

Phytonutrients - The Natural Drugs of the Future

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For over 80 years now the allopathic industry, combined with the might and power of the pharmaceutical giants, has been trying to combat degenerative diseases. Though many advances in the diagnosing of diseases and the discovery of a myriad of new names to diseases has occurred, the battle to increase quality of life and the overcoming, curing and proper treatment of degenerative diseases has been all but lost. Allopathic medicine has not changed its treatment of cancer in over 40 years. Though new drugs keep popping up, the results are still the same and the most effective treatment for cancer is still surgery. Heart disease, diabetes, arthritis, leukemia, Alzheimer's, Parkinson's, Hodgkin's, and dozens of other disease names strike fear into our minds and as we age, many of us contemplate... "Which one will take me from this life and how will I fight it?" Today with the current standard of allopathic medicine it is only a matter of time before you are beaten by one of the many known or even unknown degenerative diseases. There are no known cures to any of these degenerative diseases. Currently your only option is a long list of prescription drugs that may alleviate symptoms but slowly eat away your body's immunity and quality of life.

There is hope however. For more than 20 years now scientists have been researching plants and discoveries made within the last 15 years may hold some of the answers to combating many of the degenerative diseases that plague our senior years. We have known for a long time that many of these diseases can be prevented or even cured by changing our lifestyle and eating more fresh fruits and vegetables. Until recently many doctors scoffed at the thought that eating fresh fruits and vegetables would cure a disease. Even today the Food and Drug Administrations policy regarding food that is unadulterated (meaning natural foods) is that they cannot make you sick nor make you well and that no claims on labels or ads can be made to say that they are healthy for you.

However, new discoveries have proven that there are active ingredients in whole, unadulterated fruits and vegetables that can make us well and actually prevent, and in many cases, cure diseases.

Have you ever asked yourself...

- How can I reduce my risk of getting cancer?
- How can I protect myself from toxins and pollutants in the air and environment?
- How can I boost my immune systems to fight off new viral strains?
- How can I prevent premature aging and the degenerative diseases that come with it?

Your answers may lie with these new active nutrients found in simple fruits and vegetables. These new active compounds have been given the name of Phytonutrients. The word “phytonutrients” simply means nutrients that originate or are found within plants. Adding to your diet nature’s most powerful phytonutrients is certainly paramount in protecting yourself and your family from the ravages of disease. The earlier we start eating fruits and vegetables, the better for our bio-cellular health. While we anxiously wait for the cure of cancer and other devastating diseases, we can arm our bodies with the most powerful protective nutrients available, Phytonutrients.

Classes of Phytonutrients

There are thousands of known phytonutrients and they have been grouped into many different classifications. Many of these you will find that you already know while others you may have never heard of before. All are of benefit and in various clinical studies, many have been proven to prevent, treat and cure degenerative diseases. I will attempt to cover the major classes of phytonutrients in order to help you understand what you are eating in those many fruits and vegetables you consume everyday. Since I began to study phytonutrients it has been hard for me to eat a fruit or vegetable without saying to myself the name of the phytonutrient found in that particular fruit or vegetable. It is very hard to eat a tomato anymore; instead it has become my daily dose of lycopene. I hope the following

chapters do not have a similar effect on you but I do hope that they just might help you understand the wisdom in your mother's vocal command of "Eat your veggies!" during every meal of your childhood years.

BIOFLAVONOIDS

The term bioflavonoid refers to a large family of chemicals found throughout the plant world. Bioflavonoids are sometimes called vitamin P; however, they are not technically vitamins. So what exactly is a bioflavonoid?

Bioflavonoids are phytonutrients or plant derivatives that can have remarkable effects on biochemical pathways in human physiology. There are over 20,000 known bioflavonoids registered in chemical abstracts and over 20 million structures that fit into their chemical classification.

Bioflavonoids occur naturally in fruits and vegetables but they are subject to rapid decomposition and degradation during storage and cooking. For this reason it is important that if you choose to take a bioflavonoid dietary supplement it must be one that is made fresh, contain natural stabilizers to insure the active compounds are still active and it must be combined with all the necessary co-factors needed to activate the bioflavonoids. Bioflavonoids are considered "synergists" to vitamin C and must be combined with vitamin C for optimal benefit. For this reason I usually suggest that one stick to just eating fruits and vegetables that are high in bioflavonoids such as citrus and thus avoid the expense of supplements that may or may not work.

There are numerous bioflavonoids presently undergoing intense study in laboratories all over the world. The emerging results are exciting, to say the least. Clearly, bioflavonoids are becoming extremely impressive phytonutrient agents in cancer prevention.

While many flavonoid concentrates were used in ancient times to treat a variety of human diseases, modern medicine has failed to utilize their enormous therapeutic potential. Nutritional standards are assumed to provide us with all the vitamin C and bioflavonoids we need to be healthy. Even if these set quantities were accurate for maintaining optimal health, how many of us eat diets nutritious enough to maintain maximum health and protection? In other words, do we consume enough fruits and

vegetables to afford us adequate levels of vitamin C and bioflavonoids to provide the protection we need?

