

Virtues of Soy

*A
Practical
Health Guide and Cookbook*

Written and Cover Illustration
by

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A Practical Health Guide and Cookbook

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*This book is dedicated to Michael Tagrin.
My devoted husband, lover, best friend and soul mate.
You showed me the value of patience, perseverance and
the importance of integrity.
Thank you for your encouragement, enthusiasm, love and support.
You helped me make this book, and so much more in my life, possible.*

*This book is also dedicated to my parents,
Marianne and Warren Gilbert.
My mother gave me a passion for cooking and discovering different
cuisines, and my father, ambition and a thirst for knowledge.
Thank you both for all your love and support.*

*Each, in their own special way,
influenced my life and inspired my actions.*

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INTRODUCTION

Soy is an extremely versatile and nutritiously packed legume (bean) which promotes good health and vitality. Current research suggests soy foods can ward off heart attack, stroke, various cancers, osteoporosis, menopausal symptoms, diabetes and kidney disease. These medical conditions and diseases are widespread and approaching epidemic levels throughout our Western society. Yet soy is still a mystery to many Americans. Therefore, I feel it is my mission to educate and enlighten everyone interested in this glorious bean.

This book will examine the many *Virtues of Soy*. Not only will it describe the benefits of soy nutrition, it will also teach you how to incorporate soy into a health promoting diet. There are three very good reasons why you may want to learn how to make your own soy foods. First of all, soy can protect and enhance your overall health. Secondly, preparing your own soy foods is much more economical than buying it ready made. Finally, good old-fashioned home cooking is usually tastier, more varied and more nutritious than most commercially prepared foods.

The first part of this book discusses the background and nutritional breakdown of soy. It also details how and why soy positively affects the various health problems mentioned above. All this information is presented in a question and answer format, with references for each section provided at the end of the book. If you have any medical condition, please consult your doctor before making any dietary changes.

The second part of this book explains how to deliciously prepare soy-based products like tofu, textured soy protein, soy flour, tempeh, miso and soymilk. I have included 169 of my favorite original kitchen-tested recipes. Follow the recipe instructions carefully at first. Once you are sure of the cooking process and flavor, you can begin to experiment on your own and make adjustments to fit your own taste. Cooking should be a magical and creative event that provides enjoyable nourishment, so have fun with it.

I have been learning about and using soy for more than ten years, and would like to share with you the knowledge that I have gained along the way. The soybean has a very long and interesting past, with a very promising future. Soy and soy-based products possess many unique qualities. Because soy foods contain components that provide health benefits beyond basic nutrition, I consider soy as culinary medicine. Once you become informed about soy's many attributes and uses, you will be more apt to include it into your diet as well. By doing this, you too can reap soy's benefits and enjoy a happy healthy long life.

CHAPTER 1: SOY CULINARY HISTORY & DIETS

Recent studies show evidence that adding soy to your diet makes good nutritional sense and provides many health benefits. The Mayo Health Clinic newsletter reports rates of heart attacks, cancer and osteoporosis are far lower in Asian cultures where soy is the main source of protein. This has fueled the current interest in, and increased research of, soy. However, considering soy foods as culinary medicine is not a new concept. China has been extensively cultivating and using soybeans as a source of food and medicine for 5,000 years. So important are soybeans to the Chinese that they're considered one of the five sacred foods for health and well being, along with rice, wheat, barley and millet.

How can I know that soy foods are not just one of the latest health food fads, in the news today and forgotten by tomorrow?

While soy may be considered a new health food in the United States, soy and soy-based products actually have a long and extensive culinary history. More than 3,000 years ago farmers in Manchurian China began cultivating the wild legume to grow upright, and made soymilk from the beans. Around 2,200 years ago, in Han Dynasty China, soybeans were first fermented to make douchi, the predecessor of soy sauce and miso. Soy began to be fermented to make miso (soy paste), shoyu (soy sauce) and tempeh (a soybean cake invented in Indonesia). During this time, the Chinese also ate and considered steamed green soybeans (edamame), roasted soynuts, doufu (soy curd) and soybean sprouts highly nutritious.

Several hundred years later, during the sixth and seventh centuries, the Japanese began adopting many aspects of Chinese culture including the processing of soybeans into doufu (which became known in Japan as tofu). Japanese monks refined and exclusively made tofu and miso until the tenth century.

During the seventeenth century, the flourishing spice trade in the Far East brought soy sauce and tofu over to Europe. Soy sauce became a popular and widely traded commodity at this time.

Benjamin Franklin introduced tofu to America. He discovered it while living in France in the late 1700's. Samuel Bowen was the first to bring the soybean to America for cultivation. By 1767, soybeans were being grown in Savannah, Georgia, processed into soy sauce and sold to England. During the civil war soybeans were even used to make a facsimile of coffee.

In the 1930's, the United States began to explore and develop soybean varieties through hybridization. By the 1940's, the United States Department of Agriculture (USDA) promoted soy to be grown as a green vegetable. To supplement protein requirements and help civilians through

the food rationing of World War II, people were encouraged to plant soybeans as part of their victory garden. During this time, canned soybeans were also available in grocery stores. After World War II, farmers found soybean oil to be a growing market for their crops. Grocery stores began selling soy oil, pure or blended, under the generic name vegetable oil. Every part of the soybean found a use.

