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CANADIAN JOURNAL OF OPTOMETRY REVUE CANADIENNE D'OPTOMÉTRIE

VOL 71 NO 4 AUGUST/AOÛT 2009

REMEMBERING DR. FRANCES K. MORNY

NUTRITION & BEHAVIOR

PART TWO / SPECIFIC NUTRIENTS AND THEIR RELEVANCE TO DISEASE

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CONNECTING VISIONS

Every accomplishment starts with a decision to try
Chaque accomplissement commence par la décision d'essayer

by / par KIRSTEN NORTH, OD, PRESIDENT CAO/ PRÉSIDENTE DE L'ACO

Alanna Jankov

Dr. Len Koulton, Past President of CAO, extends a warm welcome during the President's Banquet to Dr. Kirsten North, CAO's new president. | Pendant le banquet du président, Le Dr. Len Koltun, président sortant, souhaite une chaleureuse bienvenue à la Dre. Kirsten North, nouvelle présidente de l'ACO.

I was 13 years old when I decided that this would be my goal in life, to become an optometrist. We had filled in a 100 question aptitude test and optometrist came back in the top five jobs I would be good at. I had no idea what that even was but with a little research soon determined that it was the right job for me. As I tailored my school curriculum to courses aimed at getting into the University of Waterloo School of Optometry, I was told, don't put all your eggs in one basket – it's not that likely you will get into that school. Oh yeah, watch me. A math teacher told me, you are a girl and girls aren't good enough at math so you will never be an optometrist. Oh yeah, watch me. As I handed in my university application with only

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I am pleased that you have given me the opportunity to represent Canadian optometry as your president, and I will bring to this task the same determination I have used to get me this far. I look forward to meeting and working with equally determined optometrists from across this country to keep optometry tops in the minds of the public, politicians, professionals, and others when they think eyecare. If there is something that needs doing, just tell me I can't do it, then watch me.

J'avais 13 ans lorsque j'ai décidé que j'allais être optométriste. Après avoir répondu à un test d'aptitudes de 100 questions, j'ai appris que la profession d'optométriste était au nombre des cinq principaux emplois dans lesquels j'excellerais. Je n'avais aucune idée de ce que c'était, mais une petite recherche m'a vite permis de déterminer que ce serait le bon travail pour moi. Lorsque j'ai choisi mes cours en fonction d'entrer à l'École d'optométrie de l'Université de Waterloo, on m'avait dit de ne pas mettre tous mes œufs dans le même panier, car il était probable que je ne pourrais pas entrer à cette école-là. Ah oui? Regardez-moi bien aller! Un enseignant de mathématiques m'avais dit que je ne serais jamais une optométriste parce que j'étais une fille, et que les filles n'ont pas assez de talent pour les mathématiques. Ah oui? Regardez-moi bien aller! Quand j'ai remis ma demande d'inscription à l'université, sur laquelle j'avais inscrit le nom d'une seule école, on m'avait dit de ne pas miser sur mon premier choix. Ah oui? Regardez-moi bien aller! Après six années d'études à Waterloo, j'ai reçu mon diplôme d'optométriste. J'adore mon travail et tout ce qu'il m'a apporté : une chance de mélanger art et science et de connaître différents patients, la liberté de joindre un cabinet ou d'en être propriétaire, et maintenant la chance de redonner. Un


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This is the Pavilion Roger–Gaudrey building (an architectural landmark) where the grad ceremonies took place.....high on a hill at the University of Montreal.

University of Montreal School of Optometry, Convocation Ceremonies

June 5, 2009

Although it was a short visit I was very pleased to represent CAO and participate in the convocation ceremonies for the School of Optometry at the University of Montreal. The setting was high on a hill in the beautiful Pavillon Roger – Gaudry, which was built in 1943 and is still considered a modern day architectural masterpiece (see photo).

I was given the royal treatment of being seated on stage with other university dignitaries, given the opportunity to speak and was formally introduced.

Dr. Lise-Anne Chasse, President of the Order (College) also presented congratulations and participated in the diploma presentations for those already decided to be licensed to practice in Quebec.

Fifteen donor/sponsors (CAO being one) contributed $500.00 each towards awards, which were presented in six categories – contact lenses, vision sciences, pharmacology, binocular vision, low vision, ophthalmic optics and one 'overall'. Special recognition was given to the IRIS Group for their contribution to the dispensary renovation and the Greiche & Scaff Group for their four scholarship awards.

