

Tofu and Soy for Health Benefits

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Abstract

The beneficial effects of consuming tofu and soy products are researched in the published literature and presented here. Some of the major reasons for eating tofu and soy products are detailed. The evidences of benefits for women consuming soy during menopause seem convincing. The adverse effects of soy on grown men is rather controversial. From the author's limited personal experience, it seems as though when the phytoestrogen in the soy has been partially broken down by fermentation, there are no bad effects by the tofu and other soy products. This leaves the unfermented tofu and the soy milk, as doubtful products that could have adverse effects on men in general. Funds are definitely required to research further in this area of controversy.

Keywords: *Cardiovascular Disease; Cancer; Menopause; Fermentation; Manufacture*

Background

Tofu was consumed over a millennium ago in China. Tofu is made by coagulating soymilk so that soymilk proteins become gooey and viscous. The resulting soy curds is compressed into a sliceable slab, or tofu. "Nigari" tofu is soymilk which has been coagulated with magnesium chloride. Gypsum (calcium sulfate) is an alternative popular coagulant which is used to congeal soymilk. Calcium sulfate and magnesium chloride are 'salt' coagulants. 'Acid' coagulants like glucono delta-lactone (GDL) are also used to curdle tofu in a way that produces a softer version of this soy food, often called 'silken' tofu. In addition, tofu is referred to as 'bean curd' very often, because tofu is 'curded' soymilk.

The clear majority of tofu sold in the United States has not been fermented. But many forms of fermented tofu are widely eaten around the world. Fermented tofu is referred to by a number of terms, including: pickled tofu, preserved tofu, tofu cheese, Chinese cheese, sufu, sufu cheese, stinky curd, stinky tofu, and stinky sufu, tempeh, miso, natto. All of these terms refer to tofu that has been fermented. Tofu fermentation can be caused to happen by employing a variety of ways, which counts the introduction of bacteria and molds as well as special salt solutions.

There is little to question in the research about the added health benefits that can come from fermentation of tofu. Fermentation of soy and tofu can be achieved with the addition of micro-organisms.

Fermentation of Soy Foods

Fermentation of food typically involves the breakdown of a food's carbohydrates into gasses, alcohols, and other molecules by micro-organisms. These micro-organisms include molds, yeasts, and bacteria. Common examples of fermented food include beer and wine, cider, leavened bread, yogurt, and sauerkraut. Interestingly, a relatively small subset of micro-organisms are responsible for a high fraction of commercially fermented foods, and an even smaller subset for most fermented soy foods. Fermented soy foods (including fermented tofu) usually involve the activity of the molds [1]: *Aspergillus*, *Rhizopus*, *Mucor*, *Actinomucor* and *Neurospora*; several species of the yeast *Saccharomyces*; and various species of the bacteria *Bacillus* and *Pediococcus*, while fermentation is typically characterized by the action of micro-organisms on a food's carbohydrates, many nutrients in food can be altered during fermentation. These nutrients can include the food's proteins, fats. Vitamins, minerals, and phytonutrients. In fermented soy foods, for example, proteins are often made more palatable

through fermentation. Minerals like calcium in soy foods are more soluble and bioavailable through fermentation as can the bioavailability of many phytonutrients, counting isoflavones like genistein and daidzein. In some situations, when fermentation changes the digestibility of protein in soy foods, smaller protein portions are formed (named peptides) that have exclusive healthful properties. For instance, one of the important storage proteins in soybeans is called conglycinin. Conglycinin and its fellow storage protein, glycinin, make up to 80% of the total proteins in soybeans. When fermenting, conglycinin in soy is often broken down into smaller peptides that act as antioxidants, improve immune function, and prevent excessive inflammatory response.

Generally, it is believed [1] that non-fermented soy foods like non-fermented tofu (or a non-fermented fresh green soybean food i.e. edamame) can provide the human body with important health benefits. In addition, there is research support for the health benefits of soy foods as being stronger for fermented compared to non-fermented soy foods [1,2]. It is also recommended to include fermented soy food, such as fermented tofu, in one's diet.

Nutritional Benefits

Tofu is a good source of protein and contains all eight essential amino acids, not produced naturally by the body, i.e. isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine. They are not more important than other amino acids, but they do need to be included in one's daily diet. Hence, the adjective 'essential' is used on these amino acids. Tofu is also an outstanding source of calcium, iron, manganese, selenium and phosphorous. Tofu is additionally a very good source of vitamin B1 as well as copper, zinc as well as magnesium.

Tofu has been known to lower the risk of heart disease [3,4]. It could decrease the levels of bad cholesterol or low-density lipoprotein in the body which in turn could improve one's cardiovascular health.

Selenium is a mineral needed by the body for the correct performance of the antioxidant system. Tofu, being a significant source of selenium, protects one's body from colon cancer [5]. Men can reduce the risk of prostate cancer by eating tofu [5]. According to studies [5], women who consume good amounts of tofu are sixty percent less likely to have 'high risk' breast tissues than women who eat less amounts or do not eat tofu.

Tofu has a high content of calcium which women need during menopause. It helps prevent hot flashes, prevent the high bone-loss risk related to menopause [6,7]. It is also effective in preventing rheumatoid arthritis. It is also helpful during pre-menopausal stage when there is an imbalance in estrogen-levels.

Discussion and Conclusion

The beneficial effects of consuming tofu and soy products have been presented in the current work. Some of the chief reasons (three categories of disease prevention) of eating tofu are detailed. That soy is beneficial towards cardiovascular disease prevention is presented. The epidemiological studies which have led to positive conclusions about soy and a few cancers have also been written up here. Lastly, the benefits for women to consume soy during menopause are mentioned.

The adverse effects of soy have been debated back and forth, especially online. In [8], a balanced look at what has been shown and what has not been shown is provided. In [9], the question 'Does Soy Feminize Men?' is posed. From the author's limited personal experience, it seems like when the phytoestrogen in the soy has been modified by fermentation, there is no adverse effect by the soy products including tofu. The rash that may accompany the consumption of certain types of soy sauce could be caused by the sulfite preservatives used in those types. This leaves the unfermented tofu and the soy milk, as suspect products that could have adverse effects on men in general. This is related to a topic brought up and discussed in the journal article [10]. The published documents cited are [11,12]. Research funds are desperately needed to shed light on this controversy regarding men and consumption of non-fermented soy and soy products.

Acknowledgments

This paper is dedicated to all the people of male gender around the world who might have suffered adversely from consuming tofu and soy products, that have not been fermented.

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