STATE BOARD OF OPTOMETRY
2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834
P (916) 575-7170 F (916) 575-7292 www.optometry .ca.gov

Continuing Education Course Approval Checklist

Title: Macular Pigment Supplementation: A Prescription for Vision and Cognitive Health

Provider Name: NVISION Eye Centers c/o Ms. Leslie Kuhlman

☑Completed Application
Open to all Optometrists? ☑Yes ☐No
Maintain Record Agreement? ☑Yes ☐No

☑Correct Application Fee

☑Detailed Course Summary

☑Detailed Course Outline

☑PowerPoint and/or other Presentation Materials

☑Advertising (optional)

☑CV for EACH Course Instructor

☑License Verification for Each Course Instructor
Disciplinary History? ☐Yes ☑No

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CONTINUING EDUCATION COURSE APPROVAL APPLICATION

$50 Mandatory Fee

Pursuant to California Code of Regulations (CCR) § 1536, the Board will approve continuing education (CE) courses after receiving the applicable fee, the requested information below and it has been determined that the course meets criteria specified in CCR § 1536(g).

In addition to the information requested below, please attach a copy of the course schedule, a detailed course outline and presentation materials (e.g., PowerPoint presentation). Applications must be submitted 45 days prior to the course presentation date.

Please type or print clearly.

Course Title	**Course Presentation Date**
Macular Pigment Supplementation: A prescription for Vision and Cognitive Health	03/05/2017

Course Provider Contact Information

Provider Name

Leslie (First) Kuhlman (Last) Ann (Middle)

Provider Mailing Address

Street 75 Enterprise **City** Aliso Viejo **State** CA **Zip** 92673

Provider Email Address Leslie.Kuhlman@nvisioncenters.com

Will the proposed course be open to all California licensed optometrists?	☑ YES ☐ NO
Do you agree to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as the Board requires, for a period of at least three years from the date of course presentation?	☑ YES ☐ NO

Course Instructor Information

Please provide the information below and attach the curriculum vitae for each instructor or lecturer involved in the course. If there are more instructors in the course, please provide the requested information on a separate sheet of paper.

Instructor Name

John (First) Nolan (Last) M. (Middle)

License Number	**License Type** ~~OD~~ Ph.D
Phone Number (353) 51 845505	**Email Address** jmnolan@wit.ie

I declare under penalty of perjury under the laws of the State of California that all the information submitted on this form and on any accompanying attachments submitted is true and correct.

Signature of Course Provider *Date* 3/1/17

OPTOMETRY

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For Office Use Only

Receipt No. _____

ATS No. _____

Date Rec'd _

Request for Approval of Continuing Education Course(s)

Leslie Kuhlman
NVISION Eye Centers
75 Enterprise, Suite 200
Aliso Viejo, CA 92656

Requests for approval of continuing optometric education (CE) courses should be submitted on this form. The California State Board of Optometry requires the following information in order to process a course approval request:

- **$50** processing fee
- Name of provider
- Course title(s)
- Date(s) the course is scheduled to be offered
- Topical outline of the course subject matter
- Any announcements, notices or advertisements of the course
- Curriculum vitae (CV) of all instructors and lecturers involved (NOTE: CVs should include every term of employment, academic credential, publication, contribution or significant achievement)

Requests for approval and the supplemental information should be submitted to the Board office at least 45 days prior to the first date that the course will be offered. Requests will be reviewed by staff and forwarded to the CE Committee for final review. If necessary, Board staff will contact the requestor for additional information. Course approvals are valid for 12 months or until the course is modified.

The CE Committee's decision(s) will be noted and a copy of this form will be returned to the provider to serve as official notification of approval and/or disapproval of the course(s). Please remember to include the contact person's name and mailing address in the space provided above.

_____

CE Committee Member

NVISION
EYE CENTERS

STATE BOARD OF OPTOMETRY
2450 Del Paso Road, Suite 105
Sacramento, CA 95834

On behalf of NVISION Eye Centers, we are writing to request approval of Continuing Education to California doctors of optometry. The education will be delivered by Board Certified Ophthalmologists, clinical investigators and experts in technology and patient consultation.

We are writing in response to your letter for information pursuant to CCR 1536 (g), to address why our application was submitted earlier than 45 days for course accreditation. As well as additional content requested.

The reason why our application was submitted earlier than 45 days for the course named "Macular Pigment Supplementation: A Prescription for Vision and Cognitive Health" given March 5, 2017 access to the final presentation of the material being in development prior to the time period needed. Once information required, we moved quickly to process accreditation requests. Please accept our apologies and deepest regrets. Going forward, we will make every effort to process these applications in a timely manner.

Conditions of Availability: This course will be open to all licensed ODs. They will be notified through flyers, Eventbrite, and fax by request.

Records: NVISION Eye Centers to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as required for a minimum of three years.

Professional Advancement: NVISION Eye Centers seeks to offer professional education to local and regional optometrist. As a leading practice in the ophthalmology field, NVISION doctors are engaged in research and latest developments on procedures, technology, and clinical therapies. The field of optometry is constantly evolving at a rapid pace and optometrists need to keep up. All Things Refractive in an interactive presentation. This CE activity will help attending ODs learn a full understanding of refractive surgery technology, clinical treatments and procedures, candidates, post-op & pre-op care, cost, co-management, how it is performed, and benefits.

The contact person for this program is myself, and I can be reached at 949.234.8129 or Leslie.Kuhlman@nvisioncenters.com.

