Nutrition Guidelines for Cancer Prevention: More Than Just Food for Thought

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Older adults represent the highest percentage of new cancer diagnoses each year. This, combined with the increasing age of the population, underscores the importance of identifying methods for risk reduction. The World Cancer Research Fund, together with the American Institute for Cancer Research, has published recommendations for cancer prevention through diet and physical activity. These guidelines should be considered when counselling patients in cancer prevention. In this article, colorectal, breast, and prostate cancers are highlighted, and nutritional recommendations for these cancers are presented.

Key words: *nutrition, prevention, colorectal cancer, breast cancer, prostate cancer*

Introduction

Cancer is often considered a disease of the aging, and it is a significant cause of mortality in older adults. In Canada, 60% of deaths resulting from cancer occur in adults 70 years of age and older,[1] while in the U.S., more than 70% of cancer deaths occur in adults at least 65 years old.[2] As the cohort of baby boomers enters this age group, there will be a corresponding rise in cancer rates. Consequently, cancer prevention has received significant attention in recent health care literature.

In 2007, the World Cancer Research Fund (WCRF), in collaboration with the American Institute for Cancer Research (AICR), published 10 general recommendations for cancer prevention.[3] The current article reviews some of these recommendations and provides additional recommendations for three areas of special interest: colorectal cancer, breast cancer, and prostate cancer.

WCRF/AICR Recommendations

The joint WCRF and AICR report, titled *Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective,*[3] contains recommendations for cancer prevention that are based on an extensive review of the literature. The report states that body fat is directly linked to six cancers including colorectal and postmenopausal breast cancer.[4] As a result, many of the recommendations involve weight control, with an emphasis on maintaining a weight in the healthy range throughout adult life. Research has demonstrated that even small amounts of excess body fat, especially if carried around the waist, increase the cancer risk.[5] Weight control is particularly relevant for an aging population as weight gain often accompanies the aging process. Table 1 describes eight of the WCRF/AICR recommendations for cancer risk reduction. Following these guidelines will not only protect against cancer but will also help to lower the risk for many other chronic diseases.

Areas of Special Interest

Colorectal, breast, and prostate cancers represent 41% of new cancer cases in Canada each year.[1] The risks for developing colorectal, breast, and prostate cancers have been associated with increased age and poor dietary habits.[6] The responsiveness of these cancers to nutritional interventions makes them attractive targets for prevention strategies (Figure 1). The nutritional recommendations for each cancer group are summarized below.

Colorectal Cancer

Colorectal cancer is one of the most common cancers in Western industrialized countries.[7,8] According to the WCRF/AICR report, when compared with the 17 cancers studied in the 2007 report, colorectal cancer demonstrated the greatest association between dietary and behavioural risk factors.[9] As a result, it is most preventable by appropriate dietary habits.[3]

According to the WCRF/AICR report, there is convincing evidence that red meat and processed meat increase the risk of colorectal cancer. This relationship is attributed to heterocyclic amines and polycyclic aromatic hydrocarbons that are produced when red meat is cooked at high temperatures. The products have been shown to have carcinogenic properties.[10]

Red meat is also a rich source of heme iron, a form of iron that is only

found in animal sources and that is easily absorbed. Free iron can lead to the production of free radicals. Nitrites found in most processed meats, together with protein and heme, can contribute to the production of *N*-nitroso-compounds, some of which are known carcinogens.[3] It is therefore prudent to limit its intake to within or below the guidelines proposed in the WCRF / AICR report (see Table 1). Substituting fish for red meat on a regular basis may also have positive health benefits.[11]

