espansione group science onward

New Horizons in Posterior Segment Care

LM® LLLT (PBM) for dAMD and Beyond

espansione group

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—WHY WE'RE HERE

Helping people, through science. That's the privilege we take pride in.

We have the ambition to establish new paradigms in ophthalmology, driven by our desire to provide our customers and their patients with the best, certified medical technologies.

The resonance of our tech has been incredible, with new scientific research building up at an impressive pace on known and new applications.

> POSTERIOR SEGMENT

dAMD

5+

Scientific Papers

CSC

2+

Scientific Paper

> ANTERIOR SEGMENT

DED (MGD, CLD, ...)

35+

Scientific Papers + Articles

CHALAZION

3+

Scientific Articles

SJÖGREN'S

2+

Scientific Paper

BLEPHARITIS

2+

Scientific Papers

MICROBIOME STABILIZATION & DEMODEX BLEPHARITIS

4+

Scientific Papers

CATARACT & REFRACTIVE SURGERY

5+

Scientific Paper

—WHERE WE ARE

↓

12+ Technology Patents

55+ Scientific Papers

50+ Countries

Enabling progress through science for the betterment of all isn't an easy purpose to work towards—yet it's our north star, the guiding principle of all our actions.

That's what guided us for over four decades. That's what moved us to become the one and only company to develop, patent and certify Light Modulation® LLLT, a unique photobiomodulation (PBM), technology.

With a strong focus on anterior segment care, we challenge the status quo in ophthalmology, innovate with care and ingenuity, and believe in the power of our people.

—WHERE WE'RE GOING

We aspire to extend our leadership beyond ocular surface conditions into the posterior segment field, leveraging our decades-long expertise in photobiomodulation (PBM) technology.

Our goal is to redefine the management of posterior segment pathologies through the most optimized and disruptive light-based solutions.

We have always delivered the highest standard in the industry—pushed on by expert craftsmanship and family-owned values coupled with a global mindset and aspiration.

Every day, we invest heavily in researching and developing the Espansione Ecosystem of technologies and solutions to achieve our ambition.

eye-light®

From the front to the back of the eye, an all-in-one powerhouse for eye care.

The Espansione Ecosystem offers a comprehensive range of certified medical devices, ensuring safety and reliability while meeting patient and operator needs.

eye-light®, our core solution, integrates our groundbreaking patented technology: Light Modulation® Low Level Light Therapy.

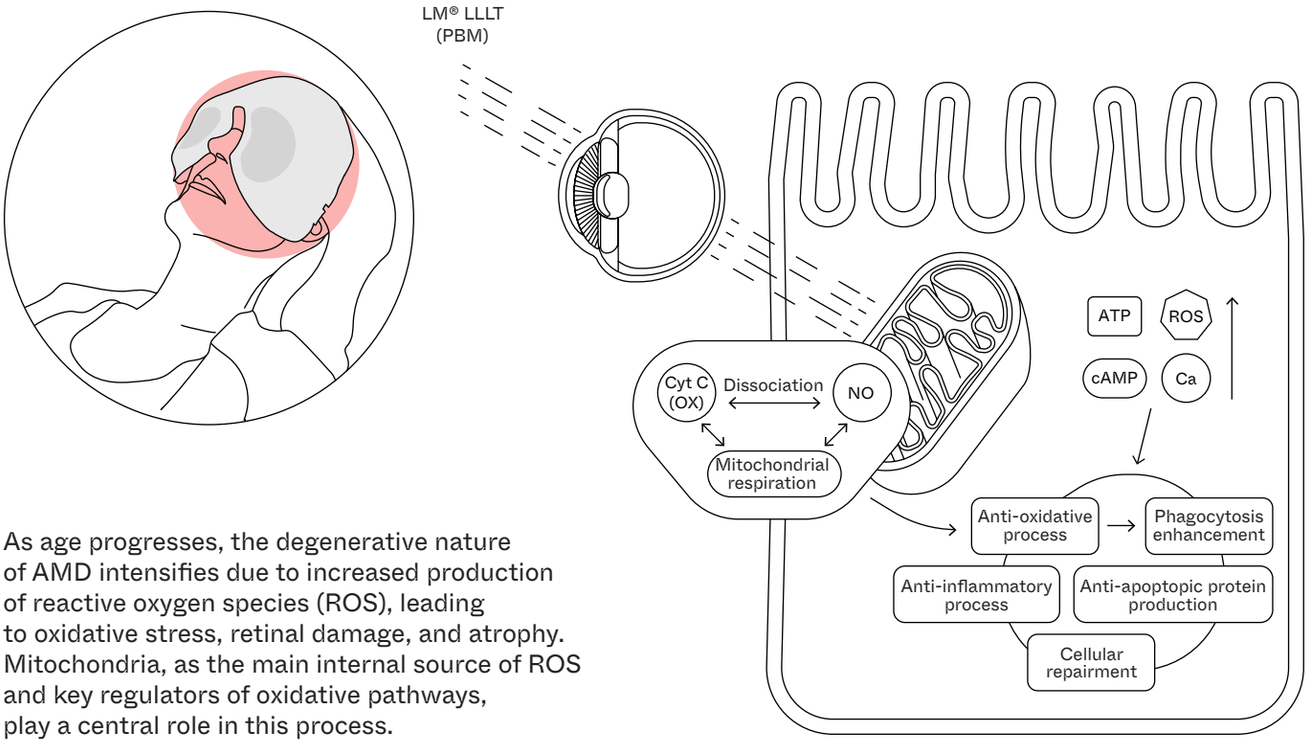
LM® LLLT already providing highly effective, non-invasive treatment for various ocular surface conditions, from Dry Eye Disease (DED) to Sjogren's Syndrome, is now venturing into posterior segment management starting with dAMD and CSC.

Discover LM® LLLT/PBM

At the heart of our ecosystem lies Light Modulation® LLLT, our innovative, patented **photobiomodulation (PBM)** technology.

Utilizing powerful LEDs, LM® LLLT stimulates ATP production in cells, promoting healing and regeneration at the biological level.

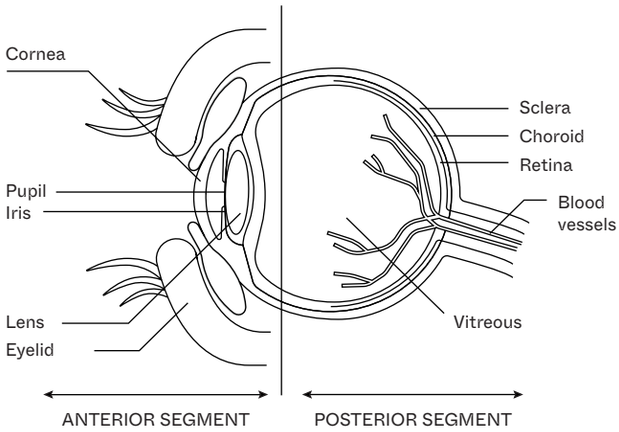
Enabled by LM® LLLT (PBM), photobiostimulation therapy is a unique kind of near-infrared light therapy (NILT) completely painless for the patient—yet extremely effective in managing a vast number of eye conditions, from the front to the back of the eye.



As age progresses, the degenerative nature of AMD intensifies due to increased production of reactive oxygen species (ROS), leading to oxidative stress, retinal damage, and atrophy. Mitochondria, as the main internal source of ROS and key regulators of oxidative pathways, play a central role in this process.

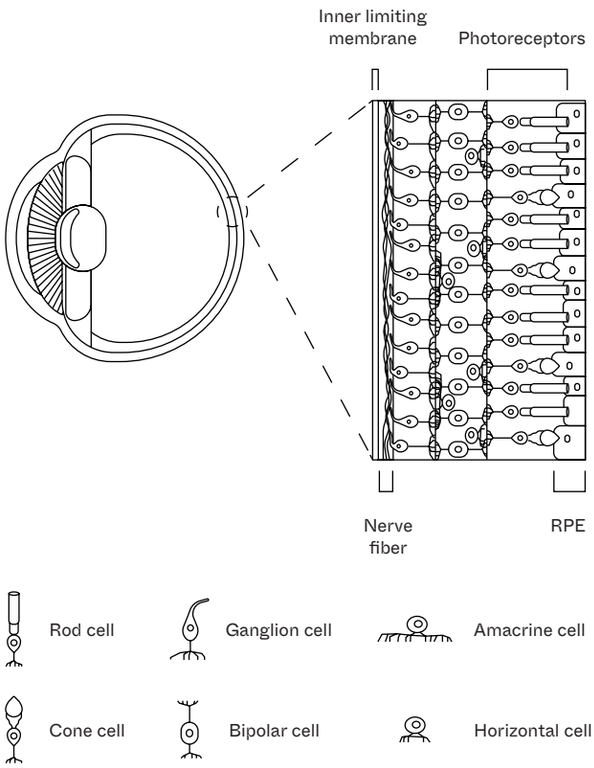
Photobiomodulation targets these mitochondrial dysfunctions effectively by stimulating ATP production and reducing oxidative stress, thus reducing the progression of AMD and supporting retinal health.

