



Integrative and Functional Medicine
New Opportunities for Optometry


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Optometric Education Consultants
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Disclosures- Greg Caldwell, OD, FAAO
All relevant relationships have been mitigated

- ↳ Lectured for: Alcon, B&L, BioTissue, Dompé
Disclosure: Receive speaker honorarium
- ↳ Advisory Board: Dompé, ImmunoGen, Iveric
Disclosure: Receive participant honorarium
- ↳ I have no direct financial or proprietary interest in any companies, products or services mentioned in this presentation
Disclosure: Non-salaried financial affiliation with Pharmexx
- ↳ Healthcare Registries – Chairman of Advisory Council for Diabetes and AMD
- ↳ The content of this activity was prepared independently by me - Dr. Caldwell
- ↳ The content and format of this course is presented without commercial bias and does not claim superiority of any commercial product or service
- ↳ Optometric Education Consultants – Scottsdale, AZ, Pittsburgh, PA, Sarasota, FL, Barcelona, Spain, Orlando, FL, Mackinac Island, MI, Quebec City, Canada, and Nashville, TN- Owner




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My Practice

I am a clinician first then a scientist

- Some are scientists first then clinician
- I need to simplify for patient and patient care.
- Science is great. But not good if there isn't a clinical application.
- Some lectures are science based without clinical application.
- My lecture will be a hybrid. Showing clinical applications of the science




It is wonderful to have someone who's digging so many aspects of optometry (scientific, clinical experience, teacher & lecturer). It is refreshing and very informative. -Sarah

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Ocular Disease Career
Allopathic

- ↳ OCT - Spectral domain
- ↳ OCT Angiography
- ↳ Visual Fields
- ↳ AMD, glaucoma, retinal degenerations, diabetic retinopathy
- ↳ Dark Adaptation
- ↳ Focusing on structure and function loss or damage
- ↳ Patients asking what about supplements
 - Reading about it on internet
 - Promised I would do my due diligence
- ↳ Ocular disease optometrist to an Integrative Optometrist



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"The Comfort Zone"



Confidence
Capable
Courage
Commitment



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Acute vs Chronic

- ↳ Corneal abrasion
- ↳ Marginal ulcer
- ↳ CL overwear
- ↳ Hordeolum
- ↳ HSV Keratitis
- ↳ Anterior Chamber Inflammation
- ↳ Randomized Clinical Trials
 - Heterogeneous input and arrive at a homogenous result
 - Evidence based medicine - we apply those average findings to everyone, that is an individual
- ↳ Everyone is not average
- ↳ The longest clinical trials are 5-10 years
- ↳ Thyroid Eye Disease
- ↳ Diabetes
 - Metabolic diseases
- ↳ Cardiovascular disease
- ↳ Rheumatoid Arthritis
- ↳ Macular degeneration
 - Geographic atrophy
 - Wet AMD

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Chronic

- Not acute or binary
 - Complex processes
- Short term fixes don't work
- More of strategy
- Assessment of risk
- We try to take complex processes and try to make them binary

- Thyroid Eye Disease
- Diabetes
 - Metabolic diseases
- Cardiovascular disease
- Alzheimer's Disease
- Rheumatoid Arthritis
- Macular degeneration
 - Geographic atrophy
 - Wet AMD

Chronic or Focus of Prevention
Shift from evidence based to
Evidence Informed Risk Adjusted Medicine

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Tele-Optometry – AI and Risk

Evidence Informed Risk Adjusted Medicine

Using AI, retina, and blood vessels for "risk"
Cardiovascular Disease

Using AI, retina, and blood vessels for "risk"
Alzheimer's Disease

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Nutrition

- Don't consume too many or too few calories
- Eat sufficient protein and essential fats
- Obtain the vitamins and minerals you need
- Avoid pathogens like E Coli
- Avoid toxins like mercury and lead
- Beyond this we know relatively little with complete certainty

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Why?

- Do not claim that a product will treat, cure, or prevent any disease or health condition (including COVID-19 or viruses) or that the product cured your own ailment
- Dietary supplements are not intended to treat, diagnose, mitigate, prevent, or cure disease

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Comprehensive Antioxidant Support

- Cell membrane support
- Immune support
- Support to the oxidative stress to the extracellular matrix
- Support to cell signaling

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Optometry's Opportunity?

Antioxidants

Gut Health

Skin - Inside Collagen

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Life Span versus Health Span

- If we are all "Human Beings: version 1600", why are we getting weaker and sicker than ever before? Why are we not continuing to evolve and get better and stronger, like our mobile phones have done in only 10 generations?
- Our average age or life span may be getting longer, but the average health span, the number of healthy years we live, is dropping. In the USA it's now about 79 years while health span is 63 years. In other words, we are living an average of 63 years of healthy life followed by a 16-year burden of chronic disease.
- Why is this happening to us? The answer is **chronic diseases**, most of which are self-inflicted. We have accepted unhealthy lifestyle and dietary choices, robbing our bodies of the tools and ingredients necessary to stay healthy, to repair itself and evolve. Only we can make ourselves healthy. Medications, especially those for chronic disease do NOT make us better. They just reduce the symptoms, whether it is pain, diabetes, high blood pressure or a wide range of eye disorders. Medications for chronic conditions like these do not treat our underlying medical conditions. They reduce the symptoms of the disease process by tampering with our internal body chemistry to reduce our symptoms or change the numbers on a lab test, without addressing the actual cause of the problem.

BARRY SHAWAN, D.O., M.P.H., F.A.C.C.P.
East Coast Integrative Consultants

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Life Span versus Health Span

Today slow death has surpassed fast death.

Most can expect to live to be their 80s, but die from chronic disease or slow death.

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Patients Are Expecting

- Early detection
- Wellness
- Prevention

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Early Detection and Allopathic Treatments

Rubin Cone Contrast Test

ERG and VEP

Estimate Informed Risk Adjusted Medicine

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Measuring Carotenoids – Gives You the Patient’s Over-All Antioxidant Status – In the Office – 30 Seconds

19,000

26,000

34,000

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Vulnerable to Oxidation

Betacarotene

Lutein

Lycopene

Vitamin C

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Optic Nerve and Eye Pressure Support

Optic Nerve and Eye Pressure Support

Optic Nerve and Eye Pressure Support

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Comprehensive versus Isolate

COMING SOON

Optic Nerve & Eye Pressure Support

Ocular Nutrition
Tying Structure, Function, and Molecular Altogether

Is it really any different than systemic nutrition?
Tying Structure, Function, and Molecular Altogether

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Organ and End Organ Damage from Oxidative Stress

- ~ Dry eye
- ~ Floaters
- ~ AMD
- ~ Glaucoma
- ~ Diabetes
- ~ Autoimmune disease

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Comprehensive Antioxidant Support

- ~ Cell membrane support
- ~ Immune support
- ~ Support to the oxidative stress to the extracellular matrix
- ~ Support to cell signaling

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Question?

