vitamin D and clinical cancer outcomes: a review of meta-analyses. *JBMR plus*, *5*(1), e10420. https://doi.org/10.1002/jbm4.1042

Smeds, A. I., Eklund, P. C., Sjöholm, R. E., Willför, S. M., Nishibe, S., Deyama, T., & Holmbom, B. R. (2007). Quantification of a broad spectrum of lignans in cereals, oilseeds, and nuts. *Journal of agricultural and food chemistry*, *55*(4), 1337–1346. https://doi.org/10.1021/jf0629134

Smith-Spangler, C., Brandeau, M. L., Hunter, G. E., Bavinger, J. C., Pearson, M., Eschbach, P. J., Sundaram, V., Liu,

H., Schirmer, P., Stave, C., Olkin, I., & Bravata, D. M. (2012). Are organic foods safer or healthier than conventional alternatives?: a systematic review. *Annals of internal medicine*, *157*(5), 348–366. https://doi.org/10.7326

Song, J. K., & Bae, J. M. (2013). Citrus fruit intake and breast cancer risk: a quantitative systematic review. *Journal of breast cancer*, *16*(1), 72–76. https://doi.org/10.4048/jbc.2013.16.1.72

Steevens, J., Schouten, L. J., Goldbohm, R. A., & van den Brandt, P. A. (2011). Vegetables and fruits consumption and risk of esophageal and gastric cancer subtypes in the Netherlands Cohort Study. *International journal of cancer*, *129*(11), 2681–2693. https://doi.org/10.1002/ijc.25928

Steinmetz, K. A., & Potter, J. D. (1991). Vegetables, fruit, and cancer. II. Mechanisms. *Cancer causes & control : CCC*, *2*(6), 427–442. https://doi.org/10.1007/BF00054304

Steinmetz, K. A., Potter, J. D., & Folsom, A. R. (1993). Vegetables, fruit, and lung cancer in the Iowa Women's Health Study. *Cancer research*, *53*(3), 536–543.

Stoner G. D. (2009). Foodstuffs for preventing cancer: the preclinical and clinical development of berries. *Cancer prevention research (Philadelphia, Pa.)*, *2*(3), 187–194. https://doi.org/10.1158/1940-6207.CAPR-08-0226

Stoner, G. D., Wang, L. S., Zikri, N., Chen, T., Hecht, S. S., Huang, C., Sardo, C., & Lechner, J. F. (2007). Cancer prevention with freeze-dried berries and berry components. *Seminars in cancer biology*, *17*(5), 403–410. https://doi.org/10.1016/j.semcancer.2007.05.001

Story, E. N., Kopec, R. E., Schwartz, S. J., & Harris, G. K. (2010). An update on the health effects of tomato lycopene. *Annual review of food science and technology*, *1*, 189–210. https://doi.org/10.1146/annurev.food.102308.124120

Suganuma, M., Takahashi, A., Watanabe, T., Iida, K., Matsuzaki, T., Yoshikawa, H. Y., & Fujiki, H. (2016). Biophysical Approach to Mechanisms of Cancer Prevention and Treatment with Green Tea Catechins. *Molecules (Basel, Switzerland)*, *21*(11), 1566. https://doi.org/10.3390/molecules21111566

Sultan, M. T., Butt, M. S., Qayyum, M. M., & Suleria, H. A. (2014). Immunity: plants as effective mediators. *Critical reviews in food science and nutrition*, *54*(10), 1298–1308. https://doi.org/10.1080/10408398.2011.633249

Supic, G., Jagodic, M., & Magic, Z. (2013). Epigenetics: a new link between nutrition and cancer. *Nutrition and cancer*, *65*(6), 781–792. https://doi.org/10.1080/01635581.2013.805794

Suttiarporn, P., Chumpolsri, W., Mahatheeranont, S., Luangkamin, S., Teepsawang, S., & Leardkamolkarn, V. (2015). Structures of phytosterols and triterpenoids with potential anti-cancer activity in bran of black non-glutinous rice. *Nutrients*, *7*(3), 1672–1687. https://doi.org/10.3390/nu7031672

