


**Omega-3s
and
Decreased Visual
Function**

**Presented by:
Michael Gross, MD
COPE 40795-SD**



**Michael B. Gross, M.D.
PRN Chief Medical Officer**

Dr. Michael Gross is a nationally recognized expert in the emerging field of wellness and prevention. A graduate of Temple University School of Medicine, Dr. Gross went on to become a board-certified Obstetrician and Gynecologist. He distinguished himself in this field and has served in the following leadership positions: Associate Professor at the Philadelphia College of Osteopathic Medicine, Medical Director of Vanguard OB/GYN Associates, National Medical Director for MedPartners Women's Health, and Chairman of the Department of Obstetrics and Gynecology at Philadelphia's Graduate Hospital, Parkview Division. He is a lifetime Fellow of the American College of Obstetricians and Gynecologists.

After many years in clinical practice and physician practice management, Dr. Gross was able to fulfill his life-long passion: educating physicians about wellness, prevention, and nutrition. While pursuing his passion, he discovered peer-reviewed medical research from many reputable institutions and journals clearly documenting the health benefits conferred by supplementation of EPA and DHA, the essential fatty acids abundant in fish oil, when food-equivalent forms and therapeutic doses were administered. Accordingly, his strong desire to use clinical nutrition to help physicians prevent disease and minimize the effects of existing conditions led him to the development PRN (Physician Recommended Nutriceuticals). PRN's mission is to provide the best Omega-3s in a therapeutic dose and form and other evidence-based nutriceuticals in the marketplace today.

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NON Pharma/Pharma = Nutriceutical


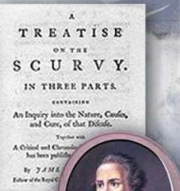

'A food or a part of a food that provides medical or health benefits, including the prevention and treatment of disease and can be dosed for outcome.'

Occam's Razor
"All things being equal, the simplest solution is most frequently the correct solution."

The Answer:

SCURVY

Scurvy was found to be a severe lack of Vitamin C in the diet




A Nutritional Deficiency Disease

Remembering an Epidemic From the Past

The following are symptoms of a disease that caused illness in epidemic proportions:

- Nausea
- Tiredness
- Muscle and joint pain
- Easy bruising
- Swollen and bleeding gums
- Loosening of teeth
- Wounds healing slowly and poorly
- Old fractures separating
- Dry skin and hair
- Bleeding into muscle and joints, causing pain
- Irritability & Anxiety
- Sleep disorder

What is this Disease?




Remembering an Epidemic From Recent Times

The following are results of another disease that caused defects in epidemic proportions:

- Spina Bifida
- Anencephaly
- Other Neural Tube Defects

What is this Disease?



Restoration of Folic Acid


70% Reduction in Spina Bifida From 2004 - 2006

*Center for Disease Control 2006

The Answer:

Folic Acid Deficiency

Folic Acid Deficiency is a severe lack of B-9 Vitamin in a woman's diet



**Pellagra
Beriberi**

A Nutritional Deficiency Disease

Occam's Razor - 21st Century North America

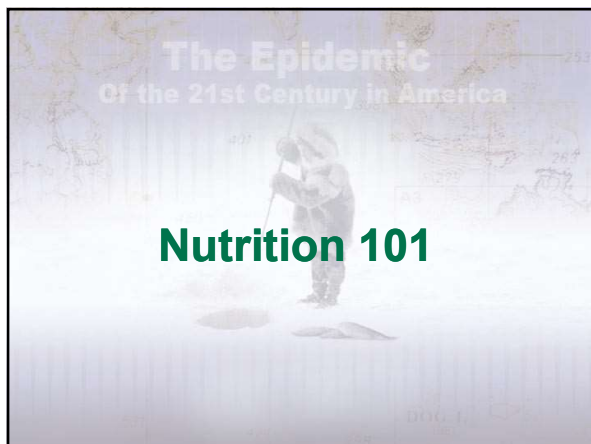
There has been a dramatic increase in the rate of the following diseases in the USA:

- Arthritis
- Adult
- Alzhei
- Cogni
- Asthm
- Anxiet
- Canc
- Decre

Ocular Surface Disease (OSD)

Age-related macular-degeneration (ARMD)

Could there be a Scurvy of the 21st Century?



The Changes in the American Diet

Past (19th Century)

- 30 Million Farmers / 100 Million People
- Small farms producing locally
- Fresh food - short shelf life

Present (21st Century)

- Agribusiness – 3 Million Farmers / 300 Million People
- Artificial fertilizers vs. natural fertilizers
- Large farms producing globally
- Processed food - long shelf life



Nutrition 101

Lack of an essential nutrient in the diet results in a nutritional deficiency disease/disorder and concomitant medical conditions and problems

Essential nutrients cannot be made or stored, they must be consumed

- Scurvy caused by the lack of Vitamin C
- Neural Tube Defects caused by the lack of Folic Acid – Vitamin B9
- Is there a Scurvy of the 21st Century?





Typical American Diet Today: Severe Omega Imbalance

- A healthy diet approaches a 1:1 ratio of Omega-3s to Omega-6s
- The average American Diet is 1:25, as high as 1:50
- This occurred when healthy unsaturated fats were replaced with trans fatty acids and diets full of processed foods (high in Omega-6)



Nutrition 101: 21st Century Food Processing Brought:

- ♦ Are all fats bad? Or is it:
- ♦ Saturated fats vs. polyunsaturated fats
- ♦ Processed foods – food additives and add-backs
- ♦ High fructose corn syrup
- ♦ Fast Food Nation

Nutrition 101: What Are Polyunsaturated Fatty Acids- "PUFAs"