The same report also offers convincing evidence in men and probable evi-

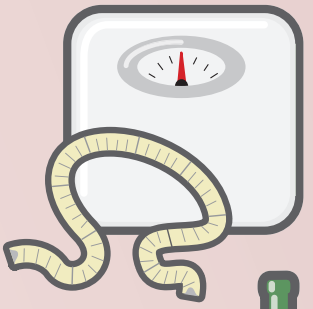
Table 1: WCRF/AICR Recommendations

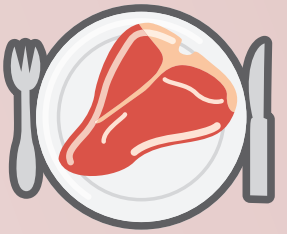
Recommendation	Specific Recommendations
Body fatness: be as lean as possible within the normal range of body weight	Ensure that body weight through childhood and adolescent growth projects toward the lower end of normal BMI range at age 21 Avoid weight gain and increases in waist circumference throughout adulthood
Physical activity: be physically active as part of everyday life	Be moderately physically active, equivalent to brisk walking, for at least 30 minutes every day As fitness improves, aim for 60 minutes or more of moderate, or for 30 minutes or more of vigorous, physical activity every day Limit sedentary habits such as watching television
Foods and drinks that promote weight gain: limit consumption of energy-dense foods; avoid sugary drinks	Consume energy-dense foods sparingly Avoid sugary drinks Consume "fast foods" sparingly, if at all
Plant foods: eat mostly foods of plant origin	Eat at least five portions/servings (at least 400 g) of a variety of nonstarchy vegetables and fruits every day Eat relatively unprocessed cereals (grains) and/or pulses (legumes) with every meal Limit refined starchy foods People who consume starchy roots or tubers as staples should ensure intake of sufficient nonstarchy vegetables, fruits, and pulses (legumes)
Animal foods: limit intake of red meat and avoid processed meat	People who eat red meat should consume less than 500 g a week,* very little if any to be processed
Alcoholic drinks: limit alcoholic drinks	If alcoholic drinks are consumed, limit consumption to no more than two drinks a day for men and one drink a day for women
Preservation, processing, preparation: limit consumption of salt	Avoid salt-preserved, salted, or salty foods; preserve foods without using salt Limit consumption of processed foods with added salt to ensure an intake of <6 g (2.4 g sodium) a day
Dietary supplements: aim to meet nutritional needs through diet alone	Dietary supplements are not recommended for cancer prevention

AICR = American Institute for Cancer Research; BMI = body mass index; WCRF = World Cancer Research Fund.
*Beyond this amount, every 48 g of red meat consumed per day increases cancer risk by 15%.[5]
Source: Adapted from World Cancer Research Fund and American Institute for Cancer Research, 2007.[3]

Figure 1:
Nutrition For Cancer Prevention

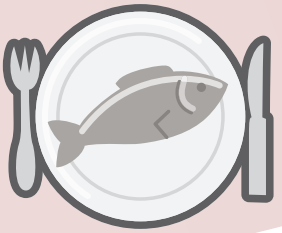
COLORECTAL CANCER PREVENTION

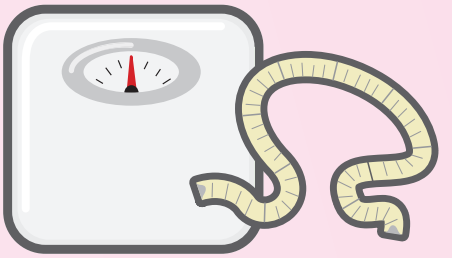




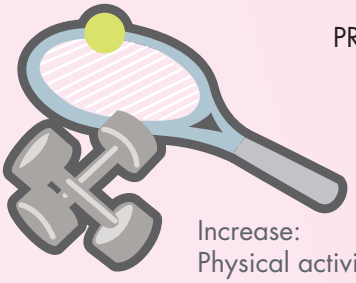
Decrease:
- Red meat / processed meats
- Alcohol intake
- Weight
- Abdomen fat

Increase:
- Dietary fibre
- Milk / dairy and calcium
- Fish



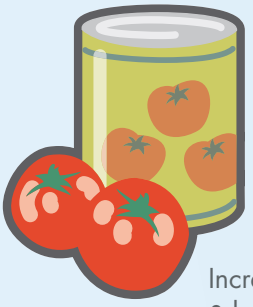


BREAST CANCER PREVENTION



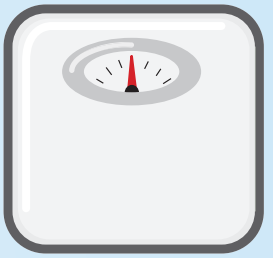
Increase:
Physical activity

Decrease:
- Alcohol intake
- Weight
- Abdomen fat



PROSTATE CANCER PREVENTION

Increase:
- Lycopene-rich food consumption



Decrease:
- Dairy products and calcium supplements
- Weight
- Use of vitamins

Figure 2: Prostate Cancer—Update from the Selenium and Vitamin E Cancer Prevention Trial

The WCRF/AICR review of selenium and vitamin E reported a probable role of selenium and a suggestive role of vitamin E in prostate cancer prevention.[3] Recently, the results from SELECT,[34] the largest chemoprevention trial conducted to address the issue of prostate cancer prevention, were reported. This randomized, placebo-controlled trial monitored 35,533 men for approximately 5.5 years and demonstrated that vitamin E (400 IU/d of all-rac-α-tocopheryl acetate) and selenium (200 µg/d of l-selenomethionine) do not influence the risk of prostate cancer. These results, combined with other studies showing a lack of efficacy of vitamin E in preventing prostate cancer,[37–39] provide evidence that the supplements do not play a role in prostate cancer prevention. In light of the recent SELECT results, the authors do not recommend selenium or vitamin E for prostate cancer prevention.

