

## Dietary Supplements, Phytochemicals and Functional Foods - 1

One of the goals of any nutrition course is learning to make food choices that provide the nutrients needed for our long-term health and fitness (or for some, validating that we already are choosing foods that do so). However, according to polls, 70% of the United States population chooses to look beyond our foods and turn to an alternative – supplementation. It's clear that for most, our nutrients can be obtained from our dietary food choices, if we choose well, without adding supplements, but we still do.

In addition, for the past several years, more and more studies are demonstrating that there are additional substances in foods, particularly in plant foods, that may be health promoting. In general, substances found in plants that are not identified nutrients but may promote health and prevent diseases are called **phytochemicals**. The phytochemical, or herbal, supplement market is among the fastest growing.

Some food manufacturers add phytochemicals, herbal supplements and/or vitamins and minerals to foods and market them as functional foods, using the FDA structure/function provisions.

At this time it will be useful to examine the entire area of supplementation – from the well-studied vitamin/mineral supplements to the ever-growing list of phytochemicals with the associated health claims being made about herbal supplements and phytochemicals. We will also touch on the subject of functional foods.

As discussed, when vitamins and minerals are consumed in fresh whole foods, it's rare to get too much. Unfortunately, this is not true when we add supplements to our daily intake. Agencies study nutrient intakes and have established guidelines for daily upper levels, beyond which toxicity can occur. Few of us know these limits or pay attention.

We disproportionately eat processed foods, more and more of which have added supplements. And most of these foods that have added supplements boldly advertise they have done so to promote health. In addition, we add one or more vitamin/mineral/herbal supplements to our daily ingestion.

It's also useful to discuss a business on which we spend **billions of dollars** annually – for known vitamins and minerals, and increasingly, supplements not demonstrated to be essential nutrients but promoted as health enhancing. Many of the supplements are herbal supplements, used in some cultures for centuries, new to many.

Supplementation is a personal decision. We do not need to consult health care providers for advice or recommendations. We consult ourselves, our friends, and/or follow manufacturer's advertised recommendations. We know that many of us don't get sufficient vitamins and minerals in the foods we choose to eat. We are bombarded with advertising that promotes additional substances as health-enhancing, and we want to be healthy. The products are on the shelves of groceries, pharmacies and Costco. We think that if we can buy it, it can't hurt us.

### Why do we take supplements?

Supplements may be recommended by health care professionals to correct identified deficiencies.

A general multivitamin/mineral supplement is often recommended for:

- People who have extended illnesses and need additional nutrients to fight off disease and/or infection.
- Women of childbearing age to ensure they get sufficient folic acid and vitamin B<sub>12</sub> in particular, plus adequate iron. Pregnant and nursing women should discuss supplementation with their physicians. Supplements are often recommended during pregnancy and while nursing.
- Older people absorb and utilize nutrients less well and should consider a general multivitamin/mineral supplement. In particular, older people need sufficient vitamins D, C, B6, B12 and folic acid plus zinc, calcium and magnesium.
- Vegans may be deficient in vitamin B<sub>12</sub>, and possibly zinc, iron and calcium.

Supplements may also be recommended for:

- People whose total calorie intake is too low to provide adequate vitamins/minerals in food
- People taking medications that interfere with vitamin/mineral absorption
- Alcoholics and/or heavy smokers
- Anyone who doesn't eat enough of foods that are good calcium sources
- People who have medical problems that affect absorption, digestion or regulation of nutrients
- Anyone who fails to eat a balanced diet may benefit from a multivitamin/mineral supplement, but supplementation does not take the place of a balanced diet!
- Those who have extremes of metabolic activity (either very, very active or completely sedentary)

Many people take supplements as "**insurance**". We eat well, but want to be sure that we've gotten that mix of micronutrients needed. If you are taking a general multivitamin supplement it won't hurt you. General multivitamin/mineral supplements are often recommended by health professionals for this reason, particularly for the elderly, who eat less, and have a harder time getting adequate amounts of some nutrients. Our standards are set statistically, so if an individual is one who needs the upper limits, the added supplementation helps prevent what might be a mild deficiency.