<ul style="list-style-type: none"> • Alphalinolenic Acid (ALA) Plants, Nuts • Eicosapentaenoic (EPA) Fish • Docosahexaenoic (DHA) Fish 	Omega 3s
<ul style="list-style-type: none"> • Linolenic Acid (LA) Vegetable oils, Saturated Fats, Fast Foods • Gamma-Linolenic Acid (GLA) Evening Primrose Oil, Borage Oil, Black Currant Oil • Arachidonic Acid (ARA) Vegetable oils, Saturated Fats, Fast Foods 	Omega 6s

All Polyunsaturated Fatty Acids- "PUFAs" Are NOT Created Equal

<p>Omega-6s</p> <ul style="list-style-type: none"> Vegetable Oils Processed Foods Corn Fed Cattle Farm Raised Fish <p>Pro-Inflammatory</p> 	<p>Omega-3s</p> <ul style="list-style-type: none"> Plants Nuts Wild Fish <p>Anti-Inflammatory</p> 
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ALA converts poorly (<1%) To EPA & DHA

Only two EFAs proven to || and 31% of 22:5n-3 was available for synthesis or

The inefficiency of the conversion of 18:3n-3 to 20:5n-3 indicates that the biosynthesis of long-chain n-3 PUFA from α -linolenic acid is limited in healthy individuals. In contrast, the much greater rate of transfer of mass from the plasma 20:5n-3 compartment to 22:5n-3 suggests that dietary eicosapentaenoic acid may be well utilized in the biosynthesis of 22:6n-3 in humans.—Pawlosky, R. J., J. R. Hibbeln, J. A. Novotny, and N. Salem, Jr. Physiological compartmental analysis of α -linolenic acid metabolism in adult humans. *J. Lipid Res.* 2001. 42: 1257–1265.

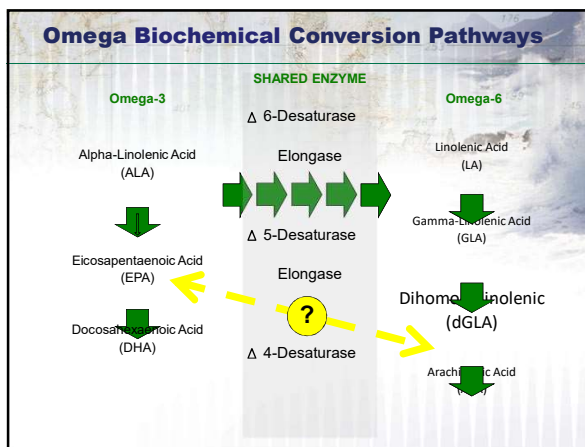
Journal of Lipid Research
Volume 42, 2001

Copyright © 2010

All Omega-3 Essential Fatty Acids (EFAs) Are NOT Created Equal

- Plants & Nuts
 - ALA (Alphalinolenic acid) - found in green leafy vegetables, flaxseed, soybeans, canola oil and walnutsAdd-back hoax?
- Fish & Supplements
 - EPA (eicosapentaenoic acid)
 - Anti-Inflammatory
 - DHA (docosahexaenoic acid)
 - Brain Food

Unfortunately ALA converts poorly (<1%) to EPA & DHA which are the only two EFAs proven to have significant health benefits



GLA = Omega-6 = Pro-Inflammatory

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nrcientists.com

Breaking News on Supplements & Nutrition - North America

CoQ10 and omega-3 show prostate benefits: RCT data

Writing in the peer-reviewed *British Journal of Nutrition*, Iranian scientists report that omega-3 and CoQ10 supplements independently reduced levels of prostate-specific antigen (PSA) levels in normal healthy men by 30 and 33%, respectively.

On the other hand, supplements containing the omega-6 fatty acid gamma-linolenic acid (GLA) were linked to increases in PSA levels. PSA is a marker commonly used to screen for prostate cancer and for tracking the disease after its diagnosis.

Results showed that the omega-3 and CoQ10 supplements were associated with 30% and 33% reductions in PSA levels, respectively, while GLA was associated with PSA increases of about 18%.

Commenting on the potential mechanisms of protection, the Tehran-based scientists note that omega-3 fatty acids may exert their anti-cancer effect by the anti-inflammatory effects of PPAR, through mediation of cyclo-oxygenase 2, a key enzyme in fatty acid metabolism and inflammation.

CoQ10, on the other hand, is an antioxidant, and may also function as a "non-specific stimulator for the immune system and a role in membrane stabilization, inhibition of reticular phospholipases and stabilization of Ca-dependent free channels."

"The results from the present study suggest that men on EPA and CoQ10 supplementation may require a lower threshold (about 10 ng/ml) for PSA screening. However, these findings need to be interpreted with caution. They are statistically significant, but the duration of treatment, longer studies are necessary to reach an appropriate conclusion. Also, studies need to be carried out to determine whether removal of the treatment when the PSA value is above 10 ng/ml is one treatment option."

Source: *British Journal of Nutrition*, September 2012, Volume 108, Pages 1-6, doi: 10.1017/S0007114512004783

Effect of omega-3 polyunsaturated acid-ester and coenzyme Q10 on serum prostate-specific antigen levels: a randomized, double-blind trial
Authors: Safarnejad M, Shafiqi H, Safarnejad S.

AREDS2 Omega-3 Arm: Null Value at 1 gram Dose (Ethyl Ester)

Primary, secondary, and subgroup analyses demonstrated no beneficial or harmful effects for treatment of AMD. These null results may be attributable to the true lack of efficacy. Other factors to consider include inadequate dose, inadequate duration of treatment, or both.

The form of treatment, or both.

of omega-3 long-chain polyunsaturated fatty acids (ethyl ester) and the DHA:EPA ratio may be inappropriate.

JAMA, May 15, 2013—Vol 309, No. 19
Corrected on May 14, 2013

Meta-analysis on Prevention

ARCHIVES

Dietary Omega-3 Fatty Acid and Fish Intake in the Primary Prevention of Age-Related Macular Degeneration

10-Jun-2009 - A high intake of omega-3 fatty acids and fish may reduce the risk of age-related macular degeneration (AMD) by up to 38 per cent, suggests a new meta-analysis.