“The USDA conducted a study in which they collected dietary information over the course of the year for four independent days. In that study 20% of the adult women had no fruit or juice for four days, and about 45% had no citrus fruit or citrus fruit juice in four days.”

Only 9% of our population gets and eats enough fruits and vegetables on a consistent basis. Unquestionably, most of us are not getting enough vitamin C and flavonoid compounds from our diets.

In addition, it's important to remember that modern farming techniques, premature harvesting of fruits and vegetables, indefinite cold storage, freezing, canning and cooking may denature food of its vitamin C and bioflavonoid content.

Because we know that diseases are often nothing more than nutritional deficiencies, we must make adequate supplementation a priority if we want to enhance our longevity.

There are many different types of bioflavanoids. Some of the most common and thoroughly studied are listed below.

BIOFLAVINOIDS: PROANTHOCYANIDINS

For generations, certain tribes of North American Indians used bioflavonoids extracted from the bark of pine trees for a variety of disorders. Because of its marvelous healing properties, they called this pine the Annedda, or “tree of life”. These Native Americans, who routinely ate deer as their primary source of protein, when confronted with a scarcity of meat asked themselves... where does the deer get its strength? They discovered that deer stripped away pine tree bark and were able to derive life-giving nutrients from its organic composition.

It was also observed that devastating diseases such as scurvy did not afflict those who ate the bark, leaves, or needles of this pine tree. In 1535, Jacques Cartier learned of the medicinal value of the bark, which remained relatively unknown until 20 or 30 years ago when scientists reviewed his notes and commenced research.

Cartier became caught in the bitter snows of Quebec while attempting to navigate the St. Lawrence River. Cartier and his crew subsisted on hard biscuits and cured meat and eventually came down with

what was believed to be scurvy. Scurvy is an abhorrent disease, which causes a very slow and agonizing death.

Several of Cartier's men died before they were approached by the Quebec Indians who prepared a tea they called "Annedda" from the bark of a certain native pine tree. The men took the tea and used the pine needles as poultices. Their recovery was almost immediate. What must have seemed like a miraculous substance was technically, nothing more than vitamin C with bioflavonoids naturally inherent to the pine tree.

Cartier was resourceful enough to document the incident. Over 400 years later, a French professor, Jacques Masquelier, assigned to the University of Quebec discovered Cartier's account. Because he was already involved in bioflavonoid research he became greatly intrigued by pine tree extract. Dr. Masquelier discovered and isolated a bioactive substance known as proanthocyanidin.

After returning to France, Professor Masquelier discovered that these compounds could be extracted from the bark of the French Maritime Pine (*pinus maritima*) found in abundance in southern France. Subsequent intensive research by Dr. Masquelier led to the discovery of the proanthocyanidin family of bioflavonoids. At the time Proanthocyanidins were thought to be the most powerful natural free radical scavenger available. This natural flavonoid has an antioxidant activity 20 times stronger than vitamin C and up to 50 times stronger than vitamin E. Proanthocyanidins are considered safe and effective in the treatment of various diseases and the maintenance of optimal health. This family of bioflavonoids is non-toxic, water-soluble and highly bioavailable.

Because proanthocyanidins scavenge free radicals so effectively, they have shown remarkable curative effects. Extensive research demonstrates that proanthocyanidins are such potent antioxidants they find and neutralize free radicals with great rapidity, allowing cells to regenerate rather than deteriorate.

Specific actions associated with proanthocyanidins include:

- Binds with Collagen and helps with skin elasticity
- Helps prevent excess wrinkling
- Protects capillaries from free radical damage which helps prevent phlebitis, varicose veins and bruising
- Acts as a powerful, natural anti-inflammatory for joint pain and injuries

- Helps control and prevent edema
- Improves the condition of the blood-brain barrier and reverses edema of the brain
- Decreases the production of histamines in Hay fever
- Treats and reduces risk of diabetic retinopathy

Proanthocyanidins have been found to benefit the following conditions

- Ulcers
- Eyesight: Increases visual acuity
- Cancers: Inhibits tumor growth
- Heart Disease
- Atherosclerosis
- Arteriosclerosis
- Multiple Sclerosis
- Colds and Flu
- Prostrate Problems
- Lupus
- Arthritis
- Memory/ Alzheimer's Disease, Senile Dementia
- Stroke
- Parkinson's Disease
- Psoriasis
- Bursitis
- Gastrointestinal Problems
- Insomnia

One of the most significant advantages of this flavonoid compound is its ability to cross and build the blood-brain barrier. Consequently, it acts as an invaluable therapeutic agent in treating depression, chronic fatigue, insomnia or loss of memory.

Other scientific tests have indicated that proanthocyanidins also possess anti-ulcer properties and may work to prevent the formation of undesirable chemicals in the stomach.

The general consensus among many experts in the health field is that proanthocyanidin supplementation is destined to become the most valuable of all the antioxidant compounds. In addition, as more scientific

evidence presents itself, bioflavonoid supplementation will undoubtedly sweep the 21st century health practices.

