



# American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Prevention

*This document is a condensed version of the article describing the American Cancer Society (ACS) Nutrition and Physical Activity Guidelines, which are updated every 5 years. The guidelines were developed by the American Cancer Society 2006 Nutrition and Physical Activity Guidelines Advisory Committee and approved by the American Cancer Society National Board of Directors on May 19, 2006. The full article, written for health care professionals, is published in the September/October 2006 issue of CA: A Cancer Journal for Clinicians, and is available for free online at: <http://caonline.amcancersoc.org/content/vol56/issue5/>.*

## Nutrition and physical activity guidelines for cancer prevention: summary

### ACS recommendations for individual choices

#### **Maintain a healthy weight throughout life.**

- Balance calorie intake with physical activity.
- Avoid excessive weight gain throughout life.
- Achieve and maintain a healthy weight if currently overweight or obese.

#### **Adopt a physically active lifestyle.**

- **Adults:** Engage in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity are preferable.

- **Children and adolescents:** Engage in at least 60 minutes per day of moderate to vigorous physical activity at least 5 days per week.

### **Eat a healthy diet, with an emphasis on plant sources.**

- Choose foods and drinks in amounts that help achieve and maintain a healthy weight.
- Eat 5 or more servings of a variety of vegetables and fruits each day.
- Choose whole grains over processed (refined) grains.
- Limit intake of processed and red meats.

### **If you drink alcoholic beverages, limit your intake.**

- Drink no more than 1 drink per day for women or 2 per day for men.

### **ACS recommendation for community action**

Public, private, and community organizations should work to create social and physical environments that help people adopt and maintain healthful nutrition and physical activity:

- Increase access to healthful foods in schools, worksites, and communities.
- Provide safe, enjoyable spaces for physical activity in schools.
- Provide for safe, physically active transportation (such as biking and walking) and recreation in communities.

## **ACS nutrition and physical activity guidelines for cancer prevention**

The following recommendations for individual choices help a person focus on the importance of maintaining a healthy body weight, adopting a physically active lifestyle, and eating a healthy diet.

### **Maintain a healthy weight throughout life.**

- Balance calorie intake with physical activity.
- Avoid excessive weight gain throughout life.
- Achieve and maintain a healthy weight if currently overweight or obese.

Being overweight or obese is clearly linked with an increased risk of developing several types of cancer:

- Breast (among women who have gone through menopause)
- Colon
- Endometrium (uterus)
- Esophagus
- Kidney

Obesity also likely raises the risk of other cancers:

- Cervix
- Gallbladder
- Hodgkin lymphoma
- Multiple myeloma
- Ovary
- Pancreas
- Thyroid
- Aggressive forms of prostate cancer

Some studies have shown a link between losing weight and lowering the risk of getting certain cancers such as breast cancer. While research in this area is still going on, people who are overweight or obese are encouraged to lose weight.

A healthy weight depends on a person's height, so recommendations for a healthy weight are often expressed in terms of body mass index (BMI). BMI is a number that is calculated using your weight and height. In general, the higher the number, the more body fat a person has.

BMI is often used as a screening tool to help decide if your weight might be putting you at risk for health problems, such as heart disease, diabetes, and cancer. Individuals should strive to maintain a healthy weight, as illustrated in the table below.

## Adult BMI chart

| BMI    | 19               | 20  | 21  | 22  | 23  | 24  | 25         | 26  | 27  | 28  | 29  | 30    | 31  | 32  | 33  | 34  | 35  |
|--------|------------------|-----|-----|-----|-----|-----|------------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-----|
| Height | Weight in Pounds |     |     |     |     |     |            |     |     |     |     |       |     |     |     |     |     |
| 4'10"  | 91               | 96  | 100 | 105 | 110 | 115 | 119        | 124 | 129 | 134 | 138 | 143   | 148 | 153 | 158 | 162 | 167 |
| 4'11"  | 94               | 99  | 104 | 109 | 114 | 119 | 124        | 128 | 133 | 138 | 143 | 148   | 153 | 158 | 163 | 168 | 173 |
| 5'     | 97               | 102 | 107 | 112 | 118 | 123 | 128        | 133 | 138 | 143 | 148 | 153   | 158 | 163 | 168 | 174 | 179 |
| 5'1"   | 100              | 106 | 111 | 116 | 122 | 127 | 132        | 137 | 143 | 148 | 153 | 158   | 164 | 169 | 174 | 180 | 185 |
| 5'2"   | 104              | 109 | 115 | 120 | 126 | 131 | 136        | 142 | 147 | 153 | 158 | 164   | 169 | 175 | 180 | 186 | 191 |
| 5'3"   | 107              | 113 | 118 | 124 | 130 | 135 | 141        | 146 | 152 | 158 | 163 | 169   | 175 | 180 | 186 | 191 | 197 |
| 5'4"   | 110              | 116 | 122 | 128 | 134 | 140 | 145        | 151 | 157 | 163 | 169 | 174   | 180 | 186 | 192 | 197 | 204 |
| 5'5"   | 114              | 120 | 126 | 132 | 138 | 144 | 150        | 156 | 162 | 168 | 174 | 180   | 186 | 192 | 198 | 204 | 210 |
| 5'6"   | 118              | 124 | 130 | 136 | 142 | 148 | 155        | 161 | 167 | 173 | 179 | 186   | 192 | 198 | 204 | 210 | 216 |
| 5'7"   | 121              | 127 | 134 | 140 | 146 | 153 | 159        | 166 | 172 | 178 | 185 | 191   | 198 | 204 | 211 | 217 | 223 |
| 5'8"   | 125              | 131 | 138 | 144 | 151 | 158 | 164        | 171 | 177 | 184 | 190 | 197   | 203 | 210 | 216 | 223 | 230 |
| 5'9"   | 128              | 135 | 142 | 149 | 155 | 162 | 169        | 176 | 182 | 189 | 196 | 203   | 209 | 216 | 223 | 230 | 236 |
| 5'10"  | 132              | 139 | 146 | 153 | 160 | 167 | 174        | 181 | 188 | 195 | 202 | 209   | 216 | 222 | 229 | 236 | 243 |
| 5'11"  | 136              | 143 | 150 | 157 | 165 | 172 | 179        | 186 | 193 | 200 | 208 | 215   | 222 | 229 | 236 | 243 | 250 |
| 6'     | 140              | 147 | 154 | 162 | 169 | 177 | 184        | 191 | 199 | 206 | 213 | 221   | 228 | 235 | 242 | 250 | 258 |
| 6'1"   | 144              | 151 | 159 | 166 | 174 | 182 | 189        | 197 | 204 | 212 | 219 | 227   | 235 | 242 | 250 | 257 | 265 |
| 6'2"   | 148              | 155 | 163 | 171 | 179 | 186 | 194        | 202 | 210 | 218 | 225 | 233   | 241 | 249 | 256 | 264 | 272 |
| 6'3"   | 152              | 160 | 168 | 176 | 184 | 192 | 200        | 208 | 216 | 224 | 232 | 240   | 248 | 256 | 264 | 272 | 279 |
|        | Healthy Weight   |     |     |     |     |     | Overweight |     |     |     |     | Obese |     |     |     |     |     |