Takata, Y., Xiang, Y. B., Yang, G., Li, H., Gao, J., Cai, H., Gao, Y. T., Zheng, W., & Shu, X. O. (2013). Intakes of fruits, vegetables, and related vitamins and lung cancer risk: results from the Shanghai Men's Health Study (2002-2009). *Nutrition and cancer*, *65*(1), 51–61. https://doi.org/10.1080/01635581.2013.741757

Tamimi, R. M., Colditz, G. A., & Hankinson, S. E. (2009). Circulating carotenoids, mammographic density, and subsequent risk of breast cancer. *Cancer research*, *69*(24), 9323–9329. https://doi.org/10.1158/0008-5472.CAN-09-1018

Tan, M. L., & Hamid, S. B. S. (2021). Beetroot as a potential functional food for cancer chemoprevention, a narrative review. *Journal of cancer prevention*, *26*(1), 1–17. https://doi.org/10.15430/JCP.2021.26.1.1

Tang, J., Wan, Y., Zhao, M., Zhong, H., Zheng, J. S., & Feng, F. (2020). Legume and soy intake and risk of type 2 diabetes: a systematic review and meta-analysis of prospective cohort studies. *The American journal of clinical nutrition*, *111*(3), 677–688. https://doi.org/10.1093/ajcn/nqz338

Tang, N. P., Zhou, B., Wang, B., Yu, R. B., & Ma, J. (2009). Flavonoids intake and risk of lung cancer: a meta-analysis. *Japanese journal of clinical oncology*, *39*(6), 352–359. https://doi.org/10.1093/jjco/hyp028

Tantamango-Bartley, Y., Jaceldo-Siegl, K., Fan, J., & Fraser, G. (2013). Vegetarian diets and the incidence of cancer in a low-risk population. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *22*(2), 286–294. https://doi.org/10.1158/1055-9965.EPI-12-1060

Tantamango-Bartley, Y., Knutsen, S. F., Knutsen, R., Jacobsen, B. K., Fan, J., Beeson, W. L., Sabate, J., Hadley, D., Jaceldo-Siegl, K., Penniecook, J., Herring, P., Butler, T., Bennett, H., & Fraser, G. (2016). Are strict vegetarians protected against prostate cancer?. *The American journal of clinical nutrition*, *103*(1), 153–160. https://doi.org/10.3945

Teas, J., Hurley, T. G., Hebert, J. R., Franke, A. A., Sepkovic, D. W., & Kurzer, M. S. (2009). Dietary seaweed modifies estrogen and phytoestrogen metabolism in healthy postmenopausal women. *The Journal of nutrition*, *139*(5), 939–944. https://doi.org/10.3945/jn.108.100834

Teas, J., Vena, S., Cone, D. L., & Irhimeh, M. (2013). The consumption of seaweed as a protective factor in the etiology of breast cancer: proof of principle. *Journal of applied phycology*, *25*(3), 771–779. https://doi.org/10.1007/s10811-012-9931-0

Terry, P., Wolk, A., Persson, I., & Magnusson, C. (2001). Brassica vegetables and breast cancer risk. *JAMA*, *285*(23), 2975–2977. https://doi.org/10.1001/jama.285.23.2975

Theobald, H.E. (2005). Dietary calcium and health. *Nutrition Bulletin, 30*(3), 237-277. https://doi.org/10.1111/j.1467-3010.2005.00514.x

Thompson, C. A., Habermann, T. M., Wang, A. H., Vierkant, R. A., Folsom, A. R., Ross, J. A., & Cerhan, J. R. (2010). Antioxidant intake from fruits, vegetables and other sources and risk of non-Hodgkin's lymphoma: the Iowa Women's Health Study. *International journal of cancer*, *126*(4), 992–1003. https://doi.org/10.1002/ijc.24830