Sometimes supplements are recommended to **reduce the risk of diseases**. The potential health-promoting role of some substances found in foods that are not essential nutrients is an active area of research. The role of phytochemicals, substances found in plant foods that may enhance health, (to be discussed in a bit), is of special interest.

### **Reasons not to take supplements**

No one should take supplements **instead of** wholesome nutritious food. Pills and powders do not replace food. Whole food has more than just those things we know to be essential; there may be additional things in food that are good for us, such as those phytochemicals. Taking just supplements deprives us of the possible synergistic benefits of substances in whole foods.

The risk of **toxicity** for some vitamins and minerals is real. Toxicity from food intake is almost unheard of, yet when someone takes several supplements, he/she may be getting too much of some. Toxicity in children is more common than in adults. Often the "dose" is the same, but being smaller, their needs are less. More commonly, children take "pills" they find and overdose accidentally. Iron overdose is second to aspirin overdose for children's poisonings, but is the leading cause of death from accidental ingestion of pills.

If you are considering taking additional supplements, it's important to analyze why.

- If you are just insecure about your diet, it's better to improve your diet than to spend money on supplements with the idea they can substitute for good food choices.
- If you think that taking supplements will make you stronger, or build better muscles, they won't. Physical activity is required to maintain muscles and to build better muscles, accompanied by a healthy diet.
- Many supplements are expensive powdered extracts from real food sources. Why take powdered parsley for nutrients when you can use fresh leafy greens? Why take a powdered "food" mix when you can eat real foods? V-8 vegetable juice may advertise that it's got all the nutrients of the real foods, but a computer diet analysis of those foods compared to the V-8 would show many additional nutrients and less salt.

### **Choosing a supplement**

Adults who take one multi-vitamin/mineral supplement rarely risk toxicity. The same is true for children's formulations given to children. Unfortunately, many children's formulations are marketed to appeal to children, who then eat them like candy, or chew them like gumballs. In addition, be aware of foods that are enriched and fortified that are already adding some vitamins and minerals to your diet. For example, if you eat lots of fortified cereal, taking even a general supplement may bring your intake close to the recommended maximum.

Intakes of more than 100% of daily values of vitamins and minerals is not health promoting, and in some cases too much of one substance interferes with absorption and utilization of other nutrients.

Most name brand supplements and most well-known house brands are equivalent, and often manufactured by the same company. It makes financial sense to choose a house brand, but it's more a matter of personal choice. Organic brands have not been demonstrated to be better or more pure. To be assured that the supplement contains what it purports to contain, some companies voluntarily submit their formulation and receive the USP standard of purity. Absent that standard, there is no requirement that a supplement contain what it says or contains the amounts it says it has.

The *University of California Berkeley Wellness Letter* (August, 2004) recommends one look for following when choosing a multivitamin/mineral supplement:

- 100% daily value of: vitamin D, thiamin (B<sub>1</sub>), riboflavin (B<sub>2</sub>), niacin (B<sub>3</sub>), B<sub>6</sub>, B<sub>12</sub>, folic acid, copper, zinc, iodine, selenium and chromium (not to exceed 200 micrograms of selenium or chromium)
- 20mg Vitamin K
- No more than 5000 IU vitamin A, with at least 40% of that as beta-carotene (Those over 50 who consume more than 6000 IU of vitamin A have an increased risk of bone fractures.)
- In addition, the UC Berkeley recommends a separate calcium supplement for most.

### **Source of the supplement's ingredients**

We absorb a certain chemical. The origin of that chemical makes no difference to the body; it's the form of the chemical, or **bioavailability**, that counts, such as ferrous iron versus ferric iron, or calcium bonded to organic acids, rather than as inorganic carbonate.

Nutritionally, there is no difference between a "natural" and a synthetic vitamin. Further, "**natural**" refers only to origin; a natural vitamin or mineral may be as highly processed as a synthetic one. In some cases, the chemical best absorbed is the one which is purer; some substances associated with an "all natural" formulation may interfere with its bioavailability or cause negative reactions.

Almost all supplements have some kind of "binder" to make the pill have bulk, such as chalk, wax, sugars, gelatin, starch and often shellac coatings.