PINE BARK PROANTHOCYANIDIN

While there is no question as to the nutritive value of the proanthocyanidin compounds, extracting them from pine bark in my own personal opinion has its disadvantages. The strong flavor components of pine bark have to be removed with chloroform, which contains some nerve damaging components. Due to their chloroform residue, some pine bark products are not the most ideal source of proanthocyanidins. In addition, extracting proanthocyanidins from pine bark is quite involved and expensive, making pine bark rather cost prohibitive. Also trees are not an easily renewable source of nutrients. Consequently, I personally prefer using OPCs found in more readily available sources such as grapes.

GRAPE SEED PROANTHOCYANIDINS

Grape seed flavonoids have undergone intensive testing and clinical studies have repeatedly supported their striking antioxidant properties. The proanthocyanidins found in these seeds can not only scavenge and remove free radicals, they can inhibit their propagation as well. The marvelous scavenging action of these compounds was confirmed by Electron Spin Resonance (ESR) spectroscopy.

In 1986 it was discovered that OPC from grape pips has an intense free radical scavenging effect (FRSE) on radical oxygen species. Recently the proanthocyanidins have been described as “the most active substances in the battle against free radicals.”

What was especially exciting about these tests was the fact that grape seed flavonoids also exhibited an anti-enzyme effect which prevented the breakdown of collagen and elastin, two compounds which keep skin firm and inhibit the formation of wrinkles.

Unquestionably, studies have demonstrated that the bioflavonoids extracted from grape seed have extraordinary antioxidant properties and have proven their ability to inhibit cellular mutation.

Double blind placebo controlled studies have indicated that patients suffering from circulatory insufficiencies and diseases on the lymph system

showed significant improvement in pain control and vessel elasticity after taking these flavonoids.

Other experiments concluded that this family of bioflavonoids contained in the grape seed was capable of improving night vision and initiating “a rapid and marked improvement of visual performances after glare in comparison with control group.”

Grape seed proanthocyanidins are particularly valuable for anyone who suffers from water retention and edema. Studies in the Institute of Physiology at the Bulgarian Academy of Sciences confirm that the grape seed extract stabilized capillary walls, which decreased fluid leakage into tissues that cause swelling and pressure.

SAFETY

It would certainly be pointless to find a substance that while seemingly beneficial, was not safe or could not be well tolerated by its users. Studies have shown that the leucoanthocyanins and proanthocyanidins derived from grape seed and skins are practically devoid of any oral toxicity. Even extremely high dosages administered over sustained periods of time showed no toxicity or side effects.

Virtually no actual or potential risks were found with this compound. Grape seed extracted proanthocyanidins have been shown to be safe for conception, pregnant women, and the unborn fetus. They are devoid of any perinatal or postnatal toxicity. On the contrary, the compounds were found to not only benefit targeted disorders, but a variety of other conditions improved as well.

DOSES

If a serious problem or disease exists and simply eating fruits and vegetables is not sufficient to treat a disease I strongly suggest supplementation of proanthocyanidins. In various clinical studies active proanthocyanidin compounds ingested at daily doses of over 100mg were quite effective at treating a myriad of diseases. I suggest that for maintenance of good health at least 50mg be ingested daily and for treatment of disease 200mg be ingested daily.

BIOFLAVINOIDS: NARINGEN, HESPERITIN and RUTIN

These three bioflavonoids are also efficient anti-oxidants and work synergistically with vitamin C and the proanthocyanidins to scavenge free radicals. Moreover, this particular trio of flavonoids has significant anti-allergenic properties. Studies have indicated that these compounds can inhibit the release of histamine, which is the chemical cause of a whole host of miserable allergic symptoms.

Naringin and rutin in many studies have been proven to prevent the release of mastocytic histamine. We hear so much about anti-inflammatories today and they are routinely prescribed for a number of disorders. Several laboratory tests support the fact that these flavonoids can significantly decrease inflammation by preventing histamine from permeating vessel walls. Obviously, any allergic condition, edema or other inflammatory diseases would substantially benefit from this vascular action.

Many acute inflammatory conditions can be controlled by inhibitors of mediator synthesis or by antagonists. . .this modulation can be obtained with these three flavonoids or chemical derivatives such as S5682 (a hesperitin mix). If you bruise easily, this group of bioflavonoids is particularly desirable. Naringin and hesperitin significantly prevent capillary fragility and interstitial bleeding.

BENEFITS

- Increase capillary strength
- Inhibit viral invasion
- Natural anti-inflammatory action
- Anti-allergenic/ inhibits histamine production
- Helps control Edema

SAFETY

To date there are no known drug contraindications or side effects to the consumption of these bioflavonoids. Naringen has been found to inhibit the absorption of statin drugs. It is also advised not to take Naringen with psychotropic drugs as well as it prolongs the AVD of the drug or the time it takes to clear the blood stream.

DOSES

Most doses between 10mg and 50mg are effective. Any dose over 50mg may be unnecessary and costly for prevention. For treatment of some diseases I have found that when combined with other bioflavonoids 25mg to 50mg is sufficient.

BIOFLAVINOIDS: QUERCETIN

Quercetin is another remarkable flavonoid. Its particular antioxidant activity has been found to help reduce the risk of coronary heart disease. Quercetin helps to dilate and relax blood vessels and has a protective effect against certain types of arrhythmias. It is the major active component of Ginkgo biloba and may be responsible for the beneficial effects that Ginkgo has on brain neurons.