Pooling the data from nine studies, researchers from the University of Melbourne in Australia report that the benefits were most pronounced against late (more advanced) AMD, while eating fish twice a week was associated with a reduced risk of both early and late AMD.

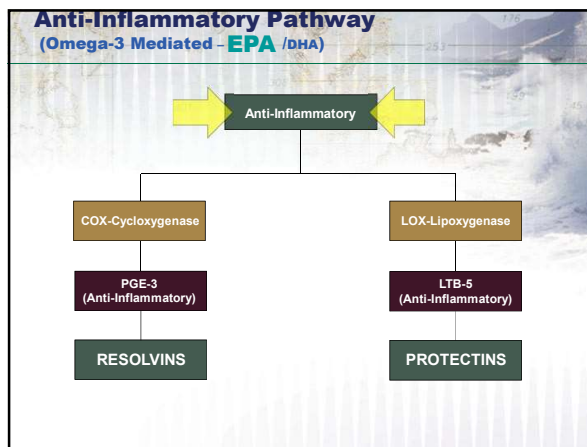
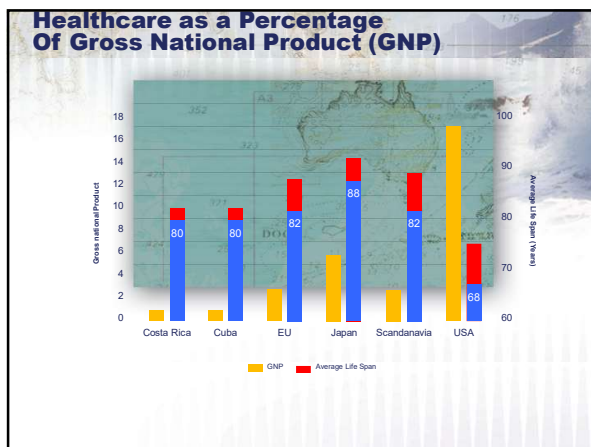
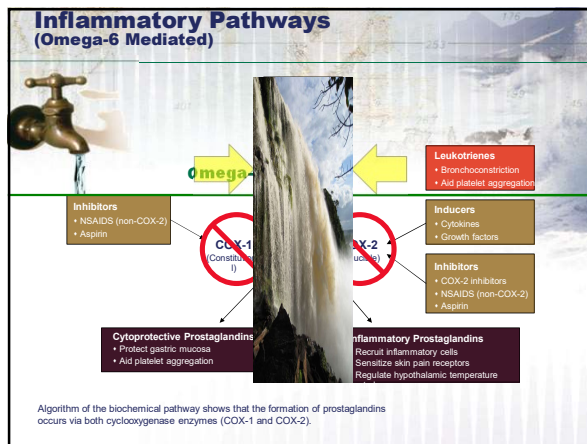
Combining the results showed that a high dietary intake of omega-3 EPA was associated with a 23 per cent reduction in the risk of early AMD, whereas DHA was associated with a 30 per cent reduction. A high intake of alpha-linolenic acid (ALA) however was associated with a 49 percent increase in risk.

JAMA, May 15, 2013—Vol 309, No. 19
Corrected on May 14, 2013

AREDS2 Omega-3 Arm: Primary Prevention/Early AMD


"There are a couple of other important points to keep in mind. This study did not assess primary prevention. While past research suggests a role for EPA+DHA in decreasing the risk of developing AMD, the present research did not address this issue. Rather, it addressed the issue of secondary prevention. With respect to secondary prevention, it's possible that earlier stages of AMD are more responsive to treatment with EPA+DHA."

JAMA, May 15, 2013—Vol 309, No. 19
Corrected on May 14, 2013




Therapeutic Approaches

Above the Line

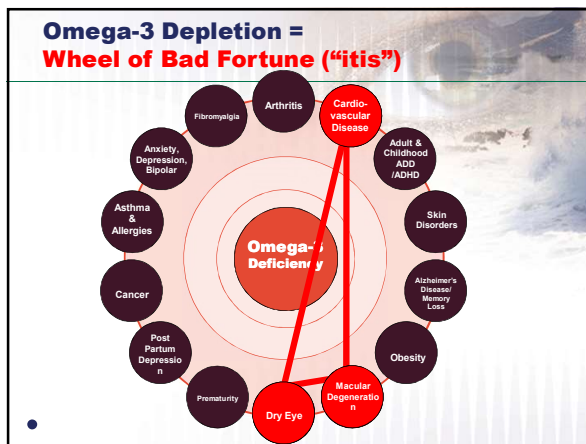


Balance
Long-Term Clinical Nutrition

Below the Line



Blocking
Short-Term Pharmaceuticals



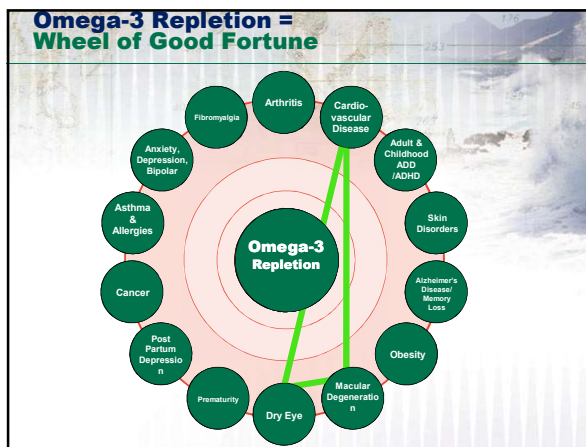
TIME

THE SECRET KILLER

The surprising link between **INFLAMMATION** and HEART ATTACKS, CANCER, ALZHEIMER'S and other diseases

What you can do to fight it

WISDOM'S MILITARY RECORDS IS MONEY MADE TAPPED?