The Posterior Segment of the eye comprises crucial structures like the retina, optic nerve, and vitreous body, and it plays a vital role in processing visual information.



Retina, operating as a camera's film, captures incoming light, transforms it into neural signals, and transmits these signals via the optic nerve to the brain, facilitating vision.

Each retina's component plays a role in maintaining the retina's ability to process visual information efficiently and accurately.



Photoreceptors, primarily rods and cones in the retina, are key for vision by converting light into neural signals.

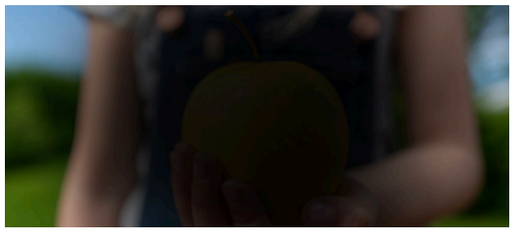
Rods, sensitive to low light, enable night vision, while **cones**, located in the central macula, handle sharp, detailed vision and color perception under higher light levels.

Behind these, the retinal **pigment epithelium (RPE)** supports visual processing and retinal health through nutrient transport, light absorption, and oxidative stress protection.

Damage to photoreceptors and the RPE, as seen in conditions like age-related macular degeneration, can significantly impair vision.

AMD—leading cause of irreversible blindness in the developed world

NORMAL VISION



MACULAR DEGENERATION

Age-related macular degeneration (AMD) is the leading cause of irreversible blindness in the developed world, that predominantly affects individuals aged 60 and above.

Estimates suggest that nearly 50 million people worldwide are affected by AMD.

AMD is a progressive retinal disease that irreversibly impairs vision by damaging the macula, primarily affecting photoreceptors and the retinal pigment epithelium (RPE).

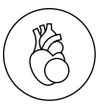
SOURCE: SCHULTZ NM, ET AL. "GLOBAL BURDEN OF DRY AGE-RELATED MACULAR DEGENERATION: A TARGETED LITERATURE REVIEW." CLIN THER. 2021;43(10):1792-1818.

—RISK FACTORS

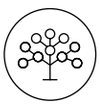
AGE

CIGARETTE SMOKING

GENETIC SUSCEPTIBILITY



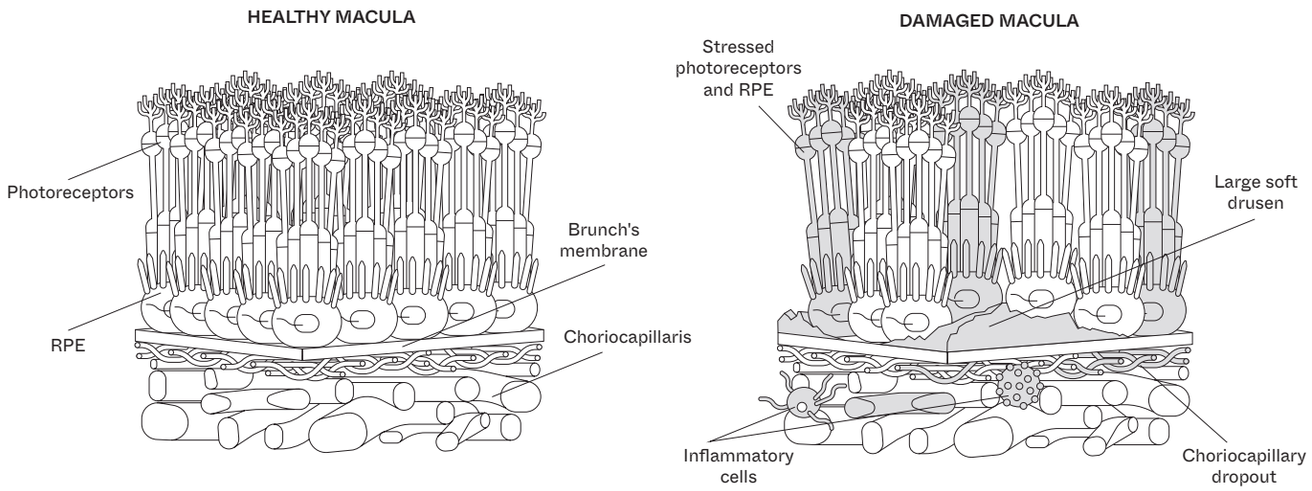
HYPERTENSION



FAMILY HISTORY

HYPERCHOLESTROLEMIA

NUTRITION



Age-related macular degeneration (AMD) involves complex factors including drusen formation, which significantly contributes to the disease's progression.

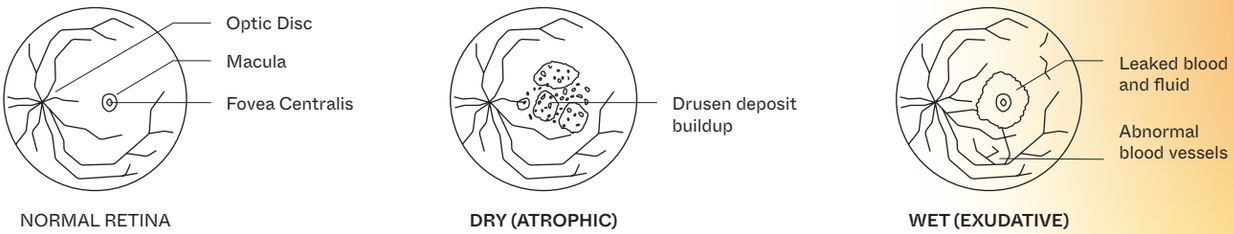
Drusen, accumulations of lipids, proteins, and debris between the retinal pigment epithelium (RPE) and Bruch's membrane, are not adequately cleared by RPE cells.

Their presence is a key risk factor for advancing to severe stages of AMD.

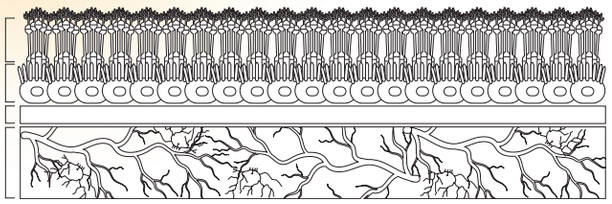
There are two main forms of AMD
and they affect the eye in different ways:

> Dry (Atrophic)

> Wet (Exudative)

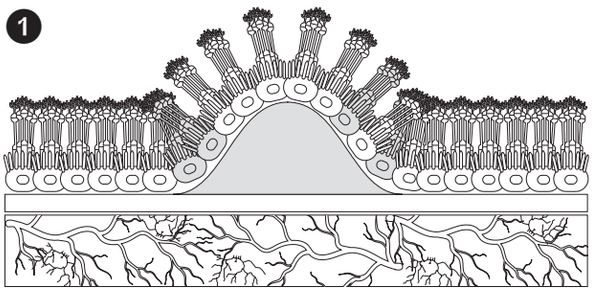


Dry AMD, which is also known as the atrophic or nonexudative form, represents the majority of AMD cases, **accounting for about 90% of diagnoses**.

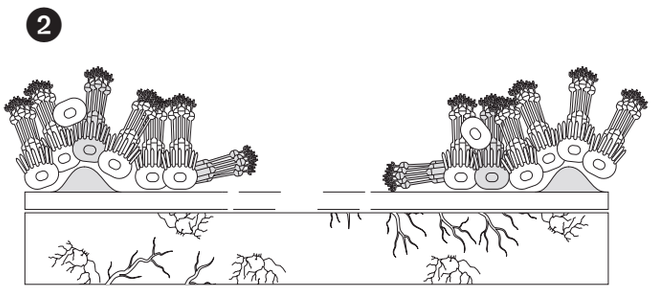


MACULA

It is characterized by the gradual accumulation of drusen [①]—tiny yellow or white deposits under the retina.
As the RPE degenerates, it fails to support the photoreceptors effectively, leading to their gradual dysfunction and death.