Quercetin has demonstrated its ability to reduce tumor incidence, which attests to its ability to neutralize oxidants within cellular material. Its anti-viral activity is particularly significant today, as we face new viral diseases capable of adjusting to various pharmacological treatments.

“Several derivatives of quercetin were found to have anti-viral activity against picornaviruses in vitro. This family includes the polio-viruses, ECHO viruses, Coxsackie viruses and rhinoviruses. The latter are the major causes of the common cold.”

Quercetin is a remarkable bioflavonoid that can help to protect the body against viral or bacterial invasion if given before an infection progresses. It is invaluable as an immune system booster and a protectant against disease. For anyone who suffers from asthma, quercetin may effectively treat and help to prevent asthmatic symptoms.

Seven Chinese herbal drugs were screened for their ability to inhibit certain enzymes that cause several of the complications associated with diabetes. Quercetin was among the compounds tested and exhibited a potent action against these destructive enzymes. Anyone who suffers from diabetes should be aware of quercetin's potential benefits.

Another exciting result of laboratory tests on quercetin was its ability to help normalize hormone levels in both males and females. The effect that quercetin demonstrated on female estrogen and male testosterone levels suggests that the flavonoid is valuable in treating women with high estrogen related problems and men who suffer from prostate disorders.

While to my knowledge quercetin has not been clinically tested for its ability to treat migraine headaches, its activity as a mast cell stabilizer suggests that it may indeed be useful.

BENEFITS

- Powerful anti-oxidant
- Strengthens immune system
- Helps lower risk of coronary heart disease
- Lowers blood cholesterol
- Anti-tumor
- Has anti-viral and anti-bacterial properties
- Decreases symptoms of gout
- May help prevent migraine headaches
- Works to normalize hormone levels

SAFETY

There are no clinical tests that prove drug contraindications to quercetin and no known side effects of taking large doses. I have found that quercetin acts as a mild blood-thinning agent if taken at 100mg or more and therefore you should be concerned if you are already on a prescription blood thinner.

DOSES

For the prevention of diseases I normally recommend between 25mg and 100mg daily. For heart disease and reduction of cholesterol 150mg or more daily is sufficient.

BIOFLAVINOIDS: SILYMARIN

Because the notion of prevention of disease and protection from toxins is crucial to many of us I had to include Milk Thistle and a certain bioflavonoid found within it called silymarin into this book. Because many herbs are adaptogenic, they work when the body is under stress. In other words, they affect no change unless change is required. In addition, herbs help to stimulate the immune system by sustaining higher levels of B and T cells when combined with exercise.

Milk Thistle, is an exceptional herb with a long history of use in the United States. It has undergone a number of rigorous clinical and laboratory tests and contains a special kind of bioflavonoid called silymarin.

The chemical components of silymarin are referred to as true hepatoprotective, or “liver friendly” chemicals. Its biochemical activity provides a protective effect on the membranes of liver cells. Concerning patients with chronic alcoholic liver disease, tests concluded that: “the scavenger, silymarin is able to increase the antioxidant protection of the cells by ameliorating the deleterious effects of free radical reactions.”

Silymarin, like the other bioflavonoids discussed, also has the ability to scavenge free radicals and has been found to be particularly valuable in treating diabetes and its side effects. Moreover, silymarin may be helpful to people suffering from high blood pressure and those that have experienced heart attacks.

Silymarin, like quercetin and the proanthocyanidins helps to control the risk of estrogen-related diseases. When combined with other ingredients, silymarin serves to enhance and complement the antioxidant supplement. I speak of silymarin when combined with supplements due to the fact that the herb is quite bitter and many people prefer to ingest it in a capsule form rather than a tea or as a garnish..

BENEFITS

- Liver protectant
- Powerful free radical scavenger
- Diabetes and its complications
- Estrogen related disorders

SAFETY

There are no cases of over toxicity of milk thistle and in many studies overdoses have only proven to cause an upset stomach. Also there are no known drug contraindications.

DOSES

At least 100mg daily of milk thistle should be consumed daily for the prevention of liver disease and for those individuals who live in over toxic environments such as large cities or developed countries. Large doses

of 500mg or more have been proven to help treat hepatitis C and other viral infections.

BIOFLAVINOIDS & Natural Vitamin C

Because bioflavonoids depend on vitamin C as a co-factor I thought it wise to include some information on vitamin C. There are many forms of natural vitamin C and ascorbic acid is not one of them. As previously stressed, in order for bioflavonoids to function effectively within bio-cellular structures, vitamin C must be present. Vitamin C potentates the action of falcenoid compounds. I never have liked, nor do I promote the use of ascorbic acid. Vitamin C, in its natural state as Calcium Ascorbate, is always recommended over ascorbic acid, which is derived through a man-made process. Though over 90% of the vitamin C supplements on the market contain ascorbic acid and tout it as being all natural, the truth is that ascorbic acid in large doses can actually harm the body. Instead of focusing on the harmful effects of ascorbic acid I simply wish to focus on natural vitamin C and several of its good, natural sources.