By the late 1950's, soy flour, soy grits and 70-percent soy concentrates had been perfected. Soy flour became an added ingredient in many bakery goods. By 1960, a 90-percent soy protein extract had been produced. During the 1960's, *Baco-bits*, a non-meat bacon substitute, became America's first commercially successful soy-based product. By 1970, the first soy protein with the texture of meat was developed and marketed as Textured Vegetable Protein (TVP).

In 1980, tofu appeared in U.S. supermarkets. Health food stores and Asian food markets were no longer the only suppliers of tofu. Americans were introduced to *Tofutti* in 1982, the first popular non-dairy ice cream using a blend of tofu, soymilk, and other soy proteins. The mid-1980's marked the beginning of the ready-made and frozen second generation soy foods, like soy-based hotdogs, burgers, cold-cuts and entrees.

During the 1990's, the USDA allowed up to 30 percent of soy in school lunch meats like hamburgers and chicken patties. A few schools were allowed to offer 100 percent soy foods through a la carte menu. There, students were able to buy whatever combinations they wanted, not just USDA approved meals.

By the year 2000, federal officials concerned with the amount of fat in school lunches, dropped their restrictions on how much soy could be used in all federally subsidized meals. They allowed schools and day care centers to increase the amount of soy added into their standard meals to 100 percent. Schools could now serve completely meatless entrees consisting of tofu, veggie-burgers and other soy-based products as meat substitutes. During that same year, the federal government also updated its Dietary Guidelines for Americans, which for the first time, recommended soy products. The new guidelines included soy-based beverages (soymilk) with added calcium in the dairy group, as well as, tofu and soy-based burgers in the meat and beans group.

Today, a much wider variety of soy-based foods can easily be found on grocery store shelves. Food manufacturers have introduced more than two thousand new soy-based products to the American marketplace since 1985, and the number is ever increasing as each day goes by. Besides the traditional soy foods like tofu, soy sauce, miso and tempeh, soy also comes in other forms, known as modern soy foods. These include soy flour, textured soy protein (textured vegetable protein), soy meal, soy concentrates, and soy isolates. A second generation of soy foods based on

traditional and modern soy products has blossomed. These processed foods include soy-based burgers, hotdogs, cold-cuts, frozen entrees, soy cheese, soy yogurt, soy ice cream, pocket sandwiches, snack bars and soy protein powders, just to name a few. Many mainstream grocery stores are even prominently displaying soy products right alongside traditional food items. Americans have such a diverse selection of soy products to choose from in today's marketplace, that soy foods are definitely here to stay.

What sparked so much interest in soy and soy-based products?

Demographic studies from around the world suggested that soy products and their constituents are partly responsible for the lower rates of chronic diseases and conditions in different populations. Many Asian societies traditionally use soy and soy-based products as their primary source of protein. After noticing dramatically lower rates of heart disease, cancer, osteoporosis and menopausal symptoms in many of these Asian cultures, researchers began to increase their focus on soy.

Chinese researchers have shown that people who eat a traditional Asian diet have lower blood cholesterol levels and are much less likely to suffer the physical symptoms of heart disease. The American Journal of Epidemiology published a study noting that people in China and Japan historically have had lower rates of breast, colon, rectal, lung, stomach, prostate, endometrial and ovarian cancers. Studies of Chinese and Japanese women reveal that they have one-fifth the rate of breast cancer of U.S. women. When comparing dietary habits to bone health, Asian women tend to have a lower incidence of osteoporosis than American women. Population studies also disclose that Asian women have fewer hot flashes and other menopausal symptoms than their American counterparts. About 85 percent of North American women report experiencing hot flashes, while only 25 percent of Japanese women report the same.

However, what researchers find most compelling is that the cancer mortality rates in Asian countries are much lower than in the United States. Countries which consume large quantities of soy in their diet also have very low rates of cancer death, even though many of them have high rates of smoking. In Japan, the mortality rate from breast cancer is only one-fourth, and the death rate from prostate cancer one-fifth, that of the United States. Interestingly, the rate of getting prostate cancer is the same for both Japanese and American men; however, the rate of death from prostate cancer is far lower in Japan than in the United States. In Asia, prostate cancer often does not develop into any life-threatening condition, while in the U.S. and other Western countries, it more often develops into an advanced and aggressive form.

What exactly is the typical Asian diet, and how is it different from the standard American diet?

Soy foods are used in many Asian countries like China, Japan, Taiwan, Korea, Indonesia and Vietnam. While the Chinese have been using soy the longest, the Japanese have been using the widest variety of soy products. The typical Asian diet is high in fruits, vegetables, rice, green tea and soy. Protein is mainly derived from soybeans, tofu, miso, soymilk, tempeh and many other soy-based products. This type of diet is low in meat, fat and dairy products, with a moderate amount of fish. Meat is used more as a condiment than the main course. The quick method of cooking, characteristic of Asian cuisine, also plays an important role in the Asian diet. Steaming and stir-frying reduces the amount of fat needed to prepare foods, and allows foods to retain much of their nutrients.