The event was also a great opportunity to network with Dr. Chasse, Dr. Steven Carrier (Association President), Francois Charbonneau (Association E D), and Marco Laverdiere (legal counsel for the order). Besides discussing scope of practice issues in Quebec, I was informed that their new rep to CAO is a 'young fellow from the Montreal' area...Dr. Claude Neilson. In conversation with past School Director Dr. Claude Beaulne, he informed me that he is enjoying retirement and writing a book on the history of the School in Montreal – which is the 3rd oldest school in North America, established in 1910 (it became affiliated with the U of M in 1925 and fully integrated with the U of M in 1969). I was informed that at the dentistry convocation there were only 38 out of 88 graduates who were from Quebec, or French – most were foreigners.

Betty Lou and I enjoyed talking to many of the 42 graduates (five of whom were male). Most will be staying in Quebec. A few were interested in the CAO Congress in Charlottetown and one 3rd year student was anxious to meet again in Washington for the traditional wine and cheese reception hosted by CAO – for Canadian students attending U.S. schools. I was very pleased that students were appreciative of our visit, receiving a CAO business card and aware that CAO is there for them.

Cérémonie de collation des grades du 5 juin 2009, école d'optométrie de l'um

Malgré la courte durée de ma visite, j'ai été très heureux de représenter l'ACO et de participer à la cérémonie de collation des grades de l'École d'optométrie de l'Université de Montréal. L'activité a eu lieu dans le magnifique et haut perché Pavillon Roger–Gaudry, construit en 1943 et considéré encore aujourd'hui comme une œuvre d'art d'architecture moderne (voir la photo).

On m'a accordé le traitement royal en me faisant asseoir sur scène avec les autres dignitaires de l'université. J'ai eu l'occasion de prendre la parole après avoir été présenté officiellement comme le Dr. Len Koltoun, président de l'ACO. La présidente de l'Ordre, la Dre Lise-Anne Chassé, a aussi présenté ses félicitations et a participé à la remise des diplômes à ceux qui avaient déjà décidé de pratiquer au Québec.

Quinze donateurs/commanditaires (dont l'ACO) ont fait chacun un don de 500 $ pour la remise de prix qui ont été présentés dans six catégories : lentilles de contact, sciences de la vision, pharmacologie, vision binoculaire, basse vision, optique ophtalmique et une catégorie « générale ». On a souligné tout particulièrement la contribution du groupe IRIS à la rénovation du dispensaire, et celle du groupe Greiche & Scaff pour ses quatre bourses d'études.

Cette collation des grades nous a également permis de rencontrer Dre Chassé, Dr. Steven Carrier (président de l'Association), François Charbonneau (DG de l'Association) et Marco Laverdière (avocat pour l'Ordre). Outre les questions entourant le champ de pratique au Québec, Steven m'a aussi informé que le nouveau représentant de l'ACO était « un jeune homme de la région de Montréal »… le Dr Claude Neilson (président de l'ACO de 2001-2002). En conversant avec l'ancien directeur de l'École, le Dr Claude Beaulne, celui-ci m'a informé qu'il trouvait la retraite agréable et qu'il écrivait un livre sur l'histoire de l'École d'optométrie de Montréal – c'est la troisième plus vieille école d'Amérique du Nord, ayant été créée en 1910 (elle s'est affiliée à l'UM en 1925 et y a été pleinement intégrée en 1969). On m'a précisé qu'à la collation des grades en art dentaire, 38 des 88 finissants seulement étaient du Québec, ou francophones – la plupart étaient de l'étranger.

Betty Lou et moi avons aimé parler à bon nombre des 42 diplômés (dont cinq étaient des hommes). La plupart habiteront au Québec. Quelques-uns étaient intéressés au Congrès de l'ACO à Charlottetown et un étudiant de 3e année était impatient de se rendre à nouveau à Washington pour le traditionnel vin et fromage offert par l'ACO aux étudiants canadiens qui fréquentent une école américaine. Les étudiants ont apprécié notre visite et la carte professionnelle que nous leur avons remise, outre qu'ils savaient que l'ACO est là pour eux.

University of Waterloo Awards and Graduation

June 9 – 10, 2009

I wish that every Canadian optometrist could have been there to experience the joy and exhilaration of the 2009 graduates and their families at this year's UW convocation. Canadian optometry is very fortunate indeed to be an integral part of UW as well as having such a high calibre of graduates entering optometric practice. The pomp and ceremony was a most appropriate recognition and acceptance of this new generation of ODs.

My report and photos tell only a small portion of the story of the tremendous pride of being associated with Optometry and the new expanded School of Optometry. I was grateful for the opportunity to address the graduates at the awards ceremony as well as given a tour of this beautiful new facility. The state of the art library, common room, study areas, lecture theatre and TLC laser centre all serve to give our students the best opportunity to learn you could possibly ask for. This tour positively reinforced the need for every Canadian optometrist to continue to support COETF and our

schools. I believe Optometry has a great future and it will surely progress to the next level, if we believe, and we continue to invest.