To date, the highest known natural source of vitamin C is found in the Acai berry. The Acai berry is a rare sub tropical berry originating from South America and is extremely rich in vitamin C. Acai Berry typically contains between 15% and 22% vitamin C. In South America, acai provided the people with protection from scurvy. It is very bitter to eat however and so many tribes dried the fruit and made teas from it sweetened with cane sugar or mixed into alcoholic beverages. Today it is quite easy to find the powdered form of the Acai berry and take it in a capsule form.

Other good sources of natural vitamin C are the common rose hip, acerola cherries, orange peels (make sure you eat peels that have not been sprayed with chemicals) and tropical fruits. All of these are very common and do not need to be explained further in this book.

INDOLES

Indoles are a phytochemical mix extracted from cruciferous vegetables, which include cabbage, broccoli, kale, turnips and bok choy

and others. Cruciferous vegetables contain a variety of Indoles such as indole-3 carbinol, ascorbigen and others.

Indoles belong to a class of phytonutrients that have been scientifically shown to benefit the body in a number of very important ways. Recent studies are just beginning to reveal the profound value of indoles.

Indole-3 Carbinol assists in detoxifying human tissues, promotes hormone balance, boosts immunity against diseases like cancer and provides excellent cellular nourishment.

Ironically, like so many other nutrients, ancient physicians were well aware of the remarkable curative power of these indoles found in certain vegetables. 2000 years ago, Roman practitioners prescribed cabbage leaves to cure an ulcerated breast. Today, science has confirmed that certain phytochemicals contained in cabbage are considered breast cancer preventative agents. Indole-3 carbinol can actually help decrease C16 estrogen and transform estrogens into the inactive C2 estrogen, which is believed to decrease a woman's risk of getting breast cancer.

All cruciferous vegetables contain this important phytochemical. Unfortunately, only 9% of the American population eats an adequate amount of vegetables and fruits. A recent report I read stated the following... "On any given day, only one in five Americans ate a fibrous or cruciferous vegetable and only 28% ate a fruit or vegetable."

Remember that to keep C2 estrogen levels elevated consistently, phytochemicals, including indole-3 carbinol must be continually consumed. Does your menu typically feature daily portions of cruciferous vegetables?

Clearly, supplementation of bioflavonoids and indoles is warranted and can enhance longevity and improve the quality of life. Taking cruciferous vegetable extracts as part of a balanced supplement can provide as many indoles as several servings of raw cruciferous vegetables. It's important to remember that if you can't eat broccoli and cabbage every day, there are other options.

The nutritional and antioxidant properties of indoles greatly contribute to sustained health and cellular nourishment. Perhaps the best attitude we can adopt regarding disease is to intensely pursue protection and prevention rather than cure.

BENEFITS

- Increase immune function

- Anti cancer activities
- Anti oxidant and youth restoring properties

SAFETY

To date there are no known drug contraindications or side effects to the consumption of these Indoles.

DOSES

Most doses between 25mg and 50mg of purified or standardized Indole blends are effective. Any dose over 50mg may be unnecessary and costly for prevention. For treatment of some diseases I have found that when combined with other bioflavonoids 25mg to 50mg is sufficient.

XANTHONES

Xanthones consist of a group of phytochemicals that are found mostly in a certain varieties of tropical fruits. Unfortunately many of these beneficial xanthones are found in the skin or the rind of the fruit and therefore are difficult to ingest or are too bitter for ones pallet. Therefore finding xanthones in the form of a dietary supplement is ideally the best way to ingest them.

There are several varieties of xanthones that have been well researched and documented to have beneficial properties. Of these types of xanthones alpha-mangostin, gamma-mangostin, and garcinone-E have proven to be the most beneficial so far. All of these varieties are very potent free radical scavengers and the mangostins act as anti-inflammatory agents as well.

Regarding the treatment of cancer, Garcinon-E was shown in a study in Taiwan to kill all cancer cell lines and actually outperformed four of five commonly known chemotherapy drugs including cisplatin and methotrexate, in liver, lung, and stomach cancer. Also, many Japanese studies have shown that varieties of Xanthones show anitproliferative activity against human leukemia.

A group of scientists in Japan found that gamma-mangostin prevented the release of prostaglandin (an inflammation stimulator). Prostaglandin is also primarily responsible for the pain and swelling

associated with most conditions of inflammation. There are several studies being conducted now to see if gamma-mangostin can prevent or treat asthma attacks in children and adults.

It has also been recently discovered that xanthonenes also possess some anti-viral properties. If these studies prove to be validated then the use of xanthonenes as an effective treatment for asthma would be highly recommended as it would act as an anti-inflammatory agent while modulating the immune system and act as an anti-microbial agent as well.

For all of these reasons I have found it wise to have my children supplement with a product containing xanthonenes as there is irrefutable evidence of potent anti-bacterial, anti-viral and immune boosting properties as well. For more information on Xanthonenes please refer to the Mangosteen Medical Reference, a book written by a good friend, Dr Frederic Templeman MD. No mother or father should be without the knowledge contained within this book.

SAFETY

To date there are no known drug contraindications or side effects to the consumption of Xanthonenes.

DOSES

Most doses between 25mg and 50mg are effective for disease prevention. Any dose over 50mg may be unnecessary and costly for prevention. For treatment of some diseases I have found that doses up to 500mg to 1 gram works quite rapidly as an anti-microbial and anti-cancer treatment.

