

WHITE PAPER

Molecular BioLife International

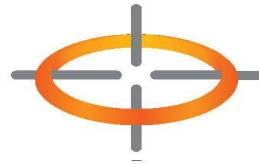
Presents

ULTRA RICH IN FLAVONOIDS, ANTIOXIDANTS

AND

POWERFUL OXYGEN RADICAL ABSORBANCE CAPACITY (ORAC)

CITRICOGEN



Research Presented By:



The Mortec Scientific Group

(Pharmaceutical / Natural Health Products Division)

6320 Northwest Drive Mississauga, ON L4V 1J7 / 101 Holiday Inn Drive #29105 Cambridge, ON N3C 0E6
3-1750 The Queensway, Suite 209 Toronto, ON M9C 5H5 / UofW Campus Laboratory, Waterloo, ON N2L 3G1
Toll Free Telephone Line: 1-800-717-2078 / Toll Free Fax Line: 1-844-202-5677

Abstract

This discourse begins by providing a comprehensive analysis of the various sub-classes of flavonoids. Following this, the various benefits associated with flavonoid consumption will be outlined. In particular, there is an emphasis on the benefits of flavonoid intake on ocular health. A new novel product called Citricogen as produced by the ever creative and innovative minds at Molecular BioLife International (MBI) is destined to take the flavonoid market by storm. Citricogen is a superlative source of flavonoids and therefore has the potential to afford a multitude of the health benefits explored but certainly not limited to this work.

Flavonoids – As Found In Citricogen

Flavonoids make up various classes of plant metabolites believed to afford a number of health benefits, including enhancing the immune system, reducing one's risk of hypertension and cerebrovascular accident, weight loss, neurodegenerative and cardiovascular disease prevention, fighting bacteria and viruses, and a slew of ocular health benefits (such as protecting the eye from oxidative stress, remedying symptoms of glaucoma, and protection against the development of cataracts and macular degeneration). It is important to note that this list of benefits is not exhaustive. Flavonoids come from various sources, naturally and through supplementation. Nonetheless, a citrus blend produced by MBI appears to be a particularly rich source of flavonoids and thus has the potential to provide the aforementioned health benefits.

What are Flavonoids?

Flavonoids are defined as a diverse group of phytonutrients present in most fruits and vegetables. In particular, flavonoids belong to the polyphenol class of phytonutrients. Flavonoids are found in abundance in onions, tea, strawberries, kale, grapes, Brussels sprouts, parsley, citrus fruit, and so on. There are over 6,000 types of flavonoids, making it the largest group of phytonutrients (Sahelian, 2016; Szalay, 2015).

Flavonoids typically consist of two aromatic rings, each containing a minimum of one hydroxyl, connected through a three-carbon "bridge" part of a heterocyclic ring. Flavonoids are divided into subclasses based on the connections of the aromatic rings, and the oxidation state and functional groups of the heterocyclic ring. In each subclass, compounds are characterized by conjugation and hydroxylation patterns (Sahelian, 2016).

As noted, flavonoids are categorized into various groups, with subgroups in each. Each flavonoid group is associated with differing benefits.

One group of flavonoid is flavones, including luteolin and apigenin. Hot peppers, celery and parsley are all excellent sources of flavones, which are associated with antioxidant benefits and delaying the metabolizing of drugs.

Anthocyanidins include cyanidin, malvidin, pelargonidin and peonidin. Red berries, purple berries, blue berries, pomegranates, plums, red wine, red grapes and purple grapes are all abundant in anthocyanidins. Anthocyanidins promote heart health, help prevent obesity and diabetes, and have powerful antioxidant properties.

Flavonones are found in citrus fruits, and include hesperetin, eriodictyol and naringenin. They are correlated with relaxation and good cardiovascular health as well as anti-inflammatory and antioxidant activity.

Isoflavones are found in high concentrations in soy products and legumes, and include the following subgroups: genistein, glycitein and daidzein. Isoflavones are phytoestrogens (they act like estrogen). It is suspected that they lower one's risk of breast, endometrial and prostate cancer, although more research is needed. It is also noted that they are being tested as a means of treating menopause.