### **Beyond Vitamins and Minerals: Supplements and Health Issues**

A number of supplements are marketed to help with some health problem. With the exception of nutritional vitamin and mineral deficiencies, most supplements have not been shown to cure health problems. This a major concern with the ever-growing **herbal supplement** industry.

Supplements are very inexpensive to manufacture, and profit margins are high. Unlike food additives, supplements are not regulated by government agencies beyond certain labeling requirements. The manufacturer does not have to demonstrate that the product is safe or that the product does what it is being advertised to do or even that it contains the amounts of the substances it says it does. Nor do manufacturers have to worry much about contaminants that may be in their product, in spite of the fact that all ingredients must be listed somewhere. Manufacturers do not need to do testing to prove either safety or efficacy of their product or do studies that demonstrate what amounts may or may not be helpful.

Equally important, many herbal supplements have not been tested for synergistic effects, or what the substance may do in combination with other substances in the body. For example:

- **St. John's Wort**, widely marketed for depression, actively interferes with the enzymes that degrade dozens of drugs, so that some prescription medications accumulate in tissues, sometimes in dangerous levels.
- **Ginkgo**, marketed as a memory enhancer, is a blood thinner. Those who take aspirin for cardiovascular disease, or any of the prescription blood-thinning drugs, such as coumadin, are at risk if they take *Ginkgo* supplements. Warnings of drug interactions are not required on supplements, so we can unknowingly endanger our health.

The 1994 **Dietary Supplement Health and Education Act** requires labeling of supplements but permits claims of value on the labels, such as:

- Claims that the substance is a good source of some nutrient.
- General health claims, such as alleviates stress, or tension, or with specific nutrients, claims about what that nutrient is known to do.
- Claims identified as structure-function claims such as the nutrient is naturally found in tissues and is needed for some function in the body.

Labels must also state that claims made have not been evaluated by the FDA (because they haven't been).

## Dietary Supplements, Phytochemicals and Functional Foods - 6

It is up to the FDA to prove that a supplement is unsafe, and then take measures to have the product removed from the marketplace. But their measures are limited. Government agencies have no ability to recall or stop the marketing of most supplements until they have **proven** that the supplement is harmful. The FDA can publish consumer advisories about safety issues that have been reported associated with supplement use and request the manufacturer stop marketing the supplement, but cannot stop sales or use of potentially harmful supplements until the FDA has sufficient evidence to prove the product is unsafe. Some individuals whose health has been damaged by specific supplement use have gone to court, and in some cases, won damages. There are hundreds of cases involving the supplement, **Ephedra**, for example.

**Ephedra** is a good example of a supplement that can result in harm. Ephedra mimics the hormone, epinephrine and has been often marketed in weight loss supplements. Several deaths have been attributed to the use of Ephedra-containing supplements. Products containing Ephedra were ordered removed from the market by the FDA in December, 2003, after years of accumulating evidence of their potential to harm health and even be a factor in death. Another weight loss supplement, **Usnic acid**, derived from lichens, has been shown to cause serious liver damage in some people.

Some companies market herbal supplements with the claims that such herbs have been used safely for centuries, not paying attention to the fact that the herbs were used as whole concoctions of the plant, not as specific concentrated chemicals. No one has done much testing on the safety or efficacy of extracts. Incidentally, within a week of the Ephedra recall, manufacturers were marketing new "weight loss" formulations boldly advertised as being "Ephedra free".

Although we can't discuss the hundreds of herbal supplements available (drug and health food stores have at least one aisle of herbal supplements), we will mention some of the more popular herbal and sports supplements, and then discuss some of the known phytochemicals:

## Herbal Supplements

Various parts of plants are used in different supplements. It is important to know which part of the plant contains the active ingredient. Manufacturers can market root extracts when the active substance is concentrated in leaves, for example. Some of the more common herbal supplements are:

- **Black Cohosh**

There is some evidence from a number of studies that black cohosh can alleviate menopausal hot flashes and may help retain bone density.

- **Chamomile and Goldenseal**

Chamomile flower extracts and goldenseal root extracts are both promoted for the relief of indigestion. Goldenseal is also marketed with Echinacea.

- **Comfrey**

Comfrey tea from leaves has been marketed for soothing nerves and its calming effects. It also causes liver damage and is less available today.