- ~ Who in here would consider themselves as an integrative optometrist?
- ~ Who has done or recommended?
 - * Supplements, vitamins, AREDS2
 - * Omega, EPA, DHA
 - * Vital tear – ASED
 - * Regener-Eyes
 - * Tea tree oil – Cliradex
 - * Azelaic membranes
 - * Hypochlorous acid – Avenova
 - * CBD
 - * Probiotic

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Allopathic vs Integrative Medicine

- ~ "Allopathic medicine" is a term used for modern or mainstream medicine
 - * Conventional medicine, mainstream medicine, Western medicine, biomedicine
 - * Treating conditions and symptoms with its "opposite"
 - * Health system in which medical doctors, nurses, pharmacists, and other healthcare professionals are licensed to practice and treat symptoms and diseases
 - * Using medication, surgery, radiation, therapies, and procedures
- ~ Complementary and integrative medicine are commonly used along with mainstream medicine
 - * Homeopathy, naturopathy, chiropractic care, Chinese medicine
- ~ Allopathic or modern medical schools have recently added more study and information on how food and nutrition can help prevent and treat disease
 - * More education is being offered on integrative approaches and potential interactions with mainstream medicine

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Medical Practices

- ~ Allopathic medicine
 - * Western medicine
- ~ Alternative "homeopathic"
 - * Functional
 - * Medicine of why, treat the cause
- ~ Integrative medicine
 - * Complementary medicine - Eastern complementing Western


What is integrative medicine?

The practice of integrative medicine refers to the blending of conventional and evidence-based natural and complementary medicines and/or therapies with lifestyle interventions to deliver holistic, patient-centred care.

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Chronic and Low-Grade Inflammation

Science has proven that chronic, low-grade inflammation can turn into a silent killer that contributes to cardiovascular disease, cancer, type 2 diabetes, diabetic retinopathy, cataracts, macular degeneration, and many other conditions.



The graph shows a positive correlation between inflammation and health expenditure. The x-axis represents 'Inflammation' and the y-axis represents 'Health Expenditure'. Multiple lines represent different countries or regions, all showing an upward trend as inflammation increases. The lines are labeled with country names: USA, Germany, France, Italy, Japan, and UK.

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Chronic and Low-Grade Inflammation

Like cancers and other slow-burn diseases, identifying these conditions early can make the difference between full recovery or a dramatically reduced quality of life or even death (vision loss or blindness)

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“Choose Your Parents Wisely”

~ This just isn't as true as it's used to be

~ Lifetime health

- ★ 8% genetics - "Picking your parents wisely"
 - DNA is our blueprint
 - Can't be influenced
- ★ 92% epigenetics
 - Lifestyle choices = we can influence
 - Turn on/off gene expression

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Biomarker

- ~ Test that has meaning
- ~ Biological molecule found in blood, other body fluids, or tissues that is a sign of a normal or abnormal process, or of a condition or disease.
- ~ A biomarker may be used to see how well the body responds to a treatment for a disease or condition
- ~ Blood pressure, blood work, heart rate, genetic testing, IOP

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Predictive Biomarker

- ~ Used to identify individuals who are more likely to respond to exposure to a particular medical product or environmental agent
- ~ The response could be a symptomatic benefit, improved survival, or an adverse effect
- ~ A value that we can guide therapy around
 - ★ HbA1c
 - ★ C-Reactive Protein
 - ★ Plasma Homocysteine
 - ★ Vitamin D (25-HydroxyD)
 - ★ Omega 3 Index
 - ★ Carotenoid – measure of all antioxidants

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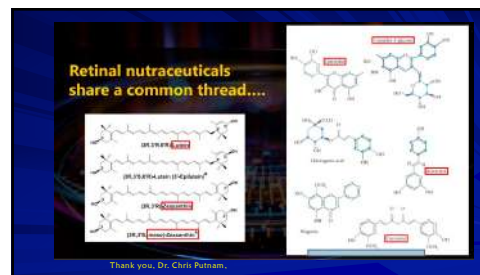
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Predictive Biomarker – Gives You the Patient's Over-All Antioxidant Status – In the Office – 30 Seconds

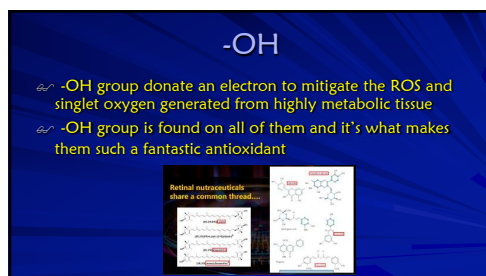
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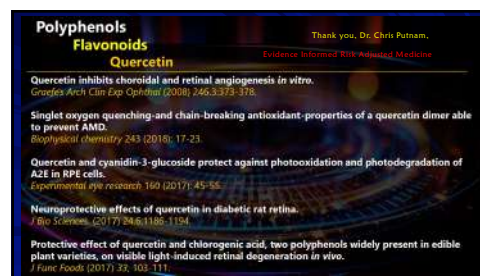
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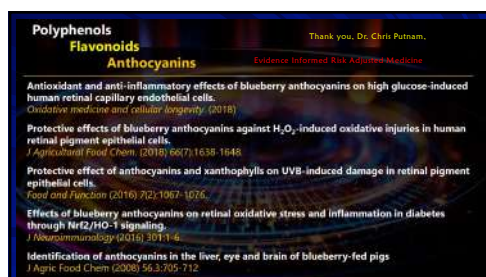
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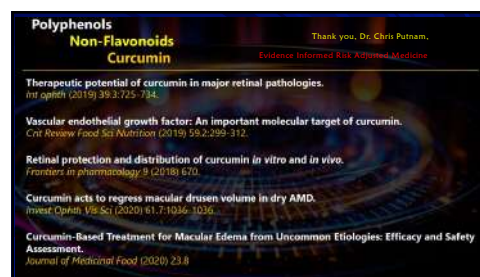
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Polyphenols
Non-Flavonoids
Resveratrol

Thank you, Dr. Chris Putnam, Evidence Informed RBC-Mediated Medicine

Resveratrol based oral nutritional supplement produces long-term beneficial effects on structure and visual function in human patients.
Nutrients, (2014), 6, 10:4404-4420.

Resveratrol suppresses expression of VEGF by human retinal pigment epithelial cells: potential nutraceutical for age-related macular degeneration.
Aging and Ageing (2014) 15:248.

SIRT1 mediated inhibition of VEGF/VEGFR2 signaling by Resveratrol and its relevance to choroidal neovascularization.
Cytokine 76:2, (2015):548-552.

Anti-oxidant, anti-inflammatory and anti-angiogenic properties of resveratrol in ocular diseases.
Molecules 21:3, (2016):304.

Toxic effects of A2E in human ARPE-19 cells were prevented by resveratrol: A potential nutritional bioactive for age-related macular degeneration treatment.
Archives of Toxicology 94:2 (2020): 553-572.

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Measure?

The slide displays a collage of scientific literature abstracts. The central focus is on the topic of 'Measuring' the effects of nutraceuticals, particularly in the context of eye health and vision. The abstracts include details about study designs, populations, and findings related to the efficacy of various supplements in improving visual function and structure in patients with age-related eye conditions.

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Chronic and Low-Grade Inflammation

The infographic illustrates the progression of inflammation. It features three circular gauges representing inflammation levels: 19,000, 26,000, and 44,000. Below the gauges are three images: a hand with a red, inflamed palm, a person's face showing signs of aging and skin issues, and a person sitting at a desk with a computer, suggesting lifestyle factors. A flowchart at the bottom shows the connection between inflammation, health, and lifestyle.

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DNA Sciences

- Genomics = all of our genes
- Genetics = individual genes
- Epigenetics – the study of how our cells control gene activity without changing the DNA
 - * Internal and external environments

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Exposome

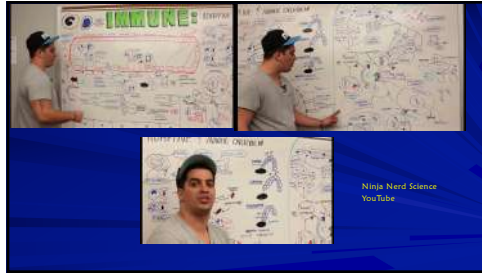
The infographic defines the exposome as the sum of all exposures an individual experiences throughout their life. It highlights how these exposures, from environmental and occupational sources, influence health outcomes. The text states: "The exposome can be defined as the measure of all the exposures an individual in a lifetime and how these exposures relate to health. An individual's exposure begins before birth and includes inputs from environmental and occupational sources. Understanding how exposures from air, electronics, diet, lifestyle, etc.,..."

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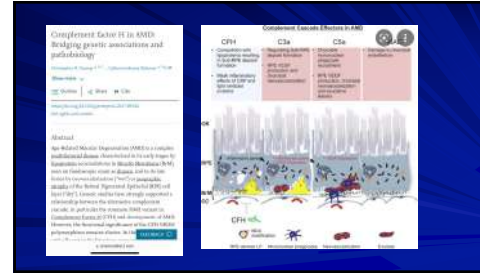
Ingredients

| Ingredient | Amount | % Daily Value |
|-------------|---------|---------------|
| Vitamin A | 1000 IU | 20% |
| Vitamin B1 | 10 mg | 20% |
| Vitamin B2 | 10 mg | 20% |
| Vitamin B3 | 10 mg | 20% |
| Vitamin B5 | 10 mg | 20% |
| Vitamin B6 | 10 mg | 20% |
| Vitamin B7 | 10 mg | 20% |
| Vitamin B9 | 10 mg | 20% |
| Vitamin C | 10 mg | 20% |
| Vitamin D | 10 mg | 20% |
| Vitamin E | 10 mg | 20% |
| Vitamin K | 10 mg | 20% |
| Calcium | 10 mg | 20% |
| Iron | 10 mg | 20% |
| Zinc | 10 mg | 20% |
| Selenium | 10 mg | 20% |
| Magnesium | 10 mg | 20% |
| Phosphorus | 10 mg | 20% |
| Potassium | 10 mg | 20% |
| Sodium | 10 mg | 20% |
| Cholesterol | 10 mg | 20% |
| Fiber | 10 mg | 20% |
| Protein | 10 mg | 20% |

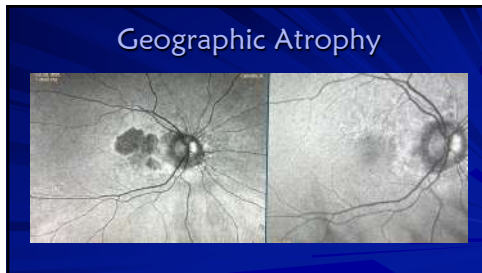
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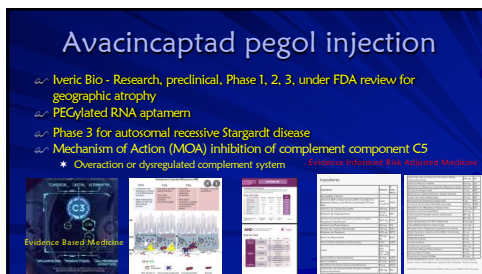
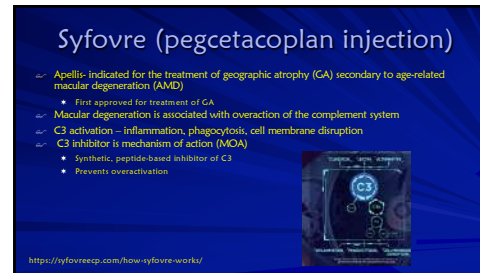
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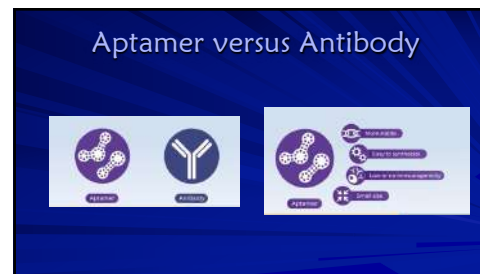
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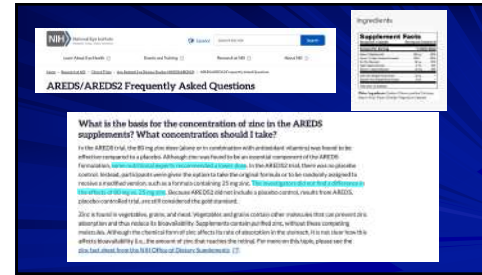
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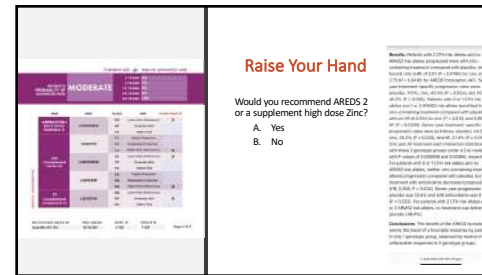
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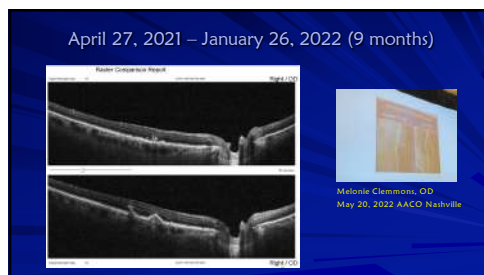
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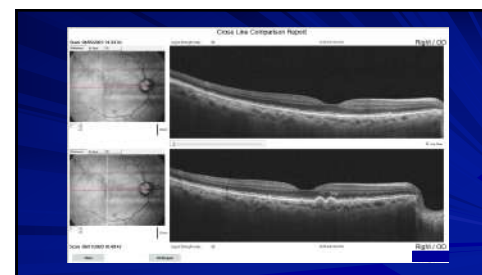
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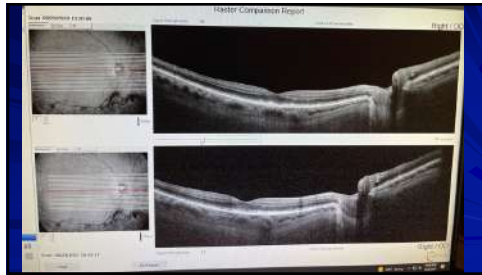
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Ingredients:

| Ingredient | Amount | Unit |
|---------------------------|---------|------|
| Ascorbic Acid (Vitamin C) | 1000 mg | mg |
| Alpha-Lipoic Acid | 300 mg | mg |
| Coenzyme Q10 | 100 mg | mg |
| Resveratrol | 50 mg | mg |
| Curcumin | 500 mg | mg |
| Omega-3 Fatty Acids | 1000 mg | mg |
| Glucosamine | 500 mg | mg |
| Chondroitin | 500 mg | mg |
| Collagen | 1000 mg | mg |
| Hydroxyapatite | 100 mg | mg |
| Calcium | 1000 mg | mg |
| Vitamin D3 | 1000 IU | IU |
| Vitamin K2 | 100 mcg | mcg |
| Magnesium | 100 mg | mg |
| Zinc | 100 mg | mg |
| Copper | 2 mg | mg |
| Selenium | 100 mcg | mcg |
| Iron | 100 mg | mg |
| Fluoride | 100 mg | mg |
| Strontium | 100 mg | mg |
| Boron | 100 mg | mg |
| Manganese | 100 mg | mg |
| Nickel | 100 mg | mg |
| Silicon | 100 mg | mg |
| Vanadium | 100 mg | mg |
| Cadmium | 100 mg | mg |
| Lead | 100 mg | mg |
| Mercury | 100 mg | mg |
| Aluminum | 100 mg | mg |
| Chromium | 100 mg | mg |
| Cobalt | 100 mg | mg |
| Gold | 100 mg | mg |
| Platinum | 100 mg | mg |
| Palladium | 100 mg | mg |
| Rhodium | 100 mg | mg |
| Ruthenium | 100 mg | mg |
| Silver | 100 mg | mg |
| Tin | 100 mg | mg |
| Titanium | 100 mg | mg |
| Tungsten | 100 mg | mg |
| Uranium | 100 mg | mg |
| Vanadium | 100 mg | mg |
| Zinc | 100 mg | mg |
| Zirconium | 100 mg | mg |

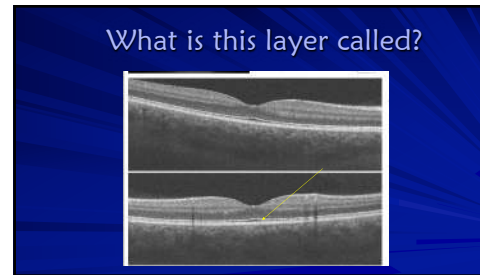
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Key Tenants of Aging, Performance and Vitality

- ✓ Oxidative Stress / Inflammation
- ✓ Hormonal Balance
- ✓ Stress Hormones
- ✓ Glucose / Insulin Regulation
- ✓ Gut Integrity and Microbiome Diversity
- ✓ Immune Balance
- ✓ Environmental Exposures/Burdens
- ✓ Individuality

Credit to: James LaVita, PhD, DCC

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The ellipsoid zone (EZ) is considered to be formed mainly by mitochondria within the ellipsoid layer of the outer portion of the inner segments of the photoreceptors. However, it was previously known as the junction between the photoreceptor IS/OS.

This image shows an OCT scan of the retina. The ellipsoid zone is highlighted in red. It is located between the inner and outer nuclear layers.

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Interpretations of OCT and OCTA images from a histological approach: A clinical and experimental perspective

This image shows OCT and OCTA scans of the retina. The OCTA scan shows the retinal vasculature. The legend identifies the following layers:

- Superficial capillary plexus (SCP)
- Deep capillary plexus (DCP)
- Choriocapillary plexus (CCP)
- Choroid
- Sclera
- Bruch's membrane
- RPE/Bruch's membrane complex (RPE/BMC)
- Photoreceptor layer (P)
- Outer nuclear layer (ONL)
- Inner nuclear layer (INL)
- Ganglion cell layer (GCL)
- Nerve fiber layer (NFL)

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Fun Facts I Have Learned About the Mitochondria

- ~ Mitochondria produce energy from organic matter
- ~ Live about 100 days
- ~ They produce 90% of energy in the body
- ~ In return they produce 90% of the free radicals
- ~ When they become dysfunction when get many clinical consequences
- ~ Mitochondria are very sensitive to reactive oxygen and need antioxidant support
- ~ Mitochondria are one of cellular organelles
 - Electron transport chain - uses co-enzyme 10, and many other micronutrients
 - Brain cell has 1-2 million/single neuron
 - Heart cell has 5,000/cell
 - Liver cell has 1000-2000/cell
 - Photoreceptors: 498/cell
 - RBE cells = 700/cell

The ellipsoid contains a densely-packed array of mostly elongated mitochondria arranged broadly parallel to the long axis of the photoreceptor. The cell contained **498 individual mitochondria**

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Mitochondria

- ~ Exercise help and increases the mitochondria
- ~ Burn both glucose and fat
 - * Metabolic flexibility
- ~ Type 2 DM – does a number to the mitochondria
 - * Burn only glucose and glycogen
 - * Unable to access fat storage
- ~ Great news they are plastic and malleable

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Inflamm-aging

One of the consequences of failing mitochondria due to aging, beyond mtROS, is the release of mtDNA. Plasma levels of mtDNA increase gradually after the 5th decade of life, correlating with elevated levels of pro-inflammatory cytokines (i.e., TNF- α , IL-6, IL-1 β , and IL-17).

These data indicate that mtDNA may promote the production of pro-inflammatory cytokines in aging. Because cell stress, senescence and death are a part of the pathophysiology of aging, designing new therapeutic strategies against circulating mtDNA, or other mtDAMPs, or their cognate receptors (e.g., TLRs or PRRs) may be a viable strategy to approaching IA and its associated conditions.

Credit to: Eneya Vojtani, MD. <https://www.researchgate.net/publication/338888888>

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Credit to: Eneya Vojtani, MD. <https://www.researchgate.net/publication/338888888>

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Raise Your Hand

Do you agree that free radical formation is a progressive process that leads to cell damage or death?

A. Yes
B. No
C. Hmmmm – I am not sure

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Free Radicals and Antioxidants

Antioxidant

Free radical

Healthy cell


ANTIOXIDANT + **FREE RADICAL** → **STABLE MOLECULE**

(An antioxidant molecule donates an electron to a free radical, stabilizing it and preventing it from causing damage.)

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Oxidative Stress


- Small percentage of oxygen is not completely reduced
- Accumulation of free radicals
- Oxidative damage
- Oxidative stress
- Considered the starting of several diseases
- Responsible for epigenetic alterations
- Mitochondria - vulnerable
- Not going to make this apple new again
 - Prevention is the one of the best medicine



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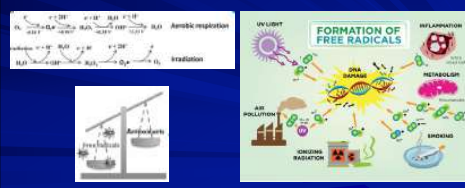
Free Radicals

- During metabolism the O₂ molecule splits and energy is released
 - Endogenous free radical formation
- Regain stability the free single oxygen atom (oxygen free radical) seeks and steals electrons from other molecules
 - Superoxide anion - will accept one electron
 - Peroxide - will accept two electrons
- These molecules can be proteins, lipids, and DNA
 - Proteins (enzymes) - kinases, phosphatases, and transcription factors




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Endogenous and Exogenous Free Radical Formation



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Our Food Sources



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Oh no

- Increasing exogenous free radicals
- Less antioxidant protection in our diet
- More bad and less good




Is an orange of the 1950's equivalent to 21 of today's oranges?

An orange from the 1950's was full of vitamin A, precious for our sight and our immune defenses. To obtain the same amounts today, you would have to consume 21 of them. Orions and peaches no longer contain any trace of it. The iron content in meat? Divided by 2. Calcium in broccoli? Divided by 4. To ingest the vitamin C contained in an apple from yesteryear, you would have to eat 100 today.

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The Equalizer



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Nutritional Antioxidants

- Exogenous antioxidants
 - Tocopherols (E), ascorbic acid (C), carotenoids, ubiquinone, and polyphenols
- Well know antioxidants
 - Vitamin C, E, Beta-carotene, lutein, zeaxanthin, selenium, quercetin, and resveratrol
- Mechanisms of action:
 - Neutralize free radicals
 - Repair oxidized membranes
 - Decrease reactive oxygen species
 - Neutral reactive oxygen species

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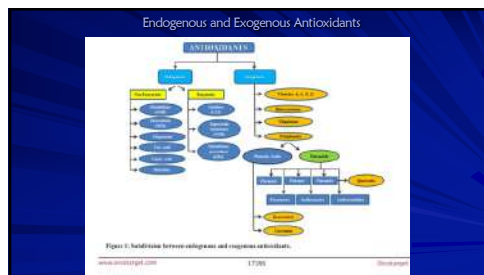


Raise Your Hand

Can our body manufacture these antioxidants? Vitamins A, C, and E, carotenoids, flavonoids, resveratrol, and quercetin

- A. Yes
- B. No
- C. Hmmmm – I am not sure

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Comprehensive Antioxidant Support

- Cell membrane support
- Immune support
- Support to the oxidative stress to the extracellular matrix
- Support to cell signaling

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Carotenoids

- Organic pigments produced by plants, algae, and bacteria
- Cannot be synthesized by the human body
 - Hydrophobic compounds
 - Important for the phospholipid bilayer
- 600 in nature – 50 human food chain – 15-20 human blood stream
- Macular carotenoids (L and Z) – highest concentration found in the human body
 - Diet derived
 - Henle fibers – between the inner and outer plexiform layers
 - Sequester or absorb blue light

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Measure?

Annual Review of Public Health
 Volume 34, 2013
 DOI: 10.1146/annurev-publhealth-070812-105611

Measuring Carotenoids in Blood
 Carotenoids are a group of pigments that are responsible for the yellow, orange, and red colors of many fruits and vegetables. They are also found in the human body, where they play a role in vision, immune function, and antioxidant activity. The most common carotenoids in the human body are beta-carotene, lutein, and zeaxanthin. These carotenoids are converted into retinol (vitamin A) in the liver, which is then used for vision and other functions. The measurement of carotenoids in blood is a useful tool for assessing nutritional status and for identifying individuals who are at risk of deficiency.

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Significance of Carotenoids

High blood levels of the carotenoid alpha-carotene may reduce the risk of dying from cardiovascular disease (CVD), cancer, and all other causes by up to 39 percent.

AREDS 2: Higher dietary intake of lutein/zeaxanthin was independently associated with decreased risk of having neovascular AMD, especially in those with large or extrafoveal lesions.

Levels of carotenoids may increase risk of persistent HPV infection.

Higher carotenoid levels and cognitive performance in an elderly population: results of the EVA study.

Oxidative stress in rheumatoid arthritis patients: relationship with carotenoid levels.

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Where is the macula?
 A. Blue
 B. Orange

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How large is the macula?

The macula is a small, specialized area of the retina responsible for central vision. It is located in the center of the fundus and is approximately 1.5 mm in diameter. The diagram shows the macula as a small red circle in the center of a larger fundus image.

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Oxidative Stress with Your OCT

OCT (Optical Coherence Tomography) is a non-invasive imaging technique that provides cross-sectional views of the retina. It can be used to identify structural changes in the retina, such as thinning of the macular layers, which may be associated with oxidative stress. The image shows a cross-section of the retina with various layers labeled, and a corresponding fundus photograph showing the macula.

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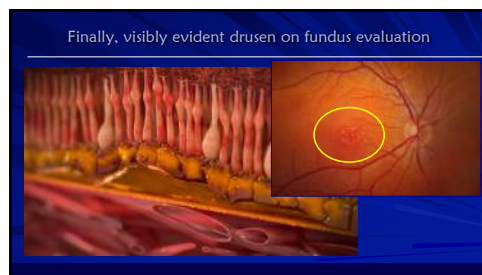
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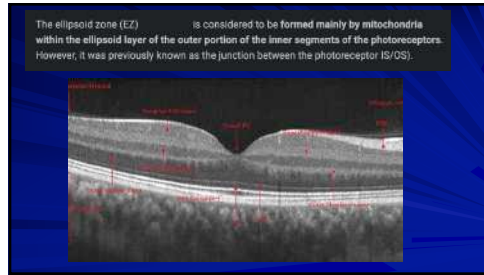
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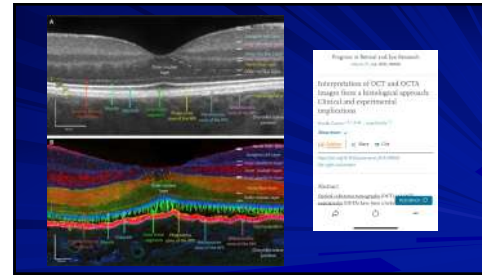
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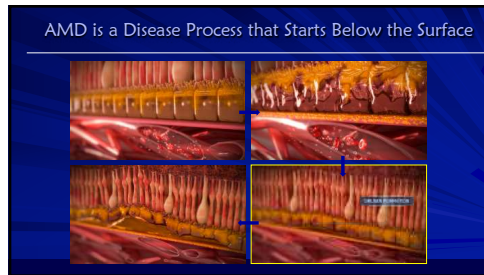
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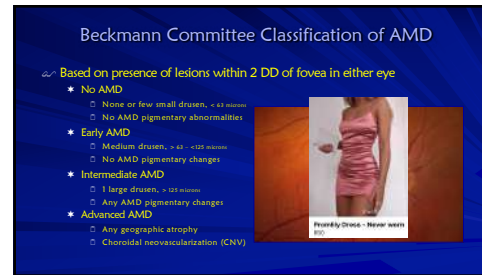
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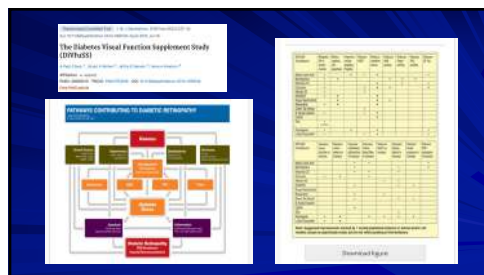
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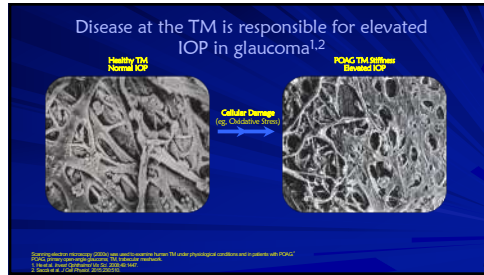
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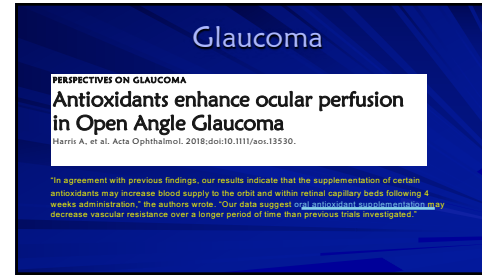
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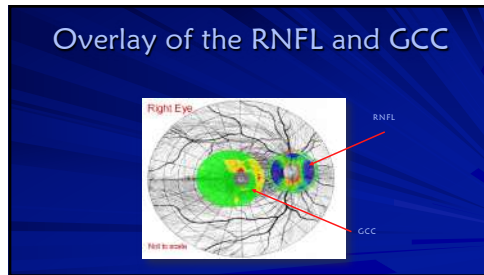
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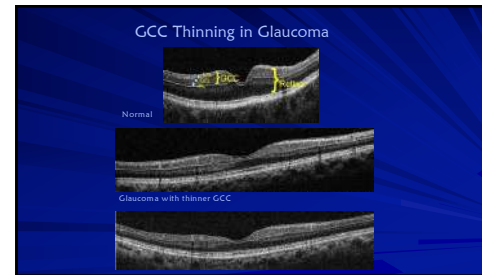
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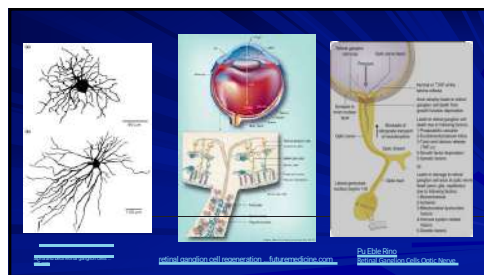
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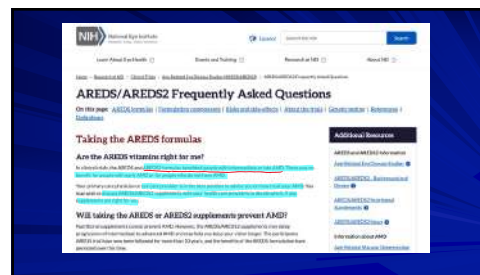
Treatments for AMD

Early detection and meaningful treatments with significant value, do not cure, but have been shown to slow or halt progression. Not limited to early stages but all stages of AMD

- Prescribe smoking cessation programs
 - Smoking and AMD
 - Depletes serum antioxidants
 - Decreases pigmentary density
 - Increases risk to advanced AMD
- Lifestyle changes
 - Diet
 - Exercise
- Systemic disease management
 - Cardiovascular disease, DM, obesity, high cholesterol

Reference: National Eye Institute, National Eye Institute

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AREDS/AREDS2 Frequently Asked Questions


On this page: AREDS/AREDS2 | Translational Research | Publications | News | AREDS/AREDS2 | Clinical Studies | Research | Additional Resources

Taking the AREDS formulas

Are the AREDS vitamins right for me?

Will taking the AREDS or AREDS2 supplements prevent AMD?

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Raise Your Hand

During the AREDS2 Study – were patients allowed to take a multivitamins?

- No – they were testing the efficacy of AREDS2
- Yes – 10% 1 of 10
- Yes – 50% 5 of 10
- Yes – 90% 9 of 10

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Will taking the AREDS or AREDS2 supplements prevent AMD?

Nutritional supplements cannot prevent AMD. However, the AREDS/AREDS2 supplements may delay progression of intermediate to advanced AMD and may help you keep your vision longer. The participants AREDS trial have now been followed for more than 10 years, and the benefits of the AREDS formulation have persisted over this time.

Can I take a daily multivitamin if I am taking one of the AREDS/AREDS2 formulas?

Yes. The AREDS and AREDS2 formulas do not substitute for multivitamins. In AREDS, two-thirds of the study participants took multivitamins along with the AREDS formulation. In AREDS2, almost nine of ten participants took multivitamins.

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Treatment for AMD

Nutritional supplements

- Subclinical/sub-threshold or early disease
 - Controversy: Pro/Con
 - No definitive guideline exists
 - Despite consensus evidence suggests using supplements
- Intermediate – advance disease
 - No controversy on advocating for supplements
- AREDS 1
 - Contains Beta-carotene and no lutein or zeaxanthin, no longer recommended
 - Investigated early AMD, no statistically significant benefit
- AREDS 2
 - Recommended for intermediate and advanced AMD, study protocol
- The Practical Guide for the Treatment of AMD - 3 primary options
 - Macular pigment supplement
 - Carotenoids: lutein, zeaxanthin, meso-zeaxanthin
 - Carotenoids, antioxidants, zinc and vitamin C + E
 - AREDS 2
 - Carotenoid macular supplement in subclinical and early AMD, Carotenoid and antioxidant in intermediate and AMD that is progressing

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An Evening with Dr. Paul Bernstein

Measurement of Macular Pigment


- HPLC
 - Psychophysical
 - Microspectrophotometry (MSP)
 - Macular meter (photometry)
 - Image Based
 - Agfa/Amersham/Orion
 - Photometry
 - Resonance Raman spectroscopy (Raman and RRS)

High Performance Liquid Chromatography

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ARVO STUDY

Interrelationships between Macula, Skin and Serum Carotenoids Paul Bernstein, Werner Gelesman et al ARVO May 2016



Conclusions:
"Our results emphasize the importance of measuring the total amount of carotenoids in the macula using an objective image based modality such as AFI w Spectralis rather than subjective MPOD."
Skin resonance Raman Spectroscopy of AFI components for assessment of macular carotenoid status. Skin carotenoid better than subjective MPOD tests.


The objective hand scanner is better than the subjective MPOD test. QuantMEFL and Spectralis are promising macular pigments.

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An Evening with Dr. Paul Bernstein

The Lutein and Zeaxanthin in Pregnancy Study: The L-ZIP Study

- Will addition of Lutein and Zeaxanthin to prenatal vitamins combat maternal carotenoid deficiency and improve maternal and infant visual health?
- Randomized, controlled trial of 50 mg/d Lutein and 10 mg/d Zeaxanthin
- Low-risk pregnancies
- Outcomes
 - Greater concentration by 50% in mother and infant
 - Maternal macular pigment by Spectralis AFI
 - Infant macular pigment and foveal structure by OCT and Dopplers
 - OCT
 - Fully awarded NIH grant



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An Evening with Dr. Paul Bernstein

The Moran AMD Genetic Testing Assessment Study: The Macular Study

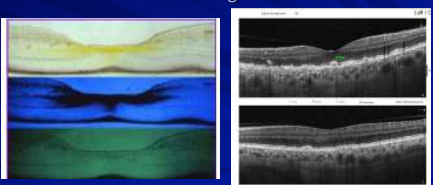
- Will knowledge of AMD genetic risk lead to specific, customized healthy changes in lifestyle?
- Randomized, controlled trial of personalized genetic risk testing and counseling
- Intervention versus placebo (sham) test
- All are done at the same time
- Outcomes
 - All are done at the same time
 - All are done at the same time
 - All are done at the same time
 - All are done at the same time
 - All are done at the same time
- Avoiding NEB testing



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Macular Pigment

Foveal Pigment?

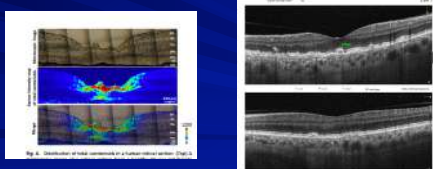


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Macular Pigment

Foveal Pigment?

Imaging lutein and zeaxanthin in the human retina with confocal resonance Raman microscopy



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Question

Do you recommend resveratrol and quercetin antioxidants when treating ocular/retinal conditions?

- Yes
- No

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Why Are We Only Treating Half the Retina?

125

Carotenoids and Polyphenols

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Measuring Carotenoids and the Macular Pigment

Biophotonic Scanner

- Measures carotenoids
- Based on an optical method known as Resonant Raman Spectroscopy (RRS)
 - Used for many years in research laboratories
- Skin RRS measurements
 - Noninvasive
 - Objective
 - Reliable methods to assess carotenoid levels
 - Ocular
 - Systemic

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Carotenoid Levels

Biomarker of health for diet and lifestyle

- Yale University
- Phospholipid bi-layer
- Carotenoids, flavonoids, and polyphenols

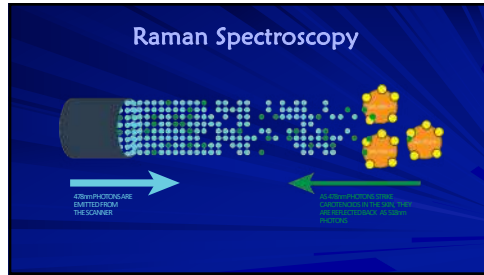
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The New Standard

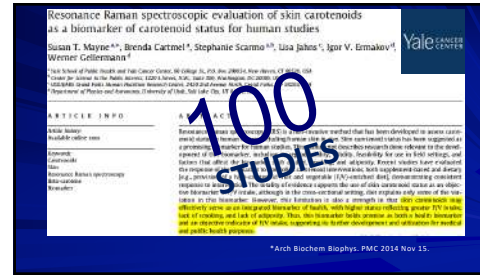
National Institutes of Health

- Quick Test (approx. 30 sec)
- Portable
- Cost Effective
- Remeasure in 60 days
- Reassurance to you and patient

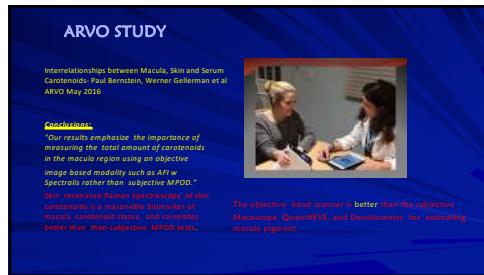
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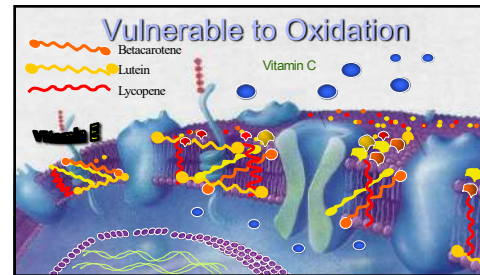
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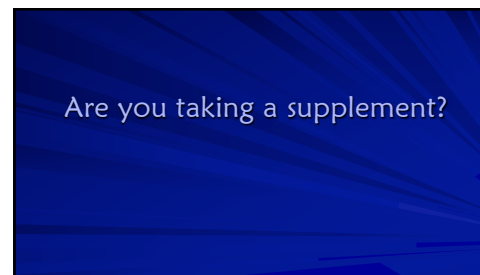
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53-year-old man

- Family history of AMD
 - Dad with 43 injections for AMD
- Pre-diabetic with borderline HbA1c
- Vision 20/20 OU
- DFE: retina clear
- OCT normal
- Passes dark adaptation

CONGRATULATIONS ON TAKING THE FIRST STEPS TOWARDS OPTIMIZING YOUR SCS.

Results on OCT (2023) passed with normal. Reported location of your leak was [redacted].

Reference: [redacted]

This score represents the current recommended level of AAK. The higher the score, the more advanced your leak is becoming.

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Ingredients

| Ingredient | Amount | Unit |
|---------------------------|--------|------|
| Ascorbic Acid (Vitamin C) | 1000 | mg |
| Alpha-Lipoic Acid | 300 | mg |
| Coenzyme Q10 | 100 | mg |
| Resveratrol | 100 | mg |
| Curcumin | 500 | mg |
| Quercetin | 100 | mg |
| Green Tea Extract | 100 | mg |
| Omega-3 Fatty Acids | 1000 | mg |
| Glucosamine | 500 | mg |
| Chondroitin | 500 | mg |
| MSM | 1000 | mg |
| Collagen | 10000 | mg |
| Hydroxyapatite | 1000 | mg |
| Calcium | 1000 | mg |
| Magnesium | 100 | mg |
| Zinc | 100 | mg |
| Selenium | 100 | mcg |
| Copper | 100 | mcg |
| Manganese | 100 | mcg |
| Iron | 100 | mcg |
| Vitamin K2 | 100 | mcg |
| Vitamin D3 | 1000 | IU |
| Vitamin E | 100 | mg |
| Vitamin B12 | 1000 | mcg |
| Vitamin B6 | 100 | mg |
| Vitamin B9 | 100 | mcg |
| Vitamin A | 10000 | IU |
| Vitamin K1 | 100 | mcg |
| Vitamin P | 100 | mg |
| Vitamin M | 100 | mg |
| Vitamin N | 100 | mg |
| Vitamin O | 100 | mg |
| Vitamin Q | 100 | mg |
| Vitamin R | 100 | mg |
| Vitamin S | 100 | mg |
| Vitamin T | 100 | mg |
| Vitamin U | 100 | mg |
| Vitamin V | 100 | mg |
| Vitamin W | 100 | mg |
| Vitamin X | 100 | mg |
| Vitamin Y | 100 | mg |
| Vitamin Z | 100 | mg |

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Supplement Facts

| Amount Per Serving | % Daily Value |
|---------------------------|---------------|
| Ascorbic Acid (Vitamin C) | 100% |
| Alpha-Lipoic Acid | 100% |
| Coenzyme Q10 | 100% |
| Resveratrol | 100% |
| Curcumin | 100% |
| Quercetin | 100% |
| Green Tea Extract | 100% |
| Omega-3 Fatty Acids | 100% |
| Glucosamine | 100% |
| Chondroitin | 100% |
| MSM | 100% |
| Collagen | 100% |
| Hydroxyapatite | 100% |
| Calcium | 100% |
| Magnesium | 100% |
| Zinc | 100% |
| Selenium | 100% |
| Copper | 100% |
| Manganese | 100% |
| Iron | 100% |
| Vitamin K2 | 100% |
| Vitamin D3 | 100% |
| Vitamin E | 100% |
| Vitamin B12 | 100% |
| Vitamin B6 | 100% |
| Vitamin B9 | 100% |
| Vitamin A | 100% |
| Vitamin K1 | 100% |
| Vitamin P | 100% |
| Vitamin M | 100% |
| Vitamin N | 100% |
| Vitamin O | 100% |
| Vitamin Q | 100% |
| Vitamin R | 100% |
| Vitamin S | 100% |
| Vitamin T | 100% |
| Vitamin U | 100% |
| Vitamin V | 100% |
| Vitamin W | 100% |
| Vitamin X | 100% |
| Vitamin Y | 100% |
| Vitamin Z | 100% |

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53-year-old man

CONGRATULATIONS ON TAKING THE FIRST STEPS TOWARDS OPTIMIZING YOUR SCS.

Results on OCT (2023) passed with normal. Reported location of your leak was [redacted].

Reference: [redacted]

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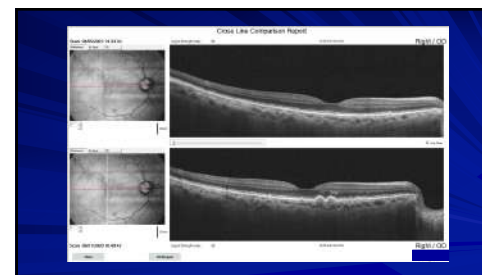
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139



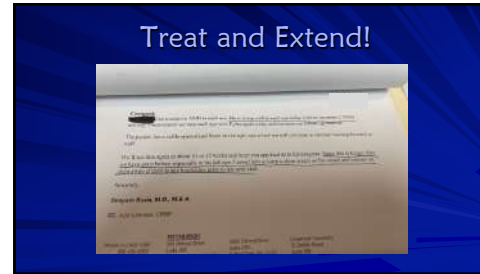
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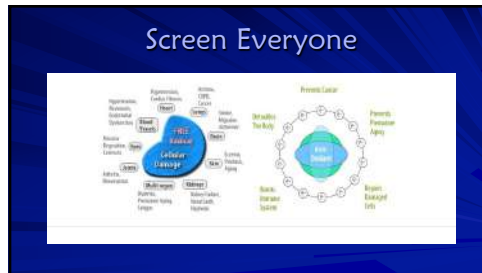
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| Ingredients | | Quantity | |
|---------------------------|--------|---------------------------|--------|
| Ascorbic Acid (Vitamin C) | 500 mg | Ascorbic Acid (Vitamin C) | 500 mg |
| ... | ... | ... | ... |

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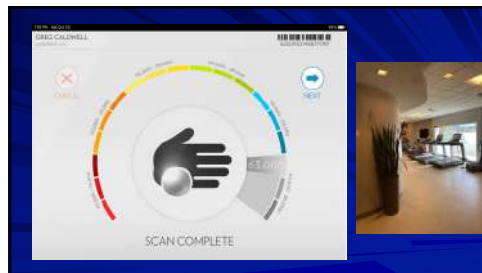


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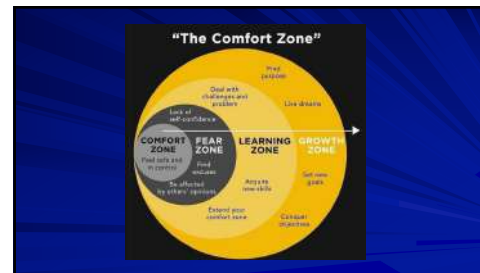
Carotenoid and Antioxidant Levels in Ocular Disease and Systemic Health

- Plenty of evidence that carotenoids are beneficial in ocular and systemic prevention
- Patients are looking for guidance
 - Many are on supplements
 - Surprised what they are doing is minimally helping
- Measuring ensures the patient
- Antioxidants in the eye and body go beyond lutein and zeaxanthin
- Dr. Oz "Ultimate nutritional lie detector"
- Best benefit of all...

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