In contrast, the standard American or Western diet is high in meat, dairy, potatoes, starches, sugar, soda, fast foods and junk foods. Beef, pork, fish and poultry are the main sources of protein. This type of diet is low in fiber and high in saturated fats and cholesterol. Deep-fried foods, such as french fries, potato chips and onion rings, are popular but very unhealthy. This method of cooking causes foods to absorb a high amount of fat, and the oils used to deep-fry are not always the best. Often vegetables are overcooked, causing them to lose many of their nutrients. The quick method of eating, characteristic of American dining, also plays an important role in the Western diet. The convenience of ready made and processed foods often provides a lot of calories with little nutritional value.

What makes researchers believe that a soy rich diet is the cause of the health differences between Asian and Western populations?

Researchers have been studying soy's health benefits for more than 30 years. Results from various population-based studies demonstrate that soy products have a protective effect against many chronic diseases and health problems. Research on diet's role in heart disease and cancer has found the plant-based diets in many lesser developed societies are the healthiest, so long people get enough to eat. Countries where soy consumption is high have relatively low rates of prostate and breast cancer compared to the United States and European countries, where soy consumption is low. Over 20 studies involving Asian participants found that consuming just one serving of soy daily is associated with a reduced risk of breast, prostate, colon, rectal, lung, and stomach cancers. One study in Japan even showed that men who consumed tofu five times a week had their risk for prostate cancer reduced by 65 percent.

Migration studies also supports the theory that a soy-based diet protects against many major health problems. When people from Asian countries move to Western countries, like the United States or Australia, and take on a Western diet, their health starts to change. They begin to have the same chronic diseases, conditions, and rates of death typically seen in these Western countries. Chinese research shows that when Chinese people move to Western cities, such as San Francisco or Sydney, their arteries make the changes which lead to heart disease. By adopting a Western diet and lifestyle, they increasingly begin to suffer the physical symptoms associated with this disease. Migration studies also disclose that when Japanese men move to Hawaii and take on the typical low-soy American diet, their death rate from prostate cancer increases to the same level as American men.

Since the early 1990's, well over 1,000 research articles have been published on soy and how it positively affects cholesterol levels, the cardiovascular system, cancer, osteoporosis, and menopause. Researchers concluded that diet and lifestyle factors, not genetics, are primarily responsible for the health differences between the two cultures.

What kind of diet do researchers recommend to promote and maintain good health?

According to the American Institute of Cancer Research (AICR), the smartest strategy to promoting good overall health is to eat a balanced, predominantly plant-based and nutritionally-dense diet. Most of your daily calories should come from vegetables, fruits, whole grains and beans, especially soy.

Take advantage of the highly developed food distribution system, which allows a vast array of fruits, vegetables and other plant foods to be available throughout the year. Eat less fat and more fiber. Make plant-based foods the largest part of every meal. Limit the amount of animal-based foods, such as meat and dairy products, which are loaded with saturated fat and cholesterol. Use olive oil or canola oil instead of butter or margarine to reduce your intake of saturated fat and hydrogenated fat. Moderate your consumption of fried, salted and smoked foods. Eat portions to satisfy hunger, not to clean the plate. The AICR recommends these steps to help protect against several cancers, lower the risk of heart disease and promote good health. Soy and most soy-based products meet these dietary guidelines. They are low in saturated fat, high in fiber, and contain many other important nutrients which offer protection from health problems like heart disease, stroke, cancer, osteoporosis, diabetes and kidney disease.

The National Cancer Institute (NCI) links one-third of all cancer deaths to diet. They state that we can reduce the risk of cancer and other chronic

diseases through dietary means. Both the AICR and the NCI believe in the benefits of eating a plant-based diet, rich in soy foods. They feel it is reasonable for most of us to include soy products, like tofu, soymilk, tempeh and textured soy protein, as part of a healthy diet. If nothing else, soy can be an excellent and complete alternative protein source when decreasing your consumption of meat and dairy products.

However, researchers do not want people to consider soy as a magic bullet to counteract bad eating habits. They don't want people to rely on adding just one or two soy products to their diets while continuing to eat foods high in saturated fat and cholesterol. Nor do they advise people to consume large quantities of soy supplements to try to achieve soy's health benefits. Balance, moderation, and variety are the keys to a healthy diet. Nothing should be excessively consumed. Loading up on any one food or nutrient is never wise. Each soy-based or plant-based product provides a different chemical composition. The best way to take advantage of these various beneficial nutrients and compounds, is to adopt good eating habits which include a wide assortment of nutritionally-dense foods.

CHAPTER 2: NUTRITIONAL & BENEFICIAL COMPOUNDS

Soy foods are nutritional powerhouses, providing many essential nutrients the body needs every day. Soy and soy-based products contain all three macro-nutrients the body needs in large amounts to function properly, namely protein, carbohydrates and fat. They also contain many micro-nutrients that the body needs in small quantities to maintain good health. These include vitamins and minerals, as well as beneficial compounds like phytochemicals and antioxidants.

Soybeans and most soy-based products are high in protein, dietary fiber, and a variety of micro-nutrients and phytochemicals. Low-fat complex carbohydrate soy foods, like textured soy protein and soy flour, offer protection against colon, rectal and pancreatic cancers due to their high content of fiber, vitamins, minerals and phytochemicals. These products along with tofu, tempeh and soymilk, can lower cholesterol and the risk of heart disease; reduce the risk of some breast, ovarian and prostate cancers; prevent osteoporosis and diabetes; and ease many menopausal symptoms.