Drusen Formation in Dry AMD



Late AMD (Geographic Atrophy)

CNV in Wet AMD

Geographic Atrophy (GA) [②] is the advanced stage of dry Age-related Macular Degeneration (AMD). It involves irreversible damage to the macula, characterized by the loss of retinal pigment epithelium (RPE) cells, photoreceptors, and the underlying choriocapillaris. The degenerated areas where the RPE has atrophied form "geographic" patches with map-like outlines.

Wet AMD [③], also known as exudative AMD, is less common than dry AMD but progresses more rapidly to severe vision loss.
It is marked by the growth of fragile, abnormal blood vessels from the choroid behind the retina, a condition known as choroidal neovascularization (CNV). These vessels often leak fluid and blood, causing significant damage.
The leakage can elevate the macula, leading to pigment epithelial detachment (PED), distorting vision and causing rapid central vision loss.

Age-related macular degeneration (AMD) is commonly classified based on its clinical presentation into early, intermediate, and late stages. The Age-Related Eye Disease Study (AREDS) provided a detailed classification system that is widely used in research and clinical practice.

Here's an overview of the classification:

AREDS 1
Low risk

An eye with no or few **small drusen** (AREDS 1) has a very low risk.

FOCUS 2 →

AREDS 2
Moderate risk

In **early AMD** (AREDS 2), patients often have several small drusen or a few medium-sized drusen. There are generally no symptoms in the early stage of AMD.

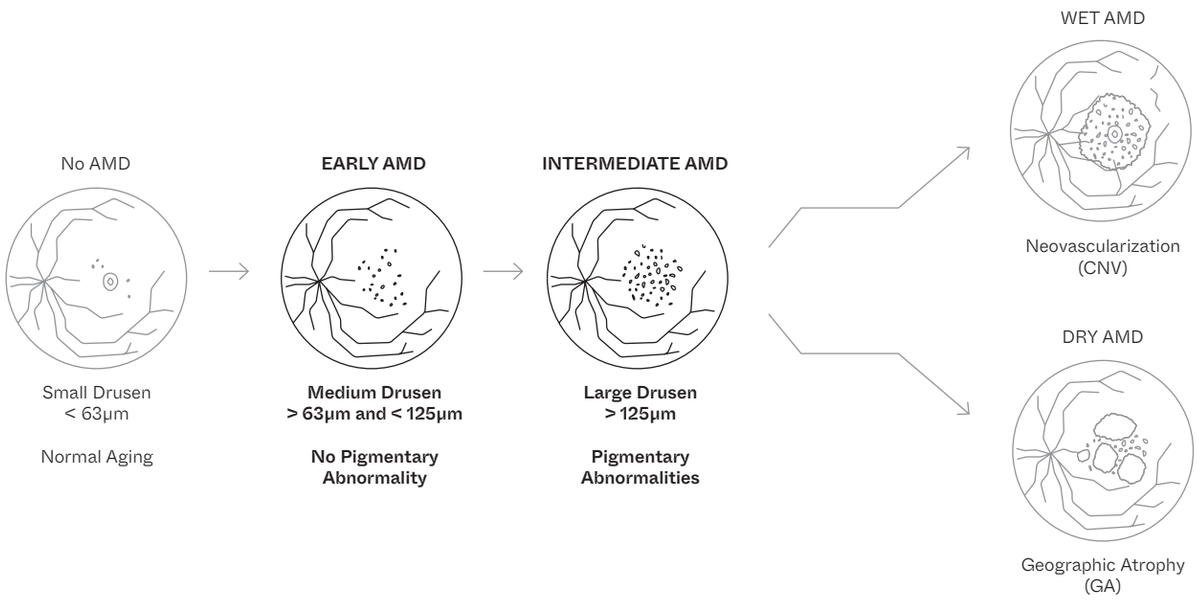
FOCUS 1 →

AREDS 3
Medium risk

Intermediate AMD (AREDS 3), is characterized by either many medium-sized drusen or one or more large drusen. There may also be changes in the pigmentation of the retina. Some people start to experience mild to moderate vision loss, but they may not notice any symptoms immediately. Difficulty seeing in low light, mild blurriness in central vision, and difficulty recognizing faces until very close to them can be signs.

AREDS 4
High risk

Late/Advanced AMD (AREDS 4), is where the most significant vision loss occurs, and it is divided dry and wet.



> So far, no treatments have been proven to effectively prevent the onset of GA or to halt lesion enlargement and/or retard vision loss.[1]

Management focuses on risk factor reduction and use of dietary supplements.
The approaches being investigated to reduce the rate of disease progression include:

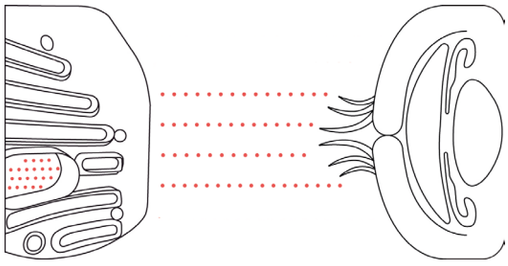
1. Drugs with antioxidative properties
2. Inhibitors of the complement
3. Neuroprotective agents
4. Visual cycle inhibitors
5. Gene therapy
6. Cell-based therapies

UNMET CLINICAL NEEDS...UNTIL NOW

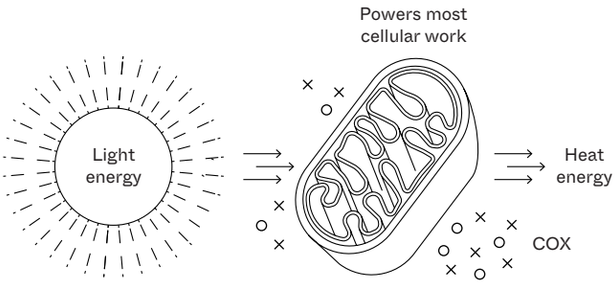
For unmet clinical needs in dry AMD, the solution is Photobiomodulation (PBM).

This groundbreaking technology uses light therapy to promote cellular repair and regeneration, providing a promising new guideline for treating dry AMD, particularly for AREDS 3 and lower classifications. PBM addresses current management gaps, offering a scientifically backed method to potentially slow disease progression, preserve vision, and improve the quality of life for patients.

[1]
CABRAL DE GUIMARAES TA, ET AL. "TREATMENTS FOR DRY AGE-RELATED MACULAR DEGENERATION: THERAPEUTIC AVENUES, CLINICAL TRIALS AND FUTURE DIRECTIONS". BR J OPHTHALMOL. 2022;106(3):297-304.



LM® LLLT, our patented photobiomodulation (PBM), involves targeted use of selected wavelengths of visible light to near-infrared light (500-1000 nm) produced by a laser or a noncoherent light source such as light-emitting diodes.

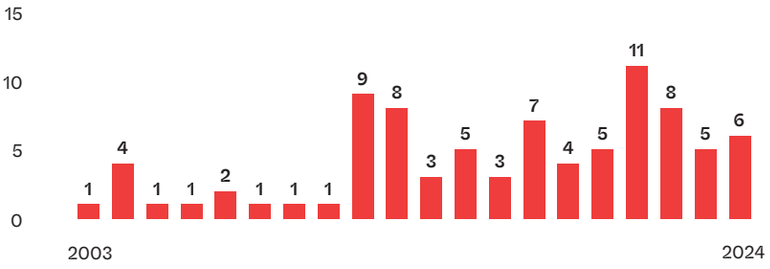


The primary effect of LM® LLLT is a localized transient stimulus of the absorbing chromophore based on electric or light oscillations.

Beneficial effects of LM® LLLT on the eye have been found in a wide array of ocular surface conditions, from **MGD** to **Sjögren's Syndrome**, from **Chalazia** all the way to the prevention of **Cataract** and **Refractive Surgery-induced Iatrogenic DED**.

Recent clinical research has highlighted increasing interest in PBM as a potential treatment for dAMD. Studies show that PBM improves visual acuity and decrease drusen volume.