Thompson, L. U., Robb, P., Serraino, M., & Cheung, F. (1991). Mammalian lignan production from various foods. *Nutrition and cancer*, *16*(1), 43–52. https://doi.org/10.1080/01635589109514139

Thompson, L. U., Chen, J. M., Li, T., Strasser-Weippl, K., & Goss, P. E. (2005). Dietary flaxseed alters tumor biological markers in postmenopausal breast cancer. *Clinical cancer research : an official journal of the American Association for Cancer Research*, *11*(10), 3828–3835. https://doi.org/10.1158/1078-0432.CCR-04-2326

Thompson, L. U., Boucher, B. A., Liu, Z., Cotterchio, M., & Kreiger, N. (2006). Phytoestrogen content of foods consumed in Canada, including isoflavones, lignans, and coumestan. *Nutrition and cancer*, *54*(2), 184–201. https://doi.org/10.1207/s15327914nc5402_5

Thomson C. A. (2015). Higher red meat intake in early adulthood is associated with increased risk of breast cancer; substitution with different protein sources such as legumes and poultry may help. *Evidence-based nursing*, *18*(2), 44. https://doi.org/10.1136/eb-2014-101941

Thomson, C. D., Chisholm, A., McLachlan, S. K., & Campbell, J. M. (2008). Brazil nuts: an effective way to improve selenium status. *The American journal of clinical nutrition*, *87*(2), 379–384. https://doi.org/10.1093/ajcn/87.2.379

Toner C. D. (2014). Communicating clinical research to reduce cancer risk through diet: walnuts as a case example. *Nutrition research and practice*, *8*(4), 347–351. https://doi.org/10.4162/nrp.2014.8.4.347

Torquato, H. F., Goettert, M. I., Justo, G. Z., & Paredes-Gamero, E. J. (2017). Anti-cancer phytometabolites targeting cancer stem cells. *Current genomics*, *18*(2), 156–174. https://doi.org/10.2174/1389202917666160803162309

Tortorella, S. M., Royce, S. G., Licciardi, P. V., & Karagiannis, T. C. (2015). Dietary sulforaphane in cancer chemoprevention: the role of epigenetic regulation and HDAC inhibition. *Antioxidants & redox signaling*, *22*(16), 1382–1424. https://doi.org/10.1089/ars.2014.6097

Totmaj, A.S., Emamat, H., Jarrahi, F., & Zarrati, M. (2019). The effect of ginger (Zingiber officinale) on chemotherapy-induced nausea and vomiting in breast cancer patients: A systematic literature review of randomized controlled trials. *Phytotherapy research : PTR*, *33*(8), 1957–1965. https://doi.org/10.1002/ptr.6377

Trock, B. J., Hilakivi-Clarke, L., & Clarke, R. (2006). Meta-analysis of soy intake and breast cancer risk. *Journal of the National Cancer Institute*, *98*(7), 459–471. https://doi.org/10.1093/jnci/djj102

Trudel, D., Labbé, D. P., Bairati, I., Fradet, V., Bazinet, L., & Têtu, B. (2012). Green tea for ovarian cancer prevention and treatment: a systematic review of the in vitro, in vivo and epidemiological studies. *Gynecologic oncology*, *126*(3), 491–498. https://doi.org/10.1016/j.ygyno.2012.04.048

Turati, F., Galeone, C., Augustin, L. S. A., & La Vecchia, C. (2019). Glycemic index, glycemic load and cancer risk:

an updated meta-analysis. *Nutrients*, *11*(10), 2342. https://doi.org/10.3390/nu11102342

Turrini, E., Ferruzzi, L., & Fimognari, C. (2015). Potential Effects of Pomegranate Polyphenols in Cancer Prevention and Therapy. *Oxidative medicine and cellular longevity*, *2015*, 938475. https://doi.org/10.1155/2015/938475

Unlu, N. Z., Bohn, T., Clinton, S. K., & Schwartz, S. J. (2005). Carotenoid absorption from salad and salsa by humans is enhanced by the addition of avocado or avocado oil. *The Journal of nutrition*, *135*(3), 431–436. https://doi.org/10.1093/jn/135.3.431

