Your expert for minerals and nutraceuticals.









New Science Available on The ALA Conversion to DHA & EPA: A GAME CHANGER

Dr. Richard Bazinet, Professor and Canada Research Chair in Brain Lipid Metabolism at the University of Toronto and a leading researcher in Brain Lipid Metabolism, omega-3s and cognition. He and his group work to clarify and expand our understanding of the EPA and DHA endogenous biosynthesis pathway and its regulation.

By changing the way Omega-3 levels are measured, they are figuring out the kinetics of the metabolism and its complexity like never before.

A new way to look at the Omega-3s





Shifting the way to look at Omega-3 Levels

It measures the amount of EPA+DHA in the red blood cell membrane expressed as the percent of total fatty acids present **only in that location at that time.**

STATIC MEASUREMENT "A PICTURE"

> Omega-3 CSIA: The disruptive way



It tracks the movements of each fatty acid in the body by measuring the C13 isotope at different stages, creating a dynamic model that explains how much was converted (including intermediates), metabolically used by tissues and organs, and stored to be used on demand.

The carbon-13 isotope acts as a "Signature"



CSIA, compound-specific isotope analysis:

A new approach that involves high-precision measurements on differences in natural isotope ratios in fatty acids.

DYNAMIC MEASUREMENT "A TRACKING"



 \rightarrow DHA does not reconvert into EPA



Revealing Surprising Results in Humans and Animals and Challenging Established Beliefs

- ALA EPA DHA
- 2. \rightarrow High blood levels of DHA after supplementation **downregulates liver DHA synthesis** by inhibiting EPA elongation



3. \rightarrow In humans, the conversion of EPA to DHA matches DHA metabolic requirements.

EPA Supplementation - DHA Homeostasis



EPA Supplementation - High Demands of DHA





1.



Revealing Surprising Results: Challenging Established Beliefs

4. \rightarrow When you give DHA supplements, in the presence of dietary ALA, EPA goes up, but that rise comes from ALA, not from DHA



5. \rightarrow When DHA is the only supplied source, high-quality ALA is needed to further rescue EPA functional levels







But Why haven't We seen this Before?

BETA - OXIDATION

Although around 67% of ALA in the brain is used for beta-oxidation, similar levels of this process occur with omega-6 fatty acids (50%) and DHA (65%). The remaining ALA available is enough to convert into the necessary LCPUFAs to meet the body's requirements.

MEASUREMENTS LIMITATIONS

Human studies often examine blood-derived cells, like red blood cells and plasma, with a half-life of under 100 days. Blood analysis measures EPA and DHA levels in red blood cell membranes as a percentage of total fatty acids present only in that location at that time. However, this does not reflect the potential elongation in other tissues, such as the brain.

TISSUE-SELECTIVE BIOSYNTHESIS

Different cells show varying capacities to convert ALA, highlighting tissue selectivity from certain ALA derivatives. ALA-enriched diets significantly boost ALA, EPA, and DPAn-3 levels in plasma, the liver, the heart, and increase DPAn-3 and DHA in the brain.

TURNOVER LEVELS

If <u>exogenous DHA replaces most endogenous plasma DHA from ALA/EPA</u> it suggests that DHA levels are mainly maintained through metabolic precursors. The turnover of DHA from n-3 PUFA precursors like ALA and EPA appears to be the key factor for <u>regulating DHA levels in plasma</u>. (please provide link as it is missing in the original presentation)

GENDER DIFFERENCES

Studies on ALA metabolism reveal gender differences. <u>Healthy young men convert about 8% of dietary ALA into EPA and 0.5% to 4% into DHA</u>. In contrast, <u>healthy young women</u> <u>convert roughly 21% of ALA into EPA and around 9% into DHA</u>, likely due to <u>estrogen's role</u> in enhancing the desaturation and elongation pathways.