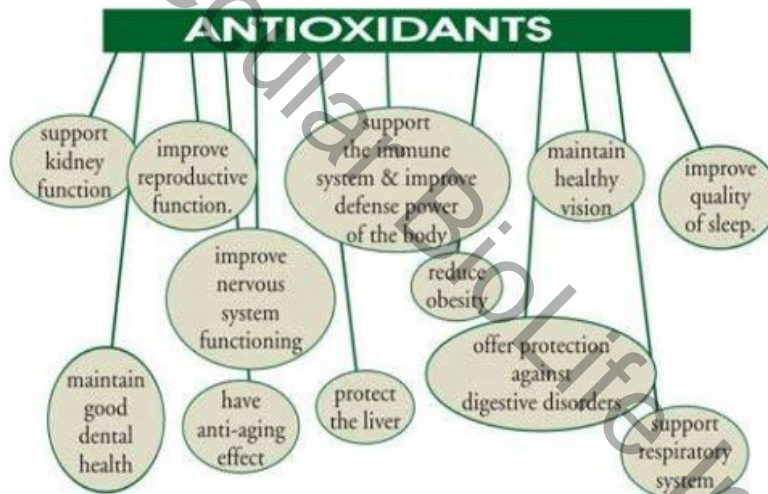
Flavonols are found in onions, leeks, Brussels sprouts, kale, broccoli, tea, berries, beans and apples, and includes quercetin and kaempferol. Quercetin, a known antihistamine, is associated with helping to remedy hives and hay fever, and has potent anti-inflammatory effects. As an antihistamine, quercetin stabilizes the membrane of cells that secrete histamine and therefore may help prevent allergies. A variety of other flavonols also have powerful anti-inflammatory and antioxidant effects, thus helping to prevent the onset of chronic disease.

The three primary types of flavanols are monomers (catechins), dimers and polymers. Some of the older traditional method for obtaining flavanols are certain teas, cocoa, grapes, apples, berries, red wine and fava beans.

The greatest hurdle though is to ensure a therapeutic level one would have to ingest a tremendous quantity of these food substances. Another drawback is that there is some inconsistency in quality of flavanols and the bioavailability within the gastrointestinal tract.

Out of these almost daily are new studies releasing the positive attributes of catechins. Catechins are a natural phenol and antioxidant, extremely useful in treating chronic fatigue syndrome and play an important role in neurological and cardiovascular health (Szalay, 2015). Catechins have recently been noted by notable medical academic institutions to play a key role in the reduction in body fat and malondialdehyde-modified LDL in men.

Above graphic adapted from Prof. Louay Labban - Professor of Nutrition at A'Sharqiyah University



Health Benefits: Elaborated

As previously stated, flavonoids are potent antioxidants and thus have powerful anti-inflammatory and immune system benefits. In a study, it was found that onion extract and quercetin were able to double the concentration of glutathione. As such, diets abundant in flavonoids are sometimes related to cancer, neurodegenerative and cardiovascular disease prevention (Sahelian, 2016; Szalay, 2015).

A meta-analysis indicates that dietary flavonoids lower one's risk of developing upper respiratory tract infections (URTIs) by strengthening immune responses: "flavonoid supplementation decreased URTI incidence by 33% compared with control... Sick-day count was decreased by 40%..."(Sahelian, 2016).

Animal studies find that flavonoids have potent anti-cancer effects against cancers of the lung, mouth, stomach, colon, skin, and so on. Nonetheless, more human studies must be conducted in order to more definitively ascertain the relationship between flavonoids and cancer. A study in the *British Journal of Cancer* found that one's risk of developing breast cancer was significantly reduced when they consumed high levels of flavones. Another study found a negative relationship between kaempferol intake and gastric cancer risk. Other studies indicate that flavonones are associated with reduced gastric cancer risk. Flavonoids contain phytochemicals that have anti-inflammatory and anti-cancer properties. Additionally, lycopene may be involved in maintaining good prostate health. Other sources of flavonoids contain allyl sulphides, which may inhibit cancer cell growth (Sahelian, 2016; Szalay, 2015). Research suggests that those who consume a high concentration of flavonoids are at a reduced risk for developing hypertension and experiencing strokes. Flavonoids exhibit anti-germ activity and thus have the ability to fight bacteria and viruses. Moreover, the antiherpetic activities of flavonoids also fight HSV-1 and HSV-2 in vitro (Sahelian, 2016).

Papers from Harvard University and the University of East Anglia suggests that flavonoids, particularly anthocyanins, flavanones and flavones, reduce the incidence of erectile dysfunction in men (Sahelian, 2016).