- ***Echinacea***

The roots of Echinacea are said to be an immune system enhancer, particularly for colds and flu. It should not be taken for longer than a two-month period of time. Recent studies indicate that *Echinacea* does not prevent or alleviate cold symptoms or shorten the duration of a cold. Children should not be given *Echinacea*.

- ***Ephedra***

Removed from the US market in 2003, Ephedra or Ma huang has been promoted for weight loss, to enhance sports performance, and to increase energy. The active ingredient, ephedrine, mimics the activity of the hormone, epinephrine. Ephedra can cause elevated heart rate, increased blood pressure, seizures, tremors and even death. A similar species, called Mormon tea, grows in the American southwest deserts. It does not contain ephedrine.

- **Cranberry juice**

Cranberry juice has long been marketed to prevent bladder infections and minimize symptoms of bladder infections. Cranberry juice is not sweet, and most cranberry juice "cocktail" beverages marketed contain little juice and much sugar.

- ***Ginkgo biloba***  
Leaf extracts of Ginkgo are marketed as a cognitive memory enhancer, with little evidence to support the assertions. It is also a blood thinner similar to aspirin. Those who take aspirin or prescription blood thinners must not take Ginkgo supplements.,
- **Ginseng**  
Roots of ginseng are purported to increase energy levels. It may cause insomnia, and may be a mild stimulant. Evidence does not support its energy-enhancing claims.
- **Glucosamine**  
Glucosamine and the combined glucosamine/chondroitin are marketed to help relieve joint pain and stiffness, including osteoarthritis pain. Some studies have shown relief and glucosamine is considered safe. Chondroitin is a blood thinner, however and should not be taken by those who use other blood-thinning medications, including aspirin. People allergic to shellfish should not consume glucosamine.
- **Laetrile**  
An apricot pit derivative marketed outside of the United States to cure cancer. There is no evidence of its efficacy and it can cause cyanide poisoning.
- **Saw palmetto**  
Fruit extracts are said to alleviate symptoms associated with benign enlarged prostate, and small studies have shown promise. A major study comparing saw palmetto to prescription drug treatment is underway. It is also a diuretic.
- **St. John's Wort**  
As mentioned, St. John's Wort is marketed for mild depression and anxiety. It is very important that physicians and pharmacists be informed when using St. John's Wort because it can interfere seriously with several drugs, including contraceptives and HIV medications.
- **Valerian**  
Root extracts of valerian promote sleep and relaxation

### **Ergogenic (Sports Enhancing) Supplements**

There are a number of supplements marketed for enhancing athletic performance. Regrettably, few of them have research substantiating their claims. They include:

- **Protein powders and Amino Acid Supplements**

Most protein powder formulations have mixtures of amino acids in appropriate proportions, and may have additional vitamins or minerals purported to be energy enhancing. Athletes need sufficient total calories to maintain their level of physical activity, and foods contain more than the amount of protein needed. Adding powdered proteins is a very expensive waste of funds – the amino acids in the protein powders are just excess amino acids and will be dismantled by the body and used for fuel putting strain on the kidneys to excrete the excess ammonia. Eating more protein does not result in getting more muscles.

- **Carnitine**

Promoted as a fat-burner. Carnitine is produced by the body and functions to move fatty acids into the mitochondria for oxidation in the Krebs cycle. The studies that have been done fail to show any increase in carnitine levels in cells when carnitine supplements are taken, nor is there evidence that more fatty acids are mobilized for cell respiration with carnitine supplement nor does carnitine enhance physical performance in studies. Carnitine can cause diarrhea, which is dehydrating and counter to enhanced physical performance.

- **Chromium picolinate**

Chromium is an essential mineral involved in carbohydrate and lipid metabolism. Since muscles burn carbohydrate and lipids, it has been suggested (by manufacturers of supplements) that additional chromium will enhance muscle strength and performance, particularly for body building. Controlled studies indicate no such result, and high doses of chromium may be toxic.