This year there were 77 graduates, 68 of whom were on the Dean's Honour Roll – meaning that they had an 80%+ average for each of the four years at the School. Once again – brilliant young people who, hopefully, will soon accept the challenge of involvement in their provincial and national optometric associations. A total of thirty awards were presented recognizing expertise in the many clinical aspects of optometry as well as recognition for students who have excelled in spite of personal adversities and hardships experienced during their school years.

I would like to extend sincere congratulations to the 2009 graduates, to Director, Dr. Thom Freddo, professors and staff who so capably administer the newly expanded School and to all the Canadian optometrists who continue to support the future of optometry.

Distinctions et collation des grades à l'Université de Waterloo

9 et 10 juin, 2009

J'aurai aimé que tous les optométristes canadiens soient là pour connaître la joie et l'exaltation des diplômés de 2009 et de leur famille à cette collation des grades de l'université de Waterloo cette année. L'optométrie canadienne est vraiment très fortunée de faire partie intégrante de l'Université de Waterloo et d'avoir un tel calibre de diplômés sur le point d'entrer dans la pratique optométrique. Le faste de cette cérémonie était fort approprié pour souligner et honorer cette nouvelle génération d'optométristes.

Mon rapport et les photos ci-jointes racontent en partie seulement l'immense fierté qui est associée à l'optométrie et à la nouvelle école d'optométrie agrandie. J'ai eu plaisir de prendre la parole devant les diplômés à la cérémonie des grades et de visiter cette magnifique installation. La bibliothèque dernier cri, la salle commune, les salles

The expansion is immediately in front of the old building and has an 'optometric' look and feel to it.....with the acuity letters, the eyes and glass. Subtle yet striking in simplicity and connotation.

d'étude, l'amphithéâtre et le centre de laser TLC donnent tous à nos étudiants la meilleure chance d'apprentissage que l'on pourrait jamais demander. Cette visite a renforcé positivement le besoin pour chaque optométriste canadien de continuer à appuyer financièrement le FFOCE et nos écoles. Selon moi, l'optométrie est promise à un bel avenir et elle passera sans aucun doute au niveau suivant si nous y croyons et si nous poursuivons notre appui financier.

Cette année, 77 diplômés ont reçu leur diplôme, dont 68 sur la liste d'honneur du doyen – cela signifie qu'ils ont eu une moyenne de 80 % ou plus pour chacune de leurs quatre années d'études à l'école. Ici encore, il s'agit de jeunes gens brillants qui, je l'espère, accepteront bientôt de s'impliquer dans leurs associations optométriques provinciale et nationale. En tout, trente distinctions ont été présentées pour souligner la compétence dans les nombreux aspects cliniques de l'optométrie ainsi que pour féliciter les étudiants de leur excellence malgré les problèmes et autres difficultés personnels qu'ils ont connus pendant leurs études.

Je félicite sincèrement les diplômés de 2009, le directeur, le Dr Thom Freddo, les enseignants et le personnel qui ont su si bien administrer la nouvelle école, et aussi tous les optométristes canadiens qui continuent d'appuyer l'avenir de l'optométrie.

Respectfully reported / Respectueusement soumis,
Dr. Len Koltun, CAO President at the time of writing / Président de l'ACO, juin 2009

One Step Forward

BY DR LEN KOULTON, CAO PAST-PRESIDENT

Betty Lou and Dr. Len Koulton give a toast . "It's time to celebrate, and it's time to say good bye." *Thanks for the memories.*

I am very pleased to report on the milestones, achievements and commitments of CAO over the past two years. In spite of the economic turbulence of an unprecedented global financial disruption we continue to move forward, beyond out 100 year history. Not only has optometry survived, but we are transformed and poised as the model for eye care efficiency for the next 100 years. I believe the future of primary eye care in Canada is in our hands!

Life is a bowlful of choices. There is no single answer to our recent success; rather our success has proven the wisdom of our strategies and ever improving internal and external relationships with government, other health care professionals and the public.

Three years ago CAO Council invented a three year, five point strategic plan to help protect and advance the profession. We were intent in our dedication and perseverance in delivering on these commitments as our GPS to guide our actions and allocation of resources, which has proven to be valid and relative even in today's ever changing economic and political times. Our strategic plan concentrated on improved government, inter-professional and public relations, elevating the standard of care, and investing in our infrastructure to support our goals. I would like to extend a sincere thank you and congratulations to our many committees working in parallel and in synergy with each other to implement and help accomplish most of our goals. Some of our most notable highlights and achievements during the past two years have been:

Turning the corner on achieving recognition, trust and status for optometry. Canadian Optometry in 2009 has arrived – I believe we are now truly accepted as an integral player in the eye health care of Canadians. Driven by our commitment to doing what's best for our patients, we can now go forward to the next level of integration, specialization and leadership in vision care.