**“An Inconvenient Truth”
of American Medicine**

Omeganemia®

Lack of Omega-3 Essential Fatty Acids (EFAs)



A Nutritional Deficiency Disease

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Proof Of Concept

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Breaking News on Supplements & Nutrition - North America

Omega-3 deficiency causes 96,000 US deaths per year, say researchers

By Shane ...

Omeganemia® ... a matter of life and death.”

Source: *Public Library of Science Medicine Journal*
Vol. 6, April, 2009

Omega-3 deficiency is the sixth biggest cause of US deaths and more deadly than excess trans fat intake, according to a new study.

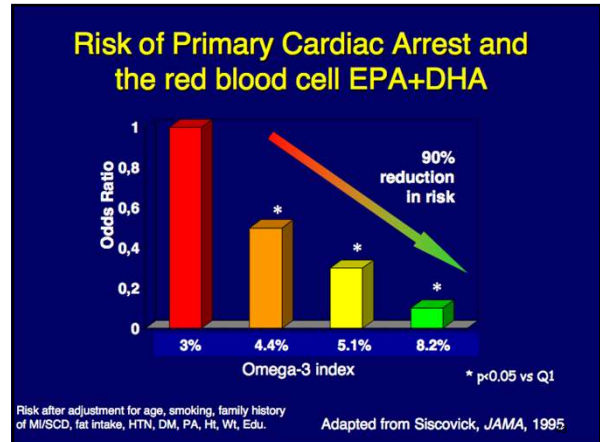
The study, jointly funded by the Centers for Disease Control and Prevention (CDC) through the Association of Schools of Public Health, drew on 2005 data from the US National Health Center for Health Statistics. They determined that there were 72,000-96,000 preventable deaths each year due to omega-3 deficiency, compared to 63,000-97,000 for high trans fat intake.

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What is a Therapeutic Dose of EPA/DHA and in What Form?

HS-Omega-3 Index®

Test



HS-Omega-3 Index® Report

OmegaQuant Analytic | Phone: 1-800-866-0512
PO Box 1208 | MO: 645-1031 | Fax: 1-800-533-9873
37205-1208 USA | info@omegaquant.com
www.omegaquant.com

Name: Low RBC | Date: April 16, 2009
DOB: N/A | ID: N/A
Provider: N/A

HS-Omega-3 Index = 3.7%

your index

↓

← Desirable over 9% | Intermediate | Desirable over 6% →

we would recommend that you increase your current EPA+DHA intake by 1 - 3 grams (1000 - 3000 mg) per day. Although this can be accomplished by eating more oily fish, fish oil supplements are usually necessary to achieve this level of EPA+DHA intake.

Omega-3 fatty acids are found primarily in fish especially "oily" fish such as those nearer the top on the accompanying table. The two most important omega-3 fatty acids are EPA and DHA.

It should be noted that omega-3 fatty acids from flaxseed oil (alpha-linolenic acid, or ALA) will have little to no effect on your HS-Omega-3 Index. Therefore, ALA is not an effective substitute for EPA and DHA.

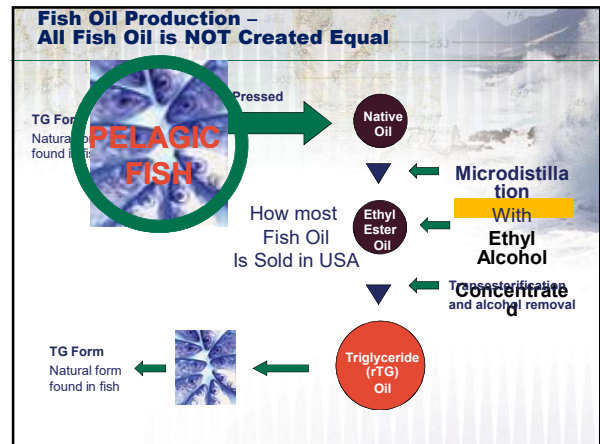
ALA can influence your body's response to additional EPA+DHA.

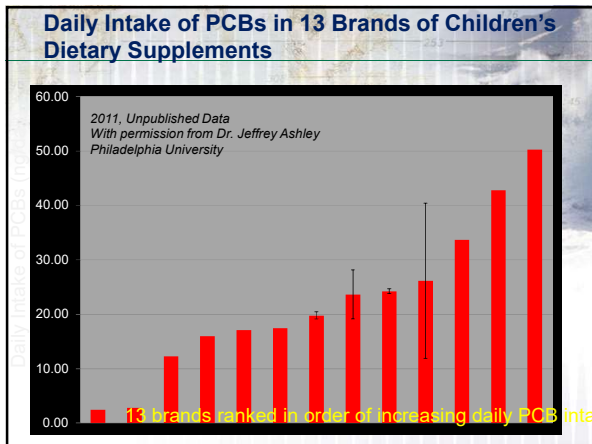
If necessary, we would recommend that you increase your current EPA+DHA intake by 1 - 3 grams (1000 - 3000 mg) per day. Although this can be accomplished by eating more oily fish, fish oil supplements are usually necessary to achieve this level of EPA+DHA intake.

The table lists the approximate amount of EPA and DHA per 3-oz. serving of a variety of sea foods and in dietary supplements.

It should be noted that omega-3 fatty acids from flaxseed oil (alpha-linolenic acid, or ALA) will have little to no effect on your HS-Omega-3 Index. Therefore, ALA is not an effective substitute for EPA and DHA.

The only way to know how your body will respond to an increased intake of EPA+DHA is to measure your HS-Omega-3 Index again. You should wait for 3-4 months before re-testing in order to give your system time to adjust to your increased intake. Once you have achieved





Summary

Summary
The use of marine n-3 polyunsaturated fatty acids (FA) as food supplements has prompted the development of concentrated formulations to overcome patient compliance problems related to the natural, rather low concentrated fish oils. Conflicting data on the bioavailability of these preparations...