Which particular vitamins and minerals are found in soy foods?

Soy foods contain a wide array of vitamins and minerals. They are very good sources of vitamin E and many of the B vitamins, especially niacin, pyridoxine (B-6) and folacin (folic acid). Vitamin E is needed for muscle development, red blood cell protection, blood clot prevention, male potency and various other bodily functions. It works with selenium in strengthening capillary walls and protecting tissue against the oxidation of LDL cholesterol (the bad cholesterol). Vitamin E is an antioxidant that helps maintain a healthy heart. It also has been linked with slowing the aging process.

Niacin is essential for healthy skin, digestive track, nervous system and the production of sex hormones. Pyridoxine (B-6) helps the body process amino acids and enhances the immune system. Blood levels of this vitamin naturally decline with age. It is necessary for macro-nutrient metabolism, energy conversion and weight control. Folic acid (folacin) is needed for cell growth and reproduction. It functions with vitamins B-12 and C in breaking down proteins and making hemoglobin (a compound in the blood that carries oxygen from the lungs to the cells and carbon dioxide away from cells and back to the lungs). Folic acid also helps make hydrochloric acid in the stomach (which is required for digestion), stimulates the appetite, and slows the graying of hair.

Soy foods are also loaded with the minerals iron, zinc, potassium, copper, magnesium and calcium. Iron is needed for healthy red blood cell production. It is vital for the formation of hemoglobin and myoglobin (a

compound that causes muscle tissue to be red in color and able to store oxygen). Zinc aids digestion, the metabolism of protein, prostate gland function and the body's healing process. Potassium helps control the activity of nerves and muscles. It is also one of the important minerals that help regulate blood pressure. Copper works with vitamin C to form elastin and aids the formation of red blood cells. It is needed for good bones, hair color and skin. Magnesium works with calcium and phosphorus for the healthy maintenance and formation of bones and teeth. It is a catalyst in the utilization of macro-nutrients, essential for the production and release of energy. Magnesium is also important for proper nerve, heart and muscle function, healthy arteries, and mental alertness.

While soybeans have a modest amount of calcium, tofu is an excellent source of this important mineral, when it is processed with calcium sulfate (gypsum). Calcium is necessary for the development of strong and healthy bones and teeth. It also helps nerve signal transmissions, muscle contractions, blood clotting, and heart function. A healthful diet with adequate calcium is crucial in achieving peak bone mass in children and young adults and maintaining bone health during adulthood. Individuals who do not store enough calcium throughout their lives have an increased risk for developing osteoporosis. Recent findings show calcium may also help relieve menstrual cycle discomfort. Other soy products, like soymilk, have added extra vitamins and minerals, like vitamin D and calcium, to boost their nutritional profile. To see if you are getting a calcium-rich soy food, check the list of ingredients and the Nutrition Facts label.

I keep hearing how some fats are good for you and some are bad. I thought all fats were bad and should be eliminated from the diet. What makes a fat good or bad?

The body needs a certain amount of fat in the diet. It stores fat to serve as a quick energy source and to protect important organs. However, all fats and oils are high in calories. Fats provide 9 calories for each gram contained in food, while protein and carbohydrates each provide only 4 calories. While fat is necessary and essential for proper health, some types of fats are damaging to the cardiovascular system.

Artery-clogging fats that increase blood cholesterol include saturated fat and trans fat. Saturated fat mainly comes from animal sources like meat and dairy products, but it can also be found in coconut and palm oils. Trans fat comes from hydrogenated vegetable oils, like margarine and vegetable shortening. Both saturated fats and trans fats stay solid at room temperature.

A more heart healthy fat is unsaturated fat, generally found in vegetables. This type of fat includes both monounsaturated and

polyunsaturated fats. Monounsaturated fat is found in olive, canola and peanut oils. These oils are liquid at room temperature but start to thicken when refrigerated. This type of fat is considered the healthiest for your heart and body. Avocados and nuts also contain monounsaturated fat. Polyunsaturated fat is found in soybean, corn, safflower and sunflower oils. These oils are liquid at room temperature and in the refrigerator. This type of fat is considered the next healthiest fat that does not clog arteries.

However, when unsaturated vegetable oils are manufactured into solid form, they turn into trans fats. This type of fat is commonly called fully or partially hydrogenated vegetable oil in a food's list of ingredients. Trans fats are found in hundreds of processed foods, usually to protect against spoiling and to enhance flavor. Restaurants tend to use a lot of trans fat (hydrogenated vegetable oil), especially for frying.

Trans fats are even worse for the cardiovascular system than saturated fats. Researchers have conservatively calculated that trans fats alone account for at least 30,000 premature deaths from heart disease every year in the United States. Recent studies indicate that trans fats drive up the body's LDL, the bad cholesterol, even faster than saturated fats. High levels of cholesterol has been linked to heart disease and stroke.

Diets high in fat, particularly saturated fat, also promotes breast, colon, endometrial, lung, prostate and rectal cancers. Therefore, saturated fats and trans fats are the only fats that we should strive to eliminate from our diet. Replace these fats with monounsaturated and polyunsaturated fats. The American Heart Association recommends that daily fat intake should be less than 30 percent of total calories; saturated fat intake less than 8-10 percent of total calories, and cholesterol less than 300 milligrams per day.