Sincerely,

Leslie Kuhlman
NVISION Laser Eye Centers
Continuing Education and Special Projects Coordinator

75 Enterprise, Suite 200, Aliso Viejo, CA 92656
p: 949.274.4652 • *f:* 949.509.4858 • *e:* info@nvisioncenters.com • *w:* www.nvisioncenters.com

YOU'RE INVITED

ORANGE COUNTY REGIONAL 5-HOUR CE EVENT

Sunday, March 5, 2017 / 7:00 am - 1:30 pm

Improv Comedy, Irvine, CA

Join NVISION for an exciting continuing education event including networking, breakfast, lunch and raffles.

FEATURED EVENTS

Exciting Presentations, Fantastic Raffle Prizes,
Vendor Booths, Delicious Food & Drinks,
and Breakfast & Lunch

SPEAKERS

Tom Tooma, MD • Franklin Lusby, MD
Sheri Rowen, MD • John Nolan, MD
Jonathan Pirnazar, MD

TOPICS

LRS, Ocular Nutrition, Crosslinking, Corneal Inlay

Limited availability. Registration ends 3/3/17.
For more information and to RSVP, visit:
https://ocregional5hrce.eventbrite.com

CA State Board of Optometry - Pending Approval

NVISION EYE CENTERS

Macular Pigment Supplementation: A prescription for vision and cognitive health

John M Nolan

Course Description: In this course, you will learn about the macular carotenoids, how they are sourced, how they are optimized in the eye, how they are optimized in the brain, and what this means for visual function, visual health and cognitive function. This information will play an important role in eye care when helping patients enhance the health and quality of their vision.

Learning Objectives:

1. What are carotenoids - what are the macular carotenoids, where do they come from, their location and function;
2. The location of brain carotenoids, their relationship to macular pigment and their potential cognitive function enhancement properties;
3. Understanding levels of evidence and evidence-based clinical trial carotenoid data with respect to vision and cognitive function outcomes;
4. Methodology to measure visual function and cognitive function and practice implementation

Topic 1- Macular carotenoids – 10 minutes

I. Carotenoids
   a. Source
      - Nature – the course will lecture on the presence of carotenoids in nature
      - Food – the course will lecture on the presence of carotenoids in food
      - Supplements – the course will lecture on the presence of carotenoids in food supplements

II. Macular carotenoids
   a. Dietary sources – the course will lecture on the presence of macular carotenoids in diet
   b. Formulations – the course will advise on the impact of different types of formulations with respect to transport and delivery of the macular carotenoids to their target tissues.

III. Chemistry of macular carotenoids
   a. Antioxidant capacity – the antioxidant activity of the macular carotenoids, uniquely at the retina, will be explained

b. Optical capacity – the optical properties of the macular carotenoids, uniquely at the retina, will be explained

c. Anti-inflammatory capacity – the potential role of the macular carotenoids as anti-inflammatory agents in retinal and neural tissue will be explained.

Topic 2-Carotenoid Brain Functions and Relationship to Macular Pigment: -10 minutes

I. Antioxidant – the mechanisms whereby carotenoids exhibit an antioxidant role in the brain will be presented

I. Anti-inflammatory – the mechanisms whereby carotenoids exhibit an anti-inflammatory role in the brain will be presented

II. Gap junction - the mechanisms whereby carotenoids support gap junction in brain neural transfer will be presented

III. Concentration – the concentration and location of the brain carotenoids will be taught

IV. Association between macular pigment and brain carotenoids – the relationship between retinal and brain carotenoid concentrations will be discussed

V. The association between macular pigment and cognitive function - the relationship between macular pigment and cognitive function will be discussed

Topic 3-Evidence-based science- 15 minutes

I. Levels of evidence

a. The importance of the level of evidence and the totality of science will be taught

II. Summary of the evidence

III. Key trials

a. AREDS – NIH study published in 2013. This study set the current recommended formulation for patients diagnosed with intermediate and advanced AMD based on risk of disease progression. The AREDS & AREDS2 studies established some practice guidelines for the management of AMD patients, however due to the secondary supplementation of all groups in AREDS 2, some confusion as to final results will be discussed

b. MOST – This study evaluated vision improvement as it relates to MPOD in patients diagnosed with early AMD and compared three different supplement formulations over a 3-year period.

c. CREST – This study had two parts: the first looking at vision improvement as it relates to MPOD in young and healthy eyes against a true placebo in a double blinds study over a 12-month period; the second looking at vision improvement as it relates to MPOD in early AMD patients when comparing a all three carotenoids in an AREDS-based formulation to the AREDS established formulation over a 2 year period.

d. CARDS – This study looked at vision improvement as it relates to MPOD in patients with Alzheimer Disease compared to age matched controls.

e. CARES – This study, currently underway looks at cognitive impairment improvements in a double blind randomized trial. The final outcome measure will assess the ability to improve cognitive function and visual performance in patients with mild cognitive impairment after MPOD supplementation.

Topic 4-Measurement of visual function and practice implementation- 10 minutes

I. Visual acuity – methodologies used to assess visual function will be explained

II. Contrast sensitivity – methodologies used to assess contrast sensitivity will be explained

III. Rod and cone vision – methodologies used to assess cognitive function will be explained

IV. Glare disability – methodologies used to assess glare disability will be explained

V. Subjective assessment – methodologies used to assess subjective visual function will be explained

VI. Parameters of cognitive function under assessment – parameters used to assess cognitive function in clinical trials will be explained, including the challenges presented when trying to measure cognitive function

VII. Conclusion – 5 minutes

a. The course will conclude by discussing methodologies that are available that can be used in clinical practice to help the doctor assess vision and retinal health

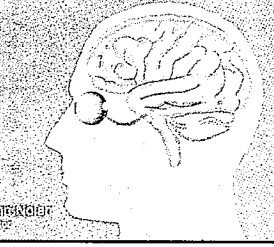
b. Identification of patients

c. How can patients be identified that will benefit from nutrition and lifestyle optimization

d. What is the current best practice to be implemented in everyday practice for preventative care using nutrition and lifestyle data in the clinic.