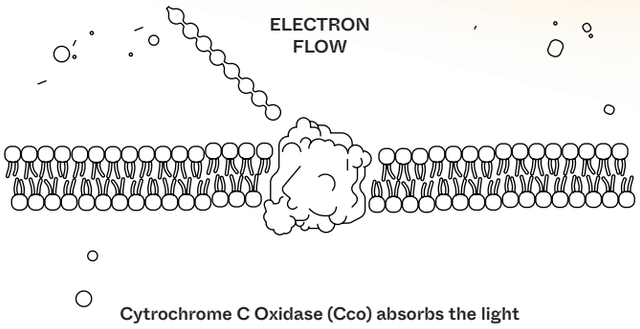
These findings emphasize the effectiveness of PBM as a treatment and reflect the scientific community's dedication to broadening therapeutic approaches for dAMD.



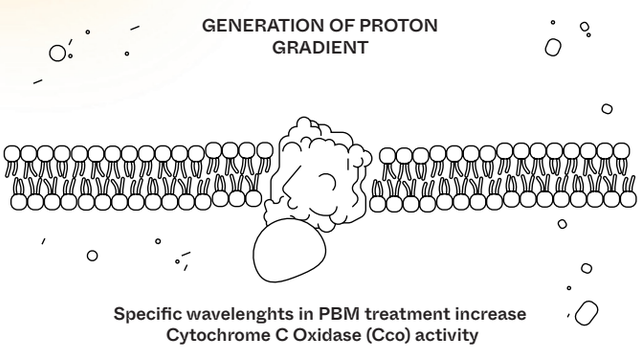
PUBMED TIMELINE RESULTS BY YEAR / SEARCH QUERY: PHOTOBIOMODULATION AND AGE RELATED MACULAR DEGENERATION, MAY 2024

→ GO TO
PUBMED WEBSITE

Read the Updates



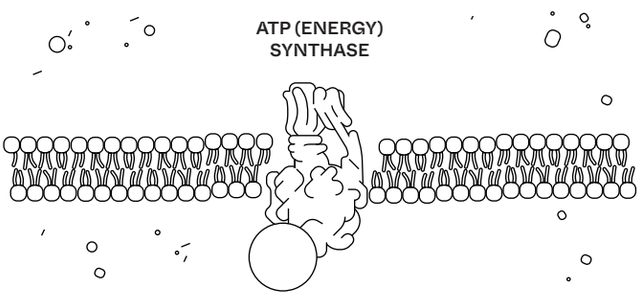
Cytrochrome C Oxidase (Cco) absorbs the light



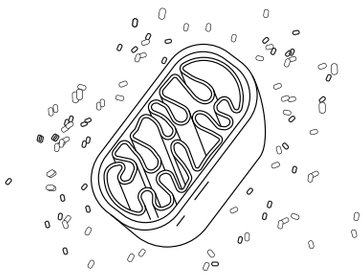
Specific wavelenghts in PBM treatment increase Cytochrome C Oxidase (Cco) activity

① The initial photon absorption event occurs in the cellular mitochondria, and the principal molecule that absorbs the light is an enzyme called **Cytochrome C Oxidase (CCO)**.

② When cells are damaged by disease or aging, the mitochondria within the cells produce **excess nitric oxide (NO)**, which **inhibits electron transport** within mitochondria and **decrease mitochondrial membrane potential**.



The ATP synthase produces ATPD (Adenosine Triphosphate) the main energy carrier in cells



Cellular respiration and methabolism are improved through increased ATP production

③ **Light absorption triggers the photodissociation of NO from cytochrome c oxidase (CCO), facilitating its release**. Given that NO plays a role in inhibiting electron transport, PBM's action leads to an increase in mitochondrial membrane potential, oxygen consumption, and the proton gradient, culminating in boosted ATP production.

④ **PBM also reduces oxidative stress** and **inflammation** and modulates cell signaling and gene expression.

• Yellow Light

The Yellow light (590 nm wavelength) **naturally inhibits expression of vascular endothelial growth factor (VEGF),** a signaling protein that stimulates the formation of blood vessels that contributes to the development of the wet-form of AMD.

It also increases the signaling protein, nitric oxide which reduces oxidative stress-mediated injury in the cell and increases local O2 delivery.
Light absorption leads to NO dissociation from CCO, restoring mitochondrial function and increasing ATP production.

> Oxydative Stress Reduction
> VEGF Inhibition
> Oedema Reduction & Drainage

• Red Light

The Red (630 nm) light exposure is directly associated with a significant **increase in ATP**.
The 630 nm wavelength is chosen based on its known interaction with cellular photo acceptors in CCO.

The 630 nm wavelength promote electron transfer and oxygen binding, respectively, in CCO **leading to restoration of mitochondria function and increases in metabolic activity** (i.e. energy production) and **inhibition in inflammatory events and cells death.**

> HIF-1α Factor Stimulus
> Inflammatory Biomarkers Reduction
> ATP Stimulus

A technology Like no other.

Operators and patients can enjoy the unique benefits of LM® LLLT technology.

i. it’s fast—a treatment lasts 12’
ii. it’s painless
iii. it’s easy and safe
iv. it’s plug&play—requires minimal training

LM® LLLT (PBM)

PATHOLOGY	TECHNOLOGY	iCYCLE 1 → INITIAL > Number of Sessions	mCYCLE 1 → MAINTENANCE CYCLES EVERY 6-9 MO.S > Number of Sessions
dAMD Age-related Macular Degeneration AREDS 2, AREDS 3	LM® LLLT YELLOW > RED	7-8 3 to 4 Days Apart	> 6 3 to 4 Days Apart

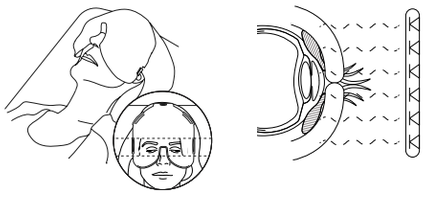
> IN-DEPTH SESSION SEQUENCE

In each session, there are two phases: Phase 1 involves wearing the LM® LLLT yellow mask for 6 minutes, during which the patient experiences 5 minutes of continuous light exposure with their eyes closed, followed by 1 minute of pulsed light with their eyes open. Phase 2 entails wearing a red mask for 6 minutes, with the same pattern of light exposure: 5 minutes continuous with eyes closed, and 1 minute pulsed with eyes open.

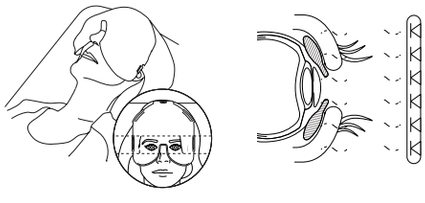
Phase 1

YELLOW LM® LLLT (PBM)

5 min [Continuous Light / Eyes Closed]



1 min [Pulsed Light / Eyes Open]



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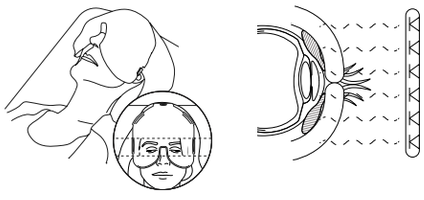
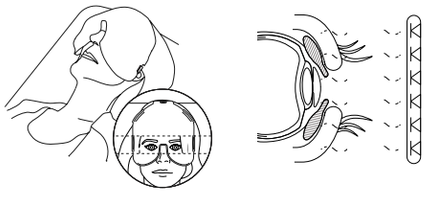
Phase 2

RED LM® LLLT (PBM)

5 min [Continuous Light / Eyes Closed]



1 min [Pulsed Light / Eyes Open]



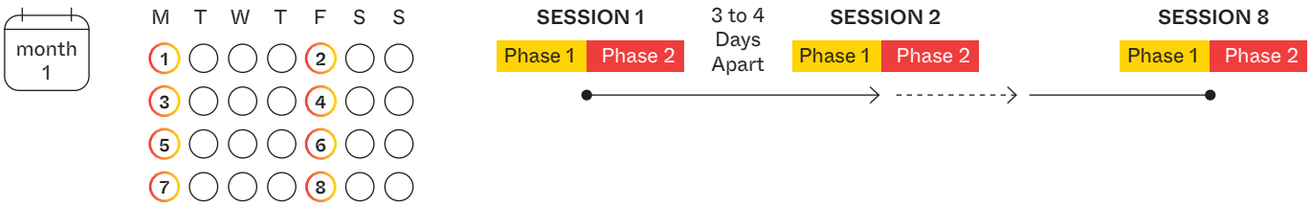
LM® LLLT (PBM)