Valles-Colomer, M., Falony, G., Darzi, Y., Tigchelaar, E. F., Wang, J., Tito, R. Y., Schiweck, C., Kurilshikov, A., Joossens, M., Wijmenga, C., Claes, S., Van Oudenhove, L., Zhernakova, A., Vieira-Silva, S., & Raes, J. (2019). The neuroactive potential of the human gut microbiota in quality of life and depression. *Nature microbiology*, *4*(4), 623–632. https://doi.org/10.1038/s41564-018-0337-x

van Weelden, G., Bobiński, M., Okła, K., van Weelden, W. J., Romano, A., & Pijnenborg, J. M. A. (2019). Fucoidan structure and activity in relation to anti-cancer mechanisms. *Marine drugs*, *17*(1), 32. https://doi.org/10.3390/md17010032

Velentzis, L. S., Cantwell, M. M., Cardwell, C., Keshtgar, M. R., Leathem, A. J., & Woodside, J. V. (2009). Lignans and breast cancer risk in pre- and post-menopausal women: meta-analyses of observational studies. *British journal of cancer*, *100*(9), 1492–1498. https://doi.org/10.1038/sj.bjc.6605003

Verhoeven, D. T., Goldbohm, R. A., van Poppel, G., Verhagen, H., & van den Brandt, P. A. (1996). Epidemiological studies on brassica vegetables and cancer risk. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *5*(9), 733–748.

Verkerk, R., Schreiner, M., Krumbein, A., Ciska, E., Holst, B., Rowland, I., De Schrijver, R., Hansen, M., Gerhäuser, C., Mithen, R., & Dekker, M. (2009). Glucosinolates in Brassica vegetables: the influence of the food supply chain on intake, bioavailability and human health. *Molecular nutrition & food research*, *53 Suppl 2*, S219. https://doi.org/10.1002/mnfr.200800065

Vermeulen, M., Klöpping-Ketelaars, I. W., van den Berg, R., & Vaes, W. H. (2008). Bioavailability and kinetics of sulforaphane in humans after consumption of cooked versus raw broccoli. *Journal of agricultural and food chemistry*, *56*(22), 10505–10509. https://doi.org/10.1021/jf801989e

Vinceti, M., Crespi, C. M., Malagoli, C., Del Giovane, C., & Krogh, V. (2013). Friend or foe? The current epidemiologic evidence on selenium and human cancer risk. *Journal of environmental science and health. Part C, Environmental carcinogenesis & ecotoxicology reviews*, *31*(4), 305–341. https://doi.org/10.1080/10590501.2013.844757

Vinson, J. A., & Cai, Y. (2012). Nuts, especially walnuts, have both antioxidant quantity and efficacy and exhibit significant potential health benefits. *Food & function*, *3*(2), 134–140. https://doi.org/10.1039/c2fo10152a

Viuda-Martos, M., Navajas, Y. R., Zapata, E. S., Fernandez-Lopez, J., & Perez-Alvarez, J. A. (2010). Antioxidant activity of essential oils of five spice plants widely used in a Mediterranean diet. *Flavour and Fragrance Journal, 25*(1), 13-19. https://doi:10.1002/ffj.1951

Volpato, M., & Hull, M. A. (2018). Omega-3 polyunsaturated fatty acids as adjuvant therapy of colorectal cancer. *Cancer metastasis reviews*, *37*(2-3), 545–555. https://doi.org/10.1007/s10555-018-9744-y

Vucenik, I., & Shamsuddin, A. M. (2006). Protection against cancer by dietary IP6 and inositol. *Nutrition and cancer*, *55*(2), 109–125. https://doi.org/10.1207/s15327914nc5502_1

Wallace, C., & Milev, R. (2017). The effects of probiotics on depressive symptoms in humans: a systematic review. *Annals of general psychiatry*, *16*, 14. https://doi.org/10.1186/s12991-017-0138-2

