



# HEALTH

---

## Nutrition and Cancer

**no. 9.313***by J. Anderson, E. Serrano, D. Bae<sup>1</sup>*

### Quick Facts...

Dietary guidelines to lower cancer risk:

1. Reduce intake of dietary fat
2. Increase consumption of fruits, vegetables and whole grain cereals.
3. Consume salt-cured, smoked and charcoal broiled foods only in moderation.
4. Drink alcoholic beverages only in moderation.

Dietary guidelines to lower cancer risk were developed by an expert panel on diet, nutrition and cancer convened by the National Academy of Sciences (NAS) in 1982. These guidelines are based on preliminary evidence.

Two types of studies are used to help identify cancer causing agents in foods: epidemiologic studies and laboratory tests of animals or humans. Epidemiologic cancer studies are comparisons between diet and death from cancer in certain populations. Laboratory studies are observations of animals or humans designed to test the effect of certain dietary factors.

Following the dietary guidelines to lower cancer risk does not guarantee that you will not get cancer. But the guidelines may help decrease your chances, particularly if you are at increased risk because of genetic or other reasons. These guidelines also may lessen the risk of other chronic diseases.

These cancer recommendations generally conform to the USDA and U.S. Health and Human Services Dietary Guidelines for Americans (see fact sheet 9.353, *Dietary Guidelines for Americans*, and 9.332, *Coping with Cancer's Effect on the Diet*). The dietary guidelines to lower cancer risk are:

1. Reduce intake of dietary fat—saturated and unsaturated—from the current average of about 34 percent to a level of 30 percent of total calories.
2. Increase consumption of fruits, vegetables and whole grain cereals.
3. Consume salt-cured, smoked and charcoal-broiled foods only in moderation.
4. Drink alcoholic beverages only in moderation.

These guidelines are not intended to overly restrict or eliminate any foods from your diet. They are meant to encourage you to consume a wide variety of foods. Choosing certain types of foods more often than others also is encouraged, as suggested below.

### Guideline #1

*Reduce intake of dietary fat—saturated and unsaturated—from the current average of approximately 34 percent to a level of 30 percent of total calories.*

**Fat in the diet.** Laboratory and epidemiologic data suggests that too much fat in the diet leads to an increased risk of a variety of cancers. The risk of these cancers appears to be higher when fat as a total percentage of calorie intake is increased. Americans consume an average of 34 percent of their calories as fat. The Food and Nutrition Board of the National Academy of Sciences recommends that people eat no more than 30 percent of their daily calories as fat.

### Guideline #2

*Increase consumption of fruits, vegetables and whole grain cereals.*

Specific nutrients and food constituents of fruits, vegetables and whole grain cereals may be anticancer substances when eaten at levels found in a varied diet. Some food constituents and specific nutrients believed to protect against cancer are dietary fiber, phytochemicals, and vitamins A, C and E.

**Dietary fiber.** Dietary fiber is the material from plant cells that the body cannot digest completely. Dietary fiber is found in vegetables, legumes, fruit and whole-grain cereals, nuts and seeds. A diet high in fiber and low in fat may reduce the risk of colon and rectal cancers. Fiber provides bulk in the diet, and it helps move food through the intestines and out of the body at regular intervals. It is unclear whether it is total fiber intake or the components of dietary fiber that is beneficial in reducing cancer risks.

**Phytochemicals.** Evidence suggests that certain compounds in plant food sources, particularly fruits and vegetables, can be cancer fighting. These compounds are called phytochemicals, which is actually a general name for several cancer-fighting substances, such as flavonoids, allylic sulfides and sulforaphanes. Scientists believe that the compounds stop cancer cells from initiating or developing into tumors. While there is no direct proof these compounds can prevent cancer, eating a diet with plenty of fruits and vegetables has proven to be a healthy food choice. Obtaining anticancer substances from food rather than supplements may be the best plan of action to prevent disease.