PATHOLOGY	TECHNOLOGY	iCYCLE 1 → INITIAL > Number of Sessions	mCYCLE 1 → MAINTENANCE CYCLES EVERY 6-9 MO.S > Number of Sessions
dAMD Age-related Macular Degeneration AREDS 2, AREDS 3	LM® LLLT YELLOW > RED	7-8 3 to 4 Days Apart	> 6 3 to 4 Days Apart

↓ FOCUS

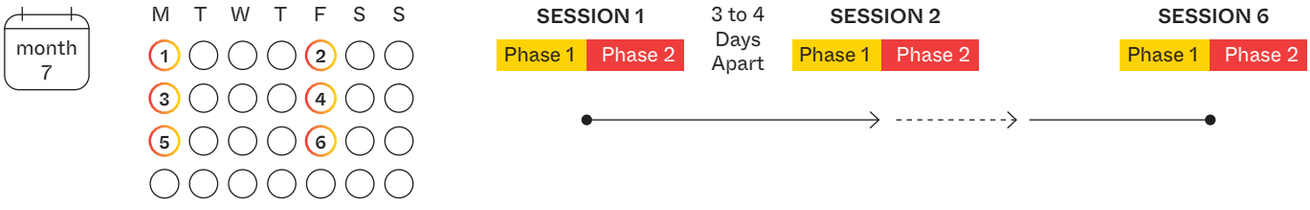
The initial treatment cycle consists of 8 sessions, each conducted 3-4 days apart. After 4 to 6 months, a maintenance cycle can be performed, consisting of 6 sessions, also spaced 3-4 days apart.

iCYCLE 1 → INITIAL



AFTER 4-6 MO.S

mCYCLE 1 → MAINTENANCE CYCLES EVERY 6-9 MO.S



DOWNLOAD ↓
LIGHTWAVE I
CASE REPORT
PRESS RELEASE

LightWave I: First Dry AMD Multi-centric Study

A female subject, aged 68, diagnosed with Age-Related Macular Degeneration (AMD) classified under the Age-Related Eye Disease Study (AREDS) Category 3, was incorporated into the multicentric, randomized controlled investigation termed LightWave I.

At baseline, the subject's best-corrected visual acuity was quantified at 50 letters on the Early Treatment Diabetic Retinopathy Study (ETDRS) chart.

> CASE REPORT #1

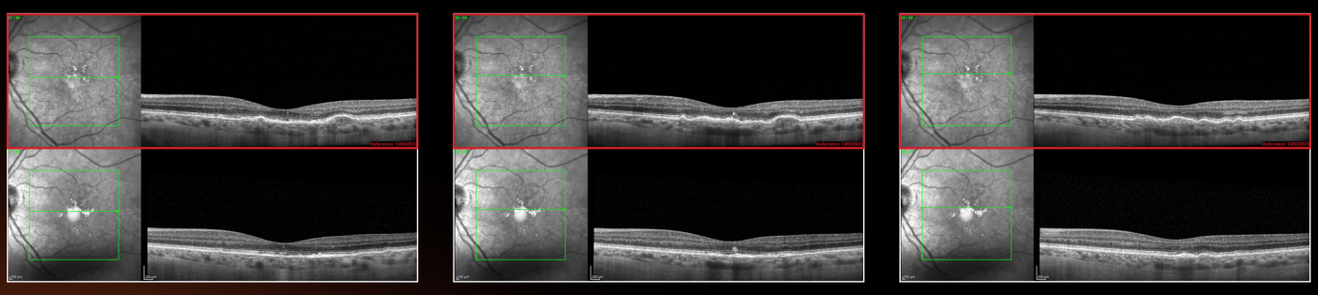
The subject underwent a regimen of photobiomodulation (PBM) employing Light Modulation® Low-Level Light Therapy (LM® LLLT) via the eye-light® system. The treatment protocol entailed bi-weekly sessions spanning a four-week duration.

Subsequent to a one-month interlude post the culmination of the therapy, a reevaluation of the subject's best-corrected visual acuity manifested an enhancement to 55 ETDRS letters. Additionally, a complete resolution of certain soft drusen was observed.

[WOMAN, 68 Y/O, AREDS 3]

CASE #1—Describes a 68-year-old female patient with AMD (AREDS Category 3) witnessed an improvement in visual acuity from 50 to 55 ETDRS letters post-treatment.

① ② ③



Figures 1, 2, and 3, which are retinal images of the identical eye, depict a marked decrement in the volume of drusen within the macular region, corroborating the therapeutic efficacy of the intervention.

NOTE: Presented cases are integral to our multicentric clinical trial, LightWave I, currently underway.

A female subject, aged 72, diagnosed with Age-Related Macular Degeneration (AMD) classified under the Age-Related Eye Disease Study (AREDS) Category 3, was included in the multicentric randomized controlled investigation termed LightWave I.

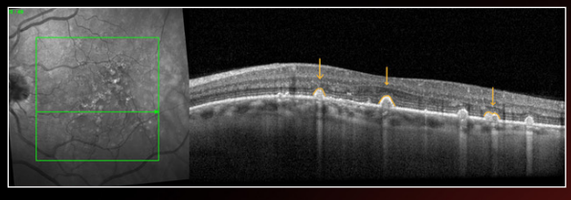
At baseline, the subject's best-corrected visual acuity was quantified at 52 letters on the Early Treatment Diabetic Retinopathy Study (ETDRS) chart.

The subject underwent a regimen of photobiomodulation (PBM) employing Light Modulation® Low-Level Light Therapy (LM® LLLT) via the eye-light® system. The treatment protocol entailed bi-weekly sessions spanning a four-week duration.
Subsequent to a one-month interlude post the culmination of the therapy, a reevaluation of the subject's best-corrected visual acuity manifested anenhancement to 56 ETDRS letters. Additionally, a marked decrement in the volume of certain soft drusen was observed.

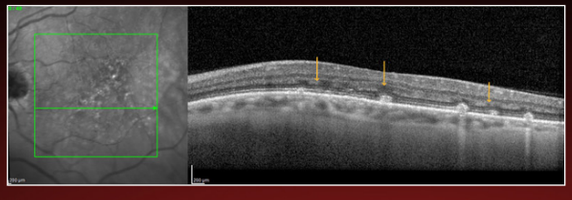
[WOMAN, 72 Y/O, AREDS 3]

CASE #2—Describes a 72-year-old female patient with AMD (AREDS Category 3) witnessed an improvement in visual acuity from 52 to 56 ETDRS letters post-treatment.

①



②



Figures 1 and 2, showing retinal images of the same eye, illustrate a significant reduction in drusen volume, confirming the effectiveness of the treatment.

NOTE: Presented cases are integral to our multicentric clinical trial, LightWave I, currently underway.

A male participant, aged 55, was recruited with a diagnosis of n**on-neovascular age-related macular degeneration**.
The participant underwent a therapeutic regimen of Light Modulation® Low-Level Light Therapy (**LM® LLLT**) through the **eye-light®** solution.

At baseline, the participant's best-corrected visual acuity was ascertained to be 25 letters on the Early Treatment Diabetic Retinopathy Study (**ETDRS**) chart, and Spectral-Domain Optical Coherence Tomography (**SD-OCT**) revealed a substantial pigment epithelial detachment (**PED**) accompanied by **subretinal fluid at its apex.**

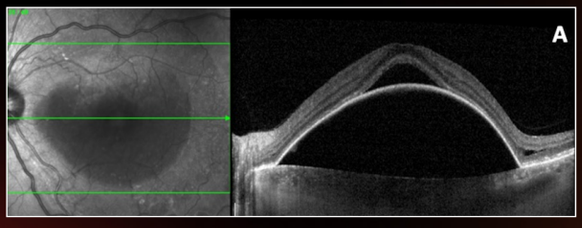
The therapeutic protocol encompassed **one session per week for a duration of four weeks**, followed by one session **bi-weekly for an additional two months.**

At a one-month follow-up subsequent to the final treatment, there was a **complete reabsorption of the subretinal fluid and a collapse of the pigment epithelial detachment, with no residual retinal atrophy. The best-corrected visual acuity was recorded at 60 ETDRS letters.**

[MAN, 55 Y/O, NON-NEOVASCULAR AMD]

CASE #3—Describes a 55-year-old male patient diagnosed with non-neovascular AMD observed a staggering rise in visual acuity from 25 to 60 ETDRS letters, accompanied by pronounced therapeutic effects at the cellular level.