Wang, C. H., Qiao, C., Wang, R. C., & Zhou, W. P. (2015). Dietary fiber intake and pancreatic cancer risk: a meta-analysis of epidemiologic studies. *Scientific reports*, *5*, 10834. https://doi.org/10.1038/srep10834

Wang, J., Zhang, Y., & Zhao, L. (2020). Omega-3 PUFA intake and the risk of digestive system cancers: a meta-analysis of observational studies. *Medicine*, *99*(19), e20119. https://doi.org/10.1097/MD.0000000000020119

Wang, L. S., & Stoner, G. D. (2008). Anthocyanins and their role in cancer prevention. *Cancer letters*, *269*(2), 281–290. https://doi.org/10.1016/j.canlet.2008.05.020

Wang, L.-S., Sardo, C., Henry, C., Larue, B., Rocha, C., McIntyre, C., Frankel, W., Arnold, M., Martin, E., Lechner, J., & Stoner, G. (2008). Chemoprevention of human colorectal cancer with freeze-dried black raspberries. *Cancer Research, 68*(9_Supplement), LB-328.

Wang, Y., Wang, Z., Fu, L., Chen, Y., & Fang, J. (2013). Legume consumption and colorectal adenoma risk: a meta-analysis of observational studies. *PloS one*, *8*(6), e67335. https://doi.org/10.1371/journal.pone.0067335

Wang, Y., Huang, P., Wu, Y., Liu, D., Ji, M., Li, H., & Wang, Y. (2022). Association and mechanism of garlic consumption with gastrointestinal cancer risk: a systematic review and meta-analysis. *Oncology letters*, *23*(4), 125. https://doi.org/10.3892/ol.2022.13245

Watson, G.W., M Beaver, L., E Williams, D., H Dashwood, R., & Ho, E. (2013). Phytochemicals from cruciferous vegetables, epigenetics, and prostate cancer prevention. *The AAPS journal*, *15*(4), 951–961. https://doi.org/10.1208/s12248-013-9504-4

Weisburger J. H. (2001). Chemopreventive effects of cocoa polyphenols on chronic diseases. *Experimental biology and medicine (Maywood, N.J.)*, *226*(10), 891–897. https://doi.org/10.1177/153537020122601003

Welch, A. A., Shakya-Shrestha, S., Lentjes, M. A., Wareham, N. J., & Khaw, K. T. (2010). Dietary intake and status of n-3 polyunsaturated fatty acids in a population of fish-eating and non-fish-eating meat-eaters, vegetarians, and vegans and the product-precursor ratio [corrected] of α-linolenic acid to long-chain n-3 polyunsaturated fatty acids: results from the EPIC-Norfolk cohort. *The American journal of clinical nutrition*, *92*(5), 1040–1051. https://doi.org/10.3945/ajcn.2010.29457

Wertz K. (2009). Lycopene effects contributing to prostate health. *Nutrition and cancer*, *61*(6), 775–783. https://doi.org/10.1080/01635580903285023

Wertz, K., Siler, U., & Goralczyk, R. (2004). Lycopene: modes of action to promote prostate health. *Archives of biochemistry and biophysics*, *430*(1), 127–134. https://doi.org/10.1016/j.abb.2004.04.023

Wolfe, K., Wu, X., & Liu, R. H. (2003). Antioxidant activity of apple peels. *Journal of agricultural and food chemistry*, *51*(3), 609–614. https://doi.org/10.1021/jf020782a