What kind of fat is found in soy foods? Are soy foods high in fat?

Soybeans and most soy products contain no cholesterol and virtually no saturated fat. The fat found in soy foods is mostly polyunsaturated and high in essential fatty acids, especially Omega-3. Our body cannot produce essential fatty acids, but we need them for correct growth and functioning. Omega-3 is necessary for proper brain growth and development. Tests have shown Omega-3 fatty acid can help lower blood cholesterol levels and inhibit the growth of tumors. Evidence also suggests Omega-3 can reduce the risk of cardiovascular disease, hypertension, arthritis and diabetes.

The actual fat content in soy foods varies considerably. Some soy-based products like textured soy protein and defatted soy flour contain next to no fat, because processing methods extract the fat from these products. Other soy foods do contain fat, like tofu, tempeh, soy cheese, soy yogurt and soymilk. However, low-fat varieties of these soy products are also available. Some second generation soy products can be high in total fat or

contain trans fat (hydrogenated oil). Always read the Nutrition Facts label and list of ingredients to find out the amount of, and the type of, fat contained in any particular soy food. Avoid all foods that have fully or partially hydrogenated oil in its ingredients.

Are soy foods a good source of fiber?

Yes, soybeans and many soy-based products are excellent sources of fiber. According to the American Heart Association (AHA), fiber is important for the health of the digestive system as well as for lowering cholesterol. Dietary fiber is a transparent solid carbohydrate that is the main part of the cell walls of plants. It is nondigestible, but provides the bulk needed for proper functioning of the stomach and intestines. Fiber promotes healthy intestinal action and prevents constipation by moving bodily waste through the digestive tract faster, so harmful substances don't have as much contact with the intestinal walls. Both the AHA and the National Cancer Institute recommend that people consume 25 to 30 grams of fiber a day.

Whole soybeans and foods made from whole soybeans, such as soy flour, textured soy protein and tempeh, are extremely rich in fiber. Some soy foods, like tofu and soymilk, contain very little fiber due to the way they are processed. Tofu, for example, leaves most of its fiber behind in processing when the milk is squeezed from the soybean. A fiber-rich diet is very important in reducing the risk of getting heart disease, certain types of cancer and diabetes.

I keep hearing so much about the benefits of soy protein. What makes soy protein so good?

The soybean is the only vegetable offering a complete protein profile. Soy protein is of the highest quality, equal to that of meat and dairy products, but without the cholesterol and saturated fat. It can be the sole source of protein, without causing any nutritional imbalance. Our body breaks down protein into individual amino acids, which form helpful antibodies and enzymes for our bodies. Amino acids are necessary for proper growth, development, health and maintenance. Of the twenty-two amino acids we require, our body produces only fourteen. These are called nonessential amino acids. The remaining eight are called essential amino acids, which must come from the foods we eat.

Soy protein provides all eight of these amino acids, making it a complete protein. Besides having a higher quality protein, soybeans also have a higher amount of protein than other beans. Soybeans have 35 to 38 percent of total calories coming from protein, while other beans only have

about 20 to 30 percent. However, not all soy foods contain the same amount of protein. Extra firm and firm tofu, for instance, has more protein than soft or silken tofu because they contain less water. Read the Nutrition Facts label on soy foods to determine the protein content.

Soy protein also contains a high concentration of the phytochemical compound called isoflavones. Soy isoflavones possess a myriad of biological properties that can benefit the body. Chemists at the USDA found that the isoflavones in soy protein help certain cells screen out error-prone messages before they can do any damage to the body. Therefore, scientists have attributed most of soy's positive health effects to its unique combination of protein and isoflavones.

What are phytochemicals? Are isoflavones the only phytochemical contained in soy?

Phytochemicals are a large collection of chemical compounds found only in plants (phyto means plant). Many hundreds of these bio-active plant chemicals are found in dietary sources. Phytochemicals have become a catchall term for the vast array of chemical substances found naturally in beans, fruits, vegetables, nuts, seeds, grains, herbs and spices.

Soybeans contain a variety of phytochemicals. They are the only food source with nutritionally significant amounts of one important class of phytochemical called isoflavones. While low levels of isoflavones can be found in chick peas and other legumes, soybeans are unique because they have the highest concentrated amount of this beneficial compound.

The phytochemicals in soy show tremendous potential to fight disease on several fronts. Researchers have discovered that isoflavones protect against errant cell signals that can spark illness. Isoflavones have been shown to help prevent the buildup of arterial plaque which leads to atherosclerosis (hardening of the arteries) and heart disease. These compounds help to reduce breast cancer by blocking the cancer-causing effects of human estrogen, and fight osteoporosis by stimulating bone formation. Evidence also suggests that isoflavones decrease many of the symptoms associated with menopause and PMS.

Laboratory studies reveal that soy contains several other phytochemicals that also impede or prevent the development of cancer, like protease inhibitors, saponins, and phytosterols. Protease inhibitors have been shown to slow the rate of cancer division in cells, saponins may prevent cancer cells from multiplying, and phytosterols seem to block estrogen.

