


Ocular Nutrition
Tying Structure, Function, and Molecular Altogether


Greg Caldwell, OD, FAAO
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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 Pharmacia
- 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 overgrowth
- Hordolium
- HSV Keratitis
- Anterior Chamber Inflammation
- Thyroid Eye Disease
- Diabetes
 - Metabolic diseases
- Cardiovascular disease
- Rheumatoid Arthritis
- Macular degeneration
 - Geographic atrophy
 - Wet AMD
- 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

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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.O.
Eye Care Systems 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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Three charts or reports showing data and graphs related to eye health and nutrition.

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Comprehensive versus Isolate

COMING SOON

Optic Nerve & Eye Pressure Support

30 Tablets

30 Day Supplement

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
 - * Azotic 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 significant upward trend in health expenditure over time, with a sharp increase in the most recent period shown.

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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 destiny
 - 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

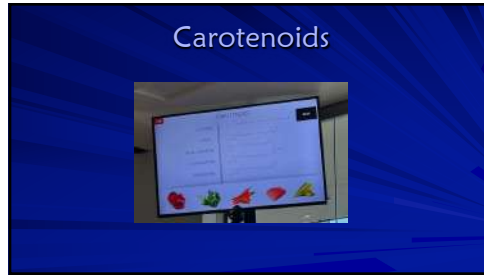
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Evidence Informed Risk Adjusted Medicine

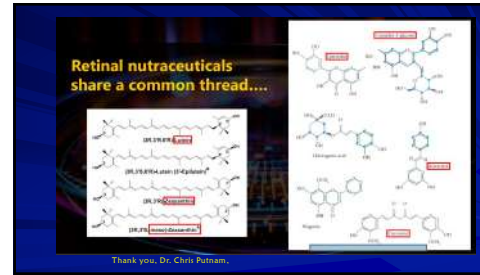
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Predictive Biomarker – Gives You the Patient's Over-All Antioxidant Status – In the Office – 30 Seconds

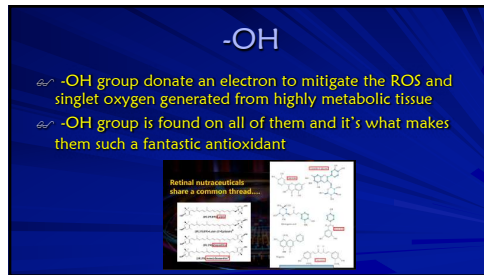
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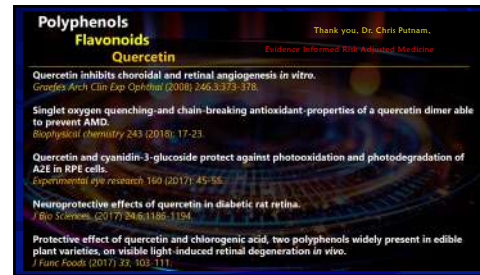
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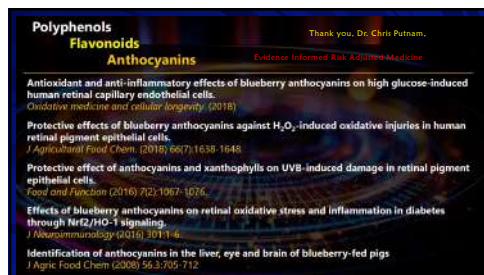
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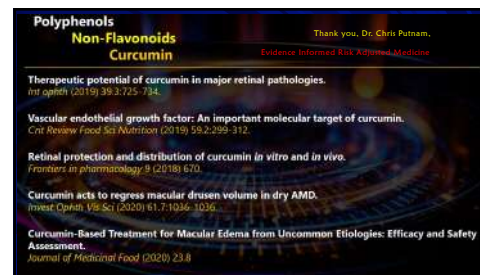
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Polyphenols
Non-Flavonoids
Resveratrol

Thank you, Dr. Chris Putnam,
 Evidence Informed ROK-Related 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.
Ageing and Disease (2014) 5:288.

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 image shows a screenshot of a journal article from 'Annual Review of Public Health' and a text box defining 'epigenetics'. The text box states: 'epigenetics is a relatively recent branch of genetics that focuses on the study of heritable changes in gene expression that do not involve changes to the underlying DNA sequence. These changes are often influenced by environmental factors and can be reversible. Epigenetics plays a crucial role in cellular differentiation, development, and disease. It involves modifications to DNA and histone proteins that affect how genes are read and expressed without changing the actual sequence of the DNA code. Epigenetic changes can be passed on to offspring, but unlike genetic changes, they can also be influenced by environmental factors like diet, stress, and lifestyle. Epigenetics is a key area of research in understanding the link between environment and disease, particularly in cancer, metabolic disorders, and mental health.'

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Chronic and Low-Grade Inflammation

The image displays three circular diagrams representing different levels of inflammation. Each diagram is a ring divided into colored segments (red, orange, yellow, green, blue, purple). The first ring is labeled '19,000' and has a small red segment. The second ring is labeled '26,000' and has a larger orange segment. The third ring is labeled '84,000' and has a significant portion of the ring in red and orange. Below the diagrams are three small images: a human figure with a red area on the back, a diagram of a cell with various components, and two people talking.

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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

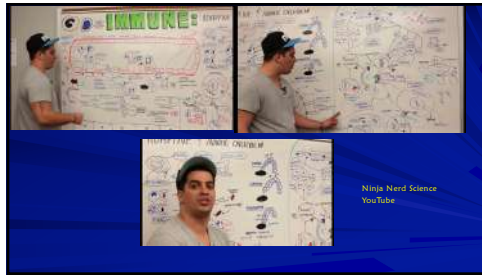
The image shows a diagram of the 'exposome' and a definition. The diagram depicts a person surrounded by various environmental factors like air, water, food, and stress. The text defines the exposome as 'the measure of all the exposures an individual has in a lifetime and how those exposures relate to health. An individual's exposure begins before birth and includes inputs from environmental and occupational sources. Understanding how exposures from our environment, diet, lifestyle, etc.,' and provides a link to 'https://www.ehponline.org'. At the bottom, it says 'Exposome and Exposomics - NIOSH Workplace Safety and Health Topic - CDC'.

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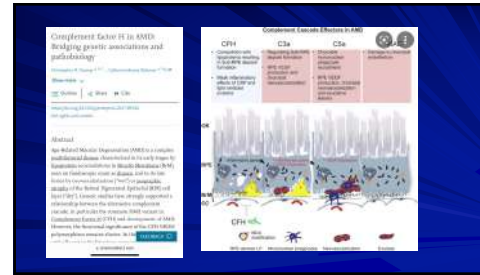
Ingredients

The image is a screenshot of a detailed list of ingredients, likely from a nutraceutical product. It includes various vitamins (A, B1, B2, B3, B5, B6, B7, B9, B12, C, D3, E, K), minerals (Calcium, Magnesium, Zinc, Selenium, Manganese, Copper, Molybdenum, Chromium, Vanadium, Boron, Silicon, Iodine, Magnesium Oxide, Magnesium Citrate, Magnesium Malate, Magnesium Aspartate, Magnesium Glycinate, Magnesium L-Threonate, Magnesium Oxide, Magnesium Citrate, Magnesium Malate, Magnesium Aspartate, Magnesium Glycinate, Magnesium L-Threonate), and other nutrients like Omega-3 fatty acids, Coenzyme Q10, and various botanical extracts. The list is organized into columns with checkboxes.

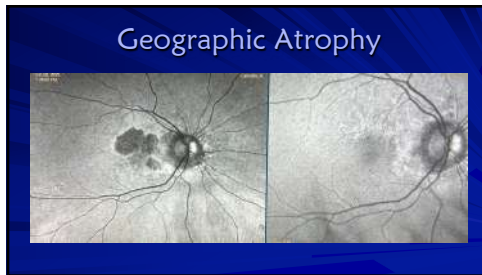
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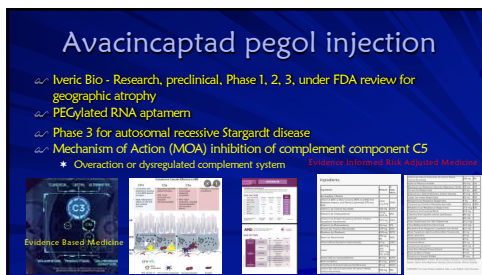
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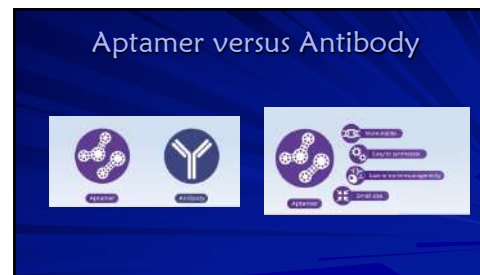
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Supplement Facts

Vitamin C (Ascorbic Acid)	500 mg
Vitamin E (d-Alpha-Tocopherol)	400 IU
Beta-Carotene	10,000 IU
Zinc (as Zinc Oxide)	25 mg
Copper (as Cuprous Oxide)	2 mg
Lutein	10 mg
Zeaxanthin	2 mg
Omega-3 Fatty Acids (as EPA and DHA)	1,200 mg
Other Ingredients	...

AREDS/AREDS2 Frequently Asked Questions

What is the basis for the concentration of zinc in the AREDS supplements? What concentration should I take?

In the AREDS trial, the 10 mg zinc concentration in the combination with carotenoids was found to be the most effective concentration for AREDS2. Although zinc was found to be an essential component of the AREDS2 formulation, the 10 mg zinc concentration was chosen for the AREDS2 trial. There was no significant benefit from higher zinc concentrations. The 10 mg zinc concentration was chosen to be a safe and effective concentration for a long-term study. The 10 mg zinc concentration was chosen to be a safe and effective concentration for a long-term study. The 10 mg zinc concentration was chosen to be a safe and effective concentration for a long-term study.

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Treatment response to antioxidants and zinc based on CETE and AREDS2 genetic risk allele number in the Age-Related Eye Disease Study

Abstract

To evaluate the impact of complementary zinc (Zn) and age-related macular degeneration (AMD) genetic risk allele number on the response to supplements of the Age-Related Eye Disease Study (AREDS2) formulation.

Design: Genetic and clinical data from the AREDS2 study were analyzed to evaluate the impact of complementary zinc (Zn) and age-related macular degeneration (AMD) genetic risk allele number on the response to supplements of the AREDS2 formulation.

Participants: 3,643 subjects from the AREDS2 study were included in the analysis.

Results: Subjects with 0 CETE and 0 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 1 CETE and 1 AREDS2 risk allele responded best to the AREDS2 formulation. Subjects with 2 CETE and 2 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 3 CETE and 3 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 4 CETE and 4 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 5 CETE and 5 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 6 CETE and 6 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 7 CETE and 7 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 8 CETE and 8 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 9 CETE and 9 AREDS2 risk alleles responded best to the AREDS2 formulation. Subjects with 10 CETE and 10 AREDS2 risk alleles responded best to the AREDS2 formulation.

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MODERATE

Raise Your Hand

Would you recommend AREDS 2 or a supplement high dose zinc?

A. Yes
B. No

Supplement Facts

Vitamin C (Ascorbic Acid)	500 mg
Vitamin E (d-Alpha-Tocopherol)	400 IU
Beta-Carotene	10,000 IU
Zinc (as Zinc Oxide)	25 mg
Copper (as Cuprous Oxide)	2 mg
Lutein	10 mg
Zeaxanthin	2 mg
Omega-3 Fatty Acids (as EPA and DHA)	1,200 mg
Other Ingredients	...

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Right Comparison Report

April 27, 2021 – January 26, 2022 (9 months)

Melanie Clemmons, OD
May 20, 2022 ACOO Nashville

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Cross Line Comparison Report

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Right Comparison Report

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Ingredients			Amount % Daily Value	
	Amount	% Daily Value		% Daily Value
Energy	100 kcal	2%	Vitamin A	1000 IU
Total Fat	10g	20%	Vitamin B1	100%
Sodium	2g	40%	Vitamin B2	100%
Total Carbohydrate	20g	40%	Vitamin B3	100%
Dietary Fiber	5g	10%	Vitamin B6	100%
Sugars	10g	20%	Vitamin B9	100%
Protein	10g	20%	Vitamin D	100%

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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 LeVine, PhD, OCN

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What is this layer called?

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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/OIS.

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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 dysfunctional 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 coenzyme 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

• RPE 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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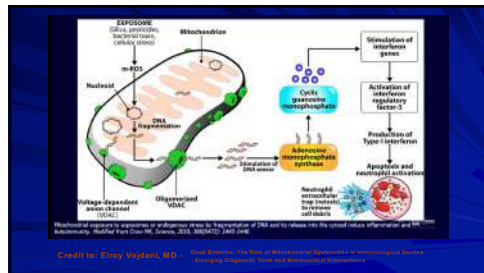
Inflamm-aging

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

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 mtDNA, or their cognate receptors (e.g., TLRs or PRRs) may be a viable strategy to approaching IA and its associated conditions.

Credit to: Evey Vojtko, MD. Your Release: The Role of Mitochondria in Age-Related Disease. Proceedings of the National Academy of Sciences

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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?

- Yes
- No
- Hmmm – I am not sure

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Free Radicals and Antioxidants

How antioxidants reduce free radicals

ANTIOXIDANT + FREE RADICAL → HEALTHY CELL + OXIDIZED ANTIOXIDANT

Credit to: Evey Vojtko, MD. Your Release: The Role of Mitochondria in Age-Related Disease. Proceedings of the National Academy of Sciences

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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 medicines

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Free Radicals

- During metabolism the O_2 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

Reactive oxygen species ([•] acquired electrons)				
Oxygen	Superoxide anion	Peroxide	Hydroxyl radical	Hydroxyl anion
O_2	$O_2^{\bullet -}$	O_2^{2-}	$\bullet OH$	OH^-

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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 1950s 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 attain the same amount today, you would have to consume 21 of them. Onions and potatoes 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 yesterday, you would have to eat 100 today.

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The Equalizer

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American Rainbow

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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, zeathanin, 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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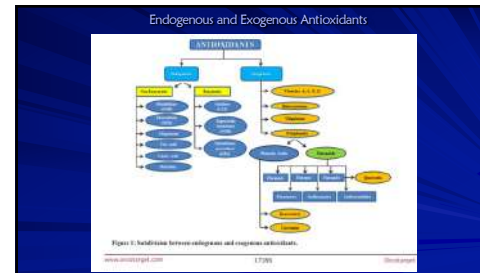
Optometric Education Consultants

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

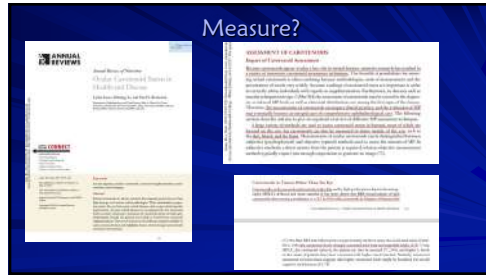
- ~ Cell membrane support
- ~ Immune support
- ~ Support to the oxidative stress to the extracellular matrix
- ~ Support to cell signaling

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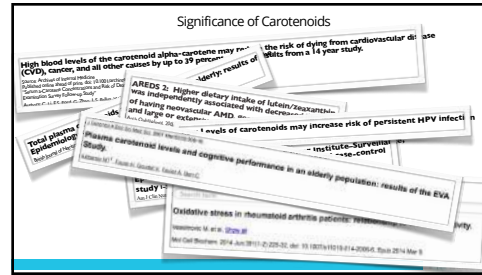
Carotenoids

- ~ Organic pigments produced by plants, algae, and bacteria
- ~ Cannot be synthesized by the human body
 - * Hydrophobic compounds
 - o 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

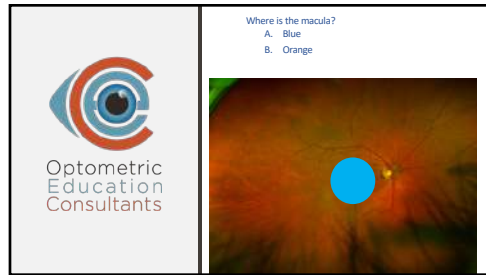
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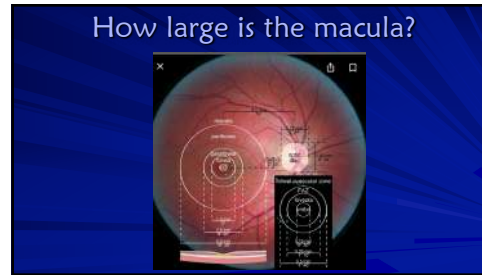
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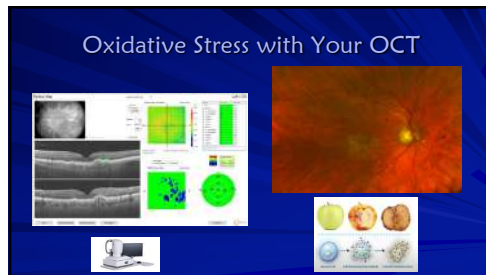
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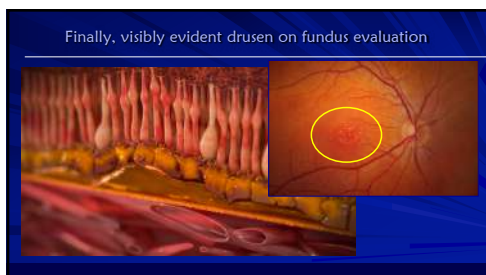
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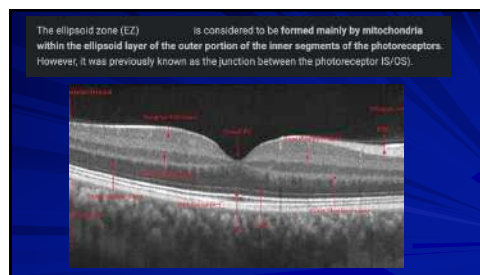
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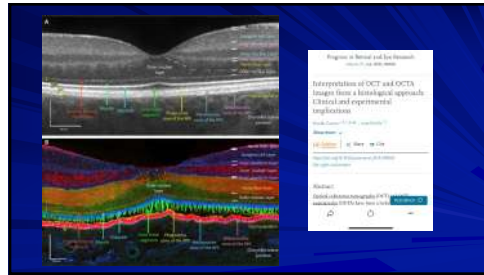
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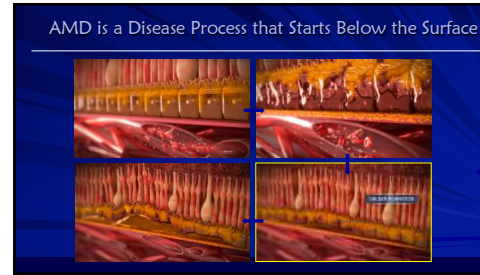
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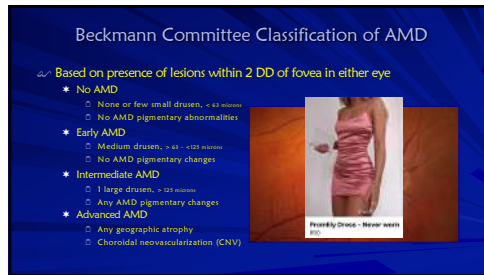
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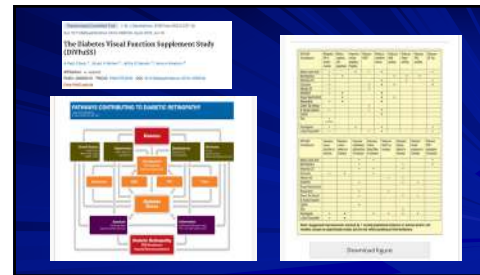
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101



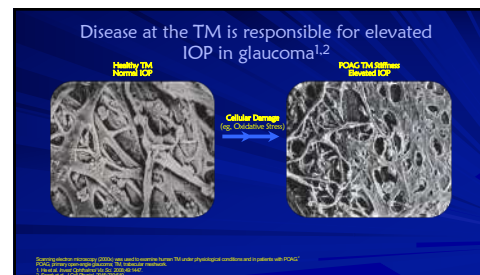
102



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Glaucoma

PERSPECTIVES ON GLAUCOMA

Antioxidants enhance ocular perfusion in Open Angle Glaucoma

Harris A, et al. Acta Ophthalmol. 2018;doi:10.1111/aos.13530.

"In agreement with previous findings, our results indicate that the supplementation of certain antioxidants may increase blood supply to the orbit and within retinal capillary beds following 4 weeks administration," the authors wrote. "Our data suggest oral antioxidant supplementation may decrease vascular resistance over a longer period of time than previous trials investigated."

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Overlay of the RNFL and GCC

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GCC Thinning in Glaucoma

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109

110

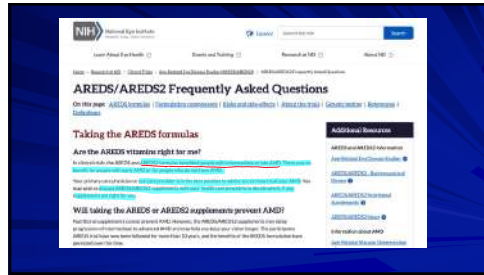
Treatments for AMD

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

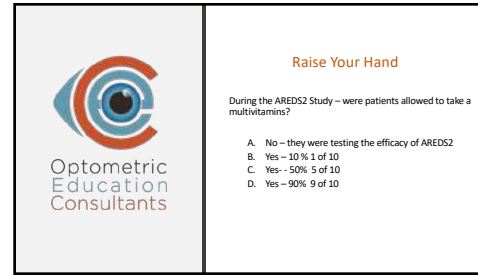
- ★ Prescribe smoking cessation programs
 - Smoking and AMD
 - Depletes serum antioxidants
 - Decreases pigmentary density
 - Increases risk to advanced AMD
- ★ Lifestyle changes
 - Diet
 - Exercise
- ★ Systemic disease management
 - Cardiovascular disease, DM, obesity, high cholesterol

Evidence collected from National Institutes of Health

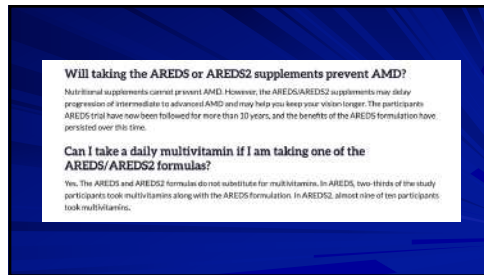
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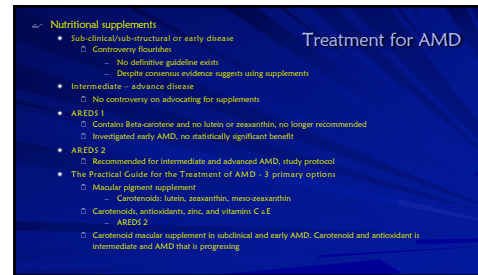
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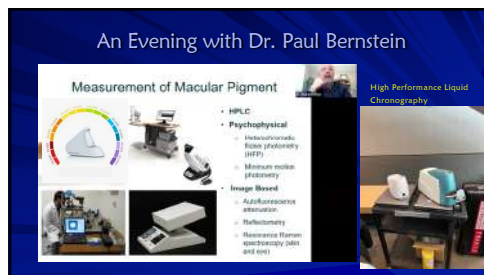
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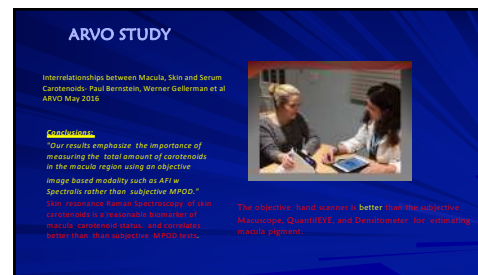
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116

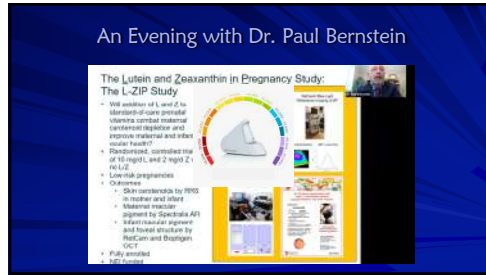


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An Evening with Dr. Paul Bernstein

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

- Will addition of L and Z to identical twin prenatal vitamins control maternal antioxidant load and improve maternal and infant ocular health?
- Randomized, controlled trial of 10 mg/L and 2 mg/Z, RCUZ
- Lutein/zeaxanthin Outcomes
 - Skin carotenoids by 19SS in mother and infant
 - Macular macular pigment by Spectral AP
 - Infant macular pigment and foveal structure by RetCam and RetCam-NCI
 - Fully enrolled

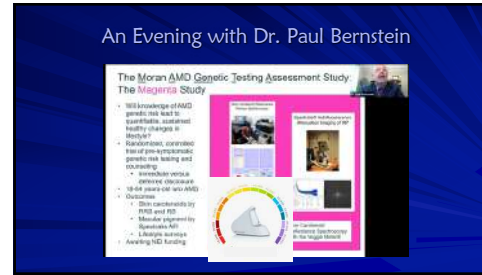


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An Evening with Dr. Paul Bernstein

The Moran AMD Genetic Testing Assessment Study: The Magaria Study

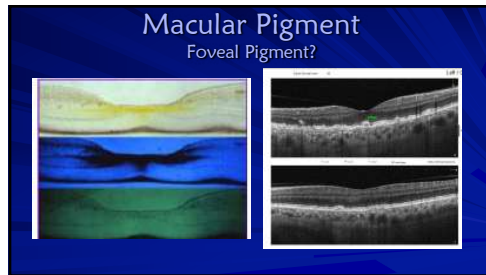
- Will knowledge of AMD genetic risk lead to healthier, sustained healthy changes in lifestyle?
- Randomized, controlled trial of pre-symptomatic genetic risk testing and counseling
 - Interventions: genetic counseling
 - Use of gene risk with AMD diagnosis
- DNA genotyping by 19SS and 19SS
- Macular pigment by Spectral AP
- Lifestyle outcomes: Avoiding AMD leading



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Macular Pigment

Foveal Pigment?



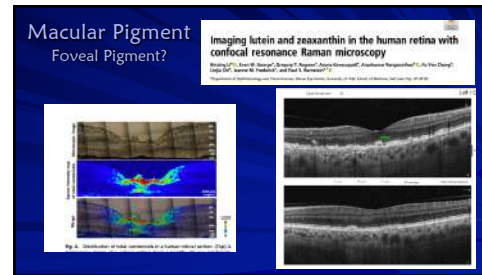
120

Macular Pigment

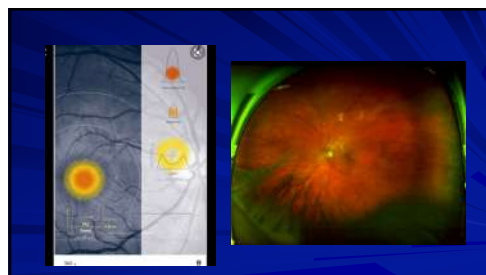
Foveal Pigment?

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

Boysen JT, Bora W, Wang J, Wang Y, Wang J, Acosta-Gonzalez A, Anderson P, Wang J, Xu Y, Cheng J, Wu J, Wang J, Wang J, Wang J, Wang J



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Question

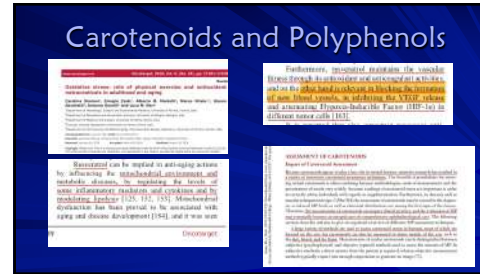
Do you recommend resveratrol and quercetin antioxidants when treating ocular/retinal conditions?

- * Yes
- * No

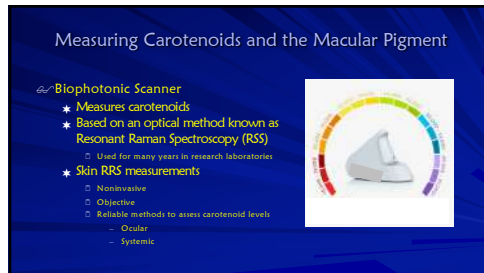
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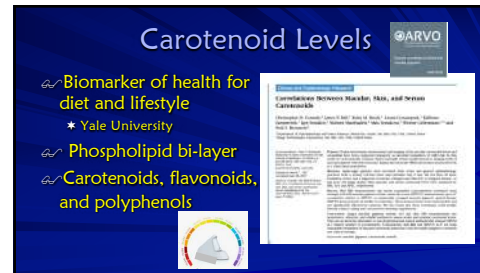
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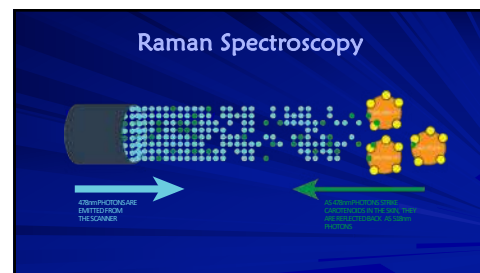
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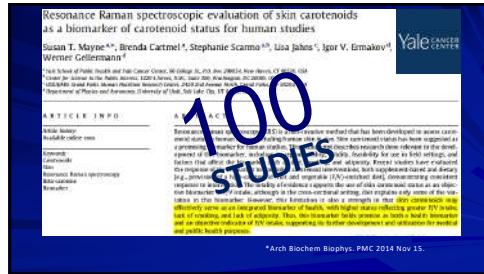
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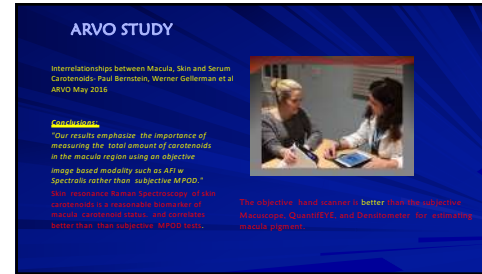
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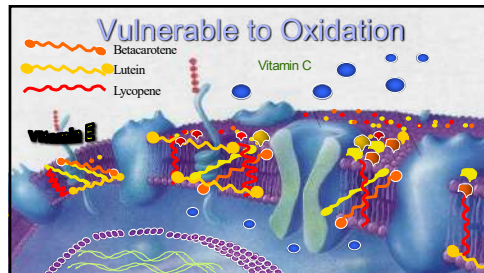
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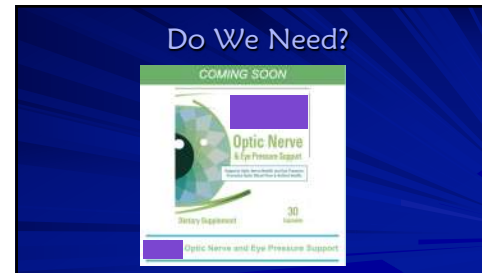
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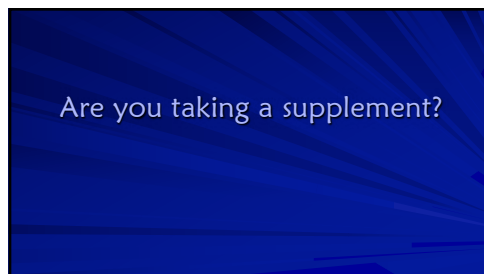
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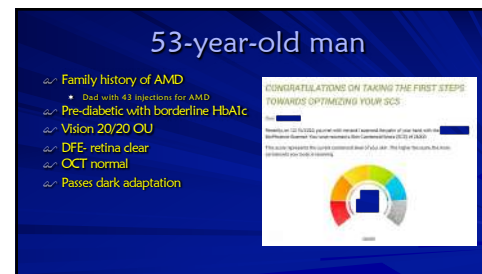
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Ingredients		Amount		% Daily Value*	
Blueberry	100 mg	20%	50%		
Orange Juice	100 mg	20%	50%		
...

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Supplement Facts		Amount per Serving	
Blueberry	100 mg	20%	50%
Orange Juice	100 mg	20%	50%
...

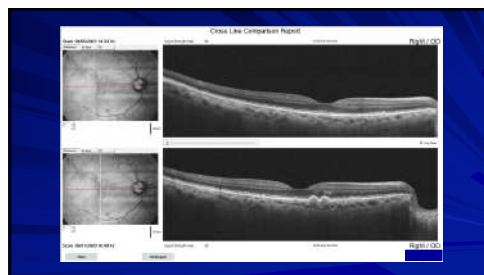
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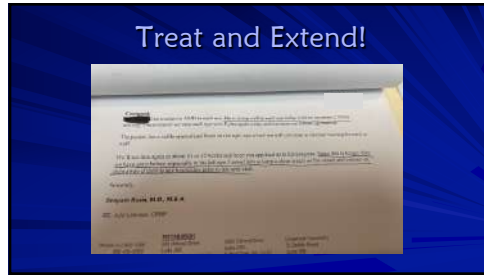
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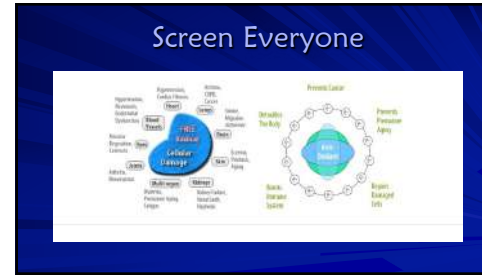
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Ingredients		Amount		% Daily Value*	
Blueberry	100 mg	20%	50%		
Orange Juice	100 mg	20%	50%		
...

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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
 - o 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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Optometric
Education
Consultants

Questions and Thank You

**Ocular Nutrition
Tying Structure, Function, and Molecular
Altogether**

Greg Caldwell, OD, FAAO

Disney 2024
Sunshine State Summer Conference
Optometric Education Consultants
Sunday, June 9, 2024



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