

# Foods and Breast Cancer Survival

Healthful diets not only help prevent cancer; evidence suggests that they also improve survival when cancer has been diagnosed. The first clues that foods might affect the course of breast cancer came from studies of women in Japan in the early 1960s. Compared to Western women, Japanese women were much less likely to develop the disease and much more likely to survive it if it occurred.(1) Over the next several decades, researchers have followed up on these observations to try to clarify what is the best diet for cancer survival. Although this work is still in its early stages, important information has already come to light.

## **The Advantage of Being Thin or Losing Weight**

One of the best-established factors affecting breast cancer survival is body weight. Women with breast cancer who are near their ideal body weight at the time of diagnosis are more likely to survive than are women with higher body weights. In a 2002 review of 26 studies published since 1990 on body weight and cancer recurrence or decreased survival in women previously diagnosed with breast cancer, 17 studies showed that higher body weight was associated with increased risk; 7 studies showed no relationship, and 2 showed an inverse relationship between body weight and risk. (2) Overall, the body of evidence supports a relationship between body weight and poor outcomes.

The relationship may hold even among relatively thin women. A 2006 study from

Shanghai, China, studied the relationship between body mass index (BMI) and survival in 1,455 women, aged 25-64, who had previously been diagnosed with breast cancer. (3) For reference, a health BMI is between 18.5 and 24.9 kg/m<sup>2</sup>. Women with a BMI below 23 had a 5-year survival rate of 86.5%. Those who were slightly heavier, with a BMI of 23.00 to 24.99, had a slightly lower 5-year survival rate of 83.8%. Those with a BMI of 25 or greater had a 5-year survival of 80.1%.

Although weight gain often occurs after diagnosis, studies suggest that women who avoid weight gain after diagnosis tend to have longer disease-free survival.(2)

The link between lower body weight and better survival may relate to estrogens, female sex hormones that can encourage the growth of cancer cells. In essence, body fat acts like an estrogen factory, producing estrogens from other compounds coming from the adrenal glands (small organs situated atop each kidney). As a result, women with more body fat tend to have higher amounts of estrogens circulating in their blood, compared to leaner women.

## Reduced Fat Intake

Specific dietary factors appear to play key roles in cancer survival. First, two studies of women diagnosed with breast cancer showed that those who had been consuming less fat prior to diagnosis generally had smaller tumors with less evidence of cancer spread, compared to women whose diets had included more fatty foods.(4,5) One of these

studies identified benefits among premenopausal women; the other, among postmenopausal women.

Studies that have followed women for several years after diagnosis have generally found that those with less fatty diets prior to diagnosis live longer than other women. In one of the first such studies, researchers at the State University of New York in Buffalo, N.Y., found that women with advanced cancer had a 40 percent increased risk of dying at any point in time for every 1,000 grams of fat they consumed per month.<sup>(6)</sup> Note that this does not mean a person's risk of dying is 40 percent. It means that, if a person's diet contains an extra 1,000 grams of fat per month at the time of diagnosis, that person's risk of dying is 40 percent higher than it would otherwise have been. There is, of course, tremendous variation from one woman to another, so this figure is simply an overall observation drawn from the group of participants. To make this more concrete: The difference between a typical American diet and a low-fat, vegan diet is approximately 1,000–1,500 grams of fat per month, which corresponds to a 40–60 percent difference in mortality risk at any point in time.

Other studies found much the same thing—fatty diets are associated with increased risk, and that is particularly true for saturated fat, the kind that is common in meat, dairy products, eggs, and chocolate.<sup>(7-10)</sup> Some studies have failed to confirm the dangers of fatty diets.<sup>(11–14)</sup> However, most evidence indicates that women consuming less fat tend to do better after diagnosis, including the Women's Intervention Nutrition Study (WINS) sponsored by the National Cancer Institute (NCI).<sup>(15)</sup> This study followed

nearly 2,500 post-menopausal women with breast cancer for five years after their standard surgery and cancer treatments. Researchers instructed some of them to continue their regular diets while the rest were put on a low-fat diet. The women continuing their usual diets consumed an average of 51.3 grams of fat per day, which is still lower than the average American's fat, while the low-fat group averaged 33.3 grams per day—slightly more than in a typical vegetarian diet. After five years, 12.4 percent of the women eating their usual diet had cancer recurrences compared to only 9.8 percent of the low-fat diet group, a 24 percent reduction in recurrence.