CHLOROPHYLL

Chlorophyll is the molecule that catches the biggest power source in our universe...the sun. Chlorophyll acts as a photoreceptor creating the special chemical reaction in plants known as photosynthesis. Without it, plant life could not exist as we know it. Chlorophyll is found in the chloroplasts of green plants, and is what makes green plants, green. The basic structure of a chlorophyll molecule is a porphyrin ring, co-ordinated to a central atom. This is very similar in structure to the 'heme' group

found in hemoglobin in blood, except that in hemoglobin the central atom is iron, whereas in chlorophyll it is magnesium.

There are actually 2 types of chlorophyll, named *a* and *b*. They differ only slightly in the composition of a side-chain of carbon atoms. Both of these two chlorophylls are very effective photoreceptors because they contain a network of alternating single and double bonds, which we do not need to get into too much detail in this book, however it is the effect of these double bonded strands of polyenes that give them the ability to produce energy from sunlight.

Chlorophyll absorbs sunlight so strongly that it can mask other less intense colors. Some of these more delicate colors (from phytochemicals such as carotene and quercetin) are revealed when the chlorophyll molecule decays in the autumn, only after this decay can we begin to see the colors of the other phytonutrients in plants. We observe this in the autumn when the leaves of the trees turn red, orange, and golden brown. One important note about chlorophyll is that it is easily damaged when the vegetation is cooked. When you cook foods that contain chlorophyll you are replacing the central magnesium core atom with a hydrogen ion. This affects the energy levels within the molecule, causing its absorbance spectrum to alter.

Chlorophyll has been well known for its anti cancer effects for over 70 years now. It is widely known that eating a diet consisting of a large amount of greens can not only prevent many types of cancer but will also assist in detoxifying the body and increase immunity and energy levels.

Most of the major problems facing Americans today in regards to obesity, cancer, diabetes and heart disease could be overcome within a generation if we simply ate more nutrient dense, dark green leafy vegetables. This simple solution alone could save taxpayers billions of dollars a year in hospice care and other related health care costs.

BENEFITS

- Increases iron and Vitamin K levels
- Powerful free radical scavenger
- Anti cancer benefits
- Enhances the absorption of Calcium

SAFETY

To date there are no known drug contraindications or side effects to the consumption of chlorophyll rich vegetables. If consumed in extremely large quantities a runny stool or symptoms such as diarrhea could develop.

DOSES

Most doses in the form of spirulina, chlorella, and other types of sea greens are safe and effective at 1000mg to 5000mg a day for disease prevention. For the treatment of disease I have not found it effective at any dose except in cases of mild anemias where a simple dose of 10 grams a day can make all the difference in one's energy levels.

CAROTENOIDS

Our understanding of the value of the carotenoid family of phytonutrients has increased enormously since the 1980's. Although scientists now appreciate their value, the name "carotenoid" is still not generally a household word (it is pronounced ka-rot-ten-noid). The name is derived from "carrot" and essentially means compounds similar to the orange-pigmented nutrients found in carrots. Unfortunately, American diets are woefully deficient in these marvelous nutrients.

Exactly what is beta-carotene good for and where does it come from? This is a question I get all the time as most people seem to think that carrots are the only source. The fact of the matter is that anything with an orange or yellow pigment most likely contains carotenoids.

The objective of this section is to simply explain what carotenoids are, what they do and how they can keep you healthier longer. Also I will additionally discuss the functions of carotenoids and how they protect us from a wide array of diseases, including cancer, heart disease, cataracts, macular degeneration and many other age-related diseases.

WHAT ARE CAROTENOIDS AND CAROTENES?

Carotenoids are simply compounds having a long chain of carbon atoms with conjugated double bonds. While it is not important to know what a conjugated double bond system is, it is important to note that this

particular chemical structure makes the carotenoids very highly colored, because the double bonds readily absorb most colors of the light spectrum.

Without carotenoids, it would indeed be a very dark and dreary world. Carotenoids are particularly beautiful. The yellow, orange and many red pigments in plants are usually carotenoids. These pigments are made by plants primarily to protect the stems and leaves from the powerful energy of sunlight which plants need for photosynthesis. In the autumn, when deciduous trees prepare for winter and shut off their chlorophyll production, the green fades and the carotenoids that give autumn leaves their brilliant yellows, oranges and reds are revealed before the leaves fade to brown and fall.

The beauty of nature continues as the carotenoid pigments can accumulate—or be modified—in the protective coloration and sexual attraction of some animals, especially birds, fish and crustaceans. The brilliant red plumage of the cardinal, the pink of the flamingo and the distinctive coloration of shrimp are just three of thousands of possible examples.

More importantly, without carotenoids, not only would there be less color in the world, we wouldn't be able to see anything at all. Without carotenoids, there would be no vitamin A anywhere. And without vitamin A, there would be no light-gathering pigments in the eye.

VITAMIN A AND THE CAROTENOIDS

As a child I was taught to eat my carrots because they contained vitamin A and that was good for my eyes. Most people also learned that yellow and orange vegetables as well as leafy greens contained vitamin A. The truth is that none of these vegetables contain vitamin A.