Source: US Department of Health and Human Services, National Institutes of Health, National Health, Lung, and Blood Institute. The Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults: Evidence Report. September 1998 [NIH pub. No. 98-4083].

The way to achieve a healthy body weight is to balance energy intake (food and drink) with energy used (physical activity).

The healthiest way to reduce calories is to reduce intake of added sugars, saturated and trans fats, and alcohol, which provide a lot of calories but few or no essential nutrients. Calorie intake can also be reduced by decreasing the size of food portions (see table below) and limiting the intake of foods and drinks that are high in calories, fat, and/or refined sugars, and which provide few nutrients. Examples include fried food, cookies, cakes, candy, ice cream, and sweetened soft drinks.

## What counts as a serving?

|                      |  |
|----------------------|--|
| Fruits               | <ul style="list-style-type: none"> <li>• 1 medium apple, banana, orange</li> <li>• 1/2 cup of chopped, cooked, or canned fruit</li> <li>• 1/2 cup of 100% fruit juice</li> </ul>           |
| Vegetables           | <ul style="list-style-type: none"> <li>• 1 cup of raw leafy vegetables</li> <li>• 1/2 cup of other cooked or raw vegetables, chopped</li> <li>• 1/2 cup of 100% vegetable juice</li> </ul> |
| Grains               | <ul style="list-style-type: none"> <li>• 1 slice bread</li> <li>• 1 ounce ready-to-eat cereal</li> <li>• 1/2 cup of cooked cereal, rice, pasta</li> </ul>                                  |
| Beans and nuts       | <ul style="list-style-type: none"> <li>• 1/2 cup cooked dry beans</li> <li>• 2 tablespoons peanut butter</li> <li>• 1/3 cup nuts</li> </ul>  |
| Dairy foods and eggs | <ul style="list-style-type: none"> <li>• 1 cup milk or yogurt</li> <li>• 1 1/2 ounces of natural cheese</li> <li>• 2 ounces processed cheese</li> <li>• 1 egg</li> </ul>                   |
| Meats                | 2–3 ounces of cooked lean meat, poultry, fish  |

*Note that foods listed as "cooked" should be measured after cooking.*

## Adopt a physically active lifestyle.

- Adults: Engage in at least 30 minutes of moderate to vigorous physical activity, above usual activities, on 5 or more days of the week; 45 to 60 minutes of intentional physical activity are preferable.
- Children and adolescents: Engage in at least 60 minutes per day of moderate to vigorous physical activity at least 5 days per week.

Usual activities are those that are done on a regular basis as part of one's daily routine. These activities include those done at work (such as walking from the parking garage to the office), at home (such as climbing a flight of stairs), as well as those that are part of daily living (such as dressing and bathing). Usual activities are typically brief and of low intensity. Intentional activities are those that are done in addition to these usual activities. Moderate activities are those that require effort equal to a brisk walk. Vigorous activities generally use large muscle groups and cause faster heart rate, deeper and faster breathing, and sweating.

## Examples of moderate and vigorous intensity physical activities

|  | Moderate Activities | Vigorous Activities |
|--|---------------------|---------------------|
|  |                     |                     |

|                              |  |  |
|------------------------------|--|--|
| <b>Exercise and Leisure</b>  | Walking, dancing, leisurely bicycling, ice-skating or roller-skating, horseback riding, canoeing, yoga | Jogging or running, fast bicycling, circuit weight training, aerobic dance, martial arts, jumping rope, swimming |
| <b>Sports</b>                | Volleyball, golfing, softball, baseball, badminton, doubles tennis, downhill skiing                    | Soccer, field hockey or ice hockey, lacrosse, singles tennis, racquetball, basketball, cross-country skiing      |
| <b>Home Activities</b>       | Mowing the lawn, general lawn and garden maintenance   | Digging, carrying and hauling, masonry, carpentry  |
| <b>Occupational Activity</b> | Walking and lifting as part of the job (custodial work, farming, auto or machine repair)               | Heavy manual labor (forestry, construction, fire fighting)   |

Physical activity may reduce the risk of several types of cancer:

- Breast
- Colon
- Endometrium (uterus)
- Prostate

The benefits of a physically active lifestyle go far beyond lowering cancer risk. They include lower risk of heart disease, high blood pressure, diabetes, and osteoporosis (bone thinning).