The bioavailability of EPA + DHA from reesterified triglycerides was superior (124%)

Two single blinded arms with natural fish body oil and cod liver oil were also included in the study. The study comprised 72 volunteers divided into six groups who were given approximately 3.3 g of ethyl-eicosapentaenoic acid (EPA), ethyl-docosahexaenoic acid (DHA), ethyl-eicosapentaenoic acid (EPA) + ethyl-docosahexaenoic acid (DHA) as ethyl esters. This formulation compared with natural fish oil triglycerides, whereas the bioavailability of EPA + DHA from ethyl esters was inferior (73%). Free fatty acid bioavailability (91%) did not differ substantially from observed. The bioavailability of EPA + DHA from reesterified triglycerides was superior (124%) compared with natural fish oil triglycerides, whereas the bioavailability of EPA + DHA from ethyl esters was inferior (73%). Free fatty acid bioavailability (91%) did not differ substantially from natural triglycerides. The study further demonstrated that fatty acid stereochemistry of the acylglycerols does not influence the bioavailability of EPA and DHA in man.

Bioavailability of Omega-3 Fatty Acid Formulations

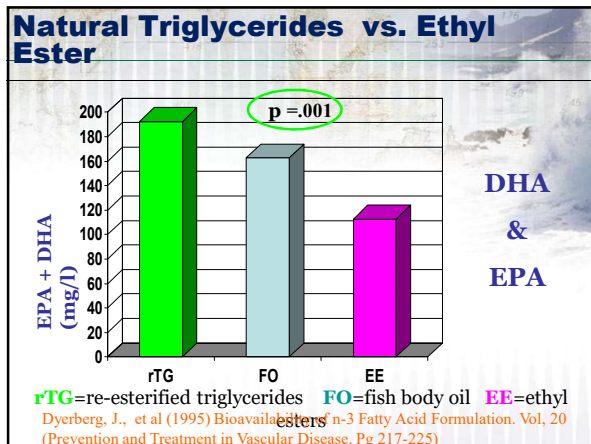
Bioavailability of n-3 Fatty Acid Formulations

Essential Fatty Acids

Bioavailability of marine n-3 fatty acid formulations*

J. DYERBERG¹,

*Dyerberg, J., et al (1995) Bioavailability of n-3 Fatty Acid Formulation. Vol. 20 (Prevention and Treatment in Vascular Disease, Pg 217-225)



Proof of Bioavailability Concept

NUTRA

Fish oil forms: Triglycerides better for omega-3 index increase

By Stephen Daniels, 18-Nov-2010

As the resulting omega-3 index was significantly higher after n-3 fatty acid- re-esterified triglycerides (FA-TG) administration compared with n-3 fatty acid-ethyl ester (FA-EE), the results indicate that n-3 FA-TG is superior to n-3 FA-EE in view of the EPA + DHA tissues incorporation following a long-term administration,

Results of the double-blinded placebo-controlled trial showed that EPA and DHA increases were both quicker and more when omega-3 was supplemented in its triglyceride form.

Expert Clinical Endorsement

You Are What You Eat

Studies show that the re-esterified triglyceride form achieves 200% to 300% better absorption and greater than 70% better bioavailability and that it is better tolerated than ethyl Esters resulting in a significant improvement in meibomian gland function and DED.

Michael Gross, MD

What makes a superior Omega-3 EFA dietary supplement?

- Quality & Purity: Pharmaceutically Licensed
- No "fish" taste
- Bioavailability: Natural TG form
- Age, Lifestyle and Condition Specificity
- Price - less cost per **Therapeutic** dose
- NSF - Highest Manufacturing Certification
- Compliant with FDA/cGMP requirements

NSF Live safer.™ **cGMP** Pharmaceutical Grade Manufacturing

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Is Meibomian Gland Dysfunction/ Posterior Blepharitis the Major Component of Dry Eye?

Lipid Layer

- Lipids are the major components of meibum (also known as "meibomian gland secretions").
- Lipids are universally recognized as major components of human and animal meibum.

References

- ▲ "eye, human." Encyclopædia Britannica. Encyclopædia Britannica Ultimate Reference Suite. Chicago: Encyclopædia Britannica, 2010.
- ▲ Nicolaidis N, Kaitaranta JK, Rawdah TN, Macy JJ, Boswell FM 3rd, Smith RE. "Meibomian gland studies: comparison of steer and human lipids." *Invest Ophthalmol Vis Sci.* 1981 Apr;20(4):522-536. PMID 7194326
- ▲ Butovich IA. "The Meibomian puzzle: combining pieces together." *Prog Retin Eye Res.* 2000 Nov;29(5):483-498. PMID 19680571
- ▲ Butovich IA. "Lipidomic analysis of human meibum using HPLC-MSn." *Methods Mol Biol.* 2009;579:221-246. PMID 19793478
- ▲ Tsai PS, Evans JE, Green KM, Sullivan RM, Schaumberg DA, Richards SM, Dana MR, Sullivan DA. "Proteomic analysis of human meibomian gland secretions." *Br J Ophthalmol.* 2006 Mar;90(3):372-7. PMID 16488965

Dry Eye Subtypes

- 86% of patients with a classified DED subtype demonstrated signs of MGD
- Purely aqueous-deficient (ADDE) subtype represented the smallest percentage of patients (~10%)

Lemp MA, et al. Cornea. 2012.

Eyelid Anatomy

Labels in diagram: Skin, Orbicularis oculi muscle, Hair follicle, Perifollicular glands, Eyelash, Meibomian gland.

Tear Composition

The diagram shows a cross-section of the tear film on the eye's surface. It is divided into four layers from top to bottom: the Lipid Layer (outermost), the Aqueous Layer, the Mucin Layer, and the Epithelium (innermost, attached to the cornea).