It is asserted that flavonoids help protect against neurodegenerative diseases, such as Alzheimer's, multiple sclerosis, Huntington disease, amyotrophic lateral sclerosis and Parkinson's. It is important to note, however, that animal studies yield more conclusive results when compared to human studies. A study from the *European Journal of Epidemiology* determined that among elderly subjects, those who consumed the highest levels of flavonoids were half as likely to develop dementia over the next five years compared to those with the lowest flavonoid intake. In contrast, a study from *JAMA* found that increased flavonoid consumption lowered one's risk of dementia, but only for smokers. These findings are reminiscent of a study on Alzheimer's from *Archives of Neurology* (Szalay, 2015).

In addition to their potent antioxidant properties, flavonoids may help protect against neurodegenerative diseases by interacting “with cellular signaling pathways followed by transcription and translation that mediate cell function under both normal and pathological conditions” (Sahelian, 2016).

Flavonoids may increase blood flow to the brain, thereby improving cognitive functioning. A study in the *American Journal of Epidemiology* “found that elderly men and women with higher flavonoid intake had better cognitive performance at the start of the study and significantly lower flavonoid intake” (Szalay, 2015).

It was found that the effects of a high concentration of flavonoids are enduring: after ten years, subjects with a high flavonoid intake experienced a 1.2-point decrease in scores on the MMSE compared to those who consumed low amounts of flavonoids who experienced a 2.1-point decrease in scores (Sahelian, 2016).

Flavonoids may lower one's risk of atherosclerosis by promoting the health of blood vessel walls and protecting low-density lipoprotein (LDL) cholesterol from free radical damage.

Diets rich in flavonoids are thought to invoke endothelium-dependent vasorelaxation. In particular, acacetin, apigenin, chrysin, hesperetin, luteolin, pinocembrin, 4'-hydroxyflavanone, 5-hydroxyflavone, 5-methoxyflavone, 6-hydroxyflavone and 7-hydroxyflavone all show full vasorelaxing effects, while other flavonoids show partial vasorelaxing effects. The dilation of blood vessels may be helpful in preventing vascular diseases, such as coronary heart disease, by improving blood flow and concurrently preventing the formation of blood clots. The stimulation of vascular potassium channels has been implicated as a possible pathway for the vasodilatory action of some flavonoids. Moreover, ATP-sensitive potassium channels may be implicated in these processes (Sahelian, 2016).

A slew of studies support the contention that flavonoid consumption is related to lowered cardiovascular disease risk. This includes a study published by the *American Journal of Clinical Nutrition*.

This study, testing 10,000+ subjects, found that "those with higher levels of quercetin had lower rates of ischemic heart disease and those with higher levels of kaempferol, naringenin and hesperetin had lower cerebrovascular disease rates" (Szalay, 2015).

A variety of flavonoids prevent platelet aggregation, which contribute to the formation of blood clots. In particular, flavonoids inhibit platelet function through binding to the thromboxane A2 receptor (Sahelian, 2016; Szalay, 2015).

Flavonoids are associated with skin protection as well as blood pressure and blood sugar regulation. A study published in *Diabetic Medicine* found that adding flavonoids to a type 2 diabetic's meal resulted in improved vascular function in merely hours (Szalay, 2015).

A 25-year study published in the *Archives of Internal Medicine* found that flavonoid consumption is highly correlated with longevity. It was determined that flavonoid consumption “could account for 25 percent of the observed difference in mortality rates from coronary heart disease and cancer” (Szalay, 2015).

Flavonoids are associated with weight loss by suppressing hunger related hormones (Szalay, 2015). Furthermore, flavonoids have “abdominal fat-lowering and hypoglycemic effects, possibly mediated via activation of peroxisome proliferator-activated receptor-gamma” (Sahelian, 2016).

Rutin, another type of flavonoid, helps prevent bruising and bleeding abnormalities, and may be found in buckwheat, among other sources (Heiting, 2016).

In vitro studies reveal that flavonoids, including anthocyanins, interact with rhodopsin, a light-sensitive receptor implicated in phototransduction, and moderate visual pigment function. They also protect retinal cell types from oxidative-stress resulting in cell death. This is of particular importance since the retina is highly prone to oxidative-stress. Nonetheless, the researchers note that additional clinical evidence is needed (Kalt, Hanneken, Milbury, & Tremblay, 2010).

According to Heiting (2016), experienced eye care provider, anthocyanins may reduce one’s likelihood of developing cataracts and macular degeneration.

In addition, it promotes eye health by maintaining the health of the cornea and blood vessels.

Heiting (2016) cites bilberry as a particularly rich source of anthocyanins to improve and protect ocular health.