### **Tips on how to be more active**

- Use stairs rather than an elevator.
- If you can, walk or bike to your destination.
- Exercise at lunch with your co-workers, family, or friends.
- Take an exercise break at work to stretch or take a quick walk.
- Walk to visit co-workers instead of phoning or sending an e-mail.
- Go dancing with your spouse or friends.
- Plan active vacations rather than sit-down trips.
- Wear a pedometer (a device that counts each step taken) every day and increase your daily steps.
- Join a sports team.

- Use a stationary bicycle or treadmill while watching TV.
- Plan your exercise routine to gradually increase the days per week and minutes per session.

Spend time playing with your kids.

**Eat a healthy diet, with an emphasis on plant sources.**

**Choose foods and beverages in amounts that help achieve and maintain a healthy weight.**

- Pay attention to standard serving sizes (see “What counts as a serving?” table under the section, “Maintain a healthy weight throughout life”), and read food labels to become more aware of the number of actual servings you eat.
- Eat smaller portions of high-calorie foods. Be aware that "low-fat" or "nonfat" does not mean "low-calorie" and that low-fat cakes, low-fat cookies, and other low-fat foods are often high in calories.
- Switch to vegetables, fruits, and other low-calorie foods and beverages to replace calorie-dense foods and beverages such as French fries, cheeseburgers, pizza, ice cream, doughnuts and other sweets, and regular sodas.
- When you eat away from home, choose food low in calories, fat, and sugar, and avoid large portion sizes.

**Eat 5 or more servings of vegetables and fruits each day.**

- Include vegetables and fruits at every meal and for snacks.
- Eat a variety of vegetables and fruits each day.
- Limit French fries, snack chips, and other fried vegetable products.
- Choose 100% juice if you drink vegetable or fruit juices.

**Choose whole grains over processed (refined) grains and sugars.**

- Choose whole grain rice, bread, pasta, and cereals.
- Limit intake of refined carbohydrates (starches), such as pastries, sweetened cereals, and other high-sugar foods.

**Limit intake of processed meats and red meats.**

- Choose fish, poultry, or beans instead of beef, pork, and lamb.

- When you eat meat, choose lean cuts and eat smaller portions.
- Prepare meat by baking, broiling, or poaching, rather than by frying or charbroiling.

## **If you drink alcoholic beverages, limit your intake.**

People who drink alcohol should limit their intake to no more than 2 drinks per day for men and 1 drink a day for women. The recommended limit is lower for women because of their smaller body size and slower breakdown of alcohol. A drink is defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of 80-proof distilled spirits.

Alcohol is a known cause of cancers of the:

- Mouth
- Pharynx (throat)
- Larynx (voice box)
- Esophagus
- Liver
- Breast

Alcohol may also increase the risk of colon and rectum cancer.

## **Diet and physical activity factors that affect risks for select cancers**

### **Bladder cancer**

The major risk factors for bladder cancer are tobacco smoking and being exposed to certain industrial chemicals. Some research suggests that drinking more fluids and eating more vegetables may lower the risk of bladder cancer.

### **Brain tumors**

There are no known nutritional risk factors for brain tumors.

### **Breast cancer**

The risk of breast cancer is increased by several factors that cannot be easily changed:

- Having your first period before age 12
- Not having children or having your first birth after age 30
- Late age at menopause
- Family history of breast cancer

But other factors may raise breast cancer risk as well. Both increased body weight and weight gain during adulthood are linked with a higher risk of breast cancer after menopause. Alcohol also increases risk to some extent, especially in women whose intake of folate is low.

Moderate to vigorous physical activity may lower breast cancer risk. Greatly lowering fat intake may also lower breast cancer risk, although a recent major study found that this effect may be very small.

The best advice to reduce the risk of breast cancer is to:

- Engage in moderate to vigorous physical activity 45 to 60 minutes on 5 or more days a week.
- Reduce lifetime weight gain by limiting your calories and getting regular physical activity.
- Avoid or limit your intake of alcoholic beverages.

## Colorectal cancer

The risk of colorectal cancer is higher for those with relatives who have had colorectal cancer. Risk is also increased by long-term tobacco use and possibly excessive alcohol use.

Risk may be decreased by use of aspirin or other non-steroidal anti-inflammatory drugs (NSAIDs, such as aspirin, ibuprofen, naproxen, and drugs like them) and hormone replacement therapy after menopause (postmenopausal.) But neither aspirin-like drugs nor hormones after menopause are currently recommended to prevent colorectal cancer because of their potential side effects.

Some studies show a lower risk of colon cancer among those who are moderately active on a regular basis, and more vigorous activity may even further reduce the risk of colon cancer. Obesity raises the risk of colon cancer in both men and women, but the link seems to be stronger in men. Diets high in vegetables and fruits have been linked with lower risk, and diets high in processed meats and/or red meats have been linked with a higher risk of colon cancer.

Several studies have found that calcium, vitamin D, or a combination of the two may help protect against colorectal cancer. But because of the possible increased risk of prostate cancer with high calcium intake, it may be wise for men to limit their daily calcium intake to less than 1,500 mg per day until further studies are done.

The best advice to reduce the risk of colon cancer is to:

- Increase the intensity and duration of physical activity.
- Limit intake of processed and red meats.
- Get the recommended levels of calcium.

- Eat more vegetables and fruits.
- Avoid obesity.
- Avoid excess alcohol.

In addition, it is very important to follow the American Cancer Society guidelines for regular colorectal screening because finding and removing polyps in the colon can prevent colorectal cancer.