①



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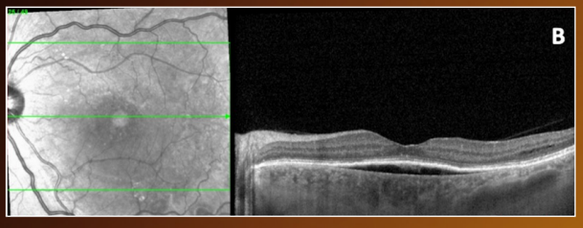

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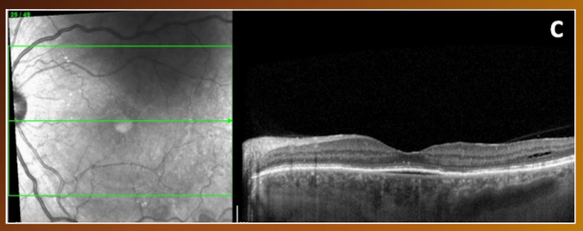

The picture delineates the SD-OCT images at **baseline** [①] which exhibit a pronounced pigment epithelial detachment (**PED**) with **subretinal fluid.** The SD-OCT image at the **one-month follow-up** [②] reveals a flattening of the PED with the persistence of flat PED accompanied by hyper/hyporeflective material. The SD-OCT image at the three-month follow-up [③] demonstrates further flattening of the PED.

NOTE: Presented cases are integral to our multicentric clinical trial, LightWave I, currently underway.

①

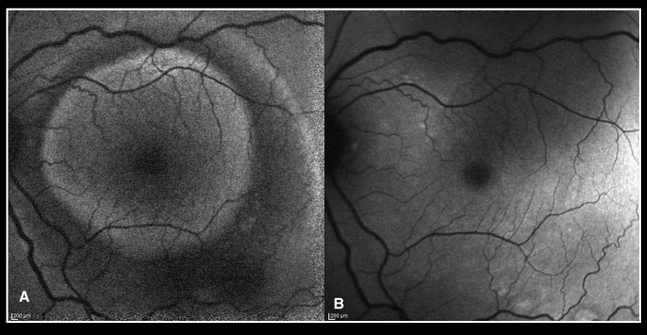

FIGURE ❶

The exhibit portrays the baseline fundus autofluorescence (**FAF**) which exhibits a **hyperautofluorescent** ring at the periphery of the PED.

The three-month follow-up image reveals isoautofluorescence in the macular region without any legacy of retinal pigment epithelial atrophy.

②

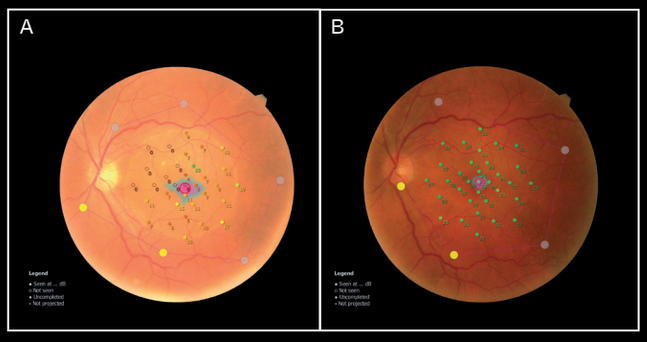

FIGURE ❷

Illustrates the **microperimetry at baseline [A]** which shows a reduction in retinal sensitivity in the macular area with a mean value of 7.4 dB.

The microperimetry at the three-month follow-up [B] exhibits a significant enhancement in retinal sensitivity in the macular area with a mean value of 26.5 dB.

NOTE: Presented cases are integral to our multicentric clinical trial, LightWave I, currently underway.

What are the benefits?

LM® LLLT delivers wavelengths of 590 nm and 630 nm in continuous and pulsed mode addressing independent cellular mechanisms that are important in age-related macular degeneration (AMD). Below are the key benefits offered:

① Visual Acuity Improvement

② Contrast Sensitivity Improvement

③ Central Drusen Volume Reduction

④ Completely Painless Therapy

⚠ dAMD remains a degenerative condition with no cure, but PBM potentially offers:

> Painless & Safe Therapy

> Drusen Volume Reduction w/ No Atrophy

> BCVA Improvement

> Contrast Sensitivity Improvement

LightWave II Seeing Beyond

We're **pioneering** what's next in retinal care through a second wave of **large-scale**, **global**, **multi-centric** research studies.

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Not all solutions and use cases available in all countries. Every piece of information shown ought to be consideredas fact-based evidence deriving from publicly available literature, for the sole purpose of scientific exchange.

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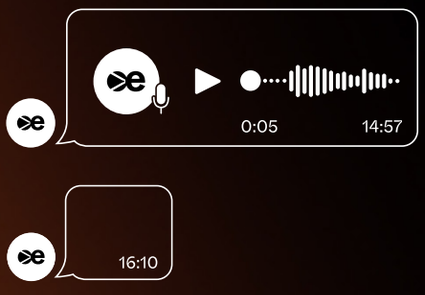
A growing and heterogeneous community of prominent thought leaders actively support us in developing new applications and elevating posterior segment care.

Become Part of our Global Scientific Community!

Throughout the years, valued members of the scientific community have contributed to the resonance of Espansione technologies by publishing a vast array of research and scientific, peer-reviewed papers applications.



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Visit our Scientific Community to connect and grow with fellow innovators.

LM® LLLT
—Our Journey

Founded with a strong focus on anterior segment care, Espansione Group has been a pioneer in ophthalmology, developing and patenting the innovative Light Modulation® LLLT technology.

Science told us. It just works.

Numerous clinical studies validate the effectiveness of LM® LLLT (PBM) in ophthalmology for a wide array of ocular surface conditions, from **MGD** to **Sjögren's Syndrome**, from **Chalazia** all the way to the prevention of **Cataract** and **Refractive Surgery-induced Iatrogenic DED**.

However, **the potential of ocular surface conditions extends beyond** direct treatment of ocular surface conditions, making the Espansione Ecosystem the optimal choice for enhancing your practice.

We have consistently been at the forefront of treating ocular surface conditions such as MGD, DED, and blepharitis, and we are now expanding our expertise to include posterior segment management.

Join us as we continue to challenge the status quo and innovate for the betterment of ocular health.

Discover the Science behind LM® LLLT

No pain,
Extreme gains.

Photobiostimulation therapy enabled by LM® LLLT is a unique kind of near-infrared light therapy (NILT) that's completely painless for the patient —yet extremely effective in managing a vast number of Conditions.

Different wavelengths (Red, Blue, Yellow) are available for various applications, making it a versatile solution for both anterior and posterior segment conditions.