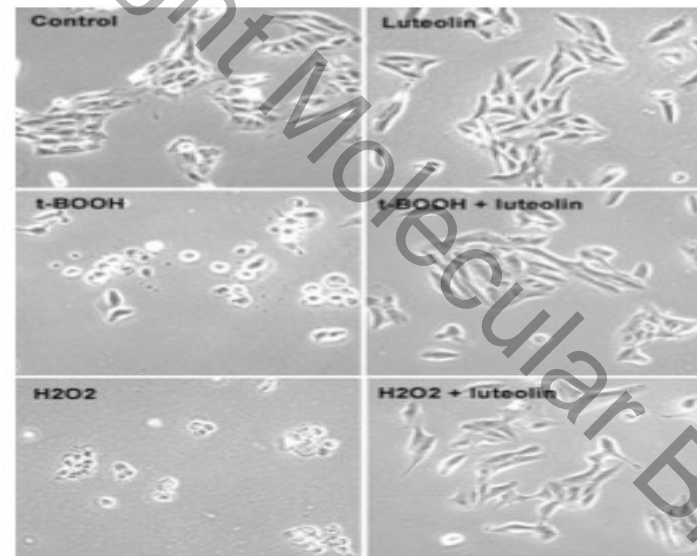
It is noted that anthocyanins are currently being investigated as a means of reducing the incidence of inflammatory eye disease and diabetic retinopathy.

It is asserted that “several pharmacological actions of natural flavonoids may operate in the prevention of cataract since flavonoids are capable of affecting multiple mechanisms or etiological factors responsible for the development of diabetic cataract... Natural flavonoids are reviewed as potential agents that could reduce the risk of cataract formation via affecting multiple pathways pertinent to eye lens opacification...” (Stefek, 2011).

Researchers claim that most cases of macular degeneration are caused by cell damage, and that 30% of people over age 75 suffer from this condition. Since repairing injured nerve cells is difficult, it is ideal to prevent the oxidative stress thought to be responsible for macular degeneration. A plethora of studies suggest that flavonoids prevent and repair oxidative stress, including a large ten-year clinical trial sponsored by the National Eye Institute. According to researchers, “flavonoids have four properties that make them promising candidates for the treatment of macular degeneration. The compounds are potent antioxidants and free radical scavengers; they induce neuronal recovery after injury; they inhibit blood vessel growth and they are tolerated well orally. Specific flavonoids can enhance the production of glutathione, block the production of reactive oxygen species and prevent the late influx of calcium, activities which prevent specific events in the nerve cell death pathway. In addition, the flavonoids can activate the antioxidant response element, which induces the expression of genes which function to increase the cells resistance to oxidative stress. The ability of flavonoids to restore the health of injured neuronal cells and induce the outgrowth of neuritis gives these compounds a unique set of advantages compared to other antioxidants” (Janneken, Lin, Johnson, & Maher, 2006).

It is important to note that specific flavonoids are more effective than others in preventing oxidative stress, including quercetin, eriodictol, fisetin and luteolin. In their study, researchers insert an image illustrating the protective effects of luteolin. RPE cells typically die when in the presence of oxidative stress caused by t-BOOH or H₂O₂. In contrast, luteolin prevents cell death and is free of cellular toxicity (see figure 1) (Janneken, Lin, Johnson, & Maher, 2006).

Figure 1: Luteolin protects RPE cells from oxidative-stress induced cell death



Note: Figure from Hanneken, Lin, Johnson, & Maher (2006)

A study in *Physiology and Behavior* suggests that that flavonols, including the flavonols found in dark chocolate, may improve one's eyesight in low-contrast conditions. Interestingly, experimenters at the University of Reading in England found that "participants' vision improved by 17 percent in contrasting light conditions after they are a dark chocolate bar..." (Daniels, 2011). It was additionally found that subjects experience improved performance on a number of cognitive tasks. According to David Field, Ph.D., flavonols increase the blood flow to the retina. It is claimed that the ocular effects of flavanols could become evidently merely one hour after consumption (Daniels, 2011).

Flavonoids, are believed to have potent effects on brain function. Overall, higher flavonoid intake is correlated with a decreased rate of cognitive decline over a 10-year period. In this experiment, 26 subjects in their late sixties were randomized to drink either 30 milliliters of a blueberry concentrate or a placebo for twelve weeks. The concoction was consumed once daily and contained 387 mg anthocyanidins.