How do isoflavones offer protection against major health problems?

A great deal of research indicates isoflavones have many beneficial and

protective health effects. In various experiments, isoflavones have been found to lower cholesterol, possess anti-cancer activity, inhibit bone resorption and relieve many menopause symptoms. Studies suggest soy isoflavones account for approximately three-fourths of this protection, while soy protein is responsible for about one-fourth. Isoflavones are a type of phytoestrogen, or plant hormone, that resembles human estrogen in chemical structure yet are weaker in their estrogenic activity. Researchers have identified at least twenty different phytoestrogens. These weaker compounds mimic human estrogen at certain sites in the body, providing many health benefits that enable the body to stay clear of disease.

Researchers believe isoflavones act much like human estrogen in lowering cholesterol and reducing the risk for coronary heart disease. These phytoestrogens also offer protection against the detrimental effects that the stronger version of this hormone has on the body. Isoflavones can compete at the estrogen receptor sites with the estrogen naturally produced by the body. Their binding action blocks the more potent estrogen from exerting their full effect. Since high blood levels of estrogen are an established risk factor for breast cancer, weaker forms of estrogen may provide protection against this type of cancer.

Isoflavones also play an important role in maintaining and protecting bones. Some significant studies conducted at the University of Illinois concluded that consuming soy isoflavones can increase bone mineral content and bone density. By preserving bone health while increasing bone mass, researchers noted the potential role of soy isoflavones in preventing, and possibly even reversing, the effects of osteoporosis. Other studies suggest soy isoflavones can also be an alternative to estrogen replacement therapy for relief of mild menopausal symptoms.

The two primary isoflavones found in soybeans are genistein and daidzein. Researchers think that these are the particular compounds responsible for soy's beneficial and preventative properties. Studies over the past decade indicate that genistein dampens the communication from a cell's surface to its interior, filtering out the undesirable signals. Chemists discovered that genistein appears to calm cell circuits so that they are less receptive to errant chemical signals which come from poor diets or harmful environmental factors. This over-active or defective cellular signaling leads to many chronic diseases.

Evidence also shows that genistein inhibits the growth of cells that form artery-clogging plaque. In addition, genistein has also been found to hinder numerous breast and prostate cancer cell lines. In fact, the National Cancer Institute is even considering using the genistein found in soy as a cancer drug. Genistein acts against cancer cells in a way similar to many common cancer-treating drugs. Scientists believe that the body has certain enzymes that convert normal cells to cancer cells. Some cancer drugs

restrain these enzymes, and genistein has been shown to do the same.

Other studies signify that genistein and daidzein help promote strong and healthy bones. Researchers found that genistein suppresses the activity of osteoclasts, which are the cells that help the resorption of bony tissue in the bone regeneration process. Nutrition experts believe that daidzein prevents bones from breaking down. Interestingly, daidzein is very similar to a drug widely used in Europe and Asia to treat osteoporosis. When the body metabolizes this drug, it actually breaks down to form daidzein. Scientists are now developing and testing a synthetic version of daidzein for the treatment of osteoporosis in the United States.

All these findings suggest eating soy foods, natural sources of the isoflavones genistein and daidzein, can protect you against heart disease, cancer and osteoporosis. Soy isoflavones can reduce hyperactive cellular signaling, mimic the hormone estrogen, exhibit antioxidant capabilities, and perform other functions that enhance overall health.

How do isoflavones act as antioxidants?

Antioxidants are compounds that prevent or repair damage to cells caused by pollution, sunlight, and normal body processes. These elements cause oxidation in our body, which produce dangerous chemical compounds called free radicals. These compounds are highly reactive and have the potential to damage DNA, causing mutations that can result in the malignant transformation of cells. Free radicals can easily cause harm to the immune system, whose cells divide often. They may also be responsible for some of the changes of aging.

We can help the body in its ability to scavenge and destroy free radicals, before they cause harm, by supplying it with natural substances that act as antioxidants. These substances block the chemical reactions that generate free radicals in the first place, and destroy the ones that have already been formed.

Many laboratory studies have documented the strong antioxidant properties of soy isoflavones in the fight against heart disease. Oxidation, the same process that leads to rust on metal, causes fats to harden and form the blockages that damage arteries. Isoflavones incorporate into lipoprotein particles, such as LDL, and protect them from oxidation. This antioxidant effect can reduce the onset of atherosclerosis by decreasing LDL accumulation in blood vessel walls.

A reduced level of oxidative damage is also associated with a decreased risk of cancer. Research has found that the antioxidants in soy foods efficiently and effectively protects cells from free radical damage while boosting the immune system. This, in turn, helps to prevent cancer and premature aging.

Which soy foods are the best sources of soy protein and isoflavones?

Researchers believe that the least amount of processing and the closer to the whole soybean the better. Edamame, roasted soynuts, tempeh, textured soy protein, soy flour and soy protein powders are the best sources of both soy protein and isoflavones. The next best sources are tofu and soymilk. Researchers claim it's the combination of isoflavones and soy protein that provide the major health benefits. However, all soy foods differ in their content of protein and isoflavones, and some products contain little to none of these compounds. For instance, soy sauce has very little soy protein with no isoflavones, and soybean oil contains neither of these healthful substances.