## Endometrial cancer

The major risk factors for the most common type of endometrial cancer (cancer of the lining of the uterus) involve excess exposure of the endometrium to estrogen, for instance:

- Estrogen therapy after menopause
- Certain types of birth control pills
- Polycystic ovarian syndrome
- Obesity

There is strong evidence of a link between obesity and endometrial cancer. Studies have also suggested lower endometrial cancer risk with high physical activity levels. Vegetable and fiber intake may lower risk, whereas red meat, saturated fat, and animal fat may increase risk. The link to weight is thought to result from the increase in estrogen levels that happens when women are overweight after menopause.

At this time, the best advice to reduce the risk of endometrial cancer is to maintain a healthy weight through diet and regular physical activity, and to eat a plant-based diet rich in vegetables, whole grains, and beans.

## Kidney cancer

The causes of kidney cancer are not clear, but the best-known risk factors that can be changed are obesity and tobacco smoking. Studies looking for links between specific parts of the diet and kidney cancer have not shown clear results.

The best advice to lower risk for kidney cancer is to maintain a healthy weight and avoid tobacco use.

## Leukemias and lymphomas

There are no known nutritional risk factors for leukemias or lymphomas.

## Lung cancer

More than 85% of lung cancers result from tobacco smoking, and another 10% to 14% may be linked to radon exposure. Many studies have shown that the risk of lung cancer is lower among both smokers and non-smokers who eat at least 5 servings of vegetables and fruits a day. Although healthful eating may reduce the risk of lung cancer, the risks from tobacco remain high. Using high-dose beta-carotene and/or vitamin A supplements has increased (not decreased) lung cancer risk among smokers (see "Beta-carotene" under the section, "Common questions about diet and cancer").

The best advice to reduce the risk of lung cancer is to avoid tobacco use and secondhand smoke. Avoid radon exposure. Eat at least 5 servings of vegetables and fruits every day.

## Mouth, throat, and esophagus cancers

Tobacco (including cigarettes, chewing tobacco, and snuff) and alcohol, and especially the combination of the two, increase the risk for cancers of the mouth, larynx (voice box), pharynx (throat), and esophagus. Obesity raises the risk for cancer in the lower esophagus and at the junction of the esophagus and stomach (likely due to increased acid reflux). There is some evidence that very hot beverages and foods may increase the risk of oral and esophageal cancers, likely as a result of the damage heat can cause. Eating the recommended amounts of vegetables and fruits probably reduces the risk of oral and esophageal cancers.

The best advice to reduce the risk of these cancers is to:

- Avoid all forms of tobacco.
- Restrict alcohol intake.
- Avoid obesity.
- Eat at least 5 servings of vegetables and fruits each day.

## Ovarian cancer

The causes of ovarian cancer are not well understood. Family history is a risk factor, but fewer than 10% of ovarian cancers are inherited. There are no clearly proven nutritional risk factors for ovarian cancer -- studies of vegetables, fruits, and dairy products have not found clear links. Moderate alcohol intake may lower risk. The roles of obesity and physical activity in ovarian cancer risk are unclear.

## Pancreatic cancer

Tobacco smoking, adult-onset diabetes, and impaired glucose tolerance (sometimes called "pre-diabetes," or "borderline diabetes") all increase the risk for pancreatic cancer. Some studies have linked obesity, physical inactivity (both factors strongly linked to diabetes and pre-diabetes), and diets high in processed and red meats with increased

pancreatic cancer risk. Some studies have also found high fruit and vegetable intake to be linked with a reduced risk. But none of these links has been clearly proven.

The best advice to reduce the risk of pancreatic cancer is to:

- Avoid tobacco use.
- Maintain a healthful weight.
- Remain physically active.
- Eat 5 or more servings of vegetables and fruits each day.

## Prostate cancer

Prostate cancer is related to male sex hormones, but just how nutritional factors might increase risk remains unclear. Several studies suggest that diets high in certain vegetables (including tomatoes, cruciferous vegetables, soy, beans, and other legumes) or fish may be linked with decreased risk. There is some evidence that foods or supplements containing antioxidant nutrients, such as vitamin E, selenium, beta-carotene, and lycopene, may lower prostate cancer risk. However, a recent large study found no benefit from vitamin E or selenium supplements.

Several studies have found that eating large amounts of red meats or dairy products may be linked with increased risk of prostate cancer. A high calcium intake, mainly from supplements, has also been linked to an increased risk for more aggressive types of prostate cancer.

Although the link between obesity and prostate cancer risk is not clear, recent studies suggest that being overweight is linked to a worse outcome in men already diagnosed with prostate cancer. Exercise, especially vigorous exercise, may offer some benefit for prostate cancer.

For now, the best advice to reduce the risk of prostate cancer is to:

- Eat 5 or more servings of a wide variety of vegetables and fruits each day.
- Limit intake of red meats and dairy products.
- Maintain an active lifestyle and healthy weight.

## Stomach cancer

Many studies have found that a high intake of fresh fruits and vegetables is linked with a lower risk of stomach cancer, while a high intake of salt-preserved foods is linked with a higher risk. There is also convincing evidence that chronic stomach infection by the bacterium *Helicobacter pylori* raises the risk of stomach cancer. Rates of stomach cancer have also likely been reduced by refrigeration and better food preservation, which allow fresh foods to be eaten all year long.

The number of stomach cancer cases in most parts of the world is falling. While stomach cancer is fairly rare in the United States, the incidence of cancers in the first part of the stomach (the top, or the cardia) has risen in recent years. This may be due at least in part to increases in gastric reflux, which has been linked to obesity.