BENEXIA® XIA OIL



An opportunity for a high-concentration and high-quality ALA source

- Chia seed is a new and sustainable source of Nutrition and Health.
- BENEXIA[®] is a producer of Chia Seed and a manufacturer of ingredients: Chia Protein, Fiber and Oil.
- Chia Oil is cold-pressed from fresh, high-quality and low-moisture chia seeds.
- It is a pure, unrefined oil processed without chemical solvents or diluents.
- With its **amazing organoleptic properties**, Chia Oil is used as a cooking oil (healthy fats).
- It is amazingly **shelf-stable** thanks to its **natural antioxidant levels** (no added tocopherols).
- As Virgin Oil, it is highly reduced in MOSH / MOAH (EU market).
- ALA from Chia Oil can supply EPA and DHA to meet the body's metabolic demand (turnover).
- Mixing ALA and DHA will increase EPA.
- Chia is a **sustainable industrial crop**, with more than 150,000 Ha sowed/year. It is strong and growing.
- Ethical and environmental issues: the plant-based movement is growing here and now.
- Chia Oil is cost-competitive and offers guaranteed supply; it is a natural and extra virgin oil.
- Supply stability and product availability!







Sustainability, Efficiency & Nutrition: THE 3 DRIVERS

	FISH OIL	ALGAE OIL	CHIA OIL ALA	CHIA OIL + ALGAE	CHIA OIL + FISH
Sustainability	Limited and uneven supply. Questioned outside well- established quotas.	It was created with sustainable practices and from renewable sources, though some fermentation processes might have a CO2 impact considering the carbon source.	It's naturally sustainable from its source.	The most sustainable plant- based Omega's combination.	Chia Oil decreases the fish oil's potential negative impact.
Efficiency	Complexity regarding price and supply predictability. Uncertainty to maintain growth and competitiveness in human markets.	High efficiency in its production process and supply stability. Cost is a challenge.	Efficiency at low cost, supply stability and long shelf-life.	Price and efficiency get balanced, providing convenience.	It makes a more efficient and competitive use of fish oil. Improves its price predictability and supply certainty.
Nutrition	Both EPA + DHA present with the health practitioners supporting and recommending it.	Only DHA source, not EPA, which might limit its functionality or market promotion.	Only ALA present (indirectly DHA & EPA) backed by science but lack of protagonism.	It enhanced the nutritional profile creating "the vegan pack of Omegas" boosting bioavailability.	It completes the nutritional profile creating "the full pack of Omegas", boosting bioavailability.



Pregnancy and Breastfeeding

- A study published in Nutrients found that women consuming chia oil transferred high levels of DHA to their infants during breastfeeding.
- The ALA/EPA/DHA values suggest a higher bioconversion of the omega-3 precursor ALA from chia oil consumption.
- In the Nutrients study, 40 pregnant women were split into two groups: one followed a normal diet, while the other consumed 12 grams (about one tablespoon) of chia oil daily from the third trimester until six months postpartum. The study monitored the fatty acid composition of their erythrocyte phospholipids and breast milk.

FATTY ACID COMPOSITION OF ERYTHROCYTE PHOSPHOLIPIDS OF MOTHERS DURING PREGNANCY AND NURSING AFTER 9 MONTHS OF SUPPLEMENTATION OF 12 g OF XIA PURE CHIA OIL DAILY.

Valenzuela R; et al. Modification of Docosahexaenoic Acid composition of milk from nursing women who received Alpha Linolenic Acid from chia oil during gestation and nursing nutrients 2015, 7, 6405-6424;doi:10.3390/nu/7085289 (2015).

* Fatty acids Methyl Ester from erythrocyte phospholipids.

The results revealed that the mothers in the chia group exhibited three compelling characteristics in comparison to those in the control group:

- Significant increase in levels of omega-3 EFAs in breast milk, specifically ALA (60%) and DHA (50%).
- During pregnancy, there are increases in ALA (76%) and EPA (57%) in maternal red blood cells, which is related to the fatty acid profile of the newborn's red blood cells, indicating the active role of the placenta during pregnancy.
- The n-6/n-3 polyunsaturated fatty acid ratio was significantly reduced in the chia group.