Overall, traditional and modern soy foods are better providers of soy protein and isoflavones than many second generation products. Because of their processing methods, products like soy-based burgers, soy hotdogs, soy sausages and other meat replacements, may not be significant sources of isoflavones. Products made from alcohol extracted soy protein concentrate have lower quantities of isoflavones because this method removes most of these compounds. Second generation products such as soy hotdogs, soy burgers, soy cheese, soy yogurt, soy ice cream and soy isolate powders do provide soy protein. However, competition with other ingredients and various processing methods can affect the quality and the amount of their isoflavones. Additionally, many soy supplements are not very reliable sources of these beneficial compounds either. When concentrated into a pill form, the process can also destroy these healthful substances.

How much soy protein and isoflavones do researchers recommend consuming per day?

Researchers recommend consuming a soy rich diet that provides at least 25 grams of soy protein and 30-50 milligrams of isoflavones daily. Scientific studies have shown that 25 grams of soy protein a day in the diet is needed to produce a significant cholesterol lowering effect. The U.S. Food and Drug Administration (FDA) recently gave food suppliers permission to use labels on soy-based foods claiming a link between eating soy and a lower risk of heart disease.

To qualify for this health claim, a food must contain at least 6.25 grams of soy protein per serving. This amount is one-fourth of the effective level of 25 grams per day. A serving generally equals 1/2 cup of cooked soybeans, tofu, textured soy protein or tempeh, or 1 cup of soymilk. Foods eligible for the FDA health claim include soy beverages (soymilk), tofu, tempeh, soy-based meat alternatives, and some baked goods. Products that

carry the claim must also meet the requirements for low fat, low saturated fat, and low cholesterol content. Foods made with the whole soybean may also qualify for the health claim if they contain no additional fat, only that present in the whole soybean.

In Asian countries, the usual daily intake of isoflavones is about 30 to 50 milligrams. This is equivalent to about one to two servings of soy foods a day. Since the Asian population has significantly lower incidences of heart disease and cancer, experts believe this is a sensible and reasonable goal for most Americans trying to maintain optimum health.

The Third International Symposium on the role of soy in preventing and treating chronic disease noted recent studies showing increased amounts of soy isoflavones and protein can offer cardiovascular and bone protecting benefits to postmenopausal women. A daily dietary inclusion of 60-70 milligrams of isoflavones and 40 grams of soy protein had a positive impact on LDL-oxidation, HDL-cholesterol and significantly reduced bone turnover in healthy postmenopausal women.

Because of the variety of soy foods available, it is possible to consume soy protein and isoflavones at all meals and snacks throughout the day. Use the following table of average soy protein and isoflavone content to help create your own daily combinations. Keep in mind these examples of common soy foods are just averages based on comparing numerous reports and product Nutrition Facts labels. Some of these products may not have the soy health claim on their label, because they may not fit the fat criteria. However, they still can help you reach 25 grams soy protein and 30-50 milligrams of isoflavones daily.

Soy Product	Serving Size	Isoflavones	Protein
Textured Soy Protein	1/2 cup (4 oz.) cooked, 1/4 cup dry	55-60 mg	16 g
Tofu	1/2 cup (4 oz.)	35-40 mg	11 g
Roasted Soybeans	1/4 cup (1 oz.)	55-60 mg	16 g
Tempeh	1/2 cup (4 oz.)	55-65 mg	19 g
Soymilk	1 cup (8 oz.)	25-30 mg	10 g
Soy Flour	1/2 cup (3 ounces)	50-60 mg	16 g
Soy Protein Powder	1/3 cup (2 scoops)	60 mg	18 g
Whole Soybeans	1/2 cup (4 ounces)	55-60 mg	14 g

What is the best way to consume soy products to get the most health benefits?

Research indicates it is best to spread out the intake of soy products throughout the day. Incorporating small amounts of soy into most meals and snacks, rather than loading up on it all at one sitting. The health claim on soy food labels is approved for one-fourth of the recommended daily amount of soy protein. The FDA does not expect people to consume all 25 grams of soy protein in one meal. Additionally, a series of studies designed to determine how the body absorbs and utilizes soy isoflavones, concluded that the absorption of isoflavones from food may be saturable. This means once these compounds reach peak levels, the body is unable to absorb any more at that time, and any additional intake of isoflavones is wasted and eliminated. Peak concentrations of these compounds are generally seen between 4-8 hours after dietary intake. Most of the isoflavones daidzein and genistein are excreted from the body within 24 hours. Based on these findings, the optimum way to maintain a steady concentration of soy isoflavones in the blood, is by regularly ingesting small amounts of these compounds throughout the day.

Many health experts discourage people from jumping prematurely to supplements. Instead, they want people to learning how to incorporate soy foods into a balanced diet. When soy is in food form, it is also in combination with other nutrients and compounds that contribute to its many health benefits. They believe soy's cholesterol-lowering effect cannot be achieved by just popping a couple of isoflavone pills. The FDA health claim is for soy protein in food form. The scientific studies for lowering cholesterol were not done using only isoflavones extracted from soy protein. Researchers do not believe isoflavones alone can lower cholesterol as effectively as in combination with soy protein. Studies indicate that when isoflavones are removed, the same cholesterol-lowering effect is not achieved. Therefore, researchers have concluded that isoflavones and soy protein work best together.