At this time, the best advice to reduce the risk of stomach cancer is to:

- Eat at least 5 servings of vegetables and fruits daily.
- Reduce intake of foods that are preserved with salt.
- Maintain a healthy weight.

## **Common questions about diet and cancer**

Because people are interested in the relationship that specific foods, nutrients, or lifestyle factors have to specific cancers, research on health behaviors and cancer risk is often reported on the news. No one study, however, provides the last word on any subject, and single news reports may put too much emphasis on what appear to be contradictory or conflicting results. In brief news stories, reporters cannot always put new research findings in their proper context. Therefore, it is rarely, if ever, advisable to change diet or activity levels based on a single study or news report. The following questions and answers address common concerns about diet and physical activity in relation to cancer.

### **Alcohol**

#### **Does alcohol increase cancer risk?**

Yes. Alcohol raises the risk of cancers of the mouth, pharynx (throat), larynx (voice box), esophagus, liver, and breast, and probably of the colon and rectum. People who drink alcohol should limit their intake to no more than 2 drinks per day for men and 1 drink per day for women. A drink is defined as 12 ounces of beer, 5 ounces of wine, or 1.5 ounces of 80-proof distilled spirits. The combination of alcohol and tobacco increases the risk of some cancers far more than the effect of either drinking or smoking alone. Regular intake of even a few drinks per week is linked to a higher risk of breast cancer in women, especially in women who do not get enough folate. Women at high risk of breast cancer may want to consider not drinking any alcohol.

### **Antioxidants**

#### **What are antioxidants, and what do they have to do with cancer?**

The body seems to use certain nutrients in vegetables and fruits to protect against damage to tissues that happens constantly as a result of normal metabolism (oxidation). Because such damage is linked with increased cancer risk, the so-called antioxidant nutrients are thought to protect against cancer. Antioxidants include vitamin C, vitamin E, carotenoids,

and many other phytochemicals (chemicals from plants). Studies suggest that people who eat more vegetables and fruits, which are rich sources of antioxidants, may have a lower risk for some types of cancer. Clinical studies of antioxidant supplements are currently under way but have not yet proven to reduce cancer risk from vitamin or mineral supplements (also see entries for: beta-carotene, lycopene, vitamin E, supplements). To reduce cancer risk, the best advice at present is to get your antioxidants through food sources rather than supplements.

## Aspartame

### **Does aspartame cause cancer?**

Aspartame is a low-calorie artificial sweetener that is about 200 times sweeter than sugar. Current evidence does not show any link between aspartame use and increased cancer risk. People with the genetic disorder known as phenylketonuria should avoid foods and drinks that contain aspartame.

## Beta-carotene

### **Does beta-carotene reduce cancer risk?**

Because beta-carotene, an antioxidant chemically related to vitamin A, is found in vegetables and fruits, and because eating vegetables and fruits is linked with a reduced risk of cancer, it seemed to make sense that taking high doses of beta-carotene supplements might reduce cancer risk. But the results of 3 major clinical trials show this is not the case. In 2 studies in which people were given high doses of beta-carotene supplements in an attempt to prevent lung cancer and other cancers, the supplements were found to *increase* the risk of lung cancer in cigarette smokers, and a third found neither benefit nor harm from them. Therefore, eating vegetables and fruits that contain beta-carotene may be helpful, but high-dose beta-carotene supplements should be avoided.

## Bioengineered foods

### **What are bioengineered foods, and are they safe?**

Bioengineered foods are made by adding genes from other plants or organisms to make a plant more resistant to pests, slow spoilage. Some genes improve flavor, nutrient composition, or make the food easier to transport. In theory, these added genes might create substances that could cause harmful reactions among sensitized or allergic individuals. But there is no evidence at this time that the substances found in bioengineered foods now on the market are harmful or that they would either increase or decrease cancer risk because of the added genes.

## Calcium

### **Is calcium related to cancer?**

Several studies have suggested that foods high in calcium might help reduce the risk for colorectal cancer, and that using calcium supplements modestly reduces the formation of colorectal adenomas (polyps). But there is also evidence that a high calcium intake, mainly through supplements, is linked with increased risk for prostate cancer, especially for prostate cancers that are more aggressive. In light of this, both men and women should try to get the recommended levels of calcium mainly from food sources. Recommended intake levels of calcium are 1,000 mg/day for people ages 19 to 50 years and 1,200 mg/day for people older than 50. Dairy products are excellent sources of calcium, as are some leafy vegetables and greens. People who get much of their calcium from dairy products should select low-fat or non-fat choices to reduce their intake of saturated fat.

## Cholesterol

### **Does cholesterol in the diet increase cancer risk?**

Cholesterol in the diet comes only from foods with animal sources -- meat, dairy products, eggs, and animal fats such as butter or lard. Although some of these foods (for example, processed and red meats) are linked with higher risk of certain cancers, at this time there is little evidence that this increased risk is specifically related to cholesterol. Lowering blood cholesterol reduces heart disease risk, but there is no evidence that lowering blood cholesterol affects cancer risk.

## Coffee

### **Does drinking coffee cause cancer?**

Caffeine may worsen symptoms of fibrocystic breast lumps (a type of benign breast disease) in some women, but there is no evidence that it increases the risk of breast cancer or other types of cancer. The link between coffee and cancer of the pancreas, which got a lot of attention in the past, has not been confirmed by recent studies. There does not appear to be any link between coffee drinking and cancer risk.

## Fat

### **Will eating less fat lower cancer risk?**

There is little evidence that the total amount of fat a person eats affects cancer risk. But diets high in fat tend to be high in calories and may contribute to obesity, which in turn is linked with an increased risk of several types of cancer. There is evidence that certain

types of fats, such as saturated fats, may increase cancer risk. There is little evidence that other types of fat (omega-3 fatty acids, found mainly in fish), monounsaturated fatty acids (found in olive and canola oils), or other polyunsaturated fats reduce cancer risk.