Why should a low fat intake improve survival? For starters, low-fat diets tend to be modest in calories, since fats and oils are the densest source of calories of any food we consume. In fact, some investigators believe that the main problem with fatty diets is simply their high calorie content. In addition, women who eat less fat and more fiber tend to have less estrogen coursing through their veins (independent of the difference in their body weight). They may also have stronger immune defenses that can help them fight cancer cells.

Evidence suggests that diet changes must be substantial to be effective. The Women's Health Initiative included 48,835 participants, aged 50-79, who were free of breast cancer, and tested a diet that emphasized vegetables, fruits, and grains. (16) Fat intake fell from 38% of calories at the beginning of the study to 24% at 1 year, but slipped back up to 29% at 6 years. After 8.1 years of follow-up, overall breast cancer risk fell 9%, but the difference was not statistically significant, meaning that it could have occurred due

to chance. However, risk of one type of breast cancer—progesterone-receptor-negative tumors—fell by 24%. While the study was not a survival study—it assessed the risk of cancer developing in the first place, rather than the course of the disease after diagnosis—it suggests that modest diet changes may bring only modest results.

## Increased Fiber

Fiber is essential to the body's ability to eliminate excess estrogens. As the liver filters estrogens from the blood, it sends them through the bile duct into the intestinal tract, where fiber soaks them up and carries them out of the body. A study in Sweden found that women with higher fiber intake at the time of breast cancer diagnosis were more likely to have smaller tumors, compared to women with lower fiber intake.<sup>(17)</sup> The amount consumed was not particularly high. Those women with larger tumors (greater than 20 millimeters) averaged 16 grams of fiber per day, compared to 19 grams for women with smaller tumors. Most authorities recommend fiber intake of at least 30 grams daily, and an optimal intake is probably over 40 grams.

## Increased Vegetables and Fruits

Some evidence suggests that women whose diets are richer in vegetables and fruits tend to survive longer.<sup>(2,18)</sup> In a study of 103 women in Australia followed for six years after they were diagnosed with breast cancer, those who consumed the most fruits and

vegetables rich in beta-carotene or vitamin C had the best chance for survival. The researchers divided the group into thirds based on how much beta-carotene they got each day in the foods they chose. It turned out that in the group getting the least beta-carotene, there were twelve deaths over the next six years. In the middle group, there were eight deaths, and in the high-beta-carotene group, there was only one death.(19)

In the digestive tract, beta-carotene is converted to vitamin A. In turn, vitamin A is converted to a compound called retinoic acid, which has a demonstrable anti-cancer effect on cells in test-tube studies.<sup>16</sup> A Swedish study found much the same thing: Among women with breast cancer, those consuming more vitamin A were more likely to have estrogen receptor-rich tumors, a good prognostic sign.(17)

The Australian researchers also analyzed their data in another way, looking simply at how much fruit of any kind the women had been eating, including both beta-carotene-rich fruits and other varieties, such as apples, bananas, berries, grapes, and dried fruits. The same sort of pattern emerged. In the group eating the least fruit, there were twelve deaths; in the middle group, there were six deaths; and in the group consuming the most fruit, there were only three deaths.(19)

Similarly, a study of Canadian women with breast cancer found that those getting the most beta-carotene and vitamin C had significantly better survival odds.(9) The benefit was dose related, meaning the more of these helpful nutrients they got, the better they did. Those who got more than 5 milligrams of beta-carotene per day had double the

likelihood of survival, compared to women who got less than 2 milligrams. To see what this means on your plate: There are about 5 milligrams of beta-carotene in half a medium carrot or one-fourth cup of cooked sweet potato.

For vitamin C, those getting more than 200 milligrams each day had roughly double the survival odds, compared to those getting less than about 100 milligrams per day. In practical terms, an orange has about 60 milligrams of vitamin C, and a one-cup serving of broccoli or other green vegetables has about 80.(9)

Vitamin E may have the opposite effect. In one study, women with breast cancer consuming larger amounts of vitamin E had poorer survival. Every one-milligram increase in daily vitamin E intake was associated with approximately a 15 to 20 percent increased risk of treatment failure.(8)

## Combined Diet Effects: The Women's Healthy Eating and Living (WHEL) Study

These dietary factors tend to work together. A diet that is higher in fruits and vegetables will also tend to be high in fiber and low in fat. In turn, women who eat such diets tend to be slimmer than other women, avoiding the risks of overweight. One study suggested that there may be a measurable benefit of these combined effects. Researchers at Mt. Sinai Medical Center in New York found that women with breast cancer who were slimmer tended to live longer, and those who had lower cholesterol levels also lived

longer. But the women at greatest risk of dying were those who were overweight and had high cholesterol levels.(20)