An 80.2 % successful implementation of the strategic plan, regularly monitored on an award-winning grid template. Some priority highlights included improved government relations resulting in: achieving legislative approval for the restricted sale of cosmetic contact lenses; helping achieve enabling TPA legislation right across Canada; and increased government payment coverage for eye examinations, including emergency care in many provinces.

Successfully implementing a new NPEC public relations campaign – *Your optometrist knows your eye inside and out* – which reinforces our brand of preventive eye health care.

Introducing the Children's Vision Initiative eye care program to six provinces and following up on our belief in the policy that every child should have a comprehensive eye examination prior to entering school.

Sharing in the celebration of the successful expansion at the School of Optometry, University of Waterloo and the renovation at the School of Optometry, University of Montreal.

Improving inter- and intra-professional relationships and collaborations with CNIB, CDC, FMF, COS, NCVH, AOA as well as a conscientious effort

to improve student relations – offering free membership, Facebook communication and initiating the White Coat Ceremony for our Canadian optometry schools – a strengthening of our pipeline.

Emphasizing and supporting the clear, constant and complimentary Communication is the Key theme as an important component for our success as the thread that binds our thoughts and actions. I believe that an informed membership makes us a stronger more unified association, and an informed public will help create that awareness which will elevate our status and recognition of who we are and what we do.

Effective and efficient governance. Improved in-office structural and operational activities have been implemented within budget – investing in the tools to support and the platforms to build our future growth and sustainability. We also adopted a new CAO Councillor Code of Conduct to help guide the professionalism of our actions.

Investing in two major historic vision care studies – 1). Canadian Uncorrected Refractive Error Study (CURES), and 2).The Recommended Frequency of Eye Examinations for the Canadian Population; as well as participating in the Government sponsored NCVH study – to determine the vision care status of Canadians.

Introducing a new member benefit Centennial frame program as another source of non dues revenue.

Participating in Centennial celebrations in Manitoba and Ontario as provinces begin to celebrate the 100th anniversary of their official legislative status in Canada.

Achieving the official legislative suffix designation, CCOA – Certified Canadian Optometric Assistant for our devoted optometric assistants

In closing, it is a pleasure to recognize and extend a sincere thank you and congratulations to CAO Council, our leaders (presidents, vice presidents, executive directors, committee chairs), my Regina Eye Centre colleagues, Executive Director Glenn and the CAO Staff for your professionalism, the great team effort, for all of your respect, support, dedication and friendship during the past two years. As you read through the reports on our many and varied committees I sincerely hope that many more colleagues will become inspired to get involved to help continue to advance the profession. I believe we have been successful because we focus on solutions, because that's how life works. We strategize and execute. We engage in change. We embrace new technologies. We have a history of talent, and being socially responsible. We build alliances, collaborations and social networks. We have a sound but flexible business model. We continue to be financially stable and build a competitive advantage though strategies, execution, sustainability and succession. But, are we there yet? No. There's plenty of heavy lifting ahead. Although we have achieved a 76% satisfaction rating from the membership and an 82.2 % success rate in achieving our stated goals we will need more member involvement and commitment if we are going to get to where we want to be.

I believe optometry is a great profession with a great future, if, since we are a small group, every member gets involved. We are a small craft in a large ocean. We will need everyone's help, faith, commitment and determination if we are going to successfully navigate through whatever stormy seas lie ahead. Success depends on all of us working together. We must all take responsibility for our future. We have a keen eye and a vision for the future. We have a strong strategic position and a great brand, a strong character and a dedicated practitioner workforce. With vision, innovation and action we will succeed. I am optimistic about the future and confident that our balanced strategies will take us to the next level of vision care for Canadians. And, rest assured, CAO is there to help you!

I am very grateful and extremely proud for the opportunity and the honour to have served as your president for the past two years and helped steer the profession that I love. Thank you all for the many memories and mementos of our journey – they are precious pictures on our refrigerator door. It truly cranks me up to be a part of the new optometry and to think that we at CAO have taken the profession one small step forward.

Betty Lou and I and our family extend our profound thanks to all!