A series of tests were administered periodically: cognitive tests as well as tests assessing brain activation, inflammation and oxidative stress. Elderly adults who drank a concoction of blueberry juice showed improvements in cognitive function, brain activity and blood flow to the brain as well as a boost in working memory. In particular, supplementation increased brain perfusion and activation in brain areas associated with cognitive functioning.

Other fruits and vegetables demonstrate similar effects. For example, high flavanol cocoa improves cognitive function in older adults after merely eight weeks when compared to a low flavanol cocoa supplement. This concoction appears to enhance vascular function and therefore improve cerebral perfusion and cognitive function. Moreover, pomegranate consumption increases task-related brain activation and cognitive function in just four weeks, and flavanone-rich orange juice consumption improves cognitive function in eight weeks. Doctor Joana Bowtell concludes, "... risk of dementia is reduced by higher fruit and vegetable intake, and cognitive function is better in healthy older adults with a diet rich in plant-based foods" (Chu, 2017).

It has been found that moderate amounts of wine, particularly red wine, contain flavonoids that have positive effects on blood vessels and blood circulation, which exert healthful effects on one's eyesight (Cenzon, 2016).

According to a 2015 meta-analysis, it is argued that flavonoids remedy the symptoms of glaucoma, which causes optic nerve damage and potentially vision loss. It is proposed that flavonoids can improve and slow the progression of glaucoma and ocular hypertension primarily through reducing oxidative stress (Long, 2016).

Citricogen contains various flavanoid fractions, including quercetin, kaempferol, sciadopitysin, ginkgetin and isoginkgetin. Citricogen has two main characteristics: protection against free radical damage and lipid peroxidation. Citricogen may preserve mitochondrial metabolism and ATP production to prevent morphologic distortion and signs of oxidative damage resulting from mitochondrial aging.

Initial studies suggest that Citricogen showed that it protected cells against nitric-oxide reactivity. In theory by preventing the death of retinal ganglion cells and atrophy (shrinking) of the optic nerve, Citricogen may protect the optic nerve from degeneration to prevent blindness in those suffering from various ocular pathologies, including glaucoma, DR and RP. Animals who are given other closely related substances to Citricogen prior to their optic nerve being crushed have higher survival rates of retinal ganglion cells than those in control groups.

Citricogen may also inhibits apoptosis of photoreceptor cells and increases cell survival after damaging light exposure. This would prevent inflammation associated with retinal detachment. Furthermore, Citricogen has shown early promise for symptoms of tension glaucoma. Studies are underway to establish the full effectiveness of Citricogen having a significant impact for both patients with glaucoma and with normal IOP much in the same way that GBE does. This is of importance due to the lower than normal treatment options after all other medical options have failed individuals.

Backing this up, research has asserted that flavonoids protect the eyes against various maladies, including cataracts and AMD. In particular, gallic acid accumulates in the retina, protecting it from harmful UV rays. The flavonoids of Citricogen includes the flavanoid profiles of spinach, kale and orange peppers. A study published in the *Journal of Agriculture and Food Chemistry* found that flavonoids offered up to 20 hours of protection after drinking green tea (Warner, 2010).

Meta-analyses find that flavonoids have a “promising role in improving visual function in patients with glaucoma and ocular hypertension (OHT), and appear to play a part in both improving and slowing the progression of visual field loss” (Patel, Mathan, Vaghefi, & Braakhuis, 2015).

Flavonoids enhance the cellular defenses that protect the retina and retinal pigment epithelium against oxidative stress, slowing the progression of MD and other ocular pathologies in advanced stages. As found in numerous studies, short-term exposure to flavonoids protects RPE cells, retinal ganglion cells and other central nervous system neurons from oxidative stress-induced death.

One such study tested the effects of the flavonoid eriodictyol to modulate the activation of Nrf2 and the expression of phase 2 proteins. It was found that long-term treatment with eriodictyol increased the resistance of RPE cells to levels of oxidative stress at a much higher rate than short-term treatment. Nrf2 plays a central role in this relationship (Johnson, Maher, Hanneken, 2009).



Citrus fruits have been found to delay or prevent the onset of ocular pathologies, such as cataracts and age-related macular degeneration (Leonard, 2015). Moreover, citrus fruits are associated with decreased inflammation; those who consume copious flavonoids have the lowest blood levels of IL-8, CRP, TNF-R2 and IL-18. This is significant since chronic inflammation is believed to be responsible for various eye-related pathologies, including AMD, glaucoma and dry eye (ScienceBased Health, n.d.). Anecdotal reports also support these findings (Johnson, Maher, Hanneken, 2009).