The Women's Healthy Eating and Living (WHEL) study included more than 3,000 pre- and postmenopausal women with breast cancer in a test of two different diets rich in fruits and vegetables. (21) Half the participants (the intervention group) were asked to include in their daily diets five vegetable servings, 16 ounces of vegetable juice, three fruit servings, 30 grams of dietary fiber, and no more than 15–20 percent of calories from fat. A comparison group was asked to consume at least five fruit and vegetable servings per day.

In 291 of the study participants, changes in diet and hormone function were compared between the two diet groups. (22) In the intervention group, fat intake fell from 28% of calories to 21% within the first year, and fiber intake rose from 22 to 29 grams per day. Estrogen levels fell, too. Serum estradiol concentrations fell from 91 pmol/L to 64 pmol/L, and bioavailable estradiol concentration fell from 41 pmol/L to 28 pmol/L. Estrone and estrone sulfate concentrations fell as well. All of these changes were greater than those in the comparison group, suggesting that a diet change has a significant effect on the amount of hormones circulating in the blood.

In the same study, the investigators tracked the experience of 1,551 women assigned to the comparison group, using blood tests for plasma carotenoids as an indicator of vegetable and fruit intake. (23) As in any large group, their diets varied from one person

to another. It turned out that those with the highest carotenoid concentrations—indicating high vegetable and fruit intake—had a 43% lower risk of either cancer recurrence or a new primary breast cancer, compared to women with lower blood levels of carotenoids.

After approximately seven years of follow-up, those women in the comparison group who followed the guideline of eating at least five fruit and vegetable servings daily and who were also physically active turned out to have nearly a fifty percent reduction in mortality, compared to women who did not meet these healthful guidelines. (24)

However, the recommendations for even greater vegetable and fruit intake made for the intervention group did not extend benefits beyond those achieved by the five-a-day (comparison) group. (25)

While the WHEL participants succeeded at emphasizing vegetable and fruit intake, they did not maintain a low fat intake or a high fiber intake. The intervention group did reduce fat intake to 21 percent of energy in the first six months, but fat intake gradually climbed back to 29 percent by the six-year point. Similarly, fiber intake was only slightly higher at six years (24 grams per day), compared to study onset (21 grams). As a result, neither the intervention nor the comparison group succeeded at weight loss; both groups were overweight at the beginning of the study and gained a small amount of weight as the study progressed. (25) A vegetarian or vegan regimen may have been a better choice; the meat and dairy products that were permitted in the WHEL guidelines contain significant amounts of fat and contribute no fiber.

Nonetheless, the WHEL study demonstrated that women previously treated for breast cancer who consume at least five vegetable and fruit servings daily and are physically active have a large measure of protection (nearly a fifty percent reduction in mortality), and their protection is not increased by pushing vegetable intake even higher. The study did not test other potentially helpful dietary measures.

## Exercise

Exercise may also improve breast cancer survival. A study published in the *Journal of the American Medical Association* concluded that physical activity after breast cancer diagnosis may reduce a woman's risk of death from the disease. In this study, the greatest benefit was shown in women who exercised the equivalent of walking at an average pace for 3 to 5 hours per week. (26)

## References

1. Wynder EL, Kajitani T, Kuno J, Lucas JC Jr, DePalo A, Farrow J. A comparison of survival rates between American and Japanese patients with breast cancer. *Surg Gynecol Obstet* 1963;117:196-200.
2. Rock CL, Demark-Wahnefried W. Nutrition and survival after the diagnosis of breast cancer: a review of the evidence. *J Clin Oncol* 2002;20:3302-16.
3. Tao MH, Shu XO, Ruan ZX, Gao YT, Zheng W. Association of overweight with breast cancer survival. *Am J Epidemiol* 2006;163:101-107.
4. Verreault R, Brisson J, Deschenes L, Naud F, Meyer F, Belanger L. Dietary fat in relation to prognostic

indicators in breast cancer. *J Natl Cancer Inst* 1988;80:819-25.

5. Hebert JR, Toporoff E. Dietary exposures and other factors of possible prognostic significance in relation to tumour size and nodal involvement in early-stage breast cancer. *Int J Epidemiol* 1989;18:518-26.