Dr. Len Koltun CAO President 2007 - 2009

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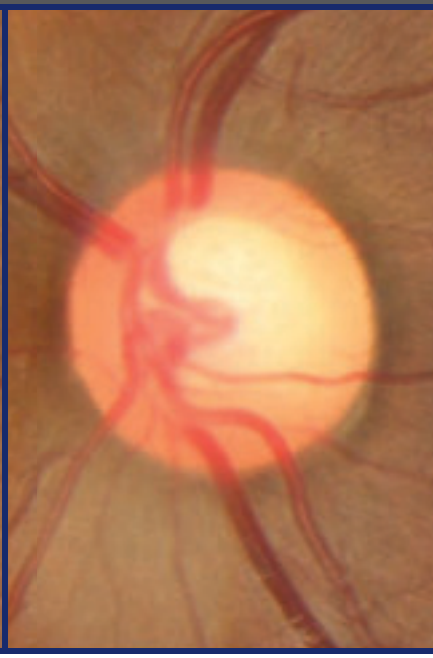

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Top: Dr. Marcy Tong, an optometrist, now living in London UK, takes a photograph of her parents, Betty-Lou and Dr. Len Koulton speaking from the podium during the President's Banquet.

Left: Dr. Reid MacDuff, left, received the CAO President's Award for making a significant contribution to the advancement of the profession of Optometry in Canada. Dr. Ron Harding, to his right, was awarded CAO Honourary Membership for his outstanding contribution to the field of Optometry.

Right: Dr. Len Koulton awards the President's Cup Golf Tournament winner, Dr. Raymond D'Hont with the esteemed cup and a new driver.

Alanna Jankov

Dr. Len Koulton

Dr. Len Koulton

Dr. Len Koulton

Alanna Jankov

Top left: Dr. Irene Mestito-Dao and Dr. Michael Nelson, the co-chairs for the CAO Congress 2011, get cosy with "Morty", the official mascot of the upcoming Congress to be held in Winnipeg.

Top right: Dr. Marlene Reiss and Dr. Len Koulton draw names for a prizes generously donated by our EHCC partners, in a contest designed to promote traffic to their booths during Optofair.

Middle left: Dr. Len Koulton presents a Communication Key pin to Professor Brien Holden, Executive Chair of Optometry Giving Sight, (OGS) and Jane Ebbern, Country Manager of OGS.

Middle right: Thursday night welcome reception hosted by the University of Waterloo.

Left: During the President's Banquet the Class of 1984 (posing with spouses) got together for a 25 year class reunion and raised $10,000 for COETF ad OGS. A fantastic effort.

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Nutrition and Behavior as it Applies to Systemic and Ocular Disease 2009

Specific Nutrients and Their Relevance to Disease

BY LARRY J. ALEXANDER, OD, FAAO

Introduction

While arguable by some, the supplementation of the average diet has considerable support in the refereed medical literature. The following will address the specific supplements and how those supplements may be of benefit to the system. This discussion is not prescriptive, but rather descriptive, attempting to report fact.

Attention to Behavior Modification, Proper Nutrition

Possible positive actions of behavior modification, proper nutrition and exercise in minimizing the risk for the development or progression of ganglion cell and nerve fiber damage in glaucoma and other ocular disease conditions include:

- Normalizing ocular collagen and protecting ocular tissue against the neurotoxicity of glutamate.
- Increasing ocular antioxidant defenses and scavenging harmful free radical molecules.
- Increasing the ocular level of glutathione to improve outflow and minimize antioxidant activity
- Preventing inappropriate release and actions of nitric oxide (NO) and vasoconstrictors from vascular endothelium.
- Improving ocular blood flow
- Minimizing inflammation and modulating the immune system
- Protecting the mitochondria before the process of apoptosis is unstoppable

The primary activity of non-pharmaceutical and traditional medical systems is in modulating the immune system, providing neuroprotection and improving cardiovascular function through action on the mitochondria, the bioenergy center of the cells. That being said, no supplement is of value without a proper diet and exercise to enhance the effect. While genetics impacts on every situation, the switch for the DNA is still subject to outside forces and sources. Studies keep piling up substantiating the importance of a good workout on a regular basis. The latest study points to the fact that increased fitness is associated with 50% to 70% reductions in all-cause mortality.[81] Another new report states that adoption of four healthy lifestyle habits including exercise, eating a diet high in fruits and vegetables, maintaining a healthy weight, and not smoking, in middle age is associated with a 40% reduction in all-cause mortality and 35% reduction in CVD events within 4 years.[82] To carry this a bit further another report suggests that adherence to a prudent diet of vegetables, whole grains, fruit, legumes, fish, and poultry is associated with lower rates of mortality from cardiovascular disease, other causes, and total mortality in female nurses. To contrast, adherence to a Western dietary pattern with high intake of red and processed meats, sweets and desserts, and french fries is associated with higher rates of cardiovascular disease, cancer, and all-cause mortality.[83] More than 60% of the US population is overweight according to the latest National Health and Nutrition Examination Survey (NHANES). [84]

Constituents of a Diet that Support Healthy Systemic and Ocular Function

Vitamin A

Vitamin A is a generic term referring to a number of related compounds. It is available in a preformed variation called retinol found in many animal products. Preformed retinol has been reported as toxic at levels above 10,000 IU. The other form is

natural beta-carotene (carotenoid), which is found in fruits and vegetables and is used to form its own vitamin A.