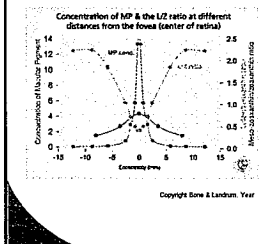
Nutrition and the Eye

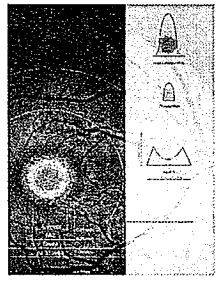
A Supplement to Enhance Vision and Cognitive Performance



Professor John Nolan

DISTRIBUTION OF CAROTENOIDS IN THE MACULA



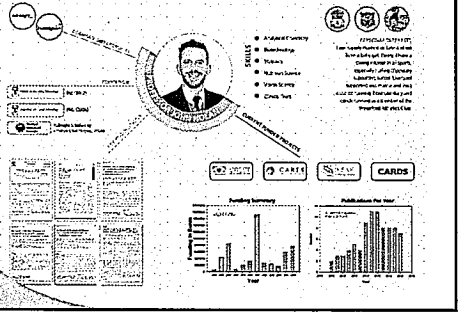


Copyright 2016 Nolan/Kuchling/Nobel

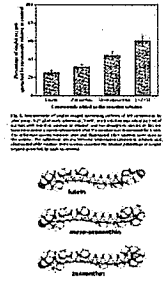
HOW MANY MACULAR CAROTENOIDS DO WE ACTUALLY EAT?

In the US, the typical dietary intake is only 1.4mg of lutein and zeaxanthin combined per day and in the UK, it is 1.59mg per day.

PROFESSOR JOHN NOLAN



CHEMICAL STRUCTURE OF MACULAR CAROTENOIDS



DEVOLUTION

We are in an era of nutrient-deficient foodstuffs

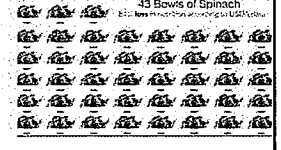
1953

1 Bowl of Spinach

Has the same nutritional content as

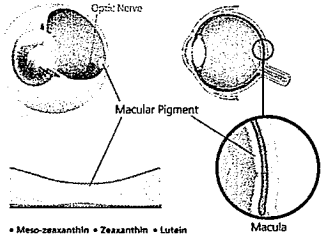
2000

43 Bowls of Spinach



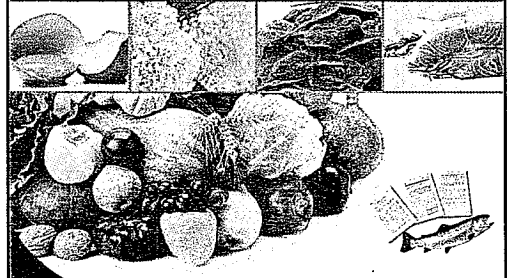
Source: United States Department of Agriculture

NUTRITION AND THE EYE: MACULAR PIGMENT



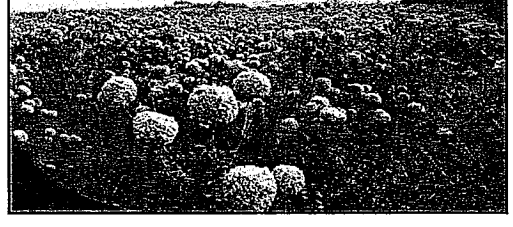
• Meso-zeaxanthin • Zeaxanthin • Lutein

SOURCES OF MACULAR CAROTENOIDS



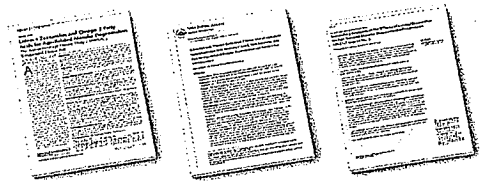
SOURCES OF MACULAR CAROTENOIDS

A field of marigold flowers in Mexico.



DIETARY SUPPLEMENTS

AREDS

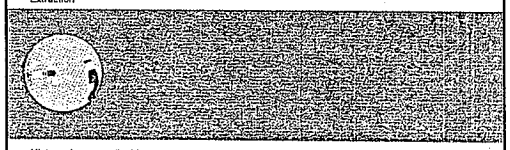


AREDS1 has shown a 25% risk reduction in progression from intermediate AMD to advanced AMD when supplemented with antioxidants and zinc

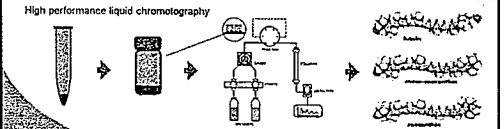
AREDS2 has shown that when supplemented with lutein and zeaxanthin provides an additional 10% risk reduction in the progression from intermediate AMD to advanced AMD

MEASURING BLOOD CAROTENOIDS (SERUM ANALYSIS)