6. Gregorio DI, Emrich LJ, Graham S, Marshall JR, Nemoto T. Dietary fat consumption and survival among women with breast cancer. *J Natl Cancer Inst* 1985 Jul;75(1):37-41.

7. Nomura A, Le Marchand L, Kolonel LN, Hankin JH. The effect of dietary fat on breast cancer survival among Caucasian and Japanese women in Hawaii. *Breast Cancer Research and Treatment* 1991;18:S135-41.

8. Holm LE, Nordevang E, Hjalmar ML, Lidbrink E, Callmer E, Nilsson B. Treatment failure and dietary habits in women with breast cancer. *J Natl Cancer Inst* 1993;85:32-6.

9. Jain M, Miller AB, To T. Premorbid diet and the prognosis of women with breast cancer. *J Natl Cancer Inst* 1994;86:1390-7.

10. Zhang S, Folsom AR, Sellers TA, Kushi LH, Potter JD. Better breast cancer survival for postmenopausal women who are less overweight and eat less fat. *Cancer* 1995;76:275-83.

11. Rohan TE, Hiller JE, McMichael AJ. Dietary factors and survival from breast cancer. *Nutr Cancer* 1993;20:167-77.

12. Kyogoku S, Hirohata T, Nomura Y, Shigematsu T, Takeshita S, Hirohata I. Diet and prognosis of breast cancer. *Nutr Cancer* 1992;17:271-7.

13. Newman SC, Miller AB, Howe GR. A study of the effect of weight and dietary fat on breast cancer survival time. *Am J Epidemiol* 1986;123:767-74.

14. Ewertz M, Gillanders S, Meyer L, Zedeler K. Survival of breast cancer patients in relation to factors which affect risk of developing breast cancer. *Int J Cancer* 1991;49:526-530.

15. Chlebowski RT. Dietary fat reduction in postmenopausal women with primary breast cancer: Phase III Women's Intervention Nutrition Study (WINS). Paper presented at: American Society of Clinical Oncology Annual Meeting; May 16, 2005; Torrance, CA.

16. Prentice RI, Caan B, Chlebowski RT, et al. Low-fat dietary pattern and risk of invasive breast cancer: The Women's Health Initiative randomized controlled Dietary Modification Trial. *JAMA*. 2006;295:629-

642.

17. Holm LE, Callmer E, Hjalmar ML, Lidbrink E, Nilsson B, Skoog L. Dietary habits and prognostic factors in breast cancer. *J Natl Cancer Inst* 1989;81:1218-23.
18. Murillo G, Mehta RG. Cruciferous vegetables and cancer prevention. *Nutr Cancer* 2001;41:17-28.
19. Ingram D. Diet and subsequent survival in women with breast cancer. *Br J Cancer* 1994;69:592-5.
20. Tartter PI, Papatestas AE, Ioannovich J, Mulvihill MN, Lesnick G, Aufses AH. Cholesterol and obesity as prognostic factors in breast cancer. *Cancer* 1981;47:2222-7.
21. Pierce JP, Faerber S, Wright FA, et al. A randomized trial of the effect of a plant-based dietary pattern on additional breast cancer events and survival: the Women's Healthy Eating and Living (WHEL) Study. *Contr Clin Trials* 2002;23:728-56.
22. Rock CL, Flatt SW, Thomson CA, et al. Effects of a high-fiber, low-fat diet intervention on serum concentrations of reproductive steroid hormones in women with a history of breast cancer. *J Clin Oncol* 2004;12:2379-2387.
23. Rock CL, Flatt SW, Natarajan L, et al. Plasma carotenoids and recurrence-free survival in women with a history of breast cancer. *J Clin Oncol*. 2005;23:6631-8.
24. Pierce JP, Stefanick ML, Flatt SW, et al. Greater survival after breast cancer in physically active women with high vegetable-fruit intake regardless of obesity. *J Clin Oncol* 2007;25:2345-51.
25. Pierce JP, Natarajan L, Caan BJ, et al. Influence of a diet very high in vegetables, fruit, and fiber and low in fat on prognosis following treatment for breast cancer: The Women's Healthy Eating and Living (WHEL) randomized trial. *JAMA* 2007;298:289-98.
26. Holmes MD, Chen WY, Feskanich D, Kroenke CH, Colditz GA. Physical activity and survival after breast cancer diagnosis. *JAMA*. 2005 May 25;293(20):2479-86.