Eye on Macular Carotenoids: Diet and Supplementation Transcript

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Introduction and Guest Welcome

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The other piece I want to also highlight here, not just in the context of children but in infants, is that the macular carotenoids are accumulated as early as during gestation, during pregnancy, within the first trimester of pregnancy.

Welcome to the IQ Podcast. I'm Dr. Ronni Banek, here to help you boost your IQ with powerful insights that connect your eyes, your brain, and your whole body wellness.

This episode was recorded during the iHealth Summit, where the world's leading experts shared breakthrough insights in vision and holistic eye care. Hello everyone and welcome back to the iHealth Summit.

I'm your host Dr. Rani Banik and today it is my honor to introduce my guest Dashani Rai. Dashani Rai is a leader as a vision scientist in the area of the macular carotenoids.

She is part of the team at OmniActive Health Technologies, and she's currently the Vice President of Global Regulatory and Advocacy for OmniActives. Thank you so much for joining us on the iHealth Summit, Dr.

Rai. Thank you for the invitation to be a part of this inaugural event. And kudos, Dr. Banik, for hosting this platform to educate consumers and patients on integrative approaches to support their eye health.

Oh, thank you for your kind words. It really is my mission to get this information out there. And I think some of the topics that we're discussing in the Eye Health Summit are not commonly discussed between patients and their eye care providers.

So it's wonderful to be able to share this important information about how people can be more proactive about their vision health. Dr.

Dr. Rai's Path Into Vision Science

Rai, can you share with us what was your journey into the eye care field? I know that you're a researcher, you're a vision scientist, but what interested you so much about the eye that got you turned on to this topic?

I appreciate that. So a little bit about my journey. I've always believed that science, when appropriately conducted, translated and disseminated, can be used as a lever to help empower self-care and advanced public health.

I grew up in a household that valued using food as medicine. And as a scientist, I also recognized early on that it behooves us to research and understand what is it about certain foods that give it its healing and therapeutic properties.

For example, there's been a lot of buzz around kale and spinach for protecting eye health. But do we know what is it about these vegetables that makes them nutritionally and physiologically beneficial?

In other words, what's in them and how do they work to support vision? So addressing and unraveling these types of questions is what has made me passionate about leveraging science as a tool to advocate nutrition and more specifically certain food components and bioactives and how they can holistically be used to support health in particular, ocular health through all life stages.

In addition to that, I also want to highlight that I'm a firm believer in the power of connections and collaborations

with fellow scientists from academia, government, regulatory agencies, and trade organizations, and how we can all work together to deliver and amplify meaning scientific messages for the benefits of ocular health and therefore public health.

Thank you for sharing those insights into your journey, Dr. Rai. Really, I'm completely in alignment with you when you mentioned the topic of food as medicine.

I myself have seen the incredible benefits of shifting one's diet to a healthier diet to include some of these nutrients as you mentioned, bioactives, to help promote health.

and prevent against disease. Now when it comes to food as medicine, a lot of people have heard about certain types of nutrients that are good for our bodies, for example vitamin D or the omega fatty acids, particularly DHA and EPA, but many people unfortunately have not heard about the macular carotenoids.

which are so important, so critical for healthy vision. I'm going to pick your brain a little bit here about these macular carotenoids. First, could you give us an overview about what they are, what types of compounds are these, and what role do they play in eye health?

And then we'll move on to how can we get these nutrients in our diets. Excellent question and very worthy of a simple but maybe somewhat lengthy explanation.

So let me unpack the answer by first defining the term macula and then subsequently I'll do the same for carotenoids so that we can fully appreciate the unique function in the context of eye health.

So macula is derived from the word macula. The macula is a tiny oval shaped pigmented area within the retina at the back of the eye.

What Macular Carotenoids Are and Why They Matter

The macula is responsible for our central and high resolution vision, which is essential for everyday tasks such as reading, driving, including driving at night, recognizing faces and seeing the fine details of objects, especially those that are at a distance.

The macula is densely packed with photoreceptor cells, the rods and the cones, and it is strategically located close to the optic nerve to facilitate that eye-brain crosstalk and communication.

Now, since the macula is responsible for our central vision, if there's any reduced macular pigment or if there's degeneration of the macula, central vision is compromised.