If soy isoflavone pills are taken for bone health or reducing menopausal symptoms, researchers advise taking these supplements along with foods containing soy protein. This way the benefits of both forms of soy can complement and enhance each other.

Finally, even with a hectic or fast paced lifestyle, you can still take advantage of soy's healthful qualities. Soynuts, soy protein powders and nutritional soy protein bars are quick and easy sources for soy's beneficial compounds. Because these soy products require no cooking and are portable, they are good alternatives for those who don't have time to cook or travel frequently.

CHAPTER 3: HEART DISEASE, STROKE & CHOLESTEROL

According to the American Heart Association (AHA) and the FDA, coronary heart disease is the leading cause of death in the United States, killing more people than any other disease. Coronary heart disease causes heart attack and angina (chest pain). The AHA ranks stroke as the third most fatal disease in America, causing paralysis and brain damage. Heart disease and stroke have become major health problems in most developed countries, and are rapidly increasing in prevalence in many lesser developed countries. This is mainly due to the influence of the animal-based Western diet, which is high in saturated fat and low in fiber. The AHA calculates that there are over 1 million new and recurrent cases of coronary attack each year in the United States. Approximately 12 million victims of angina, heart attack and other forms of coronary heart disease are still living. They also estimate that about 600,000 Americans suffer a new or recurrent stroke each year, with more than 4 million stroke survivors alive today.

While many risk factors, such as cigarette smoking and hypertension (high blood pressure), contribute to the risk for coronary heart disease and stroke, lipid abnormalities are the most significant factors. The FDA claims that high levels of total cholesterol and high levels of low density lipoprotein (LDL) cholesterol are the largest risk factors for these killers. About 20 percent of Americans, almost 40 million adults, have high blood cholesterol levels of 240 mg/dL or higher. Approximately 32 percent of Americans, nearly 59 million adults, are considered borderline with levels from 200 to 239 mg/dL. Studies done on people 20 years old and over show that more women than men have total blood cholesterol of 200 mg/dL or higher beginning at age 50.

What exactly is cholesterol and how does it contribute to coronary heart disease and stroke?

The AHA states that cholesterol is a substance found in all animal-based foods and fats. (Plant-based foods do not contain cholesterol.) They also say that the human body constantly makes cholesterol, mostly in the liver and kidneys. In our body, cholesterol is most common in the blood, brain tissue, liver, kidneys, adrenal glands and the fatty covers around nerve fibers. It helps absorb and move fatty acids. Cholesterol is necessary to form cell membranes, for the making of vitamin D on the surface of the skin and the making of various hormones, including the sex hormones. It sometimes hardens in the gallbladder and forms into gallstones. High amounts of cholesterol in the blood have been linked to the development

of cholesterol deposits in the blood vessels, known as atherosclerosis.

Cholesterol, and other fats, can't dissolve in the blood. They have to be transported to and from the cells by special carriers of lipids and proteins called lipoproteins. There are several kinds of lipoproteins, but the ones to be most concerned about are low density and high density lipoproteins.

Low density lipoprotein (LDL) carries the bulk of the cholesterol in the blood, and has a central role in the atherosclerotic process. LDL penetrates the walls of blood vessels and arteries feeding the heart and brain, where they are oxidized by free radicals and accumulate as a gruel-like material that blocks the blood vessels. When this plaque-like material leaks into the blood vessel, it can cause a blood clot (thrombosis). Thrombosis can lead to a stroke if the clot goes to the brain, or a heart attack if the clot blocks a coronary artery. A high level of LDL cholesterol reflects an increased risk of heart disease and stroke, which is why LDL cholesterol is often called the bad cholesterol.

High density lipoprotein (HDL) only carries approximately one-third to one-fourth of the blood cholesterol in our body. HDL cholesterol has a protective effect, preventing LDL oxidation and removing cholesterol that accumulates in the blood vessel walls. Medical experts believe HDL carries cholesterol away from the arteries and back to the liver, where it is eliminated from the body. They also suspect HDL removes excess cholesterol from atherosclerotic plaques and slows their growth. A high level of HDL seems to protect against heart attack and stroke, which is why HDL is known as the good cholesterol.

Cholesterol is measured in milligrams per deciliter of blood (mg/dL). Total blood cholesterol is the most common measurement of cholesterol. It is the number you normally receive as test results. Knowing your total blood cholesterol level is an important first step in determining your risk for heart disease and stroke. An important second step is knowing your level of good HDL cholesterol in relation to total cholesterol. Some doctors use the ratio of total cholesterol to HDL cholesterol. The goal is to keep the ratio below 5 to 1, with the optimum ratio at 3.5 to 1.

Triglycerides are also often measured when testing for cholesterol levels. Triglycerides are the chemical form in which most fat exists in food as well as in the body. Calories ingested in a meal and not used immediately are converted to triglycerides and transported to fat cells to be stored. Hormones regulate the release of triglycerides from fat tissue so they meet the body's needs for energy between meals. Elevated triglycerides are linked to the occurrence of coronary artery disease and may be a consequence of other diseases, such as untreated diabetes mellitus. Saturated fats and trans fats are the chief culprits in raising blood cholesterol and triglyceride levels. Ingesting animal-based products and