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018a). *Diet, nutrition, physical activity and the prevention of cancer: a global perspective. Continuous update project expert report 2018.* https://www.wcrf.org/wp-content/uploads/2021/02/Summary-of-Third-Expert-Report-2018.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018b). *Continuous Update Project Expert Report 2018. Wholegrains, vegetables and fruit and the risk of cancer*. https://www.wcrf.org/wp-content/uploads/2020/12/Wholegrains-veg-and-fruit.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018c). *Continuous Update Project Expert Report 2018. Body fatness and weight gain and the risk of cancer*. https://www.wcrf.org/wp-content/uploads/2021/01/Body-fatness-and-weight-gain_0.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018d). *Continuous Update Project Expert Report 2018. Other dietary exposures and the risk of cancer*. https://www.wcrf.org/wp-content/uploads/2021/02/Other-dietary-exposures.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018e). *Continuous Update Project Expert Report 2018. Diet, nutrition, physical activity and prostate cancer*. https://www.wcrf.org/wp-content/uploads/2021/02/Other-dietary-exposures.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018f). *Continuous Update Project Expert Report 2018. Meat, fish and dairy products and the risk of cancer*. https://www.wcrf.org/wp-content/uploads/2021/02/Meat-fish-and-dairy-products.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2018g). *Continuous Update Project Expert Report 2018. Physical activity and the risk of cancer*. https://www.wcrf.org/wp-content/uploads/2021/02/Physical-activity.pdf

World Cancer Research Fund [WCRF], & American Institute for Cancer Research [AICR]. (2007). *Food, nutrition, physical activity, and the prevention of cancer: a global perspective.* AICR.

World Health Organization [WHO]. (2020). WHO guidelines on physical activity and sedentary behaviour. World Health Organization. file:///C:/Users/USER1/Downloads/9789240015128-eng.pdf

World Health Organization [WHO]. (2022, Feb 3). *Cancer. Fact Sheets*. https://www.who.int/news-room/fact-sheets/detail/cancer

Wu, A. H., Yu, M. C., Tseng, C. C., Stanczyk, F. Z., & Pike, M. C. (2009). Dietary patterns and breast cancer risk in Asian American women. *The American journal of clinical nutrition*, *89*(4), 1145–1154. https://doi.org/10.3945/ajcn.2008.26915

Wu, L., Wang, Z., Zhu, J., Murad, A. L., Prokop, L. J., & Murad, M. H. (2015). Nut consumption and risk of cancer and type 2 diabetes: a systematic review and meta-analysis. *Nutrition reviews*, *73*(7), 409–425. https://doi.org/10.1093/nutrit/nuv006

Xin, Y., Li, X. Y., Sun, S. R., Wang, L. X., & Huang, T. (2015). Vegetable oil intake and breast cancer risk: a meta-analysis. *Asian Pacific journal of cancer prevention : APJCP*, *16*(12), 5125–5135. https://doi.org/10.7314/apjcp.2015.16.12.5125

Xu, C., Zeng, X. T., Liu, T. Z., Zhang, C., Yang, Z. H., Li, S., & Chen, X. Y. (2015). Fruits and vegetables intake and risk of bladder cancer: a PRISMA-compliant systematic review and dose-response meta-analysis of prospective cohort studies. *Medicine*, *94*(17), e759. https://doi.org/10.1097/MD.0000000000000759

Xu, X., Cheng, Y., Li, S., Zhu, Y., Xu, X., Zheng, X., Mao, Q., & Xie, L. (2014). Dietary carrot consumption and the risk of prostate cancer. *European journal of nutrition*, *53*(8), 1615–1623. https://doi.org/10.1007/s00394-014-0667-2

Xu, X., Li, S., & Zhu, Y. (2021). Dietary intake of tomato and lycopene and risk of all-cause and cause-specific mortality: results from a prospective study. *Frontiers in nutrition*, *8*, 684859. https://doi.org/10.3389/fnut.2021.684859

Yan, L., & Spitznagel, E. L. (2009). Soy consumption and prostate cancer risk in men: a revisit of a meta-analysis. *The American journal of clinical nutrition*, *89*(4), 1155–1163. https://doi.org/10.3945/ajcn.2008.27029

Yan, X., Qi, M., Li, P., Zhan, Y., & Shao, H. (2017). Apigenin in cancer therapy: anti-cancer effects and mechanisms of action. *Cell & bioscience*, *7*, 50. https://doi.org/10.1186/s13578-017-0179-x