- **Creatine**

Creatine is found naturally in all meats, and red meats are particularly rich in creatine. Muscles tissue naturally has a store of creatine phosphate as a phosphate reservoir for ATP formation in cell respiration for muscle activity. A more fit muscle has more creatine phosphate. There are some studies that support that creatine supplementation has improved performance for intense strength activities, such as weight lifting; other studies show no such effect. The controlled laboratory studies have been short term and with few subjects. On the known negative side, creatine supplementation, even for short term, exacerbates kidney disease and promotes weight gain, and not always muscle weight. As an unregulated supplement, some who want to enhance their physical performance take large amounts, the safety of which is not known.

## **Phytochemicals**

In addition to the traditional vitamin and mineral supplements we now have added to our list of things we might want to include in our diet the phytochemicals, those substances found in plants that are not identified nutrients but may promote health and prevent diseases. The phytochemical and herbal supplement market is among the fastest growing. Although an active area of research, it might be useful to take some time to examine some of the claims being made about phytochemicals and their potential health benefits. Note: not all herbal supplements are called phytochemicals and not all supplements are herbal; extracts from animals are also marketed.

Prior to our discussion, however, it will be beneficial to review free radicals, oxidation and antioxidants.

## **Free Radicals and Antioxidants**

Many chemical reactions that occur in cells and tissues produce substances that are themselves very reactive. One class of such reactive molecules are the free radicals. Free radicals are potent oxidizing agents. They will oxidize the handiest molecule that can be oxidized and often start chains of oxidations that cause damage to cells and tissues. The damage caused by free radicals is a health concern particularly with cancers.

Recall that oxidations are matched by reductions, and when something gets oxidized, if it is not stabilized, will want to get reduced by oxidizing something else. We naturally have a number of enzymes that neutralize radicals as they are produced. The organelle, peroxisome, contains enzymes that specifically deactivate hydrogen peroxide. Other enzymes are present in the cytoplasm of cells that perform similar functions for other free radicals. We also have molecules that are naturally anti-oxidants, a substance that is readily oxidized by the free radical thereby protecting other molecules from oxidation. Both vitamin E and vitamin C are antioxidants.

Vitamin E's job is to stop free radical oxidation of lipids, particularly in cell membranes. Vitamin C protects against oxidants in polluted air inhaled, and may also restore vitamin E to its active state by taking the electrons from vitamin E.

A number of phytochemical anti-oxidants may work with our known vitamins to help prevent damage to cells and tissues.

Antioxidants and some phytochemicals do their work by

- Destroying free radicals
- Limiting the formation of free radicals
- Restoring enzymes that have been damaged by free radicals
- Repairing damage to tissues caused by free radicals
- Stimulating the activity of the enzymes that destroy free radicals

## **Phytochemicals and Disease**

While doing their jobs, phytochemical antioxidants may protect against diseases such as cancer and cardiovascular disease. Problematic is that we have good evidence that foods rich in phytochemicals and antioxidants can be protective; we have little evidence that isolated chemicals in the form of supplements can do the same thing. As stated previously, it may be the combination of substances found in fresh vegetables and some fruits that conveys the benefit and that combination is not found in isolated supplements.

Cancers are a result of damage to the DNA of cells, and in particular, damage to the DNA that controls DNA repair, and DNA that controls the process of cell division. We will look at cancer in more detail later when we discuss diet and health concerns.

Population studies show a correlation between high intakes of vegetables and low cancer incidence and a correlation between high intakes of pork and beef and a high cancer incidence. Laboratory studies and animal studies support the population data. This alone should prompt us to look at **foods** rich in potentially beneficial phytochemicals that may promote our overall health. Plant foods hold such promise for their phytochemical activity that the American Cancer Society has an advertising campaign to promote "5-A-Day" for health. Their five a day is the number of servings of vegetables and fruits, not the servings of meats and dairy.

A number of specific phytochemicals have been identified and are being studied. We can mention some of the best known:

### **Some Phytochemicals**

- **Allicin**

The allicin found in garlic and some other members of the onion family may lower serum cholesterol and protect against cardiovascular disease. Other organosulfur compounds found in onions and their relatives may increase anti-cancer enzyme production.

- **Capsaicin**

Capsaicin, found in hot peppers, may reduce blood clotting. It is also the source of pepper spray, which, when sprayed in the eyes of a threatening person, may retard the potential criminal from attacking.

