

Functional Foods

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## Functional Foods

One of the biggest growing trends in the United States is healthy living and more specifically healthy eating. There are a greater amount of advertisements than ever before that promote things like eating organic, gluten free, and juice cleanses because food is now seen as a direct mechanism to optimal health (3). One trend that's been particularly promoted is the importance of "Super foods", otherwise known as functional foods. It is well known to everyone that a poor diet is linked to increased causes of cardiovascular disease, hypertension, diabetes, obesity, osteoporosis and even death which is why the variety and access of functional foods has become much easier. Many foods are being fortified and enhanced with functional components such as antioxidants, probiotics, vitamins and minerals, to enhance overall health and reduce the risk of disease.

### I. Literature Review

#### A. Definitions of Functional Foods

Functional foods were first introduced in Japan during the 1980's as "processed foods containing ingredients that aid specific bodily functions in addition to being nutritious (2). Despite this relatively recent introduction, currently, there is still no standard definition for functional foods (1) but there are many in existence that seem to fall into one of two categories; broad definitions or specific definitions. The Mayo Clinic's definition is an example of a much broader definition; Functional foods are foods that have a potentially positive effect on health beyond basic nutrition (4). While other sources such as the Academy of Nutrition and Dietetics (AND) have a much more specified definition; Functional foods are whole foods and fortified, enriched, or enhanced foods that have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels (5). All foods do indeed have a function in the body, they provide us with calories and basic nutrients to fuel us for

survival, but functional or “super” foods go beyond this basic nutrition to improve and enhance our overall health and body systems as well as reduce the risk of many diseases. These food components can be found in whole/ natural foods such as fruits, vegetables and spices as well as processed foods that have been fortified or enhanced such as breads, cereals, butter, yogurt, beverages, etc.

#### B. Nutrient Density

In order to receive their benefits one cannot just consume one serving of a functional component per day. Just as the AND stated, functional foods must be consumed on a regular basis, as part of a varied diet and at effective levels. A foods nutrient density is what determines the level of effectiveness of a food component. Nutrient density is defined as the ratio of nutrient content to the total energy content of a food (7). This is measured on the ANDI score which stands for Aggregate Nutrient Density Index. The ANDI score shows the nutrient density of a food on a scale of 1 to 1000 based on a foods nutrient content. These scores are calculated by “evaluating an extensive range of micronutrients, including vitamins, minerals, phytochemicals and antioxidant capacities “in the food (6). Therefore, foods with a high ANDI score are considered most nutrient dense meaning they have high amounts of micronutrients with low energy content, while low ANDI scores indicate a food with low levels of micronutrients but a high caloric content. Although ANDI scores are very effective, they also tend to be misleading because foods that have high micronutrient levels with high calorie content are given a low ANDI score even though they are very nutritious and essential to our health. The more nutrient dense a food is, the more effective it will be in the body.

#### C. Functional Food’s role in Heart Health

Now that we know what functional foods are, it’s important to look at a few diseases and see how certain functional components work in preventing their development. Some of the most popular diseases that can be prevented through a healthy diet include coronary artery disease, cancer, type2

diabetes, Liver disease, hypertension and osteoporosis (15). Although all of these can be reduced through healthy eating, this review will focus on coronary heart disease, cancer and osteoporosis prevention. Heart health is incredibly impacted by eating habits. A diet high in saturated fat causes atherosclerosis, or the hardening and narrowing of artery walls with LDL cholesterol plaque; this is known as coronary artery disease. Eventually, this buildup of plaque could cause myocardial infarction, or heart attack (8). Food components that work to reduce LDL cholesterol and triglyceride blood levels while increasing HDL cholesterol (the cholesterol that removes plaque from your arteries) are ideal for optimal heart health. Omega -3 fatty acids are components that lower LDL cholesterol, blood triglyceride levels and blood pressure and increases HDL cholesterol (16), while plant sterols and soy protein lower LDL and blood triglycerides (17) and soluble fiber beta-glucan lowers LDL cholesterol (18, 2). Omega-3 fatty acid is found in fatty fish such as salmon and sardines, fortified eggs and margarine, and fortified breads. Plant sterols are incorporated into foods via fortification in dairy products, butter/margarines, and breads but are found naturally in seeds, nuts, fruits and vegetables while soy protein is found in edamame (soy beans), tofu, and soy dairy. Great sources of beta-glucan are oatmeal, wheat bran, oat flour, barley, and rye (9). Although there are many more functional components that aid in heart health, these are a few that are well known for their effectiveness.