- LIPID LAYER:** Prevents evaporation of tears and is the final optical interface.
- AQUEOUS LAYER:** Hydrates and provides optical interface.
- MUCIN LAYER:** Adheres to cornea and binds aqueous.
- EPITHELIUM:** (Implied by the text 'Adheres to cornea')

conclusion

- The majority of patients with dry eye symptoms have blepharitis
- If a secondary infection is present, treat with AzaSite, Doxycycline or Tobradex ST
- Omega 3's provide short and long term treatment of the inflamed oil glands, effectively providing the underpinnings of a great dry eye therapy.

The Hypothesis behind "The Root Cause" of Dry Eye

The diagram shows a balance scale. On the left pan, which is lower, are Omega-3s represented by a fish and a yellow vegetable. On the right pan, which is higher, are Omega-6s represented by a red meat and a yellow vegetable. This illustrates that an imbalance (excess Omega-6) leads to dry eye.

- Omega Imbalance (excess Omega-6:Omega-3)
 - causes the meibum to become thick, viscous and inflamed
 - causes the Meibomian Glands to become blocked
 - prevents the production of the lipid layer
- Without the lipid layer, the aqueous layer evaporates, causing the ocular surface to become irritated (red, dry, scratchy)

Medscape Ophthalmology

There's Nothing Fishy About Omega-3 Fatty Acids for Dry Eye Syndrome

Robert H. Graham, MD
Published: 09/01/2009

Omega-3 Fatty Acids as Treatment for Dry Eye Syndrome

Unfortunately, the bioavailability of ethyl ester form is reduced to as low as 20% (up to 60% with a high-fat meal). This compares poorly with the triglyceride form's absorption of 65% (increasing to 90% with a high-fat meal).¹⁸ This increased bioavailability results in 50% more plasma EPA and DHA when the acids are administered as a triglyceride rather than an ethyl ester.¹⁷

First evidence of Omega-3 EPA/DHA effect on a potential root cause of Dry Eye Syndrome

S. Gregory Smith MD, Attending Surgeon Wills Eye Institute
Presented at 2011 Cornea Society/EBAA Fall Educational Symposium

82% of patients treated with Dry Eye Omega Benefits (1680mg EPA/560mg DHA/1000IU Vitamin D3) showed a change in the composition of the meibum after 8 weeks of treatment

Positive clinical outcomes for patients in 4-8 weeks

- 70% became completely asymptomatic
- 100% noted decrease in primary complaint
- Improvement in TBUT was statistically significant
- All patients with corneal staining at baseline significantly improved
- Patients with hyperosmolarity (>308 mOsm/L) at baseline improved 25%

Dry Eye Omega Benefits normalizes the composition of the oil in the meibum, which contributes to the lipid layer of the tear.

First evidence of Omega-3 EPA/DHA effect on a potential root cause of Dry Eye Syndrome - REPEATED

S. Gregory Smith MD, Attending Surgeon Wills Eye Institute
Presented at 2011 Cornea Society/EBAA Fall Educational Symposium

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Meibum analysis – Omega-6 levels decreased, EPA/DHA APPEARED IN MEIBUM ASSAY FOR THE FIRST TIME IN RESEARCH.

Treatment Protocol

Advanced OCULAR CARE

March 2011

The traditional treatment for posterior blepharitis, as this condition is also called, has consisted of artificial tears, topical steroids, oral tetracycline and its derivatives, and more recently, topical azithromycin.

In the past 30 years, none of these agents has brought long-lasting relief to patients.

The best treatment I have found in more than 30 years of practicing ophthalmology is omega-3 fatty acids in the triglyceride form.

Physician Recommended Nutraceuticals (Plymouth Meeting, PA) makes the form of omega-3 that achieves this near 100% absorption.³

Cataract and Refractive Surgery Today

March 2014

The Role of Nutrition in Ocular Health

The essential triglyceride form of omega-3 helps reduce inflammation associated with dry eye disease.

BY S. GREGORY SMITH, MD

Back to answering the patient's question, why did I get dry eye in the first place?

My answer: I changed your diet, and your dry, red, irritated eyes resolved. I would have to say it was your diet that caused your dry eyes.

COVER STORY

What's the story? Making the most out of the nutrients in your diet is one of the best ways to improve your eye health. For example, carotenoids are "good for your eyes," and about the most of dry eye disease.

Recently, ophthalmologists are patients who present with dry eye disease, have tried numerous treatments, almost all of them without any resolution about inflammation (DHE) or hyperosmolarity (DHE).

Recently, I have been treating this patient with artificial tears, warm compresses, topical antibiotics, topical steroids, and preservative-free artificial tears, and it's not working. I've tried all of these treatments, and it's not working. I've tried all of these treatments, and it's not working. I've tried all of these treatments, and it's not working.

Form prostaglandins and intake the inflammatory pathway that helps heal the eye. Omega-3s are essential for the eye. Omega-3s are essential for the eye. Omega-3s are essential for the eye.

Omega-3 and Omega-6 Fatty Acids

What is an Omega-3 fatty acid?

Omega-3 is an essential fatty acid, meaning that a person has to get it from the diet. It is not synthesized by the body. It is not synthesized by the body. It is not synthesized by the body.

What Does Omega-3 Do?

Omega-3 is an anti-inflammatory agent and it has more importantly, an inflammation-reducing effect.

Preparing the Ocular Surface



February 2012

Pre and Post – Operative Cataract Care of Eyes with Inflammatory Disease

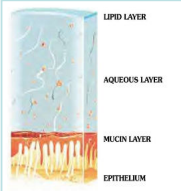
By initiating management prior to surgery, ophthalmologists can improve the success of the cataract procedure and increase patients' satisfaction.