Yang, B., Wang, F. L., Ren, X. L., & Li, D. (2014). Biospecimen long-chain N-3 PUFA and risk of colorectal cancer: a meta-analysis of data from 60,627 individuals. *PloS one*, *9*(11), e110574. https://doi.org/10.1371/journal.pone.0110574

Yang, B., Ren, X. L., Wang, Z. Y., Wang, L., Zhao, F., Guo, X. J., & Li, D. (2019). Biomarker of long-chain n-3 fatty acid intake and breast cancer: accumulative evidence from an updated meta-analysis of epidemiological studies. *Critical reviews in food science and nutrition*, *59*(19), 3152–3164. https://doi.org/10.1080/10408398.2018.1485133

Yang, C. S., Ju, J., Lu, G., Xiao, H., Hao, X., Sang, S., & Lambert, J. D. (2008). Cancer prevention by tea and tea polyphenols. *Asia Pacific journal of clinical nutrition*, *17 Suppl 1*(Suppl 1), 245–248.

Yang, Y. J., Nam, S. J., Kong, G., & Kim, M. K. (2010). A case-control study on seaweed consumption and the risk of breast cancer. *The British journal of nutrition*, *103*(9), 1345–1353. https://doi.org/10.1017/S0007114509993242

Youn, M. J., Kim, J. K., Park, S. Y., Kim, Y., Park, C., Kim, E. S., Park, K. I., So, H. S., & Park, R. (2009). Potential anticancer properties of the water extract of Inonotus [corrected] obliquus by induction of apoptosis in melanoma B16-F10 cells. *Journal of ethnopharmacology*, *121*(2), 221–228. https://doi.org/10.1016/j.jep.2008.10.016

Young, L. M., Pipingas, A., White, D. J., Gauci, S., & Scholey, A. (2019). A systematic review and meta-analysis of B vitamin supplementation on depressive symptoms, anxiety, and stress: effects on healthy and 'at-risk' individuals. *Nutrients*, *11*(9), 2232. https://doi.org/10.3390/nu11092232

Yu, E. Y. W., Wesselius, A., Mehrkanoon, S., Brinkman, M., van den Brandt, P., White, E., Weiderpass, E., Le Calvez-Kelm, F., Gunter, M., Huybrechts, I., Liedberg, F., Skeie, G., Tjonneland, A., Riboli, E., Giles, G. G., Milne, R. L., & Zeegers, M. P. (2020). Grain and dietary fiber intake and bladder cancer risk: a pooled analysis of prospective cohort studies. *The American journal of clinical nutrition*, *112*(5), 1252–1266. https://doi.org/10.1093/ajcn/nqaa215

Yu, Y., Jing, X., Li, H., Zhao, X., & Wang, D. (2016). Soy isoflavone consumption and colorectal cancer risk: a systematic review and meta-analysis. *Scientific reports*, *6*, 25939. https://doi.org/10.1038/srep25939

Yuan, J. M., Stram, D. O., Arakawa, K., Lee, H. P., & Yu, M. C. (2003). Dietary cryptoxanthin and reduced risk of lung cancer: the Singapore Chinese Health Study. *Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology*, *12*(9), 890–898.

Zari, A. T., Zari, T. A., & Hakeem, K. R. (2021). Anticancer properties of eugenol: a review. *Molecules (Basel, Switzerland)*, *26*(23), 7407. https://doi.org/10.3390/molecules26237407

Zessner, H., Pan, L., Will, F., Klimo, K., Knauft, J., Niewöhner, R., Hümmer, W., Owen, R., Richling, E., Frank, N., Schreier, P., Becker, H., & Gerhauser, C. (2008). Fractionation of polyphenol-enriched apple juice extracts to identify constituents with cancer chemopreventive potential. *Molecular nutrition & food research*, *52 Suppl 1*, S28–S44. https://doi.org/10.1002/mnfr.200700317