#### D. Functional Food's Role in Cancer Prevention

Functional foods also play a key role in the prevention of cancer. Cancer is caused by abnormal cells dividing uncontrollably in the body. These abnormal cells can metastasize or spread to different tissues in the body, causing further damage. Factors that can cause cancer include carcinogens, smoking, lack of physical activity, free radicals and poor eating habits (10). Diets high in saturated fat, sugar, salt, red meat and low in fiber, fruits and vegetables are found to promote cancer. Therefore, diets high in nutrients such as fruits, vegetables and whole grains can provide beneficial components to reduce

cancer risk. One of the most talked about cancer fighting components is antioxidants which can be defined as molecules that donate electrons to free radical molecules. Free radicals are molecules that have been oxidized making them incredibly unstable. This instability causes a great amount of cell and tissue damage in the body (11). By donating an electron, antioxidants stabilize the free radical, stopping them from causing further damage that can eventually lead to cancer. Functional food components that have antioxidant properties include vitamin E, flavonoids, and carotenoids. Vitamin E can be found in nuts, seeds, turnip greens, fortified breads and cereals, flavonoids are found in onions, apples, tea, broccoli and citrus fruits, while carotenoids such as beta-carotene can be found in carrots, sweet potatoes and cantaloupe (5). Other components are known for reducing specific types of cancer. Lycopene, a carotenoid in tomatoes and tomato products is known for its risk reduction of prostate cancer, while dietary fibers, found in oatmeal, legumes, and apples, help to prevent colon cancer by bulking stools and therefore reducing contact time with potential toxins in the gastrointestinal tract (12). Consuming functional foods that contain these beneficial components can drastically decrease your risk for a variety of cancers.

#### E. Functional Food's Role in Osteoporosis Prevention

Lastly, the link between functional foods and osteoporosis will be discussed. Osteoporosis develops when one's bone mineral density reduces to a point where their bones become porous and fragile. This porosity and fragility increases an individual's risk for fractures and breakages due to falls in areas such as the wrists and hips (13, 19). Minerals that encourage bone health include calcium and phosphorus. These form a mineral complex that provides strength and structure to bones (9) and are the main components that build bones. Sources of calcium can be found in fortified orange juice and beverages as well as spinach (9) while sources of phosphorus include cheese and meats (9). Another functional component for optimal bone health is Vitamin D. This vitamin regulates calcium and

phosphorus as well as assists in calcium absorption in the bones and can be consumed through foods such as fatty fish and cod liver (9). All of three of these components can also be found in milk, fortified lactose free beverages such as soy milk and breakfast cereals. When these foods are eaten on a regular basis, especially during the years of peak bone mass (20's and 30's), the risk of osteoporosis can be dramatically reduced.

#### V. Conclusion

No matter what kind of disease you're trying to prevent or just looking to improve your overall health, it's important to consume a balanced diet that includes a variety of fruits, vegetables, whole grains and fortified foods to reap all the benefits. It is also important to remember that eating functional foods alone can only do so much. For optimal health, one must incorporate other healthy lifestyle choices to enhance the effectiveness of these foods, meaning the incorporation of physical activity, not smoking, and limiting alcohol consumption are all essential factors that need to be considered. Functional foods, whether they are unprocessed or fortified, may be the next big thing to replace medication in the improvement of health. Like Hippocrates, the father of medicine once said "Let food be thy medicine and medicine be thy food."

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