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ON AMD

1. AGE-RELATED EYE DISEASE STUDY 2 (AREDS2) RESEARCH GROUP, et al. Lutein+ zeaxanthin and omega-3 fatty acids for age-related macular degeneration- the Age-Related Eye Disease Study 2 (AREDS2) randomized clinical trial. Jama, 2013, 309.19- 2005-2015.
2. ALBARRACIN, Rizalyn; EELLS, Janis; VALTER, Krisztina. Photobiomodulation protects the retina from light-induced photoreceptor degeneration. Investigative ophthalmology & visual science, 2011, 52.6- 3582-3592.
3. AO, Jack, et al. Safety profile of slit-lampdelivered retinal laser photobiomodulation. Translational Vision Science & Technology, 2020, 9.4. 22-22.
4. BEGUM, Rana, et al. Treatment with 670 nm light up regulates cytochrome C oxidase expression and reduces inflammation in an age-related macular degeneration model. PloS one, 2013, 8.2. e57828.
5. BENLAHBIB, Manal, et al. Photobiomodulation therapy for large soft drusen and drusenoid pigment epithelial detachment in age-related macular degeneration: a single-center prospective pilot study. RETINA, 2022, 10.1097.
6. BOYER et al. LIGHSITE III: 13-Month Efficacy and Safety Evaluation of Multiwavelength Photobiomodulation in Nonexudative (Dry) Age-Related Macular Degeneration. Retina. 2024 Mar.
7. BURTON, Ben, et al. LIGHTSITE II Randomized Multicenter Trial, Evaluation of Multiwavelength Photobiomodulation in Non-exudative AgeRelated Macular Degeneration. Ophthalmology and therapy, 2023, 1-16
8. C TEDFORD et al - Improvement of visual function following photobiomodulation ARVO 2021
9. CANNAS, C. Current Applications and Future Perspectives of Photobiomodulation in Ocular Diseases: A Narrative Review. Appl. Sci. 2024, 14, 2623
10. DE FREITAS, Lucas Freitas; HAMBLIN, Michael R. Proposed mechanisms of photobiomodulation or low-level light therapy. IEEE Journal of selected topics in quantum electronics, 2016, 22.3.348-364.
11. FANTAGUZZI, F. Shedding Light on Photobiomodulation Therapy for Age-Related Macular Degeneration: A Narrative Review. Ophthalmol Ther 12, 2903–2915 (2023).
12. FRANCESCHELLI et al. Short-term effects of extremely low irradiance photobiomodulation on retinal function, in age related macular degeneration Eur J Ophthalmol. 2024 Mar
13. GENEVA II. Photobiomodulation for the treatment of retinal diseases: a review. Int J Ophthalmol. 2016
14. GREWAL, Manjot K., et al. A pilot study evaluating the effects of 670 nm photobiomodulation in healthy ageing and agerelated macular degeneration. Journal of Clinical Medicine, 2020, 9.4. 1001.
15. GOO, H. Multi-Wavelength Photobiomodulation Ameliorates Sodium Iodate-Induced Age-Related Macular Degeneration in Rats. Int. J. Mol. Sci. 2023, 24, 17394
16. IVANDIC, Boris T.; IVANDIC, Tomislav. Low-level laser therapy improves vision in patients with age-related macular degeneration. Photomedicine and laser surgery, 2008, 26.3. 241-245
17. KAYMAK, HAKAN; SCHWAHN, HARTMUT. Photobiomodulation as a treatment in dry AMD. Retina Today. May-June Special Edition, 2020.
18. KOKKINOPOULOS, Ioannis, et al. Age-related retinal inflammation is reduced by 670 nm light via increased mitochondrial membrane potential. Neurobiology of aging, 2013, 34.2: 602-609.
19. MARKOWITZ, Samuel N., et al. A double-masked, randomized, sham-controlled, single-center study with photobiomodulation for the treatment of dry age-related macular degeneration. Retina (Philadelphia, Pa.), 2020, 40.8. 1471.
20. MERRY, Graham F., et al. Photobiomodulation reduces drusen volume and improves visual acuity and contrast sensitivity in dry age-related macular degeneration. Acta ophthalmologica, 2017, 95.4. e270-e277.
21. MERRY, Graham, M. B. B. S., et al. Treatment of dry Age-related Macular Degeneration with Photobiomodulation.
22. MUSTE, Justin C., et al. Photobiomodulation therapy in age-related macular degeneration. Current Opinion in Ophthalmology, 2021, 32.3: 225-232.

23. MUSTE, Justin C.; RUSSELL, Matthew W.; SINGH, Rishi P. Photobiomodulation therapy for age-related macular degeneration and diabetic retinopathy, a review. Clinical Ophthalmology, 2021, 3709-3720.
24. MUNK MR. Photobiomodulation in age-related macular degeneration. Retin Physician. 2022;19:36–39.3
25. RUBNER, Rhianna; LI, Kang V.; CANTO-SOLER, M. Valeria. Progress of clinical therapies for dry age-related macular degeneration. International Journal of Ophthalmology, 2022, 15.1. 157.
26. SAMANTA, Anindya, et al. Emerging therapies in nonexudative age-related macular degeneration in 2020. The Asia-Pacific Journal of Ophthalmology, 2021, 10.4- 408-416
27. SHINHMAR, Harpreet, et al. Optically improved mitochondrial function redeems aged human visual decline. The Journals of Gerontology. Series A, 2020, 75.9. e49-e52.
28. SIQUEIRA, Rubens Camargo, et al. ShortTerm Results of Photobiomodulation Using Light-Emitting Diode Light of 670 nm in Eyes with Age-Related Macular Degeneration. Photobiomodulation, Photomedicine, and Laser Surgery, 2021, 39.9: 581-586.
29. SIVAPATHASUNTHARAM, Chrishne, et al. Aging retinal function is improved by near infrared light (670 nm) that is associated with corrected mitochondrial decline. Neurobiology of Aging, 2017, 52, 66-70.
30. WONG, Wan Ling, et al. Global prevalence of agerelated macular degeneration and disease burden projection for 2020 and 2040- a systematic review and meta-analysis. The Lancet Global Health, 2014, 2.2- e106-e116.
31. ZHANG, Chun-Xia, et al. Considerations for the Use of Photobiomodulation in the Treatment of Retinal Diseases. Biomolecules, 2022, 12.12. 1811.
32. ZHU, Qin, et al. Near infrared (NIR) light therapy of eye diseases A review. International journal of medical sciences, 2021, 18.1, 109

ON AMD

33. AGE-RELATED EYE DISEASE STUDY 2 (AREDS2) RESEARCH GROUP, et al. Lutein+ zeaxanthin and omega-3 fatty acids for age-related macular degeneration- the Age-Related Eye Disease Study 2 (AREDS2) randomized clinical trial. Jama, 2013, 309.19- 2005-2015.
34. ALBARRACIN, Rizalyn; EELLS, Janis; VALTER, Krisztina. Photobiomodulation protects the retina from light-induced photoreceptor degeneration. Investigative ophthalmology & visual science, 2011, 52.6- 3582-3592.
35. AO, Jack, et al. Safety profile of slit-lampdelivered retinal laser photobiomodulation. Translational Vision Science & Technology, 2020, 9.4. 22-22.
36. BEGUM, Rana, et al. Treatment with 670 nm light up regulates cytochrome C oxidase expression and reduces inflammation in an age-related macular degeneration model. PloS one, 2013, 8.2. e57828.
37. BENLAHBIB, Manal, et al. Photobiomodulation therapy for large soft drusen and drusenoid pigment epithelial detachment in age-related macular degeneration: a single-center prospective pilot study. RETINA, 2022, 10.1097.
38. BOYER et al. LIGHSITE III: 13-Month Efficacy and Safety Evaluation of Multiwavelength Photobiomodulation in Nonexudative (Dry) Age-Related Macular Degeneration. Retina. 2024 Mar.
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40. C TEDFORD et al - Improvement of visual function following photobiomodulation ARVO 2021
41. CANNAS, C. Current Applications and Future Perspectives of Photobiomodulation in Ocular Diseases: A Narrative Review. Appl. Sci. 2024, 14, 2623
42. DE FREITAS, Lucas Freitas; HAMBLIN, Michael R. Proposed mechanisms of photobiomodulation or low-level light therapy. IEEE Journal of selected topics in quantum electronics, 2016, 22.3.348-364.
43. FANTAGUZZI, F. Shedding Light on Photobiomodulation Therapy for Age-Related Macular Degeneration: A Narrative Review. Ophthalmol Ther 12, 2903–2915 (2023).
44. FRANCESCHELLI et al. Short-term effects of extremely low irradiance photobiomodulation on retinal function, in age related macular degeneration Eur J Ophthalmol. 2024 Mar

45. GENEVA II. Photobiomodulation for the treatment of retinal diseases: a review. Int J Ophthalmol. 2016

46. GREWAL, Manjot K., et al. A pilot study evaluating the effects of 670 nm photobiomodulation in healthy ageing and agerelated macular degeneration. Journal of Clinical Medicine, 2020, 9.4. 1001.

47. GOO, H. Multi-Wavelength Photobiomodulation Ameliorates Sodium Iodate-Induced Age-Related Macular Degeneration in Rats. Int. J. Mol. Sci. 2023, 24, 17394

48. IVANDIC, Boris T.; IVANDIC, Tomislav. Low-level laser therapy improves vision in patients with age-related macular degeneration. Photomedicine and laser surgery, 2008, 26.3. 241-245

49. KAYMAK, HAKAN; SCHWAHN, HARTMUT. Photobiomodulation as a treatment in dry AMD. Retina Today. May-June Special Edition, 2020.

50. KOKKINOPOULOS, Ioannis, et al. Age-related retinal inflammation is reduced by 670 nm light via increased mitochondrial membrane potential. Neurobiology of aging, 2013, 34.2: 602-609.

51. MARKOWITZ, Samuel N., et al. A double-masked, randomized, sham-controlled, single-center study with photobiomodulation for the treatment of dry age-related macular degeneration. Retina (Philadelphia, Pa.), 2020, 40.8. 1471.

52. MERRY, Graham F., et al. Photobiomodulation reduces drusen volume and improves visual acuity and contrast sensitivity in dry age-related macular degeneration. Acta ophthalmologica, 2017, 95.4. e270-e277.

53. MERRY, Graham, M. B. B. S., et al. Treatment of dry Age-related Macular Degeneration with Photobiomodulation.

54. MUSTE, Justin C., et al. Photobiomodulation therapy in age-related macular degeneration. Current Opinion in Ophthalmology, 2021, 32.3: 225-232.

55. MUSTE, Justin C.; RUSSELL, Matthew W.; SINGH, Rishi P. Photobiomodulation therapy for age-related macular degeneration and diabetic retinopathy, a review. Clinical Ophthalmology, 2021, 3709-3720.

56. MUNK MR. Photobiomodulation in age-related macular degeneration. Retin Physician. 2022;19:36–39.3

57. RUBNER, Rhianna; LI, Kang V.; CANTO-SOLER, M. Valeria. Progress of clinical therapies for dry age-related macular degeneration. International Journal of Ophthalmology, 2022, 15.1. 157.

58. SAMANTA, Anindya, et al. Emerging therapies in nonexudative age-related macular degeneration in 2020. The Asia-Pacific Journal of Ophthalmology, 2021, 10.4- 408-416

59. SHINHMAR, Harpreet, et al. Optically improved mitochondrial function redeems aged human visual decline. The Journals of Gerontology. Series A, 2020, 75.9. e49-e52.

60. SIQUEIRA, Rubens Camargo, et al. ShortTerm Results of Photobiomodulation Using Light-Emitting Diode Light of 670 nm in Eyes with Age-Related Macular Degeneration. Photobiomodulation, Photomedicine, and Laser Surgery, 2021, 39.9: 581-586.

61. SIVAPATHASUNTHARAM, Chrishne, et al. Aging retinal function is improved by near infrared light (670 nm) that is associated with corrected mitochondrial decline. Neurobiology of Aging, 2017, 52, 66-70.

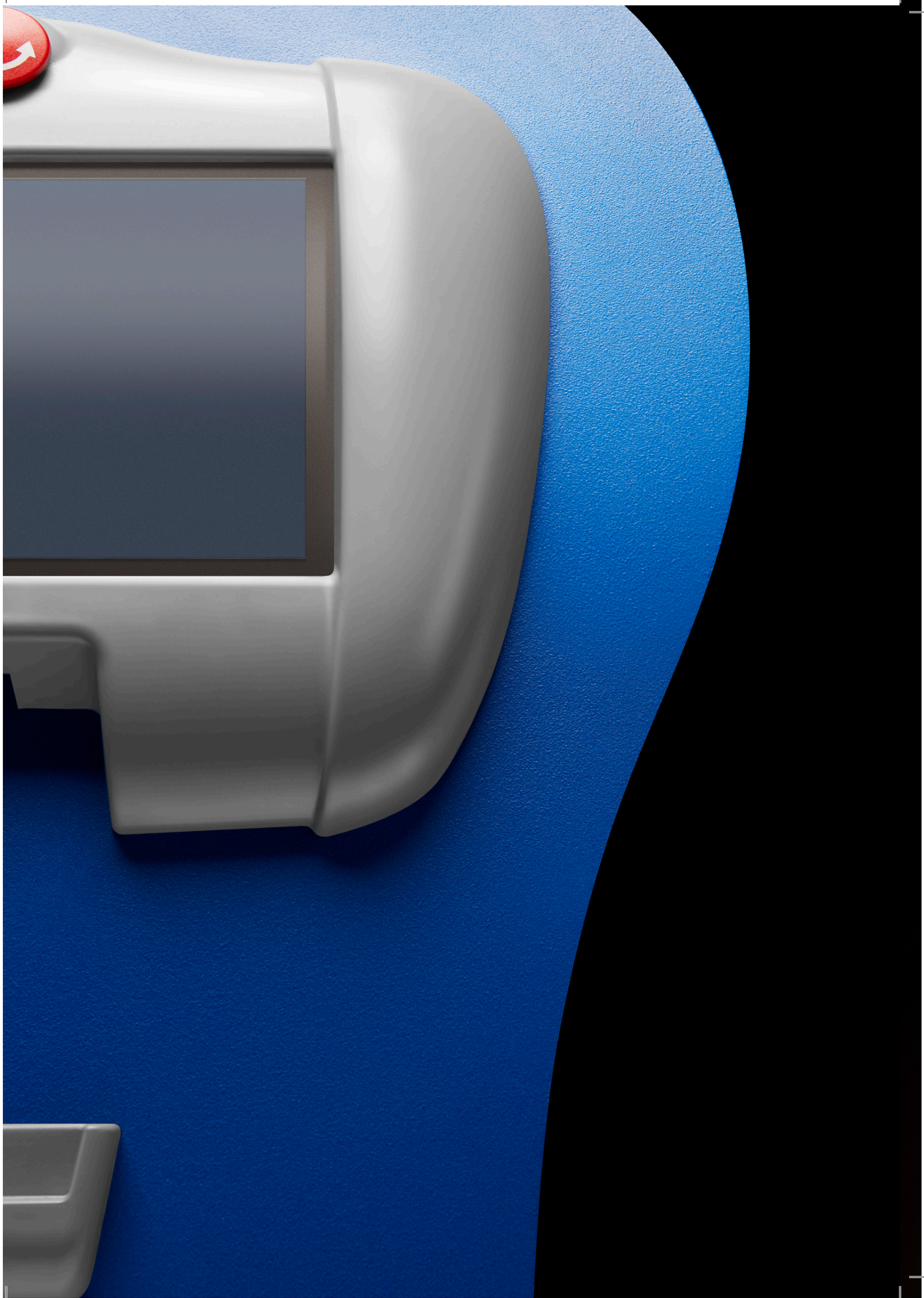
62. WONG, Wan Ling, et al. Global prevalence of agerelated macular degeneration and disease burden projection for 2020 and 2040- a systematic review and meta-analysis. The Lancet Global Health, 2014, 2.2- e106-e116.

63. ZHANG, Chun-Xia, et al. Considerations for the Use of Photobiomodulation in the Treatment of Retinal Diseases. Biomolecules, 2022, 12.12. 1811.

64. ZHU, Qin, et al. Near infrared (NIR) light therapy of eye diseases A review. International journal of medical sciences, 2021, 18.1, 109

ON OTHER RETINAL CONDITIONS

1. CALBIAGUE GARCÍA, Víctor, et al. Evaluation of Photobiomodulation and Boldine as Alternative Treatment Options in Two Diabetic Retinopathy Models. International Journal of Molecular Sciences, 2023, 24.9.7918.
2. GOPALAKRISHNAN, Sandeep, et al. Photobiomodulation preserves mitochondrial redox state and is retinoprotective in a rodent model of retinitis pigmentosa. Scientific Reports, 2020, 10.1- 1-13.
3. LE, Hoang Mai, et al. Effects of Photobiomodulation in Patients Presenting with Reticular Pseudodrusen. A Retrospective Observational Case Series Study. Medicina, 2022, 58.11. 1662
4. MEYER-BOTHLING, Ulrich; MEYER-BOTHLING, Oliver; PINNEY, Marika. A Real-World Single-Centre Study of Patients with Diabetic Macular Oedema Who Wore a Home-Use Sleep Mask (Noctura 400) for One Year. Journal of Ophthalmology, 2021, 2021.
5. SCALINCI, Sergio Zaccaria, et al. Effects of photo-biomodulation in Stargardt disease. Clinical Ophthalmology, 2022, 85-91.
6. TANG, Johnny; HERDA, Ashley A.; KERN, Timothy S. Photobiomodulation in the treatment of patients with non-center-involving diabetic macular oedema. British Journal of Ophthalmology, 2014, 98.8- 1013-1015.
7. WONG-RILEY, Margaret TT, et al. Photobiomodulation directly benefits primary neurons functionally inactivated by toxins, role of cytochrome c oxidase. Journal of Biological Chemistry, 2005, 280.6. 4761-4771.



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