AICR = American Institute for Cancer Research; SELECT = Selenium and Vitamin E Cancer Prevention Trial; WCRF = World Cancer Research Fund.

dence in women that alcoholic drinks increase the risk of colorectal cancer. The stronger associations in men than women are possibly due to men's higher alcohol intake.[12] In a recent large European study (European Prospective Investigation into Cancer and Nutrition), both lifetime and baseline alcohol consumption were observed to increase colon and rectum cancer risks. The risk increase was greatest for alcohol intake over 30 g/d,[13] which is equivalent to approximately two standard drinks.

Convincing evidence that body fatness and abdominal fatness increase the risk of colorectal cancer is also offered by the WCRF/AICR report. According to the literature, individuals with a higher body mass index (BMI) are often less physically active and consume diets that are high in calories, dietary heme iron, and saturated fat, and low in calcium.[7,14] In many studies, an elevated colorectal cancer risk has been observed in both men and women with higher BMIs. The majority of adults in North America between the ages of 50–70 have excess body fat and are therefore at a greater risk of developing colorectal cancer.[15]

The WCRF/AICR report provided probable evidence that foods containing dietary fibre decrease the risk of colorectal cancer. Insoluble fibre in grains increases the bulk and weight of stool, thereby diluting fecal contents and decreasing transit time. This consequently reduces the exposure of the colon to potentially harmful compounds.[3,16] The precise mechanism for fibre's probable protective role is not yet clearly understood[3,11]; however, whole grains have been shown to reduce the risk of other chronic diseases, including coronary heart disease and diabetes. Resultantly, Health Canada recommends that adults eat 21–38 g/d of fibre.[17]

The report also finds probable evidence that milk and calcium reduce the risk of colorectal cancer. Calcium reduces proliferation, stimulates differentiation, and induces apoptosis in cells in the gastrointestinal tract.[18] Both the WCRF/AICR report and the National Institutes of Health/American Association of Retired Persons Diet and Health Study published in 2009 suggest that calcium intake is associated with a lower risk of colorectal cancer.[3,18] Accordingly, dietary guidelines emphasize the importance of calcium intake, particularly through dairy foods, with a target intake of 1,200 mg/d for adults over the age of 50.[18,19]

In sum, the literature demonstrates that colorectal cancer risk may be reduced by following many of the WCRF/AICR recommendations presented in Table 1.

Breast Cancer

Breast cancer is the most common malignancy in women in Canada and the U.S., and it is the second leading cause of cancer death in women in both countries, after lung cancer. Breast cancer risk increases with age. Approximately 95% of new cases are in women over 40 years, with 80% occurring in women over 50.[1,20] Although incidence is highest in developed countries, rates are increasing rapidly in developing countries.[3] A significant number of these cases could be prevented through lifestyle changes.[21]

The WCRF/AICR judgments for breast cancer find that there is convincing evidence that alcoholic beverages increase the risk of breast cancer in both pre- and postmenopausal women. The

Key Points

- Goals for breast cancer prevention include achieving both a healthy weight and a waist circumference <88 cm for women.
- Even in the absence of weight loss, following the recommendations may help reduce breast cancer risk by improving the ratio of fat to lean muscle mass.
- To reduce the risk of developing colorectal cancer, patients should aim for a body mass index and waist circumference within the healthy range for their age and gender.
- Limiting consumption of red meat to approximately 70 g/d or less and choosing poultry or fish more often will also reduce colorectal cancer risk.
- To prevent increased prostate cancer risk, men over 50 years of age should consume up to 1,200 mg of calcium each day, with an emphasis placed on obtaining calcium through food sources. Multivitamins should not be taken for prostate cancer prevention.