By Edward J. Holland, MD, and Eric D. Donnenfeld, MD

Another first-line therapy for MGD is oral omega-3 nutritional supplements. The recommended dose is 3 g per day.

Contribution of Tear Film to V/A

- ♦ The tear film is the first refractive interface
- ♦ Anterior surface of the precorneal tear film has the greatest optical power of any ocular surface¹
 - With cornea, provides 2/3 of eye's optical power
 - Largest Δ in refractive index is between air & tear film



1. Albarran C, et al. Contact Lens Anterior Eye 1997;20:129-35

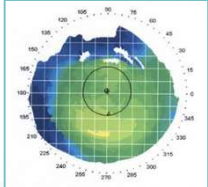
Dry Eye in the Cataract Population

- ♦ Prospective evaluation of patients presenting for routine cataract surgery
 - 200 eyes of 100 patients
- ♦ 59% had a diagnosis of blepharitis
- ♦ 61% had a TBUT of ≤ 7 seconds

Luchs J, Buznego C, Trattler W. Incidence of blepharitis in patients scheduled for phacoemulsification. Presentation, ASCRS 2010.

Impact on Preop Measurements

- ♦ Dry eye affects accuracy of measurements used for determining candidacy and for IOL selection and power
 - Keratometry
 - Magnitude and axis
 - Topography
 - Wavefront aberrometry



Surgical Planning

- ◆ Potential consequences of dry eye during surgical planning process
 - Exclude from consideration for MF IOL due to reduced acuity or suspicion of poor retinal image quality
 - Select wrong monofocal IOL based on preop SA
 - Select wrong IOL power
 - Plan for toric IOL or LRIs when not needed (or v.v.)
 - Position toric IOL on wrong axis
 - Perform unnecessary lens exchange or enhancement

Disruption of the Ocular Surface Induces Distortion That Is Magnified by a Multifocal IOL

The diagram illustrates how an irregular corneal surface (represented by a dashed line) disrupts the normal focusing of light rays. Light rays entering from the left are scattered and focused at different points on the retina, causing image distortion. A multifocal IOL (represented by a lens) further magnifies this distortion, leading to blurred and distorted retinal images.

Tear Film Irregularities & Vision

- ◆ Irregularities in the tear film scatter light and can degrade retinal image quality by 20-40%¹
- ◆ Between blinks in dry eyes vs. normal eyes
 - Visual acuity is more impaired²
 - HOAs increase³

1. Tutt R, Bradley A, Begley C, et al. IOVS 2000;
2. Goto E, Yagi Y, Masumoto Y, Tsubota K. Am J Ophthalmol 2002
3. Montes-Mico R. J Cataract Refract Surg 2007

Progression of Dry Eye with Surgery

- ◆ Patient with moderate OSD
- ◆ Add
 - Toxicity and preservatives
 - Cataract incisions and LRIs
 - Irritation/healing from surgery
- ◆ Surgery takes the cornea over the edge

The photograph shows a close-up of an eye with a dry, irregular tear film. The cornea appears slightly overexposed, and there are visible signs of dry eye syndrome (OSD) such as a dry, irregular tear film and a visible corneal edge.

Patient Satisfaction & Comfort

- ♦ Dry eye is one of the most common causes of dissatisfaction in surgical patients
 - 28% of dissatisfied LASIK patients¹
 - 15% of dissatisfied MF IOL patients²
 - Does not include impact on V/A - likely even higher
- ♦ Blame symptoms on the lens
 - Discomfort
 - Visual fluctuations
 - Increased difficulty with computer use or night driving

Does Hyperosmolarity Undermine Your Surgical Outcomes?

Hyperosmolarity affects pre-surgical cataract biometry measurements.¹

References: 2014 TearLabs Corp. submitted for publication 2014

Summary

- ♦ Dry Eye is very common in the cataract population
 - Has a significant impact on your patient's vision, comfort and quality of life
 - Can have a significant impact on your surgical outcomes
 - Important for you to diagnose and properly treat

Does Hyperosmolarity undermine your surgical outcomes?

17% of hyperosmolar eyes had >1 D (diopter) of difference in keratometry cylinder values between two pre-surgical visits

10% of hyperosmolar eyes had >0.5 D (diopter) of change in calculated IOL power

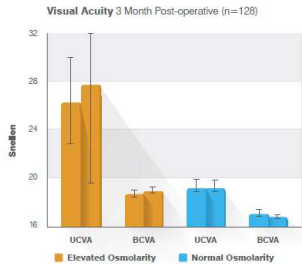
Patients with hyperosmolarity exhibit greater variability in their keratometry measurements between two preoperative visits vs the normal osmolar group?

References: 2014 TearLabs Corp. submitted for publication 2014

Does Hyperosmolarity undermine your surgical outcomes?

Pre-surgical hyperosmolarity predicts poor uncorrected vision after LASIK²

Among hyperosmolar patients, the difference between best corrected visual acuity (BCVA) and uncorrected visual acuity (UCVA) was significant. This suggests unanticipated post-operative refractive outcomes.



Eldridge D, et al. Presurgical hyperosmolarity and treatment with AMO blink Tears Predicts Refractive Outcomes. ARVO E-Abstract 1286, 2012.

What Proof do we have that Omega-3s have a Therapeutic Effect in MGD?

ASCRS Abstract Available

“THE INFLUENCE OF OMEGA-3 NUTRITIONAL REGIMEN ON TEAR OSMOLARITY IN CASES OF DRY EYE DISEASE.”

Conclusion

This study demonstrated that oral consumption of re-esterified omega-3 fatty acids (1680 mg EPA and 580 mg DHA once daily for 12 weeks) resulted in a statistically significant improvement in tear osmolarity, corneal staining, OSDI, and omega index levels.