## Fiber

### **What is dietary fiber, and can it prevent cancer?**

Dietary fiber includes a wide variety of plant carbohydrates that humans cannot digest. Specific categories of fiber are "soluble" (like oat bran) or "insoluble" (like wheat bran and cellulose). Soluble fiber helps to reduce blood cholesterol, which lowers the risk of coronary heart disease. Good sources of fiber are beans, vegetables, whole grains, and fruits. Links between fiber and cancer risk are weak, but eating these foods is still recommended. These foods contain other nutrients that may help reduce cancer risk and have other health benefits.

## Fish

### **Does eating fish protect against cancer?**

Fish is a rich source of omega-3 fatty acids. Studies in animals have found that these fatty acids suppress cancer formation or slow down cancer growth, but there is limited evidence of a possible benefit in humans.

While eating fish rich in omega-3 fatty acids is linked with a reduced risk of heart disease, some types of fish (large predatory fish such as swordfish, tilefish, shark, and king mackerel) may contain high levels of mercury, polychlorinated biphenyls (PCBs), dioxins, and other environmental pollutants. Women who are pregnant, breast-feeding, or planning to become pregnant, and young children should not eat these fish. People should vary the types of fish they eat to reduce the chance of exposure to toxins.

Research has not yet shown whether taking omega-3 or fish oil supplements produces the same possible benefits as eating fish. .

## Fluorides

### **Do fluorides cause cancer?**

Extensive research has looked at the effects of fluorides given as dental treatments or added to toothpaste, public water supplies, or foods on cancer risk. Fluorides have not been found to increase cancer risk.

## Folate

### **What is folate, and can it prevent cancer?**

Folate is a B vitamin found in many vegetables, beans, fruits, whole grains, and fortified breakfast cereals. Since 1998, all grain products in the United States have been fortified with folate. Too little folate may increase the risk of cancers of the colon, rectum, and breast, especially in people who drink alcoholic beverages. Current evidence suggests that to reduce cancer risk, folate is best obtained by eating vegetables, fruits, and enriched grain products.

## Food additives

### **Do food additives cause cancer?**

Many substances are added to foods to preserve them and to enhance color, flavor, and texture. New additives must be cleared by the Food and Drug Administration (FDA) before entering the food supply. Rigorous testing in animals to look for any effects on cancer is done as part of this process. Additives are usually present in very small quantities in food, and no convincing evidence has shown that any additive at these levels causes human cancers.

## Garlic

### **Can garlic prevent cancer?**

The health benefits of the allium compounds contained in garlic and other vegetables in the onion family have been publicized widely. Garlic is currently under study for its ability to reduce cancer risk. There is not enough evidence at this time to support a specific role for this vegetable in cancer prevention.

## Genetics

### **If our genes determine cancer risk, how can diet help prevent cancer?**

Damage to the genes that control cell growth can be either inherited or acquired during life. Certain types of mutations or genetic damage can increase the risk of cancer. Nutrients in the diet can protect DNA from being damaged. Physical activity, weight control, and diet might delay or prevent the development of cancer in people with an increased genetic risk for cancer. The interaction between diet and genetic factors is an important and complex topic, and a great deal of research is under way in this area.

## Irradiated foods

### **Do irradiated foods cause cancer?**

No. Radiation is used more often to kill harmful organisms on foods in order to extend their "shelf life." Radiation does not stay in the foods after treatment, and eating irradiated foods does not appear to increase cancer risk.

## Lycopene

### **Will lycopene reduce cancer risk?**

Lycopene is the red-orange carotene pigment found mainly in tomatoes and tomato-based foods, and to a lesser extent in pink grapefruit and watermelon. Several studies have reported that intake of tomato products reduces the risk of some cancers, but whether lycopene is the nutrient responsible is uncertain. Even if lycopene in foods is linked with lower risk for cancer, it can't be concluded that high doses taken as supplements would be either more effective or safe.

## Meat: cooking and preserving

### **Should I avoid processed meats?**

Some studies have linked eating large amounts of processed meat to increased risk of colorectal and stomach cancers. This connection may or may not be due to nitrites, which are added to many luncheon meats, hams, and hot dogs to maintain color and to prevent bacterial growth. Eating processed meats and meats preserved by methods involving smoke or salt increases exposure to potential cancer-causing agents and should be reduced as much as possible.

### **How does cooking meat affect cancer risk?**

Adequate cooking is required to kill harmful germs in meat. But some research suggests that frying, broiling, or grilling meats at very high temperatures forms chemicals that might increase cancer risk. Although these chemicals can damage DNA and cause cancer in animals, it is not clear how much they (as opposed to other substances in meat) may contribute to the increased colorectal cancer risk seen in people who eat large amounts of meat in some studies. Techniques such as braising, steaming, poaching, stewing, and microwaving meats produce fewer of these chemicals.

## Obesity

### **Does being overweight increase cancer risk?**

Yes. Being overweight or obese is linked with an increased risk of cancers of the breast (among women after menopause), colon, endometrium, esophagus, kidney, and possibly other sites as well. Although research on whether losing weight reduces cancer risk is limited, some research suggests that weight loss does reduce the risk of breast cancer. Because of other proven health benefits, people who are overweight are encouraged to lose weight. Avoiding excessive weight gain in adulthood is important not only to reduce cancer risk but also to reduce the risk of other chronic diseases.

## Olive oil

### **Does olive oil affect cancer risk?**

Intake of olive oil is linked with a reduced risk of heart disease, but is most likely neutral with respect to cancer risk. Although olive oil is a healthy alternative to butter and margarine, it is still a dense source of calories and should be used in moderation.