Clinical Pearl

Cancer prevention is best tackled with a coordinated counselling approach that incorporates healthy eating of low-calorie, nutrient-rich foods, physical activity, and alcohol reduction.

effect of alcohol is dose dependent; that is, the risk increases with the amount of alcohol consumed.[3] Since the WCRF/AICR report, a review by Lof and Weiderpass of recent studies found continued evidence of a positive association.[22] Therefore, regular daily drinking should be avoided to reduce risk.

There is also convincing evidence that body fatness increases the risk of breast cancer in postmenopausal women. Circulating estrogens, insulin, and insulin-like growth factors are elevated in those with a high percentage of body fat, and these can have a stimulatory effect on initiated breast cancer. The change in the hormonal environment also promotes chronic inflammation, which can increase breast cancer risk.[3] Recent studies have further strengthened this evidence.[23–26]

The WCRF/AICR report provides probable evidence that abdominal fatness and adult weight gain increase the risk of breast cancer in postmenopausal women.[3] Both type 2 diabetes and aspects of metabolic syndrome, including waist circumference > 88 cm (for women) and insulin resistance, have been associated with an increased risk of breast cancer.[27]

Furthermore, probable evidence exists that physical activity decreases the risk of postmenopausal breast cancer. As well as its role in maintaining a healthy weight, physical activity has been shown to reduce insulin resistance.[3,28,29]

The report found limited evidence on the effect of vitamin D on breast cancer risk and did not draw any conclusions. Since the WCRF/AICR publication, there have been reviews supporting vitamin D supplementation.[30,31] Measuring baseline vitamin D and correcting any deficiency in middle-aged and older adults seems prudent with regard to reducing the risks for various common cancers, as well as the established benefit for bone health.

Prostate Cancer

Prostate cancer is a disease that affects approximately 14–17% of men in Canada and the U.S., making it the most commonly diagnosed malignancy in men in North America.[1,6] The risk of developing prostate cancer increases with age and is a particularly important health concern for men over 65 years.[6,32] Preventive nutritional strategies have been reviewed by WCRF/AICR, and the conclusions drawn include probable evidence that foods containing lycopene decrease the risk of developing prostate cancer. Since the WCRF/AICR report, a review of the literature by Ma and Chapman has supported this conclusion, suggesting that lycopene may act as an antioxidant as well as influence insulin-like growth factor 1 signalling, which has been associated with prostate cancer risk.[33] Lycopene-rich foods (such as tomato sauce, tomato juice, and cooked tomatoes) can be easily incorporated into the daily diet and may reduce prostate cancer risk.

There has been probable evidence that selenium or selenium supplements of 200 μg/d decrease the risk of prostate cancer. However, since the time of the WCRF/AICR report, results from the Selenium and Vitamin E Cancer Prevention Trial, highlighted in Figure 2, have discounted this relationship.[34]

There is also probable evidence that diets high in calcium increase the risk of prostate cancer. According to the WCRF/AICR report, an elevated risk of prostate cancer occurs with increased intake of dairy products and calcium supplements. Dietary intake of milk and dairy products does not appear to influence the risk if calcium intake is below 1,500 mg/d[3]; however, research has shown that the risk may be increased if calcium supplements are taken in excess of 1,000 mg/d.[33] Health Canada's recommended target calcium intake (1,200 mg/d from dietary and supplement sources)[19] does not appear to be linked with an increased risk of prostate cancer.

In accordance with the WCRF/AICR report, recommendations for prostate cancer prevention include maintaining a normal BMI and meeting nutritional needs through the diet rather than supplement use (see Table 1). Although the relationship between BMI and the risk of localized prostate cancer is unclear, obesity has been linked with an increased risk of developing aggressive prostate cancer. As well, obese men diagnosed with prostate cancer have a higher rate of mortality than do prostate cancer patients with normal BMIs.[35] Therefore, weight control should be emphasized as a means of reducing prostate cancer risk.

Finally, dietary supplements should not be recommended for prostate cancer prevention. The risk of advanced and fatal prostate cancer is higher in men using multivitamins more than seven times per week compared with men who do not use multivitamins. This relationship is greater for men with a family history of prostate cancer and for men combining micronutrient supplements with multivitamins.[36] As a result, individuals should be encouraged to meet nutritional requirements through the diet whenever possible.

Conclusion

Each year, a large proportion of new cancer diagnoses affect older adults. Appropriate dietary habits may ameliorate the risk of developing a number of malignancies, including colorectal, breast, and prostate cancers. Health care practitioners should review the WCRF/AICR report when counselling patients on cancer prevention, and they should place an emphasis on maintaining appropriate BMIs and avoiding excess central adiposity.

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