Carotenoids comprise a class of natural fat-soluble pigments, which are found in numerous fruits and vegetables and are purported to have the characteristic of minimizing photo-oxidative damage to tissue. Retinol is an alcohol and retinal is an aldehyde, both referred to as preformed vitamin A. Retinol, retinal, and retinoic acid are retinoids. Beta-carotene and other carotenoids, that can be converted by the body into retinol, are provitamin A variations. Not all carotenoids synthesized by plants are provitamin A carotenoids.

Retinol reaches the eye through the circulatory system, ultimately accumulating in the retinal pigment epithelium in the form of a retinyl ester. The esters may isomerize to form 11-cis-retinol which can be oxidized to form 11-cis-retinal and transferred to the photoreceptor matrix of the rod where it binds with opsin to form rhodopsin. Absorption of light catalyzes the 11-cis-retinal to all-trans retinal triggering a cascade leading to the electrical signal that is sent through the retinal nerve fibers.

Additionally vitamin A is responsible for the normal functioning of the immune system[85] especially in the skin and mucosal cells.[86] The initial protective system from infection in the body is the mucosal system, specifically immunoglobulin A. Likewise the differentiation of white blood cells is dependant on vitamin A and retinoic acid.[87] Stem cells are also dependent on retinoids for differentiation into red blood cells.[88] Absence of vitamin A from the diet significantly impacts on tear quality and is responsible for the genesis of Bitot's spots associated with severe dry eye. Vitamin A deficiency among children continues to be a leading cause of preventable blindness.[89] Vitamin A deficiency is considered by some to be a nutritionally-acquired immunodeficiency disease because of the importance of vitamin A to the immune system function.[90]

Conflict reigns in the discussion of the benefits of antioxidants and ocular disease. One study reports no strong associations between antioxidant consumption and the risk of primary open-angle glaucoma.[91] Another report suggests that higher intakes of protein, vitamin A, niacin, thiamin, and riboflavin (i.e. vitamin B-complex) are associated with reduced prevalence of nuclear cataract.[92] Intervention trials with large doses of beta-carotene found an adverse effect on the incidence of lung cancer in smokers and workers exposed to asbestos.[93] The results of the Beta-Carotene And Retinol Efficacy Trial (CARET) suggest that high-dose supplementation of vitamin A and beta-carotene should be avoided in people at high risk of lung cancer.[94]

Uses of large dosages of Vitamin A are not without risk and should be approached cautiously. Utilization in the management of retinitis pigmentosa demonstrated that with common forms of retinitis pigmentosa that supplementation with 4,500 mcg (15,000 IU)/day of preformed vitamin A (retinol) significantly slowed the loss of retinal function over a period of 4-6 years. In contrast, supplementation with 400 IU/day of vitamin E increased the loss of retinal function by a small but significant amount, suggesting that patients with common forms of retinitis pigmentosa may benefit from long-term vitamin A supplementation but should avoid vitamin E supplementation at levels higher than those found in a typical multivitamin.[95-96] Both vitamin A serum levels and a fasting lipid profile should be obtained prior to initiation of therapy in all RP patients as there are often liver function issues creating hyperlipidemia issues in these patients.

Hypervitaminosis A is caused by over-consumption of preformed vitamin A, not carotenoids. Preformed vitamin A is rapidly absorbed and slowly cleared from the body. Therefore, toxicity from preformed vitamin A may result acutely from high-dose exposure over a short period of time or chronically from a much lower intake[97] Hypervitaminosis A is characterized by dry skin, loss of appetite, headache, cerebral and optic disc edema, and bone and joint pain. In January 2001, the Food and Nutrition Board (FNB) of the Institute of Medicine set the tolerable upper level of vitamin A intake for adults at 3,000 mcg (10,000 IU)/day of preformed vitamin A for persons over age 19 but lower dosages are recommended for children.[98] Results of some studies indicate that vitamin A intake is not

associated with detrimental effects on bone mineral density (BMD) or create an increased risk for fracture[99-101] while other studies report the opposite.[102-103]

A safe recommendation would be that combined multivitamin supplements should provide no more than 2,500 IU of vitamin A or 5,000 IU of vitamin A, of which at least 50% comes from beta-carotene.

