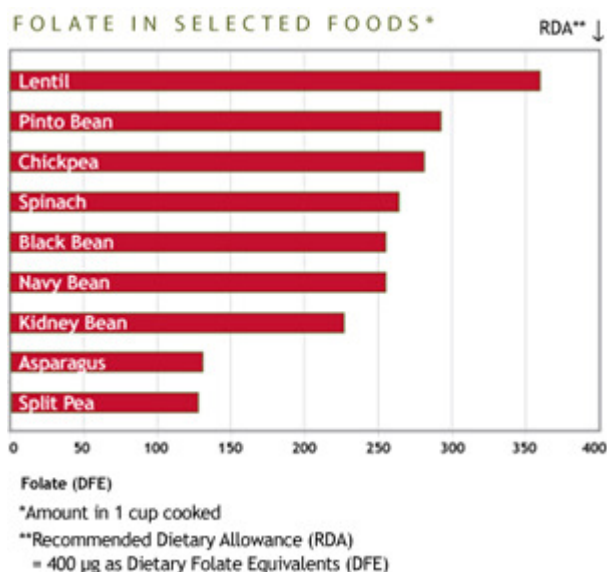


Beans and Cancer

by Maurice R. Bennink and Elizabeth A. Rondini
 Food Science and Human Nutrition
 Michigan State University

Introduction

It is becoming increasingly apparent that many people could reduce their risk of developing a chronic disease simply by eating more beans. Chronic diseases are conditions that typically take many years (10 to 30 years) to develop and include certain types of cancer, type 2 diabetes mellitus, heart disease, and other diseases of the blood system. These diseases are the most common causes of death in the U.S. and they significantly lower the quality of life for millions. Beans are often overlooked in the diet of Western societies even though they are all naturally low in fat and are a significant source of both soluble and insoluble fibers, protein, essential vitamins and minerals, and phytochemicals (1). The beans referred to here are the dry beans such as navy, black, red, brown, pinto, kidney, etc. Soybeans are not included in this category. In a four part series, we will review 25 years of research that relates bean consumption and various aspects of health.



TOTAL DIETARY FIBRE*

	Fibre (grams)	Percent Daily Value**
 Navy Bean	19.1	76%
 Split Pea	16.3	65%
 Lentil	15.6	62%
 Pinto Bean	15.4	62%
 Chickpea	12.5	50%
 Bran Flakes	7.1	28%
 Whole wheat spaghetti	6.3	25%
 Whole wheat bread	3.8	15%

*Amount in 1 cup cooked, except for Bran Flakes (1 cup dry) and whole wheat bread (2 slices)
 **Recommended daily value = 25 grams fibre/day

Beans and Inhibition of Cancer

Most epidemiological studies examining relationships between diet and cancer put little emphasis on legume/pulse (peas, lentils, soy beans, peanuts) consumption. The primary emphasis has been on intakes of total fat, animal fat vs plant fat, animal protein vs plant protein, minerals, vitamins and fiber. Even when legume intake is assessed most studies do not distinguish amongst the various legumes. Thus, it is impossible from these studies to determine the effect of dry beans on cancer versus the effect of any legume on cancer. In the Adventist Health Study, food intake patterns and colon cancer incidence were studied for 20 years. This study detected a significant inverse relationship between frequency of legume intake and colon cancer incidence (2,3). Singh and Fraser (2) noted that individuals consuming legumes more than 2 times per week were 47% less likely to develop colon cancer than individuals that consumed legumes less than once per week. Kolonel et al. (4) differentiated between soy and non-soy legumes and found an inverse relationship between non-soy legume consumption and prostate cancer.

Dry beans are generally the most commonly consumed non-soy legume, so this study suggests that beans inhibit prostate cancer. Soy consumption was not related to prostate cancer incidence. Correa (5) was the only one to specifically examine bean consumption and cancer mortality. Data from 41 countries revealed that countries with the greatest consumption of beans had the lowest death rates due to breast, prostate, and colon cancer. Although limited in number, these epidemiological studies suggest that eating beans will help reduce breast, prostate, and colon cancer.

Inter country comparisons and prospective, long-term human studies are extremely important. In such studies, researchers attempt to control parameters that are known to influence cancer. But the precise importance of these known factors and the strong possibility that other cancer modifying factors are in the diet compel researchers to use additional approaches to measure food contribution to cancer risk. Animal studies are often used when dietary factors need to be carefully controlled for long periods and to provide additional support for epidemiological findings.