As previously mentioned, citrus fruits tend to be abundant in flavonoids. Citricogen has a superlative source of flavonoids aiding a multitude of health benefits, as evident by ORAC values, DPPH activity, and total flavonoid content and phenolic content (certified laboratory analysis), which can be seen below.

Table A): ORAC Analysis:

Sample Description	Total ORAC Value
Molecular BioLife Internationals - Citricogen	15,000 mmol TE/g
Method	MG.OR-5.01

Table B): DPPH (Free Radical Scavenging Activity):

Sample Description	DPPH Free Radical Scavenging Activity (IC50 mg/ml)
Molecular BioLife Internationals - Citricogen	41.83 – Averaged Level
Method	MGDPH.3.01

Table C): Total Flavonoid Content:

Sample Description	Total Flavonoid Content (g/100g CE)
Molecular BioLife Internationals - Citricogen	2.65
Method	MGFC.4.01

Table D): Total Phenolic Content:

Sample Description	Total phenolic content (g/100g GAE)
Molecular BioLife Internationals - Citricogen	3.33
Method	MGFC.4.01

Top Flavonoids and Phenolic Compounds Present in Citricogen:

Nobiletin: Flavonoid isolated from citrus peels. It is an O-methylated flavone that has the activity to rescue bullectomy-induced memory impairment.

Tangeritin: O-polymethoxylated flavone that is found in tangerine and other citrus peels. Tangeritin strengthens the cell wall and acts as a plant's defensive mechanism against disease-causing pathogens.

Naringenin: Has an inhibitory effect on the human cytochrome P450 isoform CYP1A2, which can change pharmacokinetics in a human (or orthologous) host of several popular drugs in an adverse manner, even resulting in carcinogens of otherwise harmless substances. It has been shown to reduce oxidative damage to DNA in vitro and in animal studies. It has been shown to reduce hepatitis C virus production by infected hepatocytes (liver cells) in cell culture). The antiviral effects of naringenin are currently being investigated and thus far, clinical investigation is showing positive antiviral combatting capabilities.

Hesperidin: A compound in orange peels that gives the flavonoid hesperitin to the body, and this flavonoid mediates most benefits of hesperidin, including an increase in circulation and possible brain protective effects. Hesperidin and naringenin are widely known as the main citrus flavonoids.

Nobiletin: Has anti-inflammatory and anti-tumor invasion, proliferation, and metastasis in vitro and in animal studies. It is also found to potentially inhibit cartilage degradation.

Eriocitrin: Eriocitrin and its metabolites are powerful antioxidants. Additional benefits include capillary permeability and a decrease in lipids.

Didymin: Flavonoid glycoside isolated from citrus fruits that displays anti-oxidative and anti-cancer chemotherapeutic activities.

Rutin: Supports blood circulation, is an antioxidant, and can treat allergies, viruses, arthritis and other inflammatory conditions.

Hydroxybenzoic acid

Coumaric acid.

Vanillic acid

Ferulic acid

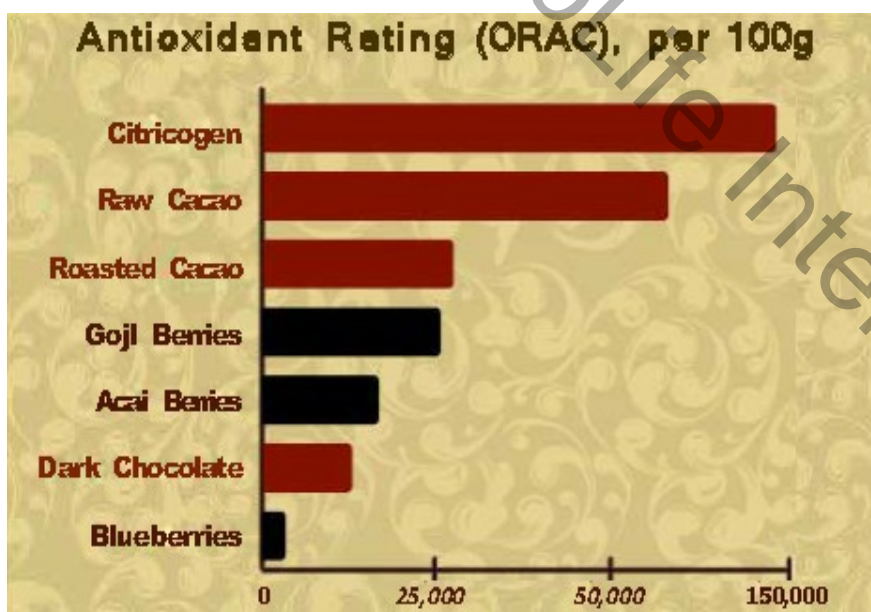
Chlorogenic acid

Sinapic acid

Caffeic acid

Protocatechuic acid.