Lycopene

Lycopene is a carotenoid in the same family as beta-carotene. Lycopene gives a tomato and several other fruits, their deep red color. Lycopene is one of the major carotenoids in the diet of North Americans and accounts for close to 50% of the carotenoid distribution found in blood. One study provides the experimental evidence for protective effects of dietary tomatoes rich in carotenoids on oxidative stress in the retinal pigment epithelium.[104] Lutein and lycopene, two prevalent carotenoids in the human diet have become increasingly popular ingredients in dietary supplements. A large body of human and animal research suggests that oral forms of these carotenoids may provide benefits in the areas of eye, prostate, skin and cardiovascular health. The evidence of safety is strong at intakes up to 20mg/d for lutein, and 75 mg/d for lycopene.[105] One study suggests that lycopene protects against experimental cataract development by virtue of its antioxidant properties, and it may be useful for prophylaxis or therapy against cataracts.[106]

Cooking and processing of tomato products makes lycopene more readily available to the body, indicating that there may be an added health benefit to eating processed tomato foods like tomato soup, pasta sauce and vegetable juices. In humans, the bioavailability of lycopene is greater from tomato paste than from fresh tomatoes.[107]

Vitamin B1-Thiamin

Thiamine is a water soluble complex also recognized as vitamin B1. It occurs as free thiamin and in phosphorylated forms. It is a required in conjunction with a number of other nutrients within the processing of enzymes. Beriberi is the result of severe thiamin deficiency appearing in three forms, wet affecting the cardiovascular system, cerebral affecting the nervous system, and dry affecting the muscular systems.[108] Cerebral beriberi can develop into Wernicke's encephalopathy with associated eye movement disorders and vision loss and Korsakoff's psychosis in alcohol abuse.[109-110] Thiamin deficiency may result from both inadequate consumption of thiamin as well as excessive loss of thiamin through the kidneys via disease or diuretic use.[111-113]

Dietary consumption of thiamin has been reported with the development of cataracts. Higher consumption of thiamin reportedly minimizes the risk for cataract development.[113-115] There is also a reported relationship to dementias but the implication is associated more with the enzymatic variations of thiamin rather than pure free thiamin. There is no strong evidence to recommend thiamin supplementation in dementias.[116-120]

Whole grain cereals, legumes, nuts, lean pork and yeast are good sources of thiamin. Most processed foods lose thiamin and must be fortified. There are no established upper levels for toxicity and the FDA recommends about 1.1 to 1.2 mg/day for most individuals.[118]

Vitamin B2-Riboflavin

Riboflavin is a water soluble vitamin also known as B2. Riboflavin is an essential component of coenzymes (flavocoenzymes) functioning in the oxidation-reduction process. Flavocoenzymes are critical in the metabolism of vitamin B6, Niacin and Folic Acid and can thus be instrumental in issues such as hyperhomocysteinemia.[121-123] Riboflavin is also involved in iron metabolism critical to red blood cell formation.[124]

There are suggestions that riboflavin deficiency may precipitate age-related cataracts yet controversy exists in this arena as well.[125-129] There has also been the suggestion that there is a relationship with migraine headaches and riboflavin. The association is purportedly via the mitochondrial oxygen metabolism but success with supplementation is limited by absorption of only 25 mg per day when given orally.[130-134]

New interest has arisen with the suggestion that cross-linking riboflavin and UVA irradiation may be efficacious in the inhibition of progression of keratoconus and the management of microbial keratitis. [135-137]

Cereals, milk, cheese, eggs, almonds and meats are good natural sources and many foods are fortified with riboflavin. There is no upper level of toxic intake of riboflavin and the primary side effect of excesses is flavinuria. The RDA for riboflavin is 1.1 to 1.3 mg per day.

Vitamin B3-Niacin

Niacin is a water-soluble vitamin that is referred to as vitamin B3 or nicotinic acid. Nicotinamide is a derivative used to form coenzymes that function in the oxidation-reduction reactions in the body. The coenzymes include nicotinamide adenine dinucleotide (NAD) and nicotinamide adenine dinucleotide phosphate (NADP), which function in carbohydrate, fat, protein and alcohol catabolism, and synthesis of fatty acids and cholesterol. There is also evidence that NAD functions in cell signaling, transcription, and cell differentiation.[138-140] NAD can be synthesized from tryptophan in conjunction with vitamin B6, riboflavin and iron.