<https://ascrs.confex.com/ascrs/15am/webprogram/Paper18565.html>

Effect Of Oral Re-esterified Omega-3 Nutritional Supplementation On Dry Eye Disease: Double Masked, Randomized, Placebo Controlled Study

- Eric C. Donnenfeld, MD**
- Edward J. Holland, MD**
- Frank A. Bucci Jr, MD**
- Alice T. Epitropoulos, MD, FACS**
- Cynthia Matossian, MD, FACS**
- Melissa M. Toyos, MD**
- Stephen S. Lane, MD**
- William J. Faulkner, MD**

ASCRS, 2015; San Diego, CA

Study Design

Double-Masked, randomized, placebo-controlled, multi-center study of a triglyceride omega-3

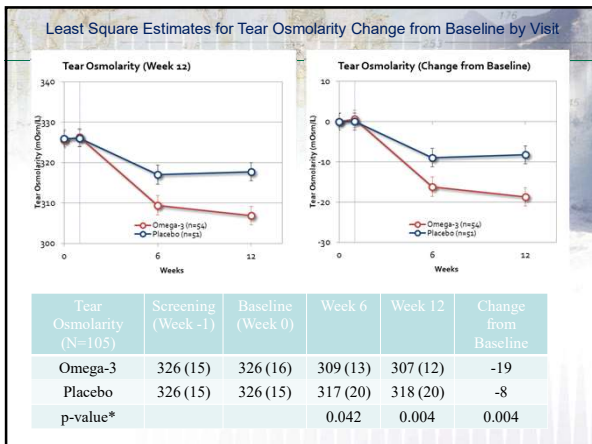
105 subjects completed the study
(54 in treatment group and 51 in placebo group)

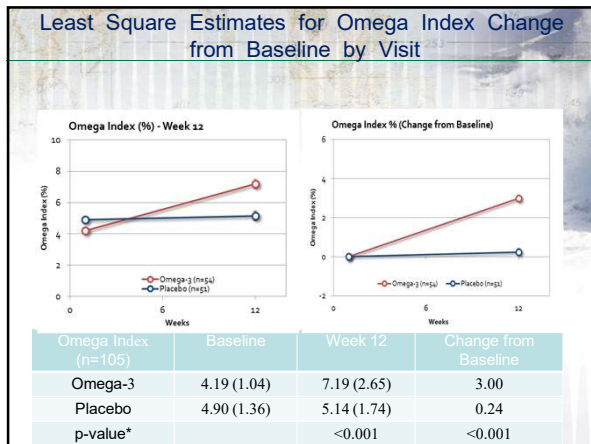
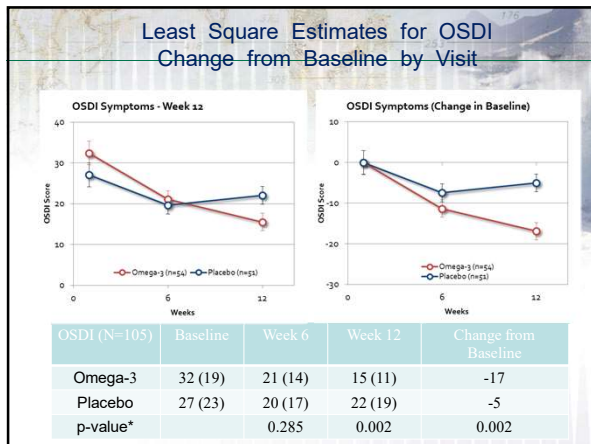
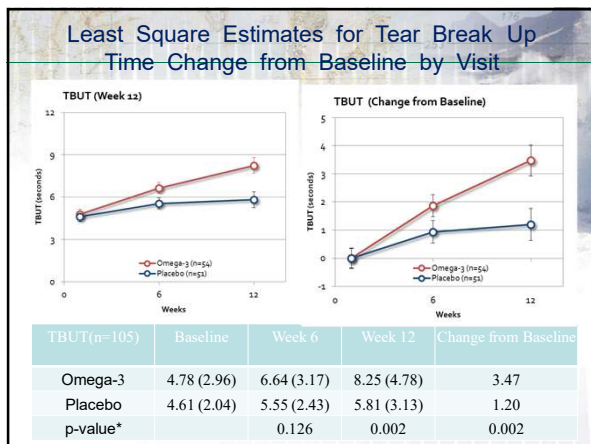
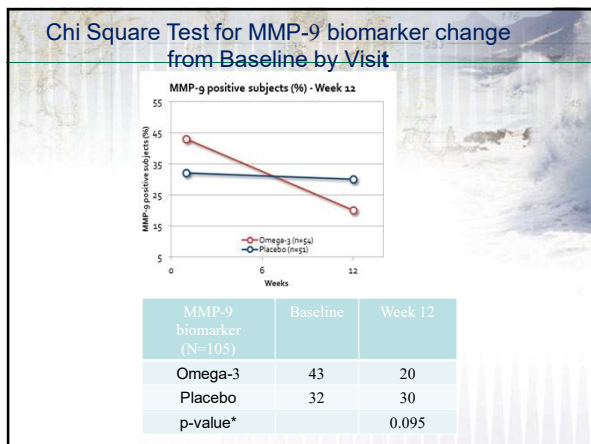
- Average Age: 56.8 years
- Gender: 71.4% women

Results

End Points

- ♦ Primary:
 - To determine the effect of 2240mg triglyceride based Omega-3 (PRN Dry Eye Omega Benefits®) on tear osmolarity
- ♦ Secondary:
 - OSDI (Symptoms)
 - Tear Film Break-Up Time
 - Corneal Staining
 - Lipid Layer Thickness
 - Schirmer's Test
 - MMP – 9
 - Omega-3 Index Score





**Conclusion:
Dry Eye and Omega-3 Supplementation**

- The natural triglyceride form of omega-3 supplementation significantly
 - Improves tear osmolarity
 - Improves TBUT
 - Improves the OSDI
 - Increases the Omega-3 Index

Thank You!