And eventually this can result in distorted vision or blindness and or blindness. In fact, age-related macular degeneration is one of the most common causes of central vision loss.

So that's the macula and what he does. Now let's turn our attention to carotenoids. Carotenoids are pigments made mainly by plants and they are what gives the plants their red, orange and yellow colors.

Carotenoids help plants absorb light energy for the purposes of photosynthesis. The most common carotenoids in the North American diets are lutein, zeaxanthin, beta-carotene, lycopene, and astaxanthin.

The structural makeup of these carotenoids allows them to be effective quenches of free radicals. What are free radicals? These are molecules that are generated in the body as a result of metabolic reactions and cellular processes.

Therefore, because of their structure, these carotenoids are commonly characterized as antioxidants. But lutein and zeaxanthin are unlike these other carotenoids, beta-carotene, astaxanthin, lycopene.

lutein and zeaxanthin have a couple of unique attributes that are exclusive only to lutein and zeaxanthin. So for example, once we consume and digest the carotenoids from our diets and or from supplements, only lutein and zeaxanthin makes its way to the macula where it is selectively accumulated.

no other carotenoid, not beta-carotene, not lycopene, not astaxanthin, is deposited in the macula. This is why lutein and zeaxanthin are referred to as macular carotenoids.

Now this would be a good time to highlight that these macular carotenoids, lutein and zeaxanthin, cannot be made by the human body. And we are therefore exclusively dependent on our diets, especially certain types of vegetables and fruits and some types of nuts, for example, pistachios, for maintaining adequate levels in the macula.

Now, to address the other part of your question, why are macular carotenoids important for our eyes? I talked about one of the unique aspects of lutein and zeaxanthin is that they are the only carotenoids deposited in the macula within the eye.

Another unique aspect of lutein and zeaxanthin versus the other carotenoids is that they are highly efficient filters of high energy blue light. Blue light is all around us, with the most common sources being sunlight, fluorescent lights, and the display screens of digital devices such as TVs, computers, smartphones, e-books, et cetera.

So why does that matter? The lens of the eye is very efficient in blocking out UV light, but not so good when it comes to blue light. So most blue light that hits the eye passes through the lens and falls on the retina.

And if left unattended, repeated blue light exposure can cause oxidative stress and compromise retinal structure and retinal function. This is where lutein and zeaxanthin accumulation in the macula becomes relevant, wherein these carotenoids absorb and filter out the blue light to protect the retina and support visual function.

Now, also remember, the eye is a highly metabolic organ and therefore vulnerable to oxidative stress. So the amount of lutein and zeaxanthin that is accumulated in the macula determines how efficiently the macula will work to filter out blue light, and equally importantly, to mitigate the effects of oxidative stress.

And this is usually measured in the context of macular pigment optical density. Studies show that lower macular pigment optical densities are directly linked to the lutein and zeaxanthin in the diet and in turn is correlated with markers of vision performance such as your ability to recover your vision after looking at bright lights such as sunlight or when you're driving at night.

The ability to see during low light conditions and also your macular pigment optical density dictates to a large extent the prevalence and severity of digital eye strain because of digital device use.

One last point in terms of why lutein, zeaxanthin, and macular health is important for overall vision performance. Low macular pigment is a risk factor for AMD.

And we know that AMD in most Western countries is a leading cause of blindness. Thank you so much, Dr. Rai, for that eloquent explanation. I think that's the best explanation I've ever heard of what these macular carotenoids are, their function in the eye, and the benefits of having enough of these, the concentration of lutein and zeaxanthin in the macula, as we can measure as macular pigment optical density or MPOD.

So to summarize for our listeners, there are different carotenoids in nature. They have various functions, usually to protect plants. But when we ingest these carotenoids, they can confer the same protective benefits in our bodies.

And in terms of the macular carotenoids, lutein and zeaxanthin, because they're so concentrated in the retina, they protect the retina against oxidative stress.

AREDS2, Zeaxanthin Isomers, and Supplementation

And that is due to various different stressors, particularly blue light. So I oftentimes refer to these macular carotenoids as our internal blue blockers, and also the lens does filter out a lot of UV light, but some UV light can get into the back of the eye.