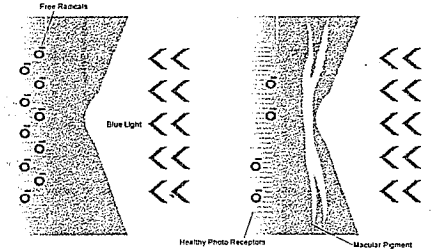
Extraction



High performance liquid chromotography



SHORT-WAVELENGTH (BLUE) LIGHT FILTRATION

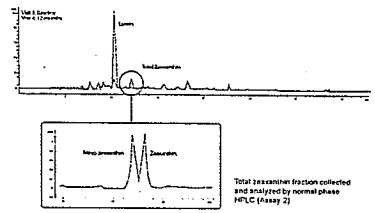


NUTRITION RESEARCH CENTRE IRELAND (NRCI)

- Clinical Trial Admission
- Clinical Trial Project Management
- Measurement of Visual Function
- Measurement of Cognitive Function
- Measurement of Biochemical Markers
- Statistical Analysis
- Publishing and Dissemination

CHROMOTOGRAPHY

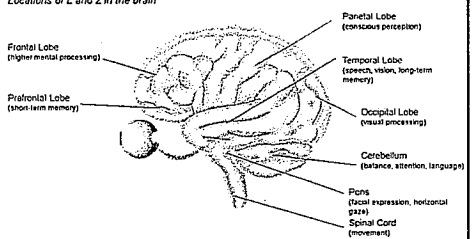
Plasma sample analyzed by reversed phase HPLC (Assay 1)



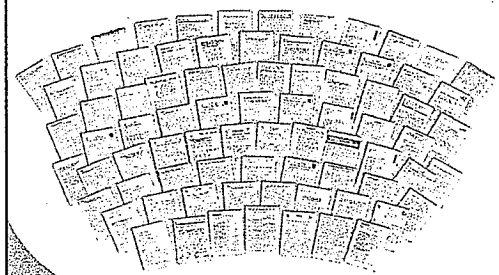
Total zeaxanthin fraction collected and analyzed by normal phase HPLC (Assay 2)

The Role of Nutrition for the Brain

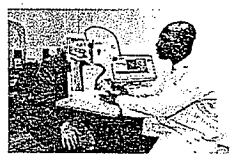
Locations of L and Z in the brain



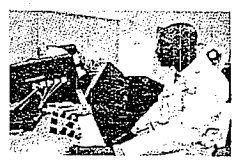
OUR PEER-REVIEWED PUBLICATIONS TO DATE



MEASURING MACULAR PIGMENT



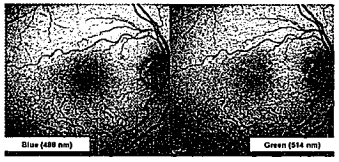
Spectralis from Heidelberg Engineering



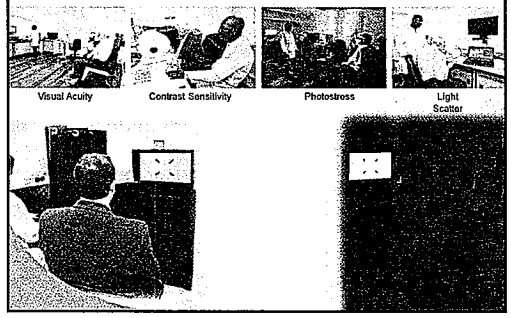
Macular Densitometer

MACULAR PIGMENT:
Dual-wavelength fundus auto fluorescence (AF) technique

In the fovea, excitation light within the absorbance range of MP is partially absorbed by the carotenoids, resulting in an area of reduced fluorescence.

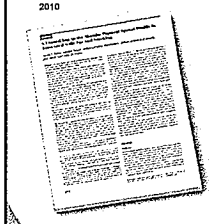


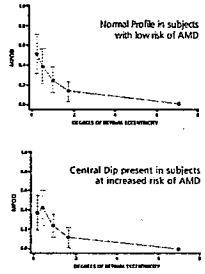
MEASURING VISUAL FUNCTION



RISK FACTORS FOR AMD AND MP

2010

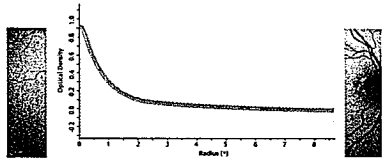




Subjects at increased risk of AMD (older subjects and cigarette smokers) were more likely to display a central dip in their MP spatial profile.

MACULAR PIGMENT:
Dual-wavelength fundus auto fluorescence (AF) technique

To measure the MP optical density, the dual-wavelength approach of the AF method compares results from two excitation wavelengths that are differently absorbed by the MP.



MEASURING COGNITIVE FUNCTION

Electronic Method

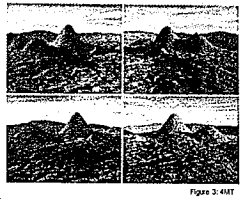


Figure 3: 4MT

CANTAB cognition battery assesses:

- Attention
- Memory
- Executive function

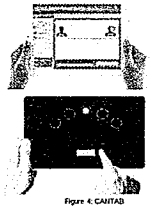
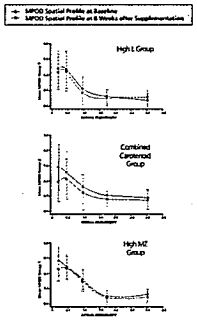


Figure 4: CANTAB

REBUILDING CENTRAL DIPS



Group 1: High L group (L = 20 mg/day, Z = 2 mg/day);

Group 2: combined carotenoid group (MZ = 10 mg/day, L = 10 mg/day, Z = 2 mg/day);

Group 3: high MZ group (MZ = 17 mg/day, L = 3 mg/day, Z = 2 mg/day).

VISION

- VISUAL ACUITY
- CONTRAST SENSITIVITY
- GLARE

NRCI

RISK FACTORS FOR AMD AND MP

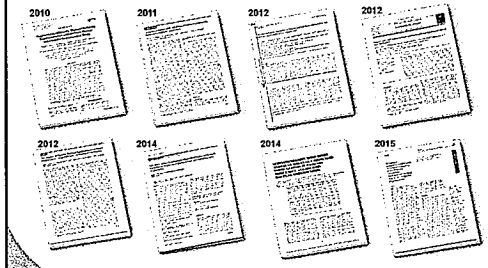
2007

2007

There is a relative lack of MP in association with the most important and established risk factors for AMD (age, cigarette smoking and family history of AMD), several decades before the onset of disease.

Given the lack of MP in association with risk for AMD, the findings indicate that a retina predisposed to this condition may have an impaired ability to accumulate circulating Z (total).

M.O.S.T CLINICAL TRIALS

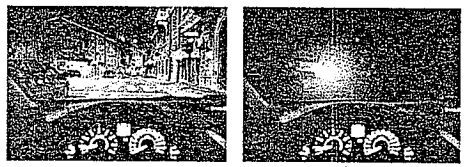


6 Head to head published clinical trials with formulations containing Meso-zeaxanthin compared to formulations lacking Meso-zeaxanthin. Confirming the stability, safety, macular pigment response and visual function response across populations e.g. normal subjects, subjects with AMD and subjects with Alzheimer's.

CREST

IMPACT

Glare Disability – Night time



VISUAL PEFORMANCE IN NORMAL HEALTHY SUBJECTS
- OCCUPATIONS

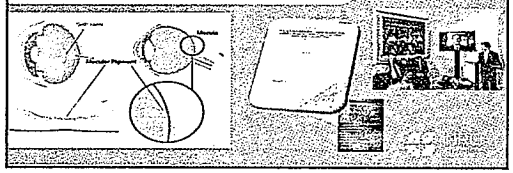
Funded by the European Research Council (ERC)
The main goal of the ERC is to encourage the highest quality research in Europe on the basis of scientific excellence through competitive funding
€1,483,342 over five years: Grant No. 281096

erc

CREST

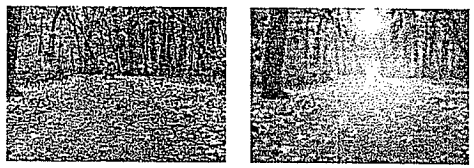
Research Questions:
Trial 1: Does supplementation with all three macular carotenoids in a ratio (mg/day) of 10:10:2 (L:MZ:Z), for 12 months, enhance visual function in normal subjects (without retinal disease) when compared to placebo?

Trial 2: Does supplementation with all three macular carotenoids in a ratio (mg/day) of 10:10:2 (L:MZ:Z) plus 500mg vitamin C, 400 IU vitamin E, 25mg zinc and 2mg copper for 24 months, enhance visual function in patients with early AMD when compared to 10:2 (L:Z) plus 500mg vitamin C, 400 IU vitamin E, 25mg zinc and 2mg copper?



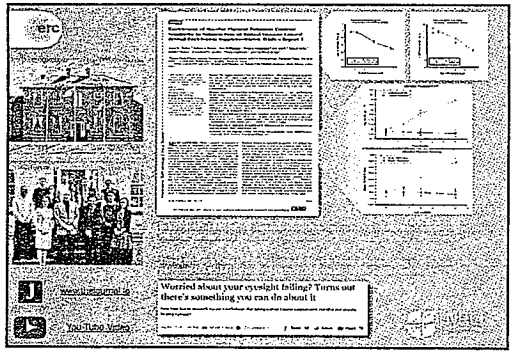
IMPACT

Reduced contrast in high light conditions



VISUAL PEFORMANCE IN NORMAL HEALTHY SUBJECTS
- SPORTS

erc



Worried about your eyesight failing? Turns out there's something you can do about it

VISUAL PEFORMANCE IN NORMAL HEALTHY SUBJECTS

FUNCTIONS OF MACULAR PIGMENT

Why Macular Pigment is important

1. Visual Performance and Protection in AMD eyes

2. Visual Performance in non-diseased eyes

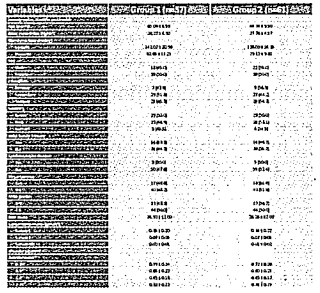
MAKING VISION GREAT AGAIN

CREST AMD- TRIAL 2

CREST

Purpose: To evaluate the impact of supplemental macular carotenoids (with and without meso-zeaxanthin [MZ]) in combination with co-antioxidants on visual function in patients with non-advanced age-related macular degeneration (AMD).

BASELINE FINDINGS



CHANGE IN AGE-RELATED MACULAR DEGENERATION (AMD) MORPHOLOGY

Change in age-related macular degeneration disease status

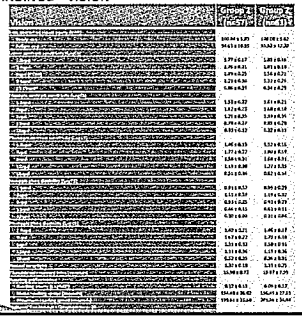
	Intervention	Low risk	High Risk	Advanced AMD	Total
Baseline	**Group 1**	12	34	0	46
	Group 2	12	38	0	50
24-months	**Group 1**	11	35	0	46
	Group 2	11	38	1	50

- Group 1, 10mg/day meso-zeaxanthin [MZ], 10mg/day lutein, 2mg/day zeaxanthin plus 500mg/day vitamin C, 400 international units [IU]/day of vitamin E, 25mg/day zinc and 2mg/day copper
- Group 2, 10mg/day lutein, 2mg/day zeaxanthin plus 500mg/day vitamin C, 400 international units /day of vitamin E, 25mg/day zinc and 2mg/day copper

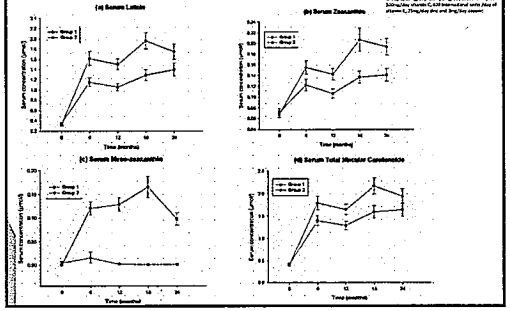
ELIGIBILITY CRITERIA

- Non-advanced AMD (one to eight on AREDS 11-step severity scale in at least one eye [the study eye], confirmed by the Moorfields Eye Hospital Reading Centre (MEHRC), London, UK
- BCVA 6/12 (20/40) or better
- No more than five diopters spherical equivalence of refraction in the study eye
- No previous consumption of supplements containing macular carotenoids
- No retinal pathology other than AMD
- No diabetes mellitus (by self-report)

BASELINE FINDINGS - VISION



SERUM CAROTENOID RESPONSE



OUTCOME MEASURES

Primary Measure:

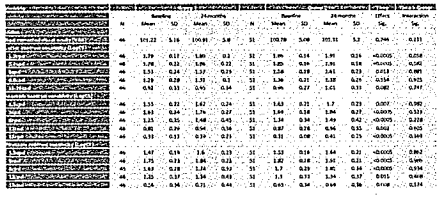
Change in contrast sensitivity (CS) at 6 cpd following 24 months of supplementation

Secondary Measures:

- CS at the other spatial frequencies
- AMD morphology
- BCVA
- Glare disability
- Photostress recovery
- Macular pigment
- Retinal straylight
- Reading acuity; reading speed and subjective visual function

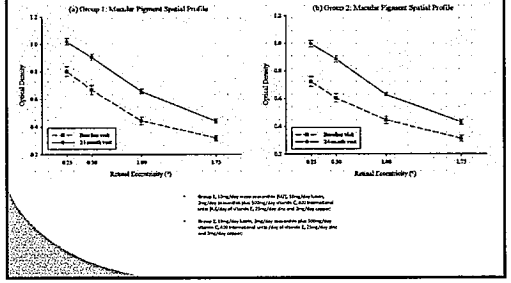
LONGITUNDINAL FINDINGS

**All data not listed

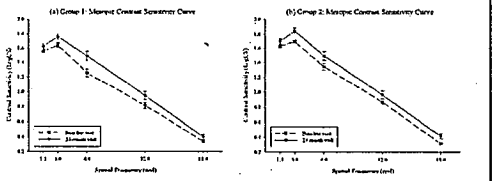


75% (24 of 32) of vision related outcome measures (e.g. contrast sensitivity, glare disability, photostress recovery) exhibited significant improvements.

MACULAR PIGMENT SPACIAL PROFILE



CHANGE IN MESOPIC CONTRAST SENSITIVITY



CONCLUSION

MacuHealth in terms of macular pigment augmentation (increases) and in terms of visual improvements is as efficacious (as effective) as the AREDS2 formula

75% (24 of 32) of vision related outcome measures (e.g. contrast sensitivity, glare disability, photostress recovery) exhibited significant improvements.

COGNITIVE FUNCTION AND MP: EXPLORATORY STUDIES

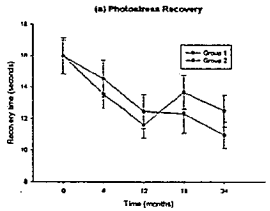
2013

This landmark study investigated the relationship between MP and cognitive function in 4453 adults aged 50 years and older as part of The Irish Longitudinal Study on Aging (TILDA). The findings support the theory that the macular carotenoids impact on cognitive function

2015

We have shown that MP levels correlate with cognitive performance on a range of cognitive tests in subjects free of retinal disease with low MP and in subjects affected with AMD

PHOTOSTRESS RECOVERY

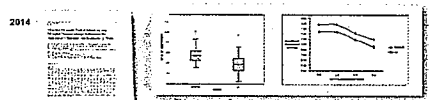


OVERALL CONCLUSION

- SUSTAINNED SUPPLEMENTATION WITH ALL THREE MACULAR CAROTENOIDS (LUTEIN, ZEAXANTHIN AND MESO-ZEAXANTHIN) IS RECOMMENDED
- FORMULATIONS CONTAINING MESO-ZEAXANTHIN OFFER ADVANTAGES OVER FORMULATIONS LACKING MESO-ZEAXANTHIN
- SUPPLEMENTATION WITH MESO-ZEAXANTHIN ENSURES 100% RESPONSE IN PATIENTS
- SUPPLEMENTATION WITH A FORMULATION CONTAINING MESO-ZEAXANTHIN IMPROVES VISUAL FUNCTION IN PATIENTS WITH EARLY (NON-ADVANCED) AMD AND IN SUBJECTS FREE OF RETINAL DISEASE
- STANDARD OF CARE FOR AMD = SUPPLEMENTATION WITH LUTEIN, ZEAXANTHIN AND MESO-ZEAXANTHIN

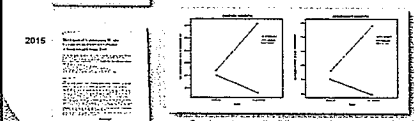
ALZHEIMER'S DISEASE AND MP: CLINICAL STUDIES

2014



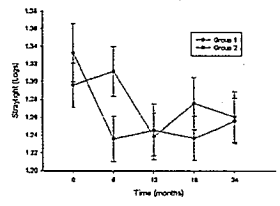
This study confirms that patients with Alzheimer's disease have significantly less MP and poorer vision when compared to age-matched controls.

2015

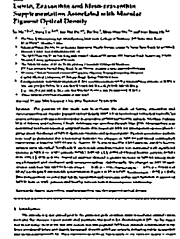


Supplementation with all three macular carotenoids (in a MZ-L-Z [mg] ratio of 10:10:2) benefits patients with AD, in terms of clinically meaningful improvements in visual function and in terms of MP augmentation.

RETINAL STRAYLIGHT



OTHER IMPORTANT RESEARCH



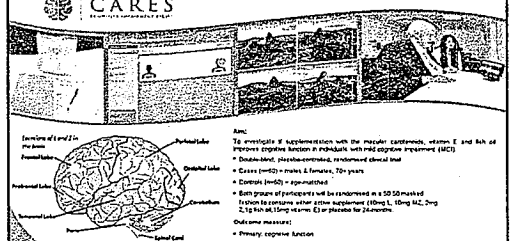
Lutein, Zeaxanthin and Meso-zeaxanthin Supplementation Associated with Macular Pigment Optical Density

Chinese study:

Meta analysis: Level 1 evidence; A recent publication from China has revealed that lutein, zeaxanthin and meso-zeaxanthin supplementation improved MPOD both in AMD patients and healthy subjects with a dose-response relationship.

CURRENT RESEARCH

CARES



Aim:

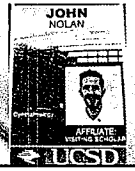
To investigate if supplementation with the macular carotenoids, vitamin E and fish oil improves cognitive function in individuals with mild cognitive impairment (MCI)

- Double-blind, placebo-controlled, randomised clinical trial
- Cases (n=60) = males & females, 70+ years
- Controls (n=60) = age-matched
- Both groups of participants will be randomised in a 50:50 masked fashion to consume either active supplement (10mg L, 10mg MZ, 2mg Z, 1g fish oil, 15mg vitamin E) or placebo for 24-months

Outcome measures:

- Primary: cognitive function
- Secondary: MP, visual function, serum assessments, development of AD

DRIVING IMPROVEMENT THROUGH VISION ENHANCEMENT (DRIVE)

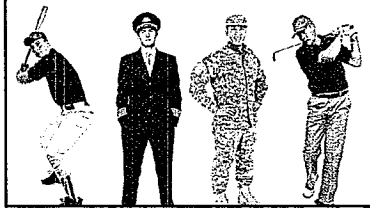


- Designed to investigate the impact of carotenoid supplementation on visual function and cognitive function across different subject populations;
- A first study of its kind;
- Bringing together unique professional expertise from different disciplines of science (i.e. nutrition; vision; cognitive function; behavioural science; ophthalmology; ageing)

PRACTICE IMPLEMENTATION: People with Healthy Eyes

In the absence of macular pigment measurment, anybody who expresses the desire to optimise their vision should be recommended to take MacuHealth with LMZ³.
Such as:

- Patients who complain of glare e.g. night driving;
- Patients working under harsh or low light environments;
- Patients in occupations that require optimal vision e.g. pilots, police, military etc.;
- Athletes- weekend warriors



PRACTICE IMPLEMENTATION: People with retinal disease

Recommend the use of MacuHealth with LMZ³

- To optimise their vision;
- To decrease the risk of the development or progression of macular disease.

Option: If the doctor or patient preferred an AREDS like formula use MacuHealth^{PLUS+}

- Low zinc (safer)
- Fortified with meso-zeaxanthin (better)

Please note the AREDS study demonstrated a benefit of the active ingredient for reducing risk of AMD progression for patients with intermediate to advanced AMD.

PROFESSOR JOHN NOLAN

Howard Chair, ERC Fellow, Fulbright Scholar

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www.mprg.ie www.macularcarotenoids.org www.meso-zeaxanthin.org www.profjohnnolan.com

Company Directorships:

- Nutrasight Consultancy Ltd: provides consultancy and conducts clinical research trials into nutrition for human well-being. Based in Waterford, Ireland (Reg no: 427680)
- Sightrisk Ltd: provides online risk assessment software to eyecare professionals. Based in Waterford, Ireland and Berlin, Germany (Reg. no: 457865)
- NutrAlgae: developing alternative methods of lutein production. Based in Waterford, Ireland (Reg. no: 557889)

Summary

I am the Principal Investigator of the Nutritional Research Centre of Ireland (NRCI), Waterford Institute of Technology, Ireland. My research group studies the role of nutrition in the human eye and brain, with a particular emphasis on carotenoids (plant pigments found in nature). I have secured over €5 million in research funding to date to support these studies. I have successfully supervised 14 students to MSc, PhD and MD level qualifications. I have presented at over 100 international scientific conferences and have published 76 peer-reviewed scientific papers, which have been cited 2,183 times. My H-index is 29. I am co-editor of Carotenoids and Retinal Disease published by Taylor and Francis in 2013 and I am a member of the Ocular Nutrition Society. I am currently serving my third term as Chair of the International Macular Carotenoids Conference and am an editor of the Journal of Alzheimer's Disease.

Skills

- High Performance Liquid Chromatography
- Separation and purification techniques
- Nutrition
- Vision science
- Cognitive function
- Statistics
- Clinical trials
- Consultancy/Dissemination

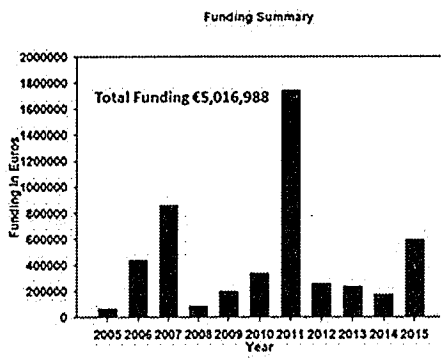
Education

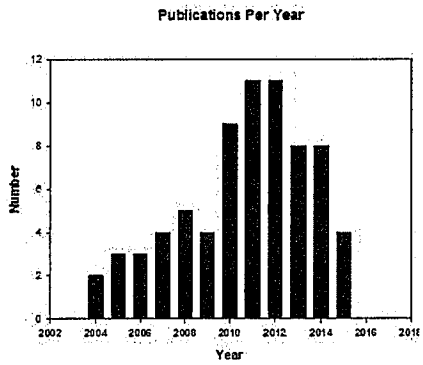
BSc (2002): Applied Biology with Quality Management, Waterford Institute of Technology, Cork Road, Waterford, Ireland;
PhD (2005): Determinants of macular pigment in healthy subjects, Waterford Institute of Technology, Cork Road, Waterford, Ireland;
Postdoctoral degree (2006): Nutrition and the eye, Medical College of Georgia, 1459 Laney Walker Blvd, Augusta, GA 30912, United States.

Recent publications

- Lutein, zeaxanthin, and meso-zeaxanthin: The basic and clinical science underlying carotenoid-based nutritional interventions against ocular disease. Bernstein PS, Li B, Vachali PP, Gorusupudi A, Shyam R, Henriksen BS, Nolan JM. Prog Retin Eye Res, November 2015
- Cognitive function and its relationship with macular pigment optical density and serum concentrations of its constituent carotenoids. Kelly D, Coen RF, Akuffo KO, Beatty S, Dennison J, Moran R, Stack J, Howard AN, Mulcahy R, **Nolan JM**. J Alzheimers Dis. August 2015
- Sustained supplementation and monitored response with differing carotenoid formulations in early age-related macular degeneration. Akuffo KO, **Nolan JM**, Stack J, Moore TC, Beatty S. Grafes Arch Clin Ophthalmol. May 2015.

- The impact of supplemental macular carotenoids in Alzheimer's disease: A randomized Clinical Trial. **Nolan JM**, Loskutova E, Howard A, Mulcahy R, Moran R, Stack J, Bolger M, Coen RF, Dennison J, Akuffo KO, Owens N, Power R, Thurnham D, Beatty S. J Alzheimer's Dis. November 2014.
- Macular pigment, visual function, and macular disease among subjects with Alzheimer's disease: An Exploratory Study. **Nolan JM**, Loskutova E, Howard AN, Moran R, Mulcahy R, Stack J, Bolger M, Dennison J, Akuffo KO, Owens N, Thurnham DI, Beatty S. J Alzheimer's Dis. January 2014





Current Funded projects

CREST (Central Retinal Enrichment Supplementation Trials): Macular Pigment and its impact on vision and blindness

This project is funded by the European Research Council (ERC starter grant; 281096). This ground-breaking study will advance understanding of the protective role of macular pigment, and potentially improve normal vision and prevent or delay blindness due to AMD.

LEAF (LutEin Algae Feasibility)

This project is funded by the ERC proof of concept program (ERC, PoC 630671). This project will develop a method of lutein production from an alternative source to the Marigold, so that the resulting patentable processes will stimulate an economically viable, EU-based and more environmentally-friendly industry to meet the growing global demand for lutein.

CARES (Cognitive impAiRmEnt Study)

This project is funded by the Howard Foundation UK (Reg UK Charity No. 285822) and will investigate if supplementation with the macular carotenoids and fish oil in subjects with mild cognitive impairment improves cognitive function compared to a placebo group.

CARES (Cognitive impAiRmEnt Study)

This project is funded by the Howard Foundation and investigates if supplements with macular carotenoids and fish oil changes the lipid profile in patients with moderate Alzheimer's Disease.

Personal Interests

I am happily married to Jane and we have a baby girl, Penny. I have a strong interest in all sports, especially hurling (Tipperary supporter), soccer and middle and long distance running. I exercise daily and coach running as a member of the Waterford Athletics Club.

References

- Professor John Landrum, Florida National University, USA – landrumj@fiu.edu
- Dr Alan Howard, The Howard Foundation, Cambridge, UK – alan.howard@howard-foundation.com