**Beta Carotene and Vitamin A.** Our bodies convert beta carotene to vitamin A. Epidemiological studies suggest that eating foods that contain beta carotene decreases the risk of a variety of cancers. Supplements are not found to provide the same benefit, and excess vitamin A can be toxic. Get vitamin A naturally by eating vitamin A or beta carotene-rich fruits and vegetables: dark green and yellow vegetables such as carrots, winter squash, broccoli and spinach. Deep yellow-orange fruits, such as apricots, peaches and cantaloupe, also are good sources.

**Vitamin C.** Vitamin C-rich foods may have cancer-inhibiting benefits, particularly for cancers of the stomach and esophagus. Nitrites and nitrates occur naturally in foods. They are commonly added to foods as preservatives and to processed meats for color. These substances can combine with amino acids from proteins to form nitrosamines. Nitrosamines are known to cause cancer. This reaction definitely occurs in the test tube. Whether it occurs in the human digestive tract is not yet clear. Research has demonstrated that vitamin C (ascorbic acid) can inhibit the reaction of nitrites with amines or amides. It competes with the amine for the nitrite, which inhibits carcinogenic compound formation.

**Vitamin E.** Vitamin E has been shown to protect against cancer in some experimental animal studies. The mechanism is similar to vitamin C's: it competes for available nitrite, which blocks the formation of nitrosamines.

**Cruciferous vegetables.** Cruciferous vegetables are from the cabbage family and include bok-choy, broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohlrabi, mustard greens and turnips. These vegetables also may be important in reducing the risk of cancer, particularly cancer of the gastrointestinal and respiratory tracts. Scientists believe the anticancer compound in these foods is called sulforaphane. It is unclear what component of these vegetables is responsible for reducing the risk of cancer, but studies have demonstrated their protective effect.

**Tips to increase consumption.** It is important to eat a variety of vitamin- and mineral-rich foods, especially fruits, vegetables and whole-grain breads and cereals, rather than relying on supplements. There may be undiscovered cancer-protecting components or nutrients that occur naturally in foods. Also, eating a variety of foods will provide adequate vitamins and minerals to maintain health. To increase dietary fiber, vitamins and selenium, select fiber-rich, whole-grain

**Good sources of fiber (> 2.5 grams):**

*Bran flake cereal, blackberries, baked beans, corn, apple with skin, broccoli, winter squash, lentils, shredded wheat (see fact sheet 9.333, Dietary Fiber).*

| Total Calories per day | Saturated fat in grams | Total fat in grams |
|------------------------|------------------------|--------------------|
| 1,600                  | 18 or less             | 53                 |
| 2,000*                 | 20 or less             | 65                 |
| 2,200                  | 24 or less             | 73                 |
| 2,500*                 | 25 or less             | 80                 |
| 2,800                  | 31 or less             | 93                 |

\*These amounts are rounded to the nearest 5 grams to be consistent with the Nutrition Facts Label.

bread, cereals and pastas; all varieties of fruits and vegetables; legumes; and oat-based products. An added benefit of eating more carbohydrate foods is that fat intake generally is decreased.

### Guideline #3

*Consume salt-cured, smoked and charcoal broiled foods only in moderation.*

Carcinogens in certain foods. Evidence suggests that eating salt-cured, smoked, pickled and charcoal-broiled foods increases cancer risk. In parts of the world where food is often prepared using these methods, stomach and esophageal cancer cases are higher. In the United States, stomach cancer is declining and esophageal cancer is rare.

Nitrates, often used in the curing process, cause cancer in laboratory animals and are suspected of causing cancer in people. In the process of smoking foods, the foods absorb large amounts of tar that arise from incomplete combustion of wood or charcoal fire. These tars have been found to contain numerous carcinogens. Today, “liquid smoke,” which may be less hazardous, often is used.

When meats are charcoal- or gas-broiled, a substance (benzopyrene) is formed when fat from the meat drips onto the hot coals. The rising smoke then carries this carcinogenic substance back up and deposits it onto the meat. However, little evidence suggests that Americans are at risk from excessive consumption of charcoal-broiled food. Much research still is needed to determine the links between charcoal-broiled foods and cancer. In the meantime, it makes sense to consume these foods in moderation.