## Organic foods

### **Are foods labeled "organic" more effective in lowering cancer risk?**

The term *organic* is popularly used to designate plant foods grown without pesticides and genetic modifications. At this time, no research exists to demonstrate whether such foods are more effective in reducing cancer risk than are similar foods produced by other farming methods.

## Pesticides and herbicides

### **Do pesticides in foods cause cancer?**

Pesticides and herbicides can be toxic when used improperly in industrial, agricultural, or other occupational settings. Although vegetables and fruits sometimes contain low levels of these chemicals, overwhelming scientific evidence supports the overall health benefits and cancer-protective effects of eating vegetables and fruits. At present there is no evidence that residues of pesticides and herbicides at the low doses found in foods increase the risk of cancer, but fruits and vegetables should be washed thoroughly before eating.

## Physical activity

### **Will increasing physical activity lower cancer risk?**

Yes. People who engage in moderate to vigorous levels of physical activity are at a lower risk of developing colon and breast cancer than those who do not. Risk is lowered whether or not the activity affects the person's weight. Data for a direct effect on the risk of developing other cancers is more limited. Even so, obesity and being overweight have been linked to many types of cancer, and physical activity is a key factor in reaching or staying at a healthy body weight. In addition, physical activity has helpful effects against heart disease and diabetes.

## Phytochemicals

### **What are phytochemicals, and do they reduce cancer risk?**

The term *phytochemicals* refers to a wide variety of compounds made by plants. Some of these compounds protect plants against insects or perform other important functions. Some have either antioxidant or hormone-like actions both in plants and in the people who eat them. Because consuming vegetables and fruits reduces cancer risk, researchers are looking for the specific compounds responsible for the helpful effects. At this time, no evidence has shown that phytochemicals taken as supplements are as good for you as the vegetables, fruits, beans, and grains from which they are extracted.

## Saccharin

### **Does saccharin cause cancer?**

No. In rats, high doses of the artificial sweetener saccharin can cause bladder stones to form that can lead to bladder cancer. But saccharin does not cause bladder stones to form in humans. Saccharin has been removed from the list of established human carcinogens by the US National Toxicology Program.

## Salt

### **Do high levels of salt in the diet increase cancer risk?**

Studies in other countries link diets that contain large amounts of foods preserved by salting and pickling with an increased risk of stomach, nasopharyngeal, and throat cancer. No evidence suggests that moderate levels of salt used in cooking or in flavoring foods affect cancer risk.

## Selenium

### **What is selenium, and can it reduce cancer risk?**

Selenium is a mineral that contributes to the body's antioxidant defense mechanisms. Animal studies suggest that selenium protects against cancer. One study has shown that selenium supplements might reduce the risk of lung, colon, and prostate cancer in humans. But repeated and well-controlled studies are needed to confirm whether selenium is helpful in preventing these cancers. High-dose selenium supplements are not recommended, as there is only a narrow margin between safe and toxic doses. The maximum dose in a supplement should not exceed 200 micrograms (this is 2/10th of a milligram) per day.

## Soy products

### **Can soy-based foods reduce cancer risk?**

Soy-derived foods are an excellent source of protein and a good alternative to meat. Soy contains several phytochemicals, some of which have weak estrogen activity and appear to protect against hormone-dependent cancers in animal studies. At this time there is little data showing that soy supplements can help reduce cancer risk. High doses of soy could possibly increase the risk of estrogen-responsive cancers, such as breast or endometrial cancer.

Women with breast cancer should take in only moderate amounts of soy foods as part of a healthy, plant-based diet. They should not ingest very high levels of soy in their diet or take concentrated sources of soy such as soy-containing pills or powders, or supplements containing high amounts of isoflavones.

## Sugar

### **Does sugar increase cancer risk?**

Sugar increases calorie intake without providing any of the nutrients that reduce cancer risk. By promoting obesity and elevating insulin levels, high sugar intake may indirectly increase cancer risk. White (refined) sugar is no different from brown (unrefined) sugar or honey with regard to their effects on body weight or insulin. Limiting foods such as cakes, candy, cookies, sweetened cereals, and high-sugar beverages such as soda can help reduce sugar intake.

## Supplements

### **Can nutritional supplements lower cancer risk?**

There is strong evidence that a diet rich in fruits, vegetables, and other plant-based foods may reduce the risk of cancer. But there is no proof at this time that supplements can reduce cancer risk. Some high-dose supplements may actually increase cancer risk.

### **Can I get the nutritional effects of vegetables and fruits in a pill?**

No. Many healthful compounds are found in vegetables and fruits, and these compounds most likely work together to produce their helpful effects. There are also likely to be important compounds in whole foods that are not included in supplements, even though these compounds have not been identified. The small amount of dried powder in the pills that are sold as being equivalent to vegetables and fruits often contains only a small fraction of the levels contained in the whole foods.

Food is the best source of vitamins and minerals. Supplements, however, may be helpful for some people, such as pregnant women, women of childbearing age, and people whose dietary intakes are restricted by allergies, food intolerances, or other problems. If a supplement is taken, the best choice is a balanced multivitamin/mineral supplement containing no more than 100% of the "Daily Value" of most nutrients.

## Tea

### **Can drinking tea reduce cancer risk?**

Some researchers have suggested that tea might protect against cancer because of its antioxidant content. In animal studies, some teas (including green tea) have been shown to reduce cancer risk, but findings from studies looking at humans are mixed. At this time, tea has not been proven to reduce cancer risk in humans.