The women reported good tolerance of the chia oil. Chia oil does not give a "fishy" taste or produce reflux.







Menopause





ALA + DHA Benefits

- Estrogen may increase the activity of the desaturation/elongation pathway.
- The action of estrogen is the greater synthesis of EPA and DHA from ALA in women than in men.
- During menopause, decreases in circulating estrogen and omega-3 synthesis may be down-regulated.
- **Omega-3 supplementation** is absolutely necessary in menopausal women.





Menopause Omega-3 Booster

During menopause, women may face symptoms like hot flashes, mood swings and joint pain, along with increased risks of cardiovascular diseases and osteoporosis due to declining estrogen levels. Omega-3 fatty acids, especially ALA and DHA, can help manage these symptoms. A diet rich in healthy fats is essential for hormone production during this time.

Conversion of ALA to EPA and DHA in Women

Research shows that women convert ALA into EPA and DHA more efficiently than men. Young women convert ALA to EPA 2.5 times better and to DHA over 200 times better than young men. Women also convert docosapentaenoic acid (DPAn-3) to DHA about four times faster than men.

The Role of Estrogen in the Desaturation/Elongation Pathway

One explanation for gender differences in desaturation and elongation pathway activity is estrogen's role. Estrogen may enhance the conversion of ALA to EPA and DHA by improving metabolic efficiency.

Estrogen's Influence on Omega-3 Metabolism

Estrogen may boost the activity of desaturation and elongation pathways. Studies indicate that women on oral contraceptives or estrogen-based hormone replacement therapy have higher levels of dihomo-γ-linolenic acid and arachidonic acid than before treatment, supporting estrogen's role in converting ALA.

Implications for Menopausal Women

This underscores the need for proper nutrition for women before and during menopause. The decline in estrogen levels during this transition reduces the synthesis of Omega-3 fatty acids. Therefore, supplementing with ALA and DHA is essential to support this reduced capacity.



^{1.} Burdge, G. C., & Wootton, S. A. (2002). Conversion of alpha-linolenic acid to eicosapentaenoic, docosapentaenoic, and docosahexaenoic acids in young women. British Journal of Nutrition, 88(4), 411-420.

^{2.} Giltay, E. J., Gooren, L. J., Toorians, A. W., Katan, M. B., & Zock, P. L. (2004). Docosahexaenoic acid concentrations are higher in women than in men because of estrogenic effects. The American Journal of Clinical Nutrition, 80(5), 1167-1174.

^{3.} Childs, C. E., Romeu-Nadal, M., Burdge, G. C., & Calder, P. C. (2008). Gender differences in the n-3 fatty acid content of tissues. Proceedings of the Nutrition Society, 67(1), 19-27.

ALA Research: Cardiovascular and Inflammation



Benefits of ALA in Inflammatory Diseases

- ALA enriched diets may suppress the pro-inflammatory cytokine production.
- Dietary ALA may provoke its **anti-inflammatory effects** via activation of gene expression.
- ALA supplementation lowers levels of inflammatory markers.
- Up to 40% reduction in CRP (C-reactive protein levels) with ALA from Chia supplementation.

The Benefits of ALA in Cardiovascular Health

- ALA reduces the risk of vascular events and hypertension.
- ALA from Chia attenuates cardiovascular risk factors.
- ALA shows highly anti-arrhythmic properties as compared with DHA.
- ALA lowers the levels of triglycerides, total cholesterol and LDL cholesterol. ALA from Chia oil decreases triglycerides and increases HDL cholesterol.

Important to highlight:

- ALA is the only omega-3 considered as 'essential' fatty acid, meaning your body needs it and can't make it on its own.
- Extensive research worldwide shows the benefits of ALA, particularly related to heart health.
- ALA also benefits from the approved EFSA Health claim on maintenance of normal blood cholesterol levels.





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