Zhang, C. X., Ho, S. C., Chen, Y. M., Fu, J. H., Cheng, S. Z., & Lin, F. Y. (2009). Greater vegetable and fruit intake is associated with a lower risk of breast cancer among Chinese women. *International journal of cancer*, *125*(1), 181–188. https://doi.org/10.1002/ijc.24358

Zhang, F. F., Haslam, D. E., Terry, M. B., Knight, J. A., Andrulis, I. L., Daly, M. B., Buys, S. S., & John, E. M. (2017). Dietary isoflavone intake and all-cause mortality in breast cancer survivors: The Breast Cancer Family Registry. *Cancer*, *123*(11), 2070–2079. https://doi.org/10.1002/cncr.30615

Zhang, G. Q., Chen, J. L., Liu, Q., Zhang, Y., Zeng, H., & Zhao, Y. (2015). Soy intake is associated with lower endometrial cancer risk: a systematic review and meta-analysis of observational studies. *Medicine*, *94*(50), e2281. https://doi.org/10.1097/MD.0000000000002281

Zhang, J., & Yang, J. (2022). Allium vegetables intake and risk of breast cancer: a meta-analysis. *Iranian journal of public health*, *51*(4), 746–757. https://doi.org/10.18502/ijph.v51i4.9235

Zhang, M., Lee, A. H., Binns, C. W., & Xie, X. (2004). Green tea consumption enhances survival of epithelial ovarian cancer. *International journal of cancer*, *112*(3), 465–469. https://doi.org/10.1002/ijc.20456

Zhao, W., Liu, L., & Xu, S. (2018). Intakes of citrus fruit and risk of esophageal cancer: a meta-analysis. *Medicine*, *97*(13), e0018. https://doi.org/10.1097/MD.0000000000010018

Zheng, J., Zhou, Y., Li, Y., Xu, D. P., Li, S., & Li, H. B. (2016). Spices for Prevention and Treatment of Cancers. *Nutrients*, *8*(8), 495. https://doi.org/10.3390/nu8080495

Zheng, J., Zhu, T., Yang, G., Zhao, L., Li, F., Park, Y. M., Tabung, F. K., Steck, S. E., Li, X., & Wang, H. (2022). The isocaloric substitution of plant-based and animal-based protein in relation to aging-related health outcomes: a systematic review. *Nutrients*, *14*(2), 272. https://doi.org/10.3390/nu14020272

Zhou, X. F., Ding, Z. S., & Liu, N. B. (2013). Allium vegetables and risk of prostate cancer: evidence from 132,192 subjects. *Asian Pacific journal of cancer prevention : APJCP*, *14*(7), 4131–4134. https://doi.org/10.7314/apjcp.2013.14.7.4131

Zhu, B., Sun, Y., Qi, L., Zhong, R., & Miao, X. (2015). Dietary legume consumption reduces risk of colorectal cancer: evidence from a meta-analysis of cohort studies. *Scientific reports*, *5*, 8797. https://doi.org/10.1038/srep08797

Ziegler R. G. (1991). Vegetables, fruits, and carotenoids and the risk of cancer. *The American journal of clinical nutrition*, *53*(1 Suppl), 251S–259S. https://doi.org/10.1093/ajcn/53.1.251S

*A Community Guide to Cancer Nutrition* provides up to date, detailed and peer-reviewed research on the types of food to consume for the prevention or management of cancer.

Whether you have just been diagnosed with cancer, are in treatment or remission and aiming to prevent recurrence, or are looking to take preventative measures, this guide provides evidence-based and practical information on foods to consume, how to consume them, and why.

*Photo of Caramelized Onion, Pear and Arugula Focaccia from The Long Table Cookbook (©Darren Kemper)*

This guide has been produced through a Social Science and Humanities Research Council (SSHRC; Canada) funded project through the College and Community Social Innovation Fund (CCSIF) in partnership with Gilda's Toronto and George Brown College (GBC), Toronto, Canada.

ISBN 978-1-7388824-3-4

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