## Trans-saturated fats

### **Do trans-saturated fats increase cancer risk?**

Trans-saturated fats are made when oils such as margarines or shortenings are hydrogenated to make them solid at room temperature. Recent evidence shows that trans-fats raise blood cholesterol levels. Their relationship to cancer risk has not been determined, but people are advised to eat as few trans-fats as possible.

## Vegetables and fruits

### **Will eating vegetables and fruits lower cancer risk?**

In most of the studies looking at large groups of people, eating more vegetables and fruits has been linked to a lower risk of lung, oral, esophageal, stomach, and colon cancer. Because we don't know which of the many compounds in these foods are most helpful, the best advice is to eat 5 or more servings of an assortment of colorful vegetables and fruits each day. (This means at least 5 servings of fruits and vegetables when added together, for instance, 4 servings of vegetables plus 1 serving of fruit.)

### **What are cruciferous vegetables, and are they important in cancer prevention?**

Cruciferous vegetables belong to the cabbage family and include broccoli, cauliflower, Brussels sprouts, and kale. These vegetables contain certain compounds thought to reduce the risk for colorectal cancer. The best evidence suggests that eating a wide variety of vegetables, including cruciferous and other vegetables, reduces cancer risk.

### **Is there a difference in nutritional values among fresh, frozen, and canned vegetables and fruits?**

Yes, but they can all be good choices. Fresh foods are usually thought to have the most nutritional value. But frozen foods can often be more nutritious than fresh foods because they are often picked ripe and quickly frozen (whereas fresh foods may lose some of their nutrients in the time between harvesting and eating). Canning is more likely to reduce the heat-sensitive and water-soluble nutrients because of the high heat that must be used. Be aware that some fruits are packed in heavy syrup, and some canned vegetables are high in sodium (salt). Choose vegetables and fruits in a variety of forms, and pay attention to the label information.

### **Does cooking affect the nutritional value of vegetables?**

Boiling vegetables, especially for long periods, can leach out their content of water-soluble (B and C) vitamins. Microwaving and steaming are the best ways to preserve these nutrients in vegetables.

### **Should I be juicing my vegetables and fruits?**

Juicing can add variety to the diet and can be a good way to consume vegetables and fruits, especially if chewing or swallowing is a problem. Juicing also helps the body absorb some of the nutrients in vegetables and fruits. But juices may be less filling than whole vegetables and fruits and often contain less fiber. Fruit juice in particular can account for quite a few calories if large amounts are drunk. Commercially juiced products should be 100% vegetable or fruit juices. They should also be pasteurized to kill harmful germs.

## Vegetarian diets

### **Do vegetarian diets reduce cancer risk?**

Vegetarian diets include many healthful features. They tend to be low in saturated fats and high in fiber, vitamins, and phytochemicals. It is not possible to conclude at this time, however, that a vegetarian diet has any special benefits for the prevention of cancer. Diets including lean meats in small to moderate amounts can also be healthful. Strict vegetarian diets that avoid all animal products, including milk and eggs, should be supplemented with vitamin B12, zinc, and iron (especially for children and women after menopause).

## Vitamin A

### **Does vitamin A lower cancer risk?**

Vitamin A (retinol) is obtained from foods in 2 ways: it can be pre-formed from animal food sources (retinol) and made from beta-carotene in plant-based foods. Vitamin A is needed to maintain healthy tissues. Vitamin A supplements, whether in the form of beta-carotene or retinol, have not been shown to lower cancer risk, and high-dose supplements may, in fact, increase the risk for lung cancer in current and former smokers. And retinol can cause serious problems if too much is taken.

## Vitamin C

### **Does vitamin C lower cancer risk?**

Vitamin C is found in many vegetables and fruits, especially oranges, grapefruits, and peppers. Many studies have linked intake of foods rich in vitamin C to a reduced risk for cancer. But the few studies in which vitamin C has been given as a supplement have not shown a reduced risk for cancer.

## Vitamin D

### **Does vitamin D lower cancer risk?**

There is a growing body of evidence from studies that observe large groups of people (not yet tested in clinical trials) that vitamin D may have helpful effects on some types of cancer, including cancers of the colon, prostate, and breast. Vitamin D is obtained through skin exposure to ultraviolet (UV) radiation and through diet, particularly products fortified with vitamin D such as milk and cereals, and supplements. But many Americans do not get enough vitamin D.

The current national recommended levels of intake of vitamin D (200 to 600 IU per day) may not be enough to meet needs, especially among those with little sun exposure, the

elderly, people with dark skin, and babies who only take in breast milk. More research is needed to define the best levels of intake and blood levels of vitamin D for cancer risk reduction, but recommended intake is likely to fall between 200 and 2,000 IU, depending on age and other factors. To reduce the health risks linked with UV radiation exposure while getting the most potential benefit from vitamin D, a balanced diet, supplementation, and limiting sun exposure to small amounts are the preferred methods of obtaining vitamin D.

## Vitamin E

### **Does vitamin E lower cancer risk?**

Alpha-tocopherol is the most active form of vitamin E and is a powerful antioxidant. In one study, male smokers who took alpha-tocopherol had a lower risk of prostate cancer compared with those who took a placebo. But several other studies have not found the same link. While studies now under way will help clarify this, the promise of alpha-tocopherol for reducing cancer risk appears to be dimming.

## Water and other fluids

### **How much water and other fluids should I drink?**

Drinking water and other liquids may reduce the risk of bladder cancer, as water dilutes the concentration of cancer-causing agents in the urine and shortens the time in which they are in contact with the bladder lining. Drinking at least 8 cups of liquid a day is usually recommended, and some studies show that even more may be helpful.

No matter who you are, we can help. Contact us anytime, day or night, for information and support. Call us at **1-800-227-2345** or visit [www.cancer.org](http://www.cancer.org).

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