Two animal studies specifically demonstrated that bean consumption reduces colon cancer (6,7). Hughes et al. (6) fed rats either pinto beans or casein (milk protein) and found that feeding pinto beans reduced the number of rats with colon cancer by 50% compared to casein-fed rats. Moreover, in rats that did develop tumors, rats fed pinto beans had only 1 tumor while rats fed milk protein had 2.5 tumors. In a similar study, Hangen and Bennink (7) fed rats a casein-based diet, a diet containing black beans, or a diet containing navy beans. They reported that feeding either black beans or navy beans reduced the number of animals that had colon cancer by over 50%. Similar to Hughes et al. (6), the number of tumors per rat was 50% less in bean fed rats. Hangen and Bennink (7) noted that rats fed beans were significantly leaner compared to control animals. These two animal studies provide confidence that the epidemiological studies are detecting a true effect of bean consumption and reduction of colon cancer.

How beans slow cancer growth and which component(s) of beans have anticarcinogenic properties are not yet known. One potential mechanism whereby beans could inhibit cancer is related to regulation of blood glucose and insulin. Even though foods containing equal amounts of carbohydrate are consumed, some foods cause a much greater increase in blood sugar (glucose) and insulin concentrations than other foods. The glycemic index measures the rise in blood glucose after eating a test food compared to eating an equal amount of carbohydrate from either glucose or white bread. Foods with a high glycemic index cause a more rapid and greater rise in blood glucose and insulin than foods with a low glycemic index. Eating foods that have a high glycemic index for a long period of time can lead to hyperinsulinemia, insulin resistance and type 2 diabetes mellitus. Recent research findings suggest that high levels of blood insulin (8,9) and/or high levels of blood glucose (10) promote colon cancer. The Cancer Prevention Study by the American Cancer Society found that subjects with type 2 diabetes have a higher propensity of developing colon cancer than individuals without diabetes (11). Type 2 diabetics typically have elevated blood glucose and insulin concentrations. Data from other large prospective studies also suggest that subjects with type 2 diabetes have an increased risk of colon cancer (12,13). Additional evidence supporting the relationship between hyperinsulinemia and promotion of colon cancer was provided by two studies that utilized animals exposed to a colon carcinogen and subsequent injections with insulin. Insulin injections promoted both the early stages of colon cancer (14) and growth of colon tumors (15).

It is well documented that eating beans produce low blood glucose and insulin concentrations compared to most other sources of dietary carbohydrates (16-25). Taken together, these studies suggest that eating beans to keep blood insulin and glucose low may be one mechanism that slows colon carcinogenesis.

The second issue of this series will discuss the relationship between high glycemic foods and the onset of obesity. Excess body fat increases the risk of developing cancers of the breast, colon, prostate, endometrium, kidney, and gall bladder (26). It is likely that hyperinsulinemia and excess body fat are acting in synergy to enhance a variety of cancers. Future studies are expected to show that excess insulin and body fat alter metabolic pathways that enhance cancer.

Beans contain phytonutrients such as flavonoids, tannins, anthocyanins, protease inhibitors, phytic acid, and saponins. Phytonutrients are not considered to be essential nutrients. However, research over the past 15 years clearly demonstrate that some phytonutrients do provide health benefits. Purified protease inhibitors, phytic acid, and saponins inhibit various aspects of carcinogenesis (27-29). But direct evidence that these phytonutrients in foods inhibit cancer is lacking. Therefore, how much of the anticancer activity associated with beans is due to phytonutrients remains to be determined.

It is estimated that appropriate diet choices, weight control, and exercise could reduce cancer incidence by 30-40% (30-32). This translates to 3 - 4 million fewer cancer cases annually for the world and to about 700,000 - 900,000 fewer cases for the USA. The World Cancer Fund/American Institute for Cancer Research (32) recommend that diets be rich in fruits, vegetables, legumes and whole grains to reduce cancer risk. We suggest that dry beans should be a major component of the legume category. Slowing the rate of cancer development even slightly will dramatically increase the number of cancer free years, increase quality of life, and lower medical costs. Eating beans could be an extremely cost effective approach for improving health.

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