Actually, vegetables and other plants contain compounds your body can convert into vitamin A. (Vitamin A is produced by animals, not plants.) The compounds that are made into vitamin A by the body are called vitamin A “precursors” and belong to the carotenoid family. Not all carotenoids can be converted into vitamin A, but all compounds that can be converted into vitamin A are carotenoids. Beta-carotene, just one of the 600 or so members of the carotenoid family, is considered the best source of vitamin A because each molecule of beta-carotene can be made into two molecules of vitamin A in the body.

Originally, we were interested in beta carotene because we were interested in vitamin A. Then we became interested in beta-carotene because it helps prevent cancer. Beta-carotene is a stronger antioxidant than vitamin A. However, beta-carotene alone is not as effective as mixed carotenoids. In fact, beta-carotene represents less than 30 percent of the total amount of mixed carotenoids circulating in the blood. Many clinical studies have shown that beta-carotene...

- Enhances the immune system
- Promotes gap-junctional communication between cells
- Protects against cancer
- Defends against heart disease
- Protects against stroke
- Lowers total cholesterol levels
- Decreases risk of cataracts and macular degeneration
- Prevents certain photosensitivity disorders
- Reduces stress reactions
- Improves fertility
- Decreases risk of degenerative diseases
- Protects cellular integrity
- Enhances gene regulation and expression

However we now know that other carotenes such as alpha-carotene and many other carotenoids have similar properties and in many cases are more effective at preventing diseases. Several carotenoids enhance the immune system and improve our body's ability to protect us against disease and foreign invaders. Recently much knowledge has been gathered on the role of certain carotenoids in gap-junctional communication (GJC). Carotenoids inhibit tumor development via gap-junctional communication and not by antiradical action alone. Gap-functioning communication may be a new concept to readers. Some scientists believe that carotenoids achieve cancer protection by improving the chemical communication between cells, which helps cells being transformed into cancer cells revert back to normal.

Other studies on carotenoids have already elucidated the relationship between the deficiency of beta-carotene and the development of cataracts. Also, the carotenoids lutein and zeaxanthin have been shown to prevent

macular degeneration, a blinding disorder of aging. Several studies have shown that carotenoids increase immune protection and may even help alleviate arthritis.

Basically the carotenoid family consists of smaller families of pigments called carotenes and xanthophylls (pronounced zan-tho-fills). Carotenes are hydrocarbons (containing only carbon and hydrogen atoms), whereas xanthophylls also contain atoms of oxygen.

The carotenes are commonly found in carrots, algae, orange fruits and green vegetables. The human diet contains about a hundred different carotenoids. Nineteen different carotenoids have been identified in human blood so far. The carotenes that are of most interest currently are beta-carotene, alpha-carotene, gamma-carotene, lycopene (pronounced lie-co-peen) and phytoene (fi-toe-een). Many of us now know the word lycopene as a Time Magazine article entitled "Is pizza good for you?" presented the fact that lycopene (contained in fruits and vegetables that are red like watermelon, pomegranates, and red peppers) was found in tomato sauce and therefore pizza was good for us. Lycopene has been proven to be a good anti-cancer agent especially for prostate cancer.

The most well studied xanthophylls are canthaxanthin (can-tha-zan-thin) found in many algae and fungi, lutein (lew-te-een or lew-teen), zeaxanthin (zee-zan-thin) found in corn, capsanthin (cap-san-thin) which gives the spice, paprika, its color, and astaxanthin (as-ta-zan-thin). Lutein, of course, is found in many dietary supplements world wide and is praised for its immune enhancing properties as well as its benefits to improving vision.

Carotenoids, are definitely phytonutrients worth our study and my purpose is not to convince you that one is better than the other. However I will say that we should ingest our carotenoids in a natural (mixed) form as we still do not know all the benefits of each individual carotenoid.

MOST PEOPLE ARE CAROTENOID DEFICIENT

Unfortunately, the vast majority of Americans are not even close to reaching the optimal dietary intake of mixed carotenoids and other antioxidant nutrients. Even those who consume adequate vitamin A can still be deficient in various carotenoids, although there is no official RDA

(recommended daily allowance) for each carotenoid. The Second National Health and Nutrition Examination survey, which accurately represented the entire U.S. population, found that only 29 percent of U.S. adults ate the recommended two servings of fruit on the survey day and only 27 percent ate the recommended three servings of vegetables. Fifty-two percent did not meet either guideline. Only 9 percent of those surveyed met the official guidelines that recommended three servings of vegetables and two servings of fruit daily.

If people are not eating enough fruits and vegetables, they are not getting adequate intakes of mixed carotenoids! This trend will slowly tax America of its health care resources as we slowly bring about the disease and degeneration of our elderly populations.

THE MAJOR CAROTENOIDS

Beta-carotene

Beta-carotene is the most well-known and best-studied member of the carotenoids. Carotenoids are synthesized by plants, and as a result they have been in the human diet for as long as we have been on earth. Beta-carotene and, to a lesser extent, alpha-carotene are precursors of vitamin A. Although many other carotenoids are not converted into vitamin A in our bodies, they are antioxidants, antiradicals and singlet-oxygen quenchers and may participate in gap-junctional communication. Beta-carotene has two identical ring structures (beta-ionone rings)—one ring at each end of the molecule. Thus our bodies, with the help of dioxygenase enzymes, can split a molecule of beta-carotene into two vitamin A (retinol) molecules.