Graphic Table 1): ORAC Values of Foods Compared to Citricogen



As can be clearly seen in the above Graphic, Citricogen handily surpasses all other foods based on its ORAC level alone.

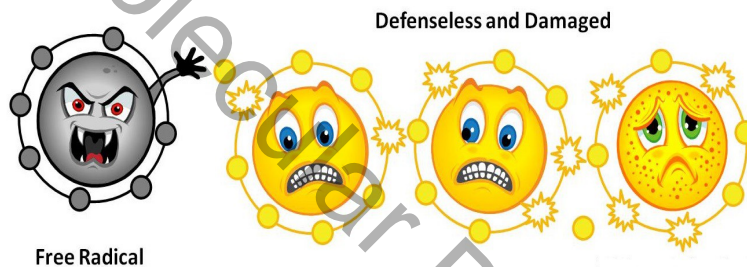
Oxygen Radical Absorbance Capacity (ORAC) Content in Citricogen:

Developed by the National Institute on Aging, the Oxygen Radical Absorbance Capacity (ORAC) scale indicates the free radical scavenging capacity—or antioxidant power—of specific foods or nutrients: the higher the ORAC units, the greater the antioxidant activity. An extremely positive thing in ones life is to maintain optimal health and well-being by fighting off free radicals. Free radicals are highly reactive molecules that damage other molecules through a process called oxidation. The accumulation of free radicals contributes to disease processes by damaging cell membranes, proteins, and even DNA. As ones age advances, free radical damage accumulates. Research proves that this occurrence is the cause of aging related effects on the body and age-related physiological decline. Free radical damage is the key contributor in several conditions such as cancer, Alzheimer's disease, atherosclerosis, osteoarthritis or joint inflammation maladies, cataracts and altered immune deficiency.

One of the most important aspects in maintaining physiologic and even anatomic health is by neutralizing free radicals with powerful efficient antioxidants. Of importance, a key universal organization, the Alliance for Aging Research (AAR) accelerates the pace of scientific research, discoveries and application to vastly improve the human experience of aging and health. They cited several critical studies indicating that simply taking useful, bioavailable antioxidants can contribute up to a 40 percent reduction in the incidence of cancer, heart disease, cataracts, and other life altering and nuisance ailments. One boosts their antioxidant levels by supplementing with free radical fighters such as fruits and vegetables and by taking nutritional supplements that contain them.

The trouble is that doing this takes a tremendous deal of work and not being able to ensure consistency of strength and amounts in daily servings via food intake. This leads us to the supplementation with MBI's Citricogen, Citricogen delivers a 150,000 mmol TE/100g.

It is clear that one wishes to take advantage of the attributes of all ORAC based research, Citricogen is the clear choice to ensure the body takes advantage of all ORAC based research/attributes. The bottom line is that it is never too late supplement, regardless of ones age and medical state. Citricogen knocks out free radicals by increasing the bodies intake of systemic antioxidants, and in our opinion we believe the best way to do that is through a combination of choice diet and the supplementation of MBI's targeted supplement Citricogen.



Excessive Free Radicals May Contribute To The Following:



Conclusion

Citricogen contains an innovative mix of choice flavonoids, polyphenols, ORAC units and antioxidant capabilities that not only assists in preventing medical decline, but also possesses powerful healing properties as well. There are over 6,000 types of flavonoids, each associated with specific health benefits. Flavonoids are documented to reduce one's risk of developing a variety of common health ailments, including Alzheimer's, multiple sclerosis, Huntington disease, Parkinson's, cardiovascular disease, cerebrovascular accident and hypertension. Flavonoids are also documented to enhance the immune system, combat bacterial and viral infections (including herpes simplex virus-1 and herpes simplex virus-2), improve overall cognitive functioning and promote weight loss. Furthermore, Citricogen's powerful flavonoid mix essentially can promote ocular health in a number of ways – for instance, protecting eyes and sight from oxidative stress, reducing the likelihood of developing cataracts and macular degeneration. It should also assist in maintaining the health of the cornea and blood vessels and remedy the symptoms of glaucoma, and so on. While flavonoids come from a variety of sources, Citricogen has proven to be a superlative source of flavonoids. The rich concentration of ORAC units and antioxidant activity contained within the Citricogen formulation is more than ample to knock down the dreaded free radicals that wreak havoc in the body. Free radicals blatantly attack the nearest stable molecule, "stealing" its electron. When the "attacked" molecule loses its electron, it becomes a free radical itself, beginning a chain reaction disrupting living cells. Some free radicals arise normally during metabolism and accumulate with aging. Environmental factors such as pollution, radiation, cigarette smoke and herbicides also spawn free radicals within the human body.