Pellagra is the condition associated with severe niacin deficiency. Pellagra is associated with corn consumption as the primary source of nutrition. Corn contains niacin but in a bound form that is released by heating it in an alkaline solution. Many cultures prepare corn in this manner limiting the occurrence of niacin deficiency. Pellagra manifests as dermatitis, dementia, diarrhea and death as well as accelerated cataract formation.[141-142]

Because of the activity of NAD on cell signaling, there are suggestions that consumption of niacin will decrease the risk of cancers. The research is currently very sketchy but offers some promise in the area of oral cancers.[143-145] Niacin also has implications in conditions like Type 1 diabetes because of the association with the reactive oxygen species (ROS) pathway and relationships to inflammation. While there appears to be some effect with supplementation on Beta Cells of the pancreas, the research is not definitive.[146-148]

The fame of niacin lies in the relationship to cardiovascular disorders and the reported ability to alter blood lipids. Nicotinic acid reduces serum cholesterol and has been shown to reduce triglycerides, recurrent nonfatal myocardial infarction and stroke while increasing HDL when given at three grams per day. This effect is enhanced at lower doses of niacin when combined with statins.[149-153] The effect is dampened by the concurrent use of antioxidants.[154] Additionally, it has been suggested that the use of oral niacin does produce retinal vasodilation and may be of benefit in both ARMD and retinal ischemic disorders [155] but the long term effect on choroidal circulation is questionable.[156]

Food sources of niacin include meat, poultry, red fish, fortified cereals, and legumes. The RDA for niacin is 12 to 16 Niacin Equivalents (NE) per day. 1 mg of NE is equal to 60 mg of tryptophan which equals 1 mg of niacin.

Toxicity is rare from food consumption of niacin but supplementation with nicotinic acid can create flushing, gastrointestinal problems, itching, liver damage, altered glucose tolerance, arrhythmia, and migraine.[157-158] Nicotinamide is better tolerated but still has associations with reactions. The upper tolerable level of niacin consumption is set by the Food and Nutrition Board at 35 mg/day.[159] It has also been reported that oral nicotinic acid may cause a spiking of intraocular pressure[160] as well as cystoid macular edema (niacin maculopathy) at 3 grams per day.[161-162] It has likewise been suggested that ocular surface disorders, discoloration of the periorbital area and loss of eyebrows and lashes may occur with niacin use.[163]

Biotin

Biotin is a water-soluble material that is usually classified as a B vitamin and is required in the body but can only be synthesized by bacteria, molds, algae, yeasts and some plants. It is attached to 5 enzymes-carboxylases. These carboxylases function in metabolic reactions including: synthesis of fatty acids and regulation of mitochondrial fatty acid oxidation, gluconeogenesis, catabolism of leucine (amino acid), and metabolism of some amino acids, cholesterol and fatty acids.[164] Under most circumstances dietary deficiency of biotin does not occur. Raw egg whites and prolonged IV feeding

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may create deficiency that manifests as hair loss and rash with facial fat deposition, depression, lethargy and numbness.[165] Biotin depletion also occurs naturally in pregnancy.[166] While there have been suggestions that biotin supplementation (even with chromium picolinate) may be beneficial in diabetes especially with hypertriglyceridemia, there is no strong indication for recommendation.[167-171] Profound biotinidase deficiency (PBD) is an autosomal recessively inherited disorder that can create optic neuropathy.[172-173] Biotin is obviously critical in the body but it appears to be provided for in the diet in most developed countries.

Food sources of biotin include egg yolk, liver, yeast and pork. The adequate intake level for biotin established by the Food and Nutrition Board of the Institute of Medicine is in the 35 to 60 mcg/day range. There is no established upper level of tolerance for biotin.

Vitamin B5-Pantothenic Acid

Pantothenic acid is found in cells in the form of coenzyme A and is critical to a number of functions. Coenzyme A (CoA) is instrumental in the synthesis of essential fats, acetylcholine, heme and melatonin. Cell signaling (DNA, gene expression and transcription of mRNA) depends on acetylation reactions that are likewise dependant on CoA. [174-175]

Deficiency of pantothenic acid is rare in the typical diet. Bacteria residing in the colon are capable of producing their own pantothenic acid but the research indicates that this form may not be used by the host. Malnutrition may create the deficiency of pantothenic acid if severe. Most research work in B5 is in the area of animals. Food sources abound for pantothenic acid and are highest in fish, chicken and eggs. An adequate intake level appears to be about 5 mg/day for most adults. There is no established upper level of intake. [176-177]

Vitamin B6 – Pyridoxamine, Pyridoxine, Pyridoxal

Vitamin B6 – pyridoxamine – is a water-soluble vitamin discovered in 1930 during nutrition studies on rats. It must be obtained from the diet or from supplements because humans cannot synthesize Vitamin B6. It is critical in the function of many enzymes and the genesis of hemoglobin as well as interacting with gene expression influencing platelet aggregation. Vitamin B6 is critical in maintenance of the thymus and thus the integrity of the immune system. Magnesium is a cofactor necessary in the proper absorption of vitamin B6. