

OPTOMETRY AND METABOLIC SYNDROME: MORE THAN MEETS THE EYE!

Optometry's Role in Managing
Patients at Risk for or Living
with Metabolic Syndrome

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OPTOMETRY AND METABOLIC SYNDROME; MORE THAN MEETS THE EYE!

COPE COURSE #: 95890-SD

- DR. EARLEY IS A PAID CONSULTANT FOR THE FOLLOWING INDUSTRY PARTNERS:
- ALCON VISION CARE, MACUHEALTH, LUMITHERA, TARSUS, NOTAL VISION and LKC TECHNOLOGIES
- All relevant relationships have been mitigated

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HOW DOES A SYNDROME DIFFER FROM A DISEASE?

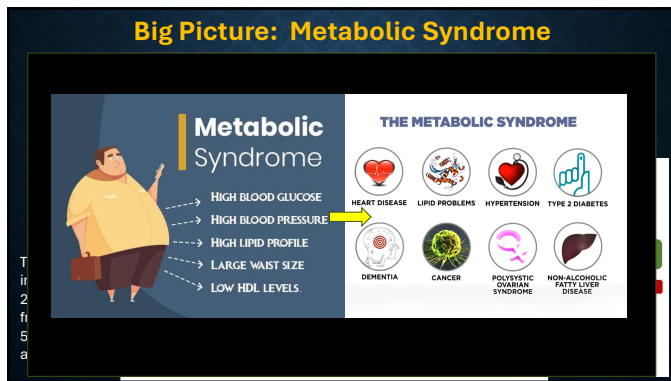
SYNDROME

- A GROUP OF SYMPTOMS THAT OCCUR TOGETHER
- MAY NOT ALWAYS PRODUCE CHANGES TO ANATOMY
- OFTEN HAVE UNCLEAR ORIGINS AND REQUIRE SYMPTOM-FOCUSED MANAGEMENT

DISEASE

- A MEDICAL CONDITION WITH A KNOWN CAUSE AND SPECIFIC SYMPTOMS
- CAUSE CHANGES IN ANATOMY
- HAVE A DEFINED CAUSE AND TREATMENT PATHS

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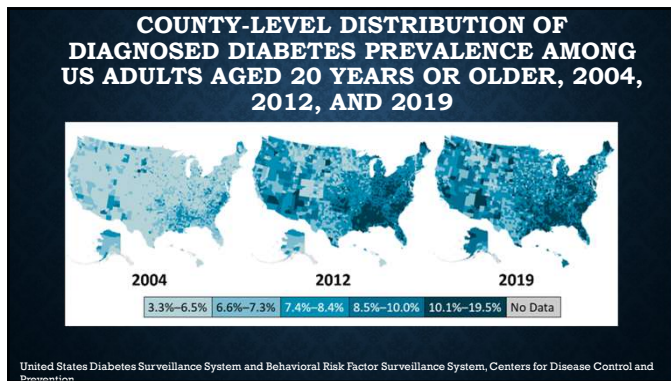
WHY SHOULD PRIMARY CARE OPTOMETRISTS CARE ABOUT METABOLIC SYNDROME?

- BECAUSE WE ARE UNIQUELY POSITIONED TO MAKE A DIFFERENCE!

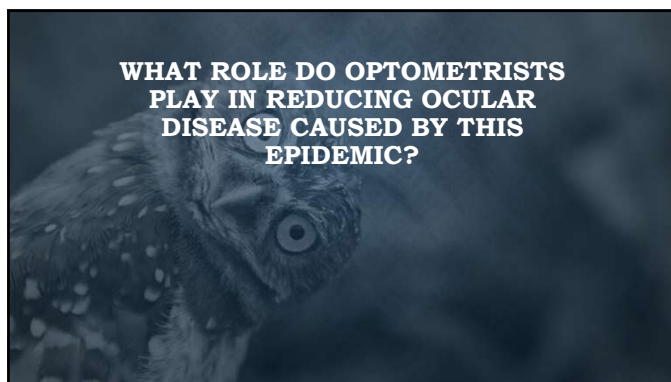
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Nutrition Can Help...Significantly

Therapeutic Advances in Cardiovascular Disease

Metabolic syndrome: pathophysiology, management, and modulation by natural compounds

Yogita Rachiani, Neeta Venkata Pethineni, Swathi Kavelamudi and Jawahar L. Mehta

Abstract: Metabolic syndrome (MetS) represents a cluster of metabolic abnormalities that include hypertension, central obesity, insulin resistance, and atherogenic dyslipidemia, and is strongly associated with an increased risk for developing diabetes and atherosclerotic and nonatherosclerotic cardiovascular disease (CVD). The pathogenesis of MetS involves both genetic and acquired factors that contribute to the final pathway of inflammation that leads to CVD. MetS has gained significant importance recently due to the exponential increase in obesity worldwide. Early diagnosis is important in order to employ lifestyle and risk factor modification. Here, we review the epidemiology and pathogenesis of MetS, the role of inflammation in MetS, and summarize existing natural therapies for MetS.

Keywords: metabolic syndrome, nutraceuticals, cardiovascular disease, hypertension, obesity, insulin resistance, atherogenic dyslipidemia

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There is a wealth of **scientific evidence** to support nutritional intervention to manage issues associated with Metabolic Syndrome (e.g., oxidative stress, inflammation, and glucose metabolism)

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WHAT ROLE DO THE MACULAR CAROTENOIDS PLAY IN METABOLIC SYNDROME?

INDIVIDUALS IN A PRO-INFLAMMATORY STATE SHOW SIGNIFICANT DIFFERENCES IN CAROTENOID LEVELS COMPARED TO CONTROLS; DESPITE A SIMILAR DIET!!

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Nutrition, Metabolism & Cardiovascular Diseases

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RESEARCH PAPER

Omega-3 Lipid Profile and Inflammation in Cardiovascular Disease: A Systematic Analysis

Zuhair S. Mattoo^{a,b,c,*}

The purpose of this paper is to review the evidence on the effect of omega-3 fatty acids on the lipid profile and inflammation in cardiovascular disease. The paper will discuss the role of omega-3 fatty acids in the development of atherosclerosis and the potential for omega-3 fatty acids to improve the lipid profile and reduce inflammation in cardiovascular disease.

KEYWORDS: Omega-3 fatty acids; Inflammation; Lipid profile; Cardiovascular disease.

Abstract: Background and aims: Systemic inflammation and oxidation are primary contributors to the development of atherosclerosis. Oxidation of low-density lipoprotein (LDL) particles within the vascular endothelium has been hypothesized to be an initial step in the formation of atherosclerotic plaques, with inflammatory cytokines serving as the signaling mechanism for subsequent macrophage activation. Supplementation with the antioxidant omega-3 fatty acids (EPA, DHA) may attenuate the inflammatory response, thereby reducing the risk of atherosclerosis. The purpose of this paper is to review the evidence on the effect of omega-3 fatty acids on the lipid profile and inflammation in cardiovascular disease. The paper will discuss the role of omega-3 fatty acids in the development of atherosclerosis and the potential for omega-3 fatty acids to improve the lipid profile and reduce inflammation in cardiovascular disease.

Introduction: Atherosclerosis is a chronic inflammatory disease of the arteries, characterized by the accumulation of lipids, inflammatory cells, and fibrous tissue in the vessel wall. The process is driven by a combination of factors, including dyslipidemia, hypertension, and systemic inflammation. Omega-3 fatty acids, found in fish oil, have been shown to have beneficial effects on the lipid profile and inflammation in cardiovascular disease. This paper will review the evidence on the effect of omega-3 fatty acids on the lipid profile and inflammation in cardiovascular disease.

Conclusion: Omega-3 fatty acid supplementation has been shown to have beneficial effects on the lipid profile and inflammation in cardiovascular disease. Further research is needed to determine the optimal dose and duration of supplementation.

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RESEARCH PAPER

Despite Similar Diet, Patients with Diabetes Have Significantly Lower Serum Lutein / Zeaxanthin Than Controls

From Hu et al. 2011

• BMI-matched controls have 3.36x serum lutein, 9.55x serum zeaxanthin compared to patients with diabetes

• Three months' supplementation with L + Z (6.5 mg / day total) in the diabetic group resulted in 8x & 2x increases over baseline in L & Z serum concentrations, respectively

• VA, contrast sensitivity and macular edema all improved significantly post supplementation

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RESEARCH PAPER

Macular Pigment Density is Dramatically Lower in Patients with DM Compared to Normal Controls

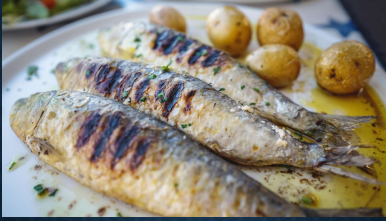
MPD

Normal controls: 0.36 +/- 0.24

Patients with DM: 0.13 +/- 0.20

*DM patients with maculopathy had significantly lower MPD than DM patients without maculopathy

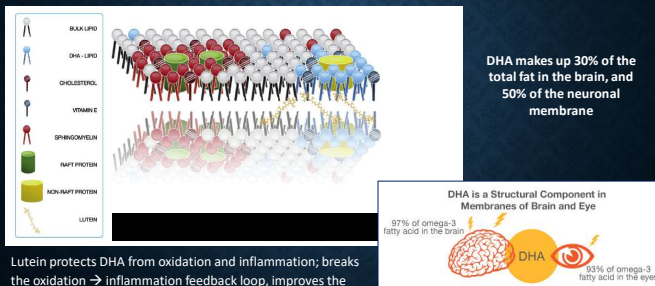
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THE ROLE OF OMEGA 3 FATTY ACIDS

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Components of neural health and communication:



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SOURCE OF OMEGA-3 FA ALSO IMPORTANT:

LOOK FOR THESE:

- Open sea/Wild caught fish
- Smaller Fish (fewer toxins)
- Re-esterified triglyceride supplements
- The purer, the better (more distillations/less "fish burp")
- 78% DHA/EPA in equal concentrations is ideal

AVOID THESE:


- Farm-raised fish
- Larger fish (tend to accumulate more toxins/heavy metals)
- Ethyl Ester-based supplements
- Read the labels and do the math - some supplements have very little DHA/EPA

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SYNERGY!!

The macular carotenoids / omega-3s have several, significant beneficial effects:

- Enhanced visual/cognitive health & performance
- Important role in neurodevelopment; systemic, retina, and brain
 - *Enhanced cognitive performance in pre-adolescents
- Antioxidant & anti-inflammatory effects**
 - Enhance neuroplasticity
 - Relieve dry eye
 - Reduce blood cortisol, psychological stress
- THE FUTURE IS NOW!**
 - Benefits to cognitive aging
 - May significantly reduce symptoms / pathogenesis of TBI
 - Cardiovascular health
 - Benefits in children / teens
 - Optometry can effectively manage AMD, Cognitive aging AND Metabolic Syndrome
- Effects may be realized within 3-6 months of consistent supplementation**



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ESSENTIAL ELEMENTS AND NUTRIENTS IN THE FIGHT AGAINST METABOLIC SYNDROME

- Chromium** – essential mineral
- Vitamin B12** – also known as cobalamin; water soluble vitamin
- Manganese** – essential element
- Selenium** – essential element
- Vanadium** – trace mineral
- Magnesium** – essential ion/element
- Zinc** – essential trace element
- Vitamin E** – fat soluble anti-oxidant compound

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Vanadium Compounds

Lidia M. P. H. Amaral^{1,2,3}, Tatiana Morais¹

Abstract Other potential anti-diabetic agents have been studied, but to date, the only one that has been shown to be an important regulatory factor of intracellular magnesium accumulation. Conditions associated with insulin resistance, such as hypercortisolism or aging, are also associated with low intracellular magnesium levels. In diabetic mellitus, it is suggested that low intracellular magnesium levels result from both increased urinary losses and insulin resistance. The extent to which such a low intracellular magnesium content contributes to the development of macro- and microangiopathy remains to be established. A reduced intracellular magnesium content might contribute to the impaired insulin response and action which occurs in Type 2 (non-insulin-dependent) diabetes mellitus. Chronic magnesium supplementation can contribute to an improvement in both side beta-cell response and insulin action in non-insulin-dependent diabetic subjects.

Key words: Magnesium, insulin, glucose homeostasis, diabetic complications, dietary magnesium supplements.

Summary: Magnesium is an important ion in all living cells being a cofactor of many enzymes, especially those utilizing high energy phosphate bonds. The relationship between insulin and magnesium has been recently studied, in particular it has been shown that magnesium plays the role of a second messenger for insulin action; on the other hand, insulin itself has been demonstrated to be an important regulatory factor of intracellular magnesium accumulation. Conditions associated with insulin resistance, such as hypercortisolism or aging, are also associated with low intracellular magnesium levels. In diabetic mellitus, it is suggested that low intracellular magnesium levels result from both increased urinary losses and insulin resistance. The extent to which such a low intracellular magnesium content contributes to the development of macro- and microangiopathy remains to be established. A reduced intracellular magnesium content might contribute to the impaired insulin response and action which occurs in Type 2 (non-insulin-dependent) diabetes mellitus. Chronic magnesium supplementation can contribute to an improvement in both side beta-cell response and insulin action in non-insulin-dependent diabetic subjects.

Key words: Magnesium, insulin, glucose homeostasis, diabetic complications, dietary magnesium supplements.

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VITAMIN B12

- Reduced levels lead to obesity and overweight individuals
- Negatively correlated with BMI
- Found in:
 - Meat
 - Fish
 - Dairy



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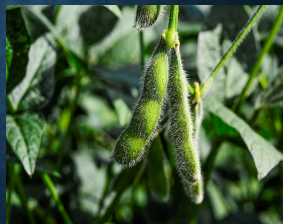
CHROMIUM

- | | |
|---|---|
| <ul style="list-style-type: none"> • Low levels lead to: • Hyperglycemia • Hyper insulinemia • Hypertension • Insulin Resistance • Increased inflammatory markers | <ul style="list-style-type: none"> • Found In: • Broccoli • Green Beans • Bananas • Whole grains • Brewer's yeast • Eggs • Chicken/Beef |
|---|---|

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MANGANESE

- Involved in enzyme synthesis
- Enzymes help regulate glucose and lipids in humans
- Found in:
 - Whole grains
 - Nuts/Legumes
 - Fruits/Leafy veggies



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SELENIUM

- Supplementation shown to significantly decrease HbA1c
 - Does not decrease fasting blood glucose
 - Research suggests its action leads to improved glycemic control
- Found in These Foods:
 - Cashews/Brazil Nuts
 - Seafood/Shellfish
 - Lamb
 - Liver
 - Eggs
 - Beans (Navy, Pinto)

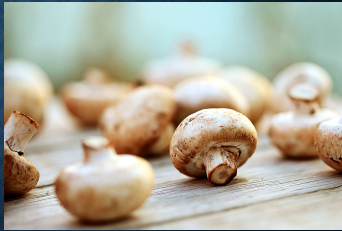
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VANADIUM

Been studied as an antidiabetic drug

Vanadium interacts with phosphatase and kinase enzymes involved in insulin signaling cascade

Found in:
Shellfish
Mushrooms
Grains/Sunflower seeds
Peanuts



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MAGNESIUM

Magnesium is a co-factor in many enzymes; in humans it plays an essential role as a second messenger for insulin action

Found in:
Nuts/Almonds
Avocado
Spinach/greens
Bananas



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ZINC

- Zinc is an essential trace element
- Helps the pancreas produce, store, and release insulin
- Zinc deficiency can lead to insulin resistance
- Low dose zinc supplementation (<25/mg/d) can improve insulin resistance, fasting glucose and type 2 DM risk factors
- Found in: Oysters, Chicken, Pork, Beef and Eggs

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VITAMIN E

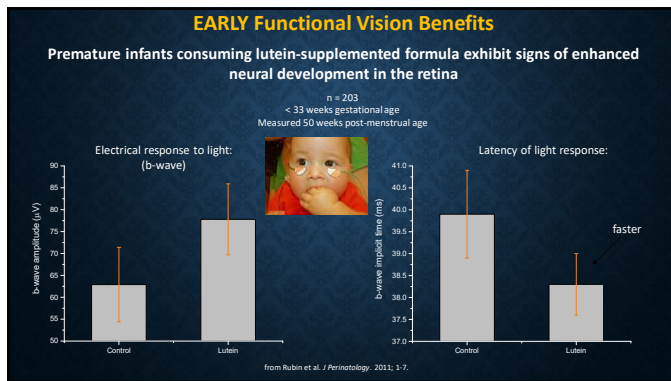
- Eight naturally occurring forms of Vitamin E
- Is the major lipid-soluble component of the cellular antioxidant defense system
- Exclusively obtained from the diet
- Richest source of Vitamin E is vegetable oils (palm, soybean, corn) and nuts (almonds, hazelnuts, peanuts)

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**WHEN SHOULD
SUPPLEMENTATION
FOR OPTIMAL
OCULAR AND
METABOLIC
HEALTH BEGIN?**

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OCULAR HEALTH IS A LIFELONG JOURNEY!

• ARE WE WAITING TOO LONG TO TALK ABOUT METABOLIC AND OCULAR NUTRITION IN AT-RISK PATIENTS?

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THE STATISTICS ARE STAGGERING; THE TIME TO ACT IS NOW!

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RECOMMEND FOODS, SUPPLEMENTS, AND A LIFESTYLE THAT SUPPORT HEALTHY METABOLISM

- ANTI-INFLAMMATORY NUTRIENTS:
 - Lutein
 - Zeaxanthin
 - Meso-Zeaxanthin
 - Omega-3 fatty acids (DHA and EPA)
 - Beta-carotene/Astaxanthin/Lycopene
- ELEMENTS SUPPORTING NORMAL METABOLISM:
 - Vitamin B12
 - Chromium
 - Manganese
 - Selenium
 - Vanadium
 - Zinc
 - Magnesium

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THANK YOU!!

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