- **Carotenoids**

Diets rich in foods containing carotenoids may also confer anti-cancer benefits, but studies have also shown that megadoses of beta-carotene increased cancer risk for smokers. It did not do so for non smokers. Carotenoids are terpenes.

- **Flavonoids**

A number of fruits contain antioxidant flavonoids that are deep red and purple pigmented. Blueberries, black raspberries and cranberries are good sources of these antioxidants that may help improve memory. Apples green tea and citrus fruits contain other flavonoids that may confer benefit. Black tea contains flavonoids that may protect against cardiovascular disease.

- **Indoles**

Indoles, found in cruciferous vegetables, appear to block carcinogens from damaging DNA.

- **Isothiocyanates**

Cruciferous vegetables contain isothiocyanates that inhibit enzymes that promote cancer activity. Chemicals that might promote damage leading to cancers are inhibited. Broccoli, particularly broccoli sprouts, contains sulforaphane, an active cancer anti-promoter. Just another reason to eat broccoli.

- **Lignans**

Lignans, found in whole grains and some seeds, may help prevent cancers that are estrogen positive from metastasizing, or spreading. Flax seed is a particularly good source of lignans.

- **Limonene**

Citrus fruits are sources of limonene, a terpene that has been shown to inhibit cancer growth.

- **Lycopene**

Lycopene is a carotenoid terpene found in plants that have scarlet pigmentation. It is especially abundant in tomatoes, and its bioavailability increases when cooked. Lycopene is also found in pink grapefruit, watermelon, guava and papaya. Lycopene may retard growth of some cancers, in particular, prostate cancer.

- **Phenolic Acids**

The phenolic acids found in many fruits and in coffee promote excretion of some carcinogens by activating enzymes that convert potential carcinogens into water-soluble forms.

- **Phytic acid**

Phytic acid, found in whole grains, may inhibit free radical activity by binding minerals that readily do oxidation-reductions that promote formation of free radicals.

- **Phytosterols**  
Soybeans contain a group of **phytosterols** that are similar to estrogen steroids of animals. The phytosterols may slow growth rates of some cancers.
- **Resveratrol**  
This phytochemical inhibits cell growth and lowers risk of blood clotting. Grapes, peanuts and red wine are sources of resveratrol.
- **Saponins**  
Saponins, found in legumes and some other vegetables may slow DNA replication, affecting rate of growth of cancer cells.
- **Tannins**  
Some tannin antioxidants can inhibit cancer activation. Legumes, tea and wine are good sources of tannins. Tannins are also terpenes.
- **Vitamin-C**  
Foods rich in vitamin C seem to help lower risk of oral cavity cancers and throat, larynx and esophagus cancers. Vitamin C-rich foods are mostly vegetables and some fruits, which are also low in fat. It may be the diet, not the vitamin C alone, that confers the benefit. Taking vitamin C supplements with a diet low in vegetables and fruits may not have the same benefit, and using vitamin C to treat established cancers has not been shown to be beneficial.

Seeing a big list of phytochemicals might be off-putting, but when we consider the food sources, the list reinforces information previously presented: that a diet rich in leafy green vegetables, cruciferous vegetables, legumes and whole grains is health promoting. Adding some pigment-rich vegetables and fruits enhances health, too.

### **Supplement Regulation**

Supplement regulation, or lack thereof, is problematic. With more and more of us looking for ways to improve health, it's tempting to think that an herb extract in a pill will be a magic formula for health. For the many of us who have weight issues, the thought of "metabolite" or any of a number of pills advertised on late-night TV will help tempt us, particularly when the claims include that all natural products are used in the formulation, so we assume they are safe. Almost anything that promises health without effort is too good to be true, and unfortunately, may not be "too good". It may be harmful.

The lack of regulation is a result of consumer and manufacturer interest, conveyed to our legislators, that we want to make our own decisions about what we purchase and what we ingest. In contrast to food additives (discussed later in this course) and drugs that are regulated by the government, the use of dietary supplements is left to our discretion.

- More than half of the US population thinks that supplements are regulated, and must be safe. They are not regulated, and may or may not be safe.
- Two-thirds of us think that if a supplement had side effects or was potentially harmful, labels would carry warnings, just as foods that have problematic additives must have warnings. This is not so.
- A fair proportion thinks that supplements should not be regulated thinking that regulation would mandate use by prescription only, and that would make substances that individuals think are health promoting too expensive to take or unavailable. There is no indication that this would be the case. However, if companies had to prove efficacy and safety prior to marketing, they would have to fund the research, and the costs of such research would no doubt be passed on to the consumer.

There is a difference between known vitamin and mineral supplements in which the functions have been identified and safe levels are known, and the multitude of chemicals available to us in supplement form that are not as well studied. Few advocate that supplements should be prescription drugs. Many advocate that supplements should be tested the way that most drugs are, including many OTC drugs, such as aspirin.

For more information on herbal supplements, a recommended source is the Natural Pharmacist. Its publications are available on the iHerb website:

<http://www.iherb.com/hs.html>. Supplements that the FDA has warnings about are listed at their website: <http://www.cfsan.fda.gov/%7Edms/ds-warn.html>.

NIH publishes fact sheets for some of the more common herbal supplements. Their website is: <http://dietary-supplements.info.nih.gov/>

### **Functional Foods**

To conclude our discussion of supplementation, we should address **functional foods**. Those who study health and nutrition are not the only ones interested in the potential benefits of phytochemicals. The food industry has taken note of the consumer interest in phytochemicals. Nor has it gone unnoticed to the food industry that many of the foods richest in phytochemicals are foods we prefer not to eat.

The term "**Functional Foods**" has been coined for those foods to which potentially health promoting substances or biologically active chemicals have been added that are not naturally present in that particular food item. Literally all foods are functional. It's just a term that promotes marketing.

Surveys by the grocery industry show that consumers prefer to get extra nutrients in their food rather than from supplements. (Considering how much we spend on supplements, this may seem surprising to some.) It didn't take long for the food industry to add phytochemical supplements to foods we like to eat. The executive editor of *Nutrition Business Journal*, Thomas Arts, was quoted in the April, 1999 issue of *Nutrition Action* as saying that retail sales of functional foods was over \$10 billion, with an annual growth rate of 8 – 10%, from an almost non-existent status in 1992. Most food sales increase at about 1% at best. This growth in functional foods dates to the 1994 Food Supplement Act that permitted marketers of supplements to make claims about what they did.

Many supplements are now added to foods and beverages, and marketed as health boosters. Soups have been marketed with St. John's Wort to mend our mood, and juices have had Echinacea added to defend our health. Even snack foods have added herbs that claim to help memory or improve our moods. Performance enhancing beverages are targeted to teens and young adults.

If the added substance is something for which a claim that sounds good can be made, it can be added to foods with a "structure-function" claim. The legal language that differentiates between health claims, nutrient claims and "structure-function" claims is muddled, at best, as we discussed. Most of us can't tell. We are impressed by what the label alleges the product can do to help us and buy it.

As stated previously, supplements, which many phytochemicals and herbal substances are, are not classified as food additives and are not subject to FDA regulation. For that matter, foods are not regulated. Only food additives and drugs are regulated. The 1994 legislation on supplements states that a supplement cannot be "represented for use as a conventional food....". But if the substance is an extract from a food or from an herb the FDA, to date, has not been questioning its addition to our foods.

Foods with added substances can do even more in advertisements than they can on their product labels. The Federal Trade Commission regulates advertising, and they don't make any distinctions, even muddled ones. So functional food advertising is wide open. We know absolutely that the public is susceptible to advertising claims; we want to think that the food choices we make will help us be happier and healthier without having to work at it. Some of us are so trusting that we eat 5 Big Macs a day for years and then sue McDonald's for making us obese by not telling us that eating too many of their burgers would not be healthy.

We might ask ourselves as consumers who seem to be embracing the "new" class of functional foods if it is better to eat foods with something added that may correct a health problem, such as Benecol margarine, to which stanol esters, which can lower cholesterol level, have been added, or to have a diet low in saturated fats and include exercise to achieve a lower cholesterol level. Benecol is one of the foods that has had at least some studies done on it. Benecol's manufacturer also successfully lobbied to have the stanol esters, which are extracts from pine, categorized under the GRAS legislation so it is an approved food additive, not a supplement.