Alpha-carotene

Alpha-carotene is normally found in the same foods as beta-carotene. However, foods differ in the ratios of these two carotenes. Alpha-carotene is very similar to beta-carotene in structure and contains the same number of carbon atoms (40), the same nine conjugated double bonds backbone and the same number of ring structures (2). One of the rings is beta-ionone, identical to that found in beta-carotene. But the other ring is slightly different in that the double bond is shifted by one carbon atom. A molecule of alpha-carotene yields only one molecule of vitamin

A. However this does not undermine the fact that alpha-carotene is an essential player in the carotenoid family. Recent evidence shows that alpha-carotene may be up to ten times better than beta-carotene at preventing some types of cancer cell mutations in the liver, lungs, skin and eyes.

Lycopene

Lycopene is often the predominant carotenoid found in the standard American diet because of the prevalence of tomato products, including pizza and spaghetti, in a population that generally avoids fruits and vegetables.

Lycopene is the carotene that has the longest chain of conjugation without the involvement of ring structures. Since lycopene has no ring structures, it does not produce vitamin A. However, this structure gives lycopene the greatest ability of the carotenoids to absorb all but the longest wavelength of light and the highest efficiency in quenching singlet oxygen molecules (free radicals). Since the only color not absorbed by lycopene is the deepest of reds, lycopene imparts a deep red to those fruits and vegetables in which it is rich. For instance, it creates the color of ripe tomatoes and watermelon pulp.

Lutein

Lutein is a xanthophyll found in many leafy green vegetables, some fruits, alfalfa and egg yolks,. Lutein is of particular import because of its role in preventing macular degeneration, a leading cause of blindness in the elderly. This phytonutrient has several clinical applications for enhancing vision in elderly patients and is very simple and inexpensive to take in supplement form thus adding to its popularity.

Astaxanthin

Astaxanthin is a carotenoid found in generous quantities in plants, yeasts and marine animals. A major commercial source of astaxanthin is Antarctic krill (*Euphausia superba*). Krill are small shrimp like crustaceans that feed on algae and are, in turn, the staple diets of several sea creatures including whales.

Several studies indicate that astaxanthin has greater antioxidant activity under some conditions than beta-carotene or vitamin E and is ten

times more efficient at quenching free radicals than beta-carotene. As a singlet-oxygen quencher, astaxanthin ranks just behind lycopene and gamma-carotene. Depending on the system being tested, data suggest astaxanthin may have five-to-twenty times the antioxidant activity of beta-carotene, while the data comparing astaxanthin to vitamin E suggest a range from somewhat greater antioxidant activity than that of vitamin E to nearly 1000 times more than that of vitamin E.

Unlike beta-carotene, astaxanthin is a membrane surface antioxidant. Astaxanthin can terminate free radicals at the membrane surface before they can damage the membrane or intrude into the cell. This is very important in that it may help prevent the cell wall becoming hard which is of particular importance to arterial sclerosis sufferers.

Why so many carotenoids?

In my studies I have formed the opinion that though we can question nature, we should never attempt to change her. (Similar to my wife) It may be that each carotenoid has a different efficiency in protecting against cancer depending upon the particular mechanism of carcinogenesis or other toxins involved. We do know that we need them and we do know that they are beneficial. Many of the 600 or more known and classified carotenoids may never be found in our life time to have beneficial properties. But rest assured, one day we will have answers and they may surprise even the brightest of us. In the end, we should trust nature more than we trust our evolving yet limited understanding of how nature works. These complexes in foods are varied and may have varied uses. It seems very likely to me that natural food concentrates, such as *D. salina* or palm seed oil, which have naturally occurring mixed carotenoids, may well have synergistic effects beneficial to humans as well as the plants they protect. It is important that we get adequate amounts of various carotenoids and avoid concentrating on any one carotenoid as that may inhibit the absorption or transport of the others. Nature already knows the answers and provides us with mixed carotenoids in the form of fresh fruits and vegetables.

SAFETY

To date there are no known drug contraindications or side effects to the consumption of any carotenoids.

DOSES

Doses vary due to the large variety of the carotenoid family however if taken in capsule form or liquid form a concentration of a variety of carotenoid family members would make a good antioxidant or disease prevention supplement.

SUMMARY

Though there are literally thousands of phytonutrients not covered in this brief booklet, I have attempted to touch upon the major classifications and hope that I have impressed upon your mind the importance of eating a variety of fruits and vegetables on a regular basis. Many people find changing their eating habits a hard thing to do and for this purpose I have also covered the importance of finding a good dietary supplement for these important phytonutrients.

It is my firm belief that within the next decade many new drugs will be utilized which will be chemical derivatives of many of the nutrients covered in this booklet. One day I hope that allopathic medicine will come to a realization that poor eating habits and the consumption of lifeless foods can kill us and that the consumption of wholesome, phytonutrients rich foods can be our drug; The drugs of the future.

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