The body tries to fight free radicals, but if no usable antioxidants are present or if the free-radical production is excessive, damage occurs. With virtually no side effects (GRAS), Citricogen is a logical way to ensure adequate an adequate amount of flavonoids, polyphenols and successful antioxidant activity via supplementation. Citricogen taken daily will enhance an individuals overall health making the best of ones life. This is particularly case on point especially as the body advances through life and the natural aging process occurs. It is clear that the attributes that aid the human body contained in Citricogen will lead the way to a clear choice for those wanting to improve their health and lifestyle in the future to come.



References

- Cenzon, M. (2016). *10 foods to improve your eyesight naturally*. Retrieved from <https://www.symptomfind.com/nutrition-supplements/10-foods-to-improve-your-eyesight-naturally>
- Chu, W. (2017). *Flavonoid-rich blueberries have a brain boosting role, says researchers*. Retrieved from <http://www.nutraingredients.com/Research/Flavonoid-rich-blueberries-have-a-brain-boosting-role-say-researchers>
- Daniels, A. (2011). *Improve your eyesight instantly*. Retrieved from <http://www.menshealth.com/health/improve-your-eyesight-instantly>
- Hanneken, A., Lin, F., Johnson, J., & Maher, P. (2006). Preserving vision in patients with macular degeneration. *Invest Ophthalmol Vis Sci*, 47:3167-3177.
- Heiting, G. *Vitamin C and bioflavonoids: Powerful eye antioxidants*. Retrieved from http://www.allaboutvision.com/nutrition/vitamin_c.htm
- Huyng, T., Mann, S. N., & Mandal, N. A. (2013). Botanical compounds: Effects on major eye diseases. *Evidence-Based Complementary and Alternative Medicine*, 2013.
- Johnson, J., Maher, P., & Hanneken, A. (2009). The flavonoid, eriodictyol, induces long-term protection in ARPE-19 cells through its effects on Nrf2 activation and phase 2 gene expression. *Investigate Ophthalmology & Visual Science*, 50(5).
- Kalt, W., Hanneken, A., Milbury, P., & Tremblay, F. (2010). Recent research on polyphenolics in vision and eye health. *J Agric Food Chem*, 58(7).
- Leonard, J. (2015). *14 foods that will save your eyesight + more vision improving tips*. Retrieved from <http://www.naturallivingideas.com/foods-that-save-eyesight>
- Long, L. (2016). *Flavonoids improve glaucoma symptoms*. Retrieved from <http://www.wholehealthinsider.com/newsletter/flavonoids-improve-glaucoma-symptoms/>
- Mortec Scientific Group (2016). *Citrus blend – Molecular Biolife International*. Cambridge, ON: Mortec Scientific Group.
- Patel, S., Mathan, J. J., Vaghefi, E., & Braakhuis, A. J. (2015). The effect of flavonoids on visual function in patients with glaucoma or ocular hypertension: a systematic review and meta-analysis. *Graefes' Archive for Clinical and Experimental Ophthalmology*, 253(11), 1841-1850.
- Sahelian, R. (2016). *Flavonoids antioxidant supplements health benefits, food rich in these substances*. Retrieved from <http://www.raysahelian.com/flavonoids.html>
- ScienceBased Health (n.d.). *In the news: Healthy flavonoids, vitamin D & AMD risk*. Retrieved from <http://www.sciencebasedhealth.com/ContentPage.aspx?WebpageId=410>
- Stefek, M. (2011). Natural flavonoids as potential multifunctional agents in prevention of diabetic cataract. *The Journal of Institute of Experimental Pharmacology of Slovak Academy of Sciences*, 4(2).
- Szalay, J. (2015). *What are flavonoids?* Retrieved from <https://www.livescience.com/52524-flavonoids.html>
- Warner, J. (2010). *Green tea: The eyes have it*. Retrieved from <http://www.webmd.com/eye-health/news/20100218/green-tea-good-for-the-eyes>