Nutrition experts have concerns that consumption of functional foods will be similar to our current consumption of foods at the top of the pyramid. We eat fat-free cookies thinking we are helping to lower the fat in our diets, yet the calories we are consuming is unchanged in the fat-free product, and we are eating these foods while excluding our vegetables, whole grains and legumes. We look for a single nutrient or phytochemical and fail to think about nutrient density and a wholesome diet.

### **Foods as Pharmaceuticals**

One goal (dream?) is to have foods that deliver pharmaceuticals – drugs. Wouldn't it be great if the banana we ate delivered the vaccine for hepatitis? Or anthrax? No one likes shots. If I could eat an apple and get my tetanus booster, I might be current. No more flu shots – just eat the "Flu-No-More Cinnabon". The down side is that we already have lots to think about with our food selections and nutrient density. Should foods be the delivery vehicle for our medicines, too?

To conclude, we should always ask with any supplement or functional food the following:

#### **Is it safe?**

- One of the biggest concerns about genetically modified foods is that the altered DNA of the food might code for an allergen not normally present in that food and someone eating the GMO could have an allergic reaction. No supplements have to be tested for potential allergic reactions. Most of us, when taking a supplement, knowingly do so. We might not carefully read the list of ingredients in functional foods. Even supplements may contain additional herbs or substances not in the bold print on the front of the package.
- Drug interactions are a serious concern to the medical community, and to individuals who trust their physicians and pharmacists. However, only drugs have to be tested for interactions. Supplements don't, so functional foods don't have to be tested, and potential or real interaction warnings are not required.
- Is it safe to take the substance for long periods of time at the concentrations found in the functional foods or the supplement (if you can even find out how much is in the supplement)? Few, if any, long term studies have been done on concentrated herbal extracts. A few European countries, notably Germany, have regulations and have done some studies, but only on a few supplements. With drugs, your physician will prescribe a particular drug at a particular dose for a specific period of time. Some herbal supplements make recommendations for length of time you should take the herb. Most do not. Few functional foods with added phytochemicals make any statements.

#### **Does it work?**

- Makers of supplements and marketers of functional foods don't have to demonstrate that their product works. We take their word for it. Studies are pretty much non-existent. Best most of us can do is "word of mouth". Often anecdotal evidence is not substantiated by controlled studies. Often something helps because we think it does, even when it's not doing any biological thing.

### **How much has been added?**

- Is the amount added an amount that can have any benefit at all? With the soups that had added St. John's Wort, the manufacturer stated that they added an amount that would not alter the taste of the soup, not an amount that might be safe and effective. But then, for most supplements, we don't know what amount, if any, is really safe and effective.

### **Is the functional food healthy?**

- A functional food can be at the top of the pyramid, nutritionally speaking, just as easily as any "junk food" can be. We have seen this with nutrition bars and energy bars that are very high in fat content. The origin of granola was a compact, high fat food that could be taken on back-packing ventures. Granola is also nutrient dense, with many nuts, dried fruits, and coconut, but the granola bars marketed today retain the fat and added many sugars to the mix.

### **Why do I want to consume this?**

- Do I have a health condition for which this product might help resolve? Are there alternative ways to achieve the same level of health? Which is best? Am I doing this because it's easy? Am I hoping for a miracle pill that empowers me to eat chips and chocolate instead of broccoli and lentils?

### **Bottom Line**

The reality is – functional foods are a good marketing strategy. The profit margin on fresh vegetables and fruits is low. Fresh vegetables and fruits in the diet probably do more to improve health and lower risk of cardiovascular disease and cancers than any functional food ever will. And real foods have a mix of many ingredients in a form that has been shown to be healthy. No single additives have been able to make that claim.

Some information on supplements, functional foods and on phytochemicals has been excerpted from the April, 1999 issue of *Nutrition Action* on functional foods and from the October 2003 issue of *Nutrition Action* of the safety of supplements. Other information is from your textbook, *Understanding Nutrition*, Highlights 10, 11, 13, 14 and 18.