

# SOY

## & HEALTH

### Preventing and Treating Cancer



### Cancer Epidemiology

### Consumption of Soyfoods May Reduce Cancer Risk

One out of every four deaths in the United States is due to cancer.<sup>1</sup> Nutrition is one of the important factors involved in reducing risk for cancer.<sup>2</sup> Soyfoods fit the dietary guidelines for reducing cancer risk, and they also contain anticarcinogens which may prove to be protective.

In the United States, cancer is the second leading cause of death.<sup>1</sup> Lifestyle factors are important in the etiology of the disease. Cigarette smoking, physical inactivity, and poor diet all contribute to cancer risk. Scientific evidence indicates that one third of cancer deaths in the United States are due to dietary factors.<sup>2</sup>

Epidemiological studies show that populations which consume a typical Asian diet have lower incidences of breast, prostate, and colon cancers than those consuming a Western diet.<sup>1</sup> The Asian diet includes mostly plant foods, including legumes, fruits, and vegetables, and is low in fat. The Japanese have the highest consumption of soyfoods.<sup>3</sup> On the other hand, the typical Western diet includes large amounts of animal foods, is lower in fiber and complex carbohydrates, and is high in fat. Soyfoods are dietary staples in the Orient, but are not commonly included in the Western diet.

Japan has a very low incidence of hormone-dependent cancers. The mortality rate from breast and prostate cancers in Japan is about one-fourth that of the United States.<sup>1</sup> There is evidence that suggests the difference in cancer rates is not due to genetics, but rather to diet. Migration studies have shown that when Asians move to the United States and adopt a Western diet, they ultimately have the same cancer incidence as Americans.<sup>3,4</sup>

The American Cancer Society has created guidelines designed to help reduce the risk for cancer.<sup>2</sup> Their recommendations include:

- **Choose most of the foods you eat from plant sources**
- **Limit your intake of high-fat foods, particularly from animal sources**

Soyfoods fit these guidelines for a health-promoting diet. Soybeans contain high quality protein, and make an excellent substitute for animal foods.<sup>5</sup> Soyfoods and soy products are amazingly versatile, and can easily be incorporated into a varied diet.

Because of the trends seen in the epidemiological studies, case-control studies have been conducted to find out whether there may be a relationship between the consumption of soyfoods and decreased cancer risk. A study of dietary intakes and breast cancer showed that in premenopausal women, high intakes of animal protein were associated with increased risk, while high intakes of soyfoods were associated with decreased risk.<sup>6</sup> Other long-term studies have noted an inverse association between regular consumption of miso soup and breast cancer risk in premenopausal women.<sup>7</sup> This association has not been shown in postmenopausal women.

In Hawaii, a long-term study of 8,000 men of Japanese ancestry showed that men who ate tofu daily were only one-third as likely to get prostate cancer as those who ate tofu once a week or less.<sup>8</sup> Other case-control studies conducted in Asia have shown an association between regular consumption of tofu or other soyfoods and a 66% to 80% decreased risk for rectal cancer.<sup>9,10</sup>

**Anticarcinogens in Soybeans** Soybeans contain five classes of compounds which have been identified as anticarcinogens. These include isoflavones, saponins, phytates, protease inhibitors, and phytosterols.<sup>11</sup> Most of these substances can be found in many different plant foods, but soy is the only significant dietary source of isoflavones. Soy isoflavones, especially genistein, have been the subject of a tremendous amount of cancer research.



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Isoflavones are weak estrogens. They can function as antiestrogens by binding estrogen receptors in place of the potent physiological estrogens, thus blocking them from exerting their effects.<sup>12</sup> Theoretically this would reduce risk for cancers which are stimulated by estrogen, such as certain breast cancers. Animal studies have shown that consuming soy isoflavones inhibits chemically induced mammary tumors.<sup>13,14</sup> However, the cancer-fighting properties of genistein apparently go beyond its antiestrogenic effects. Genistein has been found to inhibit colon cancer in rats.<sup>15</sup>

In vitro studies have demonstrated that genistein inhibits the growth of human prostate cells and human breast cancer cells.<sup>16,17,18</sup> Genistein has been shown to inhibit tyrosine kinases, and thereby block the growth and proliferation of cancer cells.<sup>19</sup> It selectively inhibits cancer cells, and leaves normal cells alone.<sup>20</sup> Genistein also inhibits angiogenesis, the growth of new blood vessels.<sup>21</sup> A tumor cannot grow large and thrive without its own blood supply, so this is another way in which genistein protects against cancer. Genistein is also a potent antioxidant that blocks formation of oxygen free radicals, which are involved in cancer promotion.<sup>22</sup> Clearly, there are several possible ways in which genistein may reduce cancer risk.

Saponins, phytates, and protease inhibitors have been called antinutrients, and were viewed negatively in the past. Now scientists are finding that they also have benefits. Saponins are antioxidants, and thus protect against cell damage. Saponins were recently shown to inhibit the growth of colon cancer cells in vitro.<sup>23</sup>

Phytates are known for their ability to bind minerals like calcium and iron, making them unavailable for absorption. In the case of excessive iron intake, this could be beneficial because it would help prevent the formation of tumor-promoting free radicals. Phytates may also directly inhibit growth of cancer cells.<sup>24</sup> Protease inhibitors interfere with digestion of protein. However, they are largely inactivated by heat, so are present in soyfoods in only small amounts.<sup>25</sup> Protease inhibitors apparently prevent the activation of oncogenes, which cause cancer.<sup>26</sup> Animal studies have shown that protease inhibitors suppress several types of cancers in vivo.<sup>27</sup>

The other soy anticarcinogen, phytosterol, is a plant compound which is largely unabsorbed by humans. As a result, it goes to the colon intact, where it appears to exert a protective effect. Phytosterols have been shown to inhibit carcinogenesis in animal models.<sup>28</sup> Much of the research on soy and cancer prevention has investigated the effects of individual compounds. However, it is important to keep in mind that the combined effects of these phytochemicals may be more than the sum of the parts. By eating whole soyfoods we gain the benefit of all these compounds, plus any synergy which may occur among them.

**Conclusion** Soyfoods fit the dietary recommendations for reducing risk of cancer. Soy contains several substances which are anticarcinogenic, but their mechanisms of action are not clear. The possible role of soy in cancer prevention and treatment is encouraging, and further research is warranted.

**For more information, call 1-800-TALK SOY. Or visit our Web site at [www.talksoy.com](http://www.talksoy.com)**

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