High-temperature frying or broiling, for example frying bacon, may convert some of the meat proteins into products that damage the genetic material of the body’s cells.

**Tips to eat moderate amounts.** To reduce cancer risk and still enjoy a cookout, cover the grill with foil and punch holes between the grids to let the fat drip out. The foil protects food from smoke and fire. Cook meat until done but don’t char it. If food does get charred, remove the charred portions before eating it. Discourage flareups by either dampening coals that become too hot with a squirt of water, or move food to another section of the grill. Also, reduce cooking time on the grill by partially precooking foods in a microwave and then grilling briefly to give it that grilled flavor. It’s probably a good idea to eat salt-cured and smoked foods only once in awhile.

### Guideline #4

*Drink alcoholic beverages only in moderation.*

**Alcohol abuse, diet and cancer.** Heavy drinking of alcoholic beverages, more than two drinks per day, increases the risk of mouth, pharynx, larynx, esophagus, liver, pancreas and bladder cancers. It is unclear whether it is alcohol or other ingredients in these beverages that are responsible for the association with cancer in people. The carcinogenic effect may be the direct contact of alcohol on the mouth, pharynx and esophagus.

Heavy drinking can result in liver cirrhosis, which may lead to liver cancer. Heavy drinkers and alcoholics commonly have nutritional deficiencies because alcohol contains only empty calories, and food intake often is compromised. When little food is eaten, low nutrient intake often results. If heavy drinkers smoke, as is commonly the case, cancer risk escalates.

The link between cancer and alcohol is complex because frequent alcohol consumption may result in many health problems. The nutritional cancer risk factors are compounded for alcohol abusers. Alcohol is high in calories and low in nutrients. It is difficult for an alcohol abuser to obtain protective benefits from foods when so little nutrient-dense food is eaten.

Counts as a drink:

12 oz of regular beer (150 calories)

5 oz of wine (100 calories)

1.5 oz of 80 proof distilled spirits (100 calories)

**Tips for moderate alcohol consumption.** Instead of alcohol, try non-alcoholic wine, beer, mineral or tonic water, cider, grape juice, or fruit juice. Always provide nonalcoholic beverages and nutrient-dense foods at social gatherings. If you do drink, do so in moderation—less than two drinks per day—and don't drive.

## Summary

Diets high in fiber and low in fat with plenty of fruits, vegetables, whole-grain breads and cereals may reduce the risk of cancer, particularly in individuals at increased risk. In addition to the recommendations by the NAS, the National Cancer Institute (NCI) and the American Cancer Society (ACS) also recommend maintaining reasonable weight. Along with the outlined diet and nutrition recommendations, to further reduce cancer risk avoid the following: tobacco, work-related exposure to harmful chemicals, and excessive exposure to the sun's rays and x-rays. These are all important preventive actions that may safeguard your health.

These dietary guidelines are intended for people who are healthy. If you have a condition that requires a special diet, consult a physician or registered dietitian before beginning any modified diet plan. If you have been diagnosed or are being treated for cancer, a more appropriate and highly recommended reference is *Eating Hints: Recipes and Tips for Better Nutrition During Cancer Treatment*, NIH Publication No. 84-2079, U.S. Department of Health and Human Services, 1984, 86p. For a free copy, write to the Office of Cancer Communications, National Cancer Institute, Building 31, Room 10A 18, Bethesda, Maryland 20205; or call 1-800-4-CANCER.

## References

For further information contact:

- American Institute for Cancer Research, Washington, DC 20069;
- American Cancer Society, 777 Third Avenue, New York, NY 10017;
- National Cancer Institute, Cancer Information Service, Bethesda, MD 20205, or call the Cancer Information Service at: 1-800-4-CANCER.

<sup>1</sup>J. Anderson, Colorado State University Cooperative Extension food and nutrition specialist and professor, food science and human nutrition; D. Bae and E. Serrano, food and nutrition specialists.

Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating. Cooperative Extension programs are available to all without discrimination. No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.