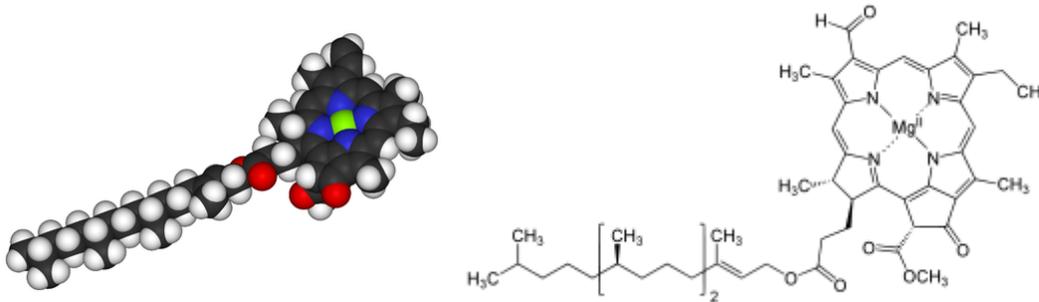


May 24, 2018

SL's Broad Spectrum Green Serene™ CBD Oil and Chlorophyll:

SNCE Laboratories (SL) owns a patented process for extracting essential oils containing highly bio available nano emulsified CBD oil from industrial hemp. It is the most efficient method, achieving extract extraction of 99% of the oil in one short pass. We do this without damaging the molecules we extract. We also extract most all the chlorophyll. Upon extraction SL's oil has about 37% CBD in the oil and very lmost all the chlorophyll in the oil. In this essay we will explore the nature of chlorophyll, how SL makes it highly available, why it is good for us and how SL's broad spectrum Green Oil with chlorophyll optimizes all things good.

What is Chlorophyll? It has the chemical formula $C_{55}H_{70}O_6N_4Mg$ and a molecular weight of 893.51 grams/mole, has a specific gravity of 1.079 grams/cc and melts at 152.3 degrees centigrade.



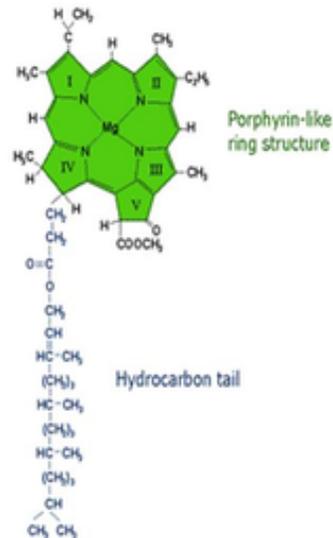
It is a complex molecule, the tail being non-polar and the ring structure being polar. Water is polar so for something to be soluble in water it must overcome water's strong and powerful hydrogen bonds. So for the most part chlorophyll is not soluble in water. But the ring side is partially soluble. In this sense its molecular properties is not dissimilar to CBD.

In nature the chlorophyll exists in protective structures that are lipid rich. These are often the membrane of the chloroplast. The molecule anchors itself by the tail in the lipid membrane and the ring structure, which has a magnesium atom at its center, performs the photosynthesis.

This nice slide from: <http://slideplayer.com/slide/2517679/>

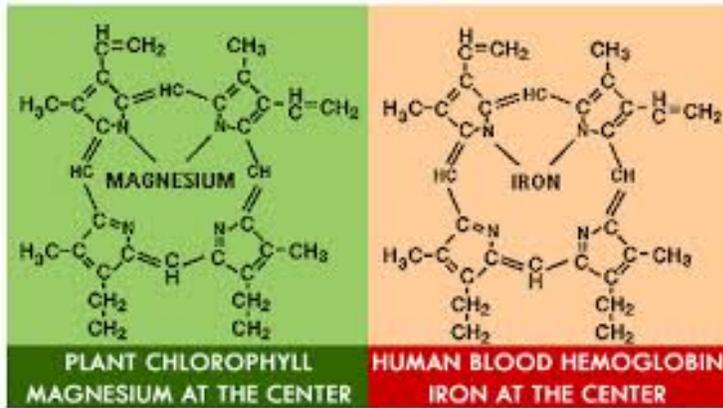
Chlorophyll

- Chlorophyll is the main photosynthetic pigment. This is where **light energy** is trapped and turned into **chemical energy**.
- The **head** of the molecule is **polar** and composed of a ring structure. At the heart of this ring structure is the inorganic ion **magnesium**. This is the light trapping region of the chlorophyll molecule.
- The **tail** of the molecule is **non polar** and **embeds itself in membranes in the chloroplast**.
 - There are other pigments, reds, yellows and browns but these are only usually seen in the experimental chromatography or if you have been lucky enough to witness the autumnal colors of deciduous trees in a temperate climate



Chlorophyll molecules are specifically arranged in and around pigment protein complexes called photosystems. These are where the tails are embedded in the thylakoid membranes of chloroplasts.

The basic structure of chlorophyll is a porphyrin ring. It is very similar to that of heme in hemoglobin, with the difference being that the central atom in chlorophyll is magnesium and in hemoglobin it is iron. Here is a nice picture of the two together:



The long hydrocarbon (phytol) tail attached to the porphyrin ring makes chlorophyll fat-soluble, but insoluble in water. Two different types of chlorophyll (chlorophyll a and chlorophyll b) are found in plants and here are the amounts:

Food	Serving	Chlorophyll (mg)
Spinach	1 cup	23.7
Parsley	½ cup	19
Cress, garden	1 cup	15.6
Green beans	1 cup	8.3
Arugula	1 cup	8.2
Leeks	1 cup	7.7
Endive	1 cup	5.2
Sugar peas	1 cup	4.8

Chinese cabbage	1 cup	4.1
SL CBD Green oil	1 cup	189.27
SL CBD Green oil	1 ml	0.8

Because the chlorophyll in plants is protected by the lipid rich membranes of the cell and the the lipid rich membrane inside the cell which is the chloroplast, it is necessary to extract the chlorophyll form its lipid rich protection to make it bio available. The SL process does this with nearly 100% efficiency, and thus we believe that our chlorophyll is more than 95% bioavailable.

How and why is chlorophyll good for us and why is it helpful to the efficacy of CBD?

- We believe that the broad spectrum of extracts from the industrial hemp which SL's process so efficiently removes without damage, especially including the highly bio available chlorophyll, optimizes the delivery of the CBD to those places in our biological operations where they do maximum good.
- We believe and understand that CBD is helpful in releasing the free arachidonic acid from phospholipid storage sites necessary for metabolizing eicosanoids from Omega 3 and 6 fatty acids. A healthy and always ready balance of instantly made and used eicosanoids is one of the major keys to healthy biological operation. This is a very recent and important finding in the history of understanding biological operations. To learn more about this please look at *Cannabidiol (CBD) and its analogs: A review of their effects on inflammation* by Sumner Burstein: Burstein, S. Bioorg. Med. Chem. (2015), <http://dx.doi.org/10.1016/j.bmc.2015.01.059>
- Burstein also details with references a large host of medical benefits being studied and observed from CBD.

- It is clear that chlorophyll is an antioxidant, and this protects the CBD and the processes in our biological operations in which CBD is engaged.
- In the titled *Chlorophyll Research Summary* (<https://static1.squarespace.com/static/57a34753ff7c509ef768ae44/t/57bb57e9b3db2b751fe85fca/1471895531307/Chlorophyll+Research+Summary.pdf>) the following benefits are studied, with the caveat on each page *FOR REFERENCE ONLY: THESE CLAIMS HAVE NOT BEEN EVALUATED OR APPROVED FOR USE BY THE FDA*

1. Cleansing / Scavenging Cancerous Free Radicals
2. Anti-inflammatory
3. Antioxidant
4. Promotes Wound Healing
5. Deodorizes the Body

- In their paper *Effects of Chlorophyll and Chlorophyllin on Low-Dose Aflatoxin B-1*

Pharmacokinetics in Human Volunteers John Mata et al, showed with credible clinical results that chlorophyll was exceptionally efficient at removing aflatoxins.

(Published Online First December 1, 2009; DOI: 10.1158/1940-6207.CAPR-09-0099)

- In their paper *Medicinal Uses of Chlorophyll: A Critical Overview* Vinod Kumar Mishra et al detail the areas studied for medical uses of chlorophyll (V.K. Mishra, R.K. Bacheti and Azamal Husen, 2011. *Medicinal Uses of Chlorophyll: a critical overview*. In: *Chlorophyll: Structure, Function and Medicinal Uses*, Hua Le and Elisa Salcedo, Eds., Nova Science Publishers, Inc., Hauppauge, NY 11788 (ISBN 978-1-62100-015-0), pp.177-196. (https://www.novapublishers.com/catalog/product_info.php?products_id=22468))

They cover

1. Potential Mechanism of action of Chlorophyll
2. Anti-oxidant
3. Modifier of genotoxic effect
4. Inhibition of Cytochrome P450 Enzymes
5. Induction of phase II Enzymes
6. Effect of Chlorophyll on Cell Differentiation, Cell arrest and Apoptosis of Cancer Cells
7. Applications in Cancer Chemotherapy
8. Photosensitizer
9. Contraindications and Safety (found to be safe)

- In their work *Low-dose dietary chlorophyll inhibits multi-organ carcinogenesis*

in the rainbow trout Simonich et al show a strong inhibition in the incidence of cancer in rainbow trout with low doses of chlorophyll.

My conclusions:

1. Chlorophyll has many potential benefits; it has not been so well studied until recently and recent and current studies are very encouraging as to its many benefits.
2. Whether it is CBD, astaxanthin or now chlorophyll, given the exceptionally complexity of biological operations and the exquisite precision and accuracy of our natural molecular chemistry, it makes sense that more and more of our nutraceutical and pharmacological solutions should come from the natural world and be based on long term effects.
3. Reactive oxidative species, especially oxygen singlets are the enemy of short and long term biological health. We cannot well or easily control them without dietary inputs such as astaxanthin and chlorophyll and vitamin C which were historically much richer in our diet than in the modern era.

4. The literature and studies and the FDA itself show it does not have dangers and is safe; (The FDA has approved astaxanthin as a food coloring material and a nutraceutical supplement)
5. As an antioxidant and as a complex molecule with a polar and non-polar side is likely to be an aid to the utility of CBD and its bioavailability.
6. SL's process is the best we know of, by the data, at extracting and making bioavailable chlorophyll.
7. We believe that 1 ml of our CBD oil containing .8 mg of highly bioavailable chlorophyll is among the best sources of chlorophyll and CBD.