And the thought is that perhaps that these carotenoids can also help to prevent against UV damage. Is that safe to say, Dr. Rai, that not only can they protect against blue light damage or possibly also other types of photo oxidative stress?

Absolutely correct, yes. And that's mainly because of their ability to absorb light within certain wavelengths. Blue light, of course, for sure, as well as UVA and B light.

Fortunately, the lens at the front of the eye does play a really good role in filtering out most UVA and B light. So the macular, but not so good at blocking out blue light.

And that's where the macular really comes in to block out the blue light. And talking about blue light and digital devices, I do want to highlight at this time, I think this may be the right time to mention this, that blue light blocking glasses are not effective in blocking blue light in the context of mitigating digital eye strain.

It is not recommended, mainly because of the absence of data to show a benefit. Yes. And there have been multiple studies that have failed to show benefit of these blue blocking glasses in preventing many of the symptoms of digital eye strain.

Whereas on the flip side, as you mentioned, Dr. Rye, there are studies to show that these pigments, when we get them in our diet or perhaps from supplementation, which we'll talk about in a moment, can help to relieve some of those symptoms of digital eye strain.

I wanted to just, before we move on more about supplementation, I wanted to have you share with our listeners, you mentioned macular degeneration and how these pigments have been shown to help to protect against macular degeneration.

What is the recommended intake for these nutrients or these bioactive compounds from our diet on a daily basis? Are there any generalized recommendations for lutein and zeaxanthin intake?

In the context of AMD and to a large extent cataract, there's a compelling body of scientific and clinical evidence which points to a minimum of 10 milligrams of lutein and two milligrams of zeaxanthin per day.

I'm really glad you brought up the topic of age-related macular degeneration. According to the CDC, more than 19 million Americans over 40 years of age have vision and eye problems.

And in the absence of effective interventions, the CDC projects that the incidence of age-related conditions such as AMD and cataracts will continue to see steep increases.

And in that vein, the CDC has launched the Vision Health Initiative describing vision loss as a public health problem. So in this context, your question is very relevant with respect to nutritional interventions and the role lutein and zeaxanthin can play, largely supported by the ARETS II study, which was conducted by the National Eye Institute here in the United States, which I believe is the primary and most important work providing gold standard evidence on the benefits of 10 milligrams of lutein and two milligrams of zeaxanthin for delaying the progression of age-related macular degeneration, and likewise for supporting macular health through the life cycle.

Absolutely. So in that particular formulation, the researchers in the AREDS2 formulation used 10 milligrams of lutein and 2 milligrams of zeaxanthin. Correct?

Is that correct? That is correct, absolutely. Yes, and so many of the supplements on the market these days, you will see mirroring that dose. However, I wanted to point out and ask you, Dr.

Rai, there is a third macular carotenoid as well, which is known as mesozyazanthin. Can you tell us a little bit more about that and its role and how we can perhaps obtain that from diet or supplementation?

I really appreciate you asking the question because when I talk about lutein and zeaxanthin for vision, I typically reference zeaxanthin in the context of zeaxanthin isomers.

So you have lutein and you have zeaxanthin isomers. The zeaxanthin isomers, the way I like to reference them, are like two sister compounds that work in concert to support macular health.

Mesozeaxanthin is naturally found in the diet, albeit less abundant abundantly than lutein and RR zeaxanthin. So you have the two isomers of zeaxanthin, you have RR zeaxanthin, and you have RS mesozeaxanthin.

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Again, two sister molecules of zeaxanthin. Their relevance, as demonstrated by very elegant research from Dr. Paul Bernstein's lab and others, is this strategic location within the macula.

And I like to describe it, again, in the context of real estate. It's all about location. And when you look at how these lutein and zeaxanthin molecules orientate in the eye.

You have mesozeaxanthin that's at the center. You have RRRR zeaxanthin around the mesozeaxanthin, and then the lutein comes in and encircles at the periphery.

So Dr. Rai, I like to oftentimes describe this to my patients as you think of the macula as a bullseye. So you have the very center of the bullseye, which is the mesozeaxanthin, that one isomer, the RS zeaxanthin isomer.

And then on the next circle outwards, you have the zeaxanthin or the RR isomer. And then outside of that is lutein. Is that safe to say, Dr. Rai, is that correct?

Very well described, correct, yes. The two isomers of zeaxanthin, their sister compounds, are they interchangeable? For example, if we're having enough sources of zeaxanthin in our diet, for example, can that be translated into more mesozeaxanthin?

Or how do we get the mesozeaxanthin in our system, in our eyes? There is an ability of the eye to convert lutein into mesozeaxanthin, and this happens within the eye.

Having said that the conversion efficiency of lutein being converted to mesozygous antin is relatively poor, which therefore makes logical sense to achieve mesozygous antin from the diet.

And when not possible through the diet, That's when you rely on supplementation. Most supplements, most lutein and zeaxanthin supplements typically would have lutein and RR zeaxanthin.

Few macular carotenoid ingredients like Ludamax 2020 will contain all three macular carotenoids, lutein, RR zeaxanthin and RRS mesozeaxanthin. Yes, you can get zeaxanthin, RR zeaxanthin from the dye, but that does not necessarily mean you are also getting RS mesozeaxanthin.

Understood, understood. Thank you for clarifying that. Dr. Rai, this has been such an intriguing conversation about the macular carotenoids and their benefits for our eye health.

We are going to take a very short break, hear from our sponsor OmniActives, and then we'll be right back with more on the Eye Health Summit.

Macular Carotenoids for Children and Cognitive Health

So please stay tuned. Did you know that most adults spend over 10 hours a day on devices? In our screen-

dominated world, meet your eye's new ally, Fortify.

Fortify is designed to defend your macula against blue light with a potent blend of lutein, zeaxanthin, mesozeaxanthin, and astaxanthin. Fortify also helps to support your optic nerve, retina, and cornea with macchi and bilberry extracts, dincobaloba, and a powerful form of vitamin E called tocotrienol.

From teens to adults, Fortify empowers you for healthier screen time. I'm Dr. Ronni. Don't let screens dim your view. See the world without limits with Fortify.

Science in every capsule. Act now. Visit my website to learn more about Fortify's powerful ingredients and to purchase. Let Fortify be your partner against blue light.

Fortify, empowering your vision. Welcome back everyone to the Eye Health Summit. Today we're learning all about the macular carotenoids with our expert guest, Dr.

Deshani Rai. So Dr. Rai, you were explaining earlier about how these macular carotenoids have been shown in numerous studies to help protect against conditions like age-related macular degeneration and even digital eye strain.

Now, what about, there has been some more recent research about the use of these carotenoids for children and maybe some of the benefits that they may experience with these carotenoids.

Can you explain a little bit more about those research studies that you and OmniActives were involved with? Absolutely. I believe the question in the context of macular health for children is relevant, especially given the fact that children their lens is less is more transparent than that of adults and therefore the light filtering capacity of children's eyes is poor relative to that of adults.

The other piece I want to also highlight here, not just in the context of children, but in infants, is that the macular carotenoids are accumulated as early as during gestation, during pregnancy, within the first trimester of pregnancy.

And the macular carotenoids lutein and zeaxanthin continue to pass between mother and baby even during the breastfeeding period. And studies show that the amount of lutein in zeaxanthin that's passed to the developing feeders and or the developing baby depends to a very large extent on what the mom's eating in her diet.

Now coming fast forward that to the children's study, The study you reference is the first clinical study providing evidence for the benefits of lutein and zeaxanthin supplementation in children.

There have been a bunch of observational studies and epi data speculating that lutein and zeaxanthin can be beneficial in children similar to its benefits in adults.

But there have been no supplementation studies to concretely demonstrate that link. And so specifically what we observed was that supplementation with Ludamax 2020 as the sole source of macular carotenoids in the diet was able to increase macular pigment optical density in these children.

And we talked about macular pigment optical density and I talked about how important it is in the context of vision performance. We also observed that Ludamax 2020 lutein and the zeaxanthin isomers supplementation improved visual processing speed and reduced eye fatigue and eye strain as a result of digital device use.

And as you correctly pointed out, these outcomes replicate earlier macular carotenoid supplementation studies showing similar benefits for both visual performance and cognition in adults.

And I'll touch on cognition in a few seconds. But the goal here is that the study essentially demonstrated that Ludamax 2020 supplementation promoted aspects of cognition related to memory and concentration.

And these findings are really interesting because they are corroborated by earlier observational data showing that

children who have higher dietary intakes of lutein had better cognitive function and performance versus those who had lower dietary intakes of lutein.

And the benefits of lutein, and I call them neuroprotective benefits of lutein, is not surprising, since lutein is also preferentially accumulated in areas of the brain, such as the hippocampus and the frontal cortex, areas that are actively involved in learning and processing information.

Now, the findings are especially overall, collectively, the findings are especially relevant for two key reasons. Number one, most children in the United States, as well as in other countries, are not receiving adequate intakes of lutein and zeaxanthin from the daily diets.

And secondly, Most children exceed the two hour daily screen time limit recommended by the American Academy of Pediatrics. And the negative effects of excessive and prolonged digital device use among children, including digital eye strain and academic performance, is well established.

So, taking all this data generated on this topic collectively, including the supplementation study, reaffirms the importance of establishing dietary recommendations of lutein and zeaxanthin for both children and adults in the context of vision performance and cognitive health.

Thank you for sharing those studies and the results. I wanted to highlight or emphasize two points that you made, Dr. Rai, specifically about children.

One is that on average, most children in the United States get about only one to two servings of fruits and vegetables per day. And that is, unfortunately, woefully inadequate to provide them with the routine that they need for their vision health and their brain health.

So that's one thing. First, there is a gap between what our eyes need and what we're getting through diet across the board, not just children, but actually across the board.

The second point I wanted to highlight is that you mentioned that the American Academy of Pediatrics recommends two hours of screen time for children between the ages of five to 13. Fortunately, recent studies have shown that many children these days are spending six hours or more on devices, so well in excess of that two hours of screen time.

Honestly, so much of our world is on screens and now many schools have shifted to having their students do homework on screens and then of course children go home, they may be playing games on screens, they may be watching television or connecting with friends and family via screen.

So screen time has exponentially increased in this age group and the diet has not kept up to provide us our eyes or children's eyes with the nutrients that we need to keep them healthy.

Let me ask you the supplementation study in children. What was the dose used and how long the dose of Lutamax 2020 that was used and how long were the children given this supplementation?

So it was a 10 milligram dose of lutein and two milligrams of zeaxanthin, again zeaxanthin isomers, RR zeaxanthin and RS mesozeaxanthin. And the reason we targeted 10 milligrams of lutein and two milligrams of zeaxanthin isomers is because it mimics to a large extent what children should be getting from their diets should they be consuming at least 50% of the recommended number of servings of fruit and vegetables.

So that's one piece. And then this study was a six month long patient study. And we observed placebo-controlled, correct?

Supplement Access, Global Availability, and Myths About Carrots

It was a prospective placebo-controlled study, which is really the highest level of scientific rigor that we have in

these types of studies. Exactly. It was randomized, double-blind, placebo-controlled, gold standard in terms of clinical study designs.

Oh, that's wonderful to hear. I wanted to ask you a little bit more, Dr. Rai, about the cognitive benefits. So you mentioned that these nutrients, lutein, zeaxanthin, isomers, can help with the hippocampus and prefrontal cortex.

So I'm assuming that means that translates into memory and cognitive speed, cognitive function. Could you talk a little bit more about that? Yeah, our studies in adults as well as those of other investigators, both in children and adults, clearly points to a benefit of lutein and zeaxanthin intakes either through the diet and or supplementation for cognitive health benefits.

Our studies showed an improvement in processing speed, verbal memory. This is in adults, in composite memory, in children. It translated into episodic memory, concentration, better concentration, focus, collectively aspects of cognitive performance that are necessary to support academic performance.

That's wonderful to know. And I'm sure many of our listeners, after hearing the results of all of these studies, the benefits for digital eye strain, both in adults and in children, as well as the benefits for macular degeneration protection, the benefits for cognitive function, people may be interested, our audience may be interested in maybe including Lutamax 2020 within their supplement regimen, in addition to, of course, getting some of these nutrients through diet, which is the way nature intended.

So if they are looking for Ludamax 2020, where may they find this particular, it's an ingredient, correct? Yes, so Ludamax 2020 is an ingredient that is subsequently incorporated into dietary supplement omulations and brands So I welcome the audience to visit OmniActives.com and you'll get a listing of where you can purchase Ludamax 2020. In other words, which dietary supplement brands contain Ludamax 2020. Wonderful.

And we will include that link right below the interview so everyone has access. And I just wanted to just to echo what you said. So there are multiple brands that have this ingredient, correct?

So it's not just that they have to look for one specific brand or just a few brands. There are multiple brands that provide this ingredient, contain this ingredient.

Exactly. And I do want to say that this ingredient has been and the research behind this ingredient has been translated into product offerings, not just here in the United States, but it's also been registered specifically for eye health benefits in countries like Korea and Japan, Australia and Canada.

So there are dietary supplement brands out there and products. around the world that contain Lutimiramax 2020, including the European Union and South Africa.

Wonderful. It's so reassuring to know that this is a globally really sought out, sought after ingredient because there's so much research behind it. There's been so much work that's gone into showing the many multiple benefits, again, not just vision health benefits, but cognitive benefits as well.

And I can, I just wanted to share with our listeners that, you know, I am a strong believer in food as medicine, but I'm also a strong believer in filling in the gaps when necessary.

And this is a wonderful way to fill in the gaps to really fully support your eye health from the inside out, rather than to try to put a bandaid on it.

Many people oftentimes do with the blue blocking glasses. Yeah, agreed. And I believe in this product so much, Lutamax 2020. It is in my own supplement line.

It's really a key nutrient ingredient in my supplement line. And I'm always telling my patients, even if they don't purchase my line, to look for that ingredient in their supplements.

One thing I did want to ask you, Dr. Rai, we mentioned earlier about the AREDS2 supplement. Does that supplement, that formulation, typically have Lutamax 2020 as its source of lutein and zeaxanthin?

Products that are positioned for AREDS or AMD, rather, yes, there are products out there that would be leveraging Omni-actives, lutein, and zeaxanthin.

That is correct. Look for the logo on the product. Yes. That's what I always tell my… The Lutamax logo. Yeah. Look for the Lutamax logo. That is so helpful, Dr.

Rai. I'm just so honored to have had the chance to chat with you about this. I can see how passionate you are about this topic and how so well-versed you are and how you take such complex concepts and make them very accessible and applicable to vision health.

So thank you for all the work you do. Now, before we end our time together, I wanted to ask you one question, which is there are many myths or misconceptions oftentimes propagated about eyes or eye care, whether that be passed down through the generations or whether that be something on social media that people hear.

Is there any particular myth or misconception about ocular nutrition or particularly about the macular carotenoids that you would love to dispel for our audience today?

Yeah, no, this is a fun one. In regards to ocular nutrition, carrots are typically considered and recommended to be the best vegetable or the best food for our health.

And while there's nothing wrong with carrots, I totally agree. They are indeed a good source of beta-carotene. They are a good source of fiber and other micronutrients.

Relative to vegetables like kale and spinach and peas, carrots are a very poor source of lutein and zeaxanthin. So if you are looking, the method here is don't rely on carrots for all your ocular nutrition needs, especially when it comes to supporting macular health.

diversify your fruit and vegetable intake, because carrots can't do it all. Yes. Well, thank you for saying that. I always say that, and I tell my patients that carrots are the tip of the iceberg when it comes to ocular nutrition.

You may see only 10% of the iceberg, but then there's 90% under the water. So yes, have your carrots, but make sure you're getting that diversity, as Dr.

Rai just mentioned. Have your kale, your spinach, your yellow and orange bell peppers, your egg yolk if you eat eggs, so many other wonderful foods beyond carrots that can provide you with these nutrients, and again supplement.

I'm such a strong believer in supplementation. Just given the amount of time we all spend on screens, it's better to be proactive in protecting our retinal health rather than to risk oxidative stress and damage.

Dr. Rai, again, thank you so much for this enlightening conversation. I really enjoyed learning from you and I hope that people do reach out. We will put the OmniActives link and website down below, so if anyone wanted to look into any of those products, they can access them.

Again, thank you for your time, Dr. Rai, and thank you all for joining us for this session on the iHealth Summit. I look forward to seeing you all very soon for our next episode.

Stay tuned. Thanks for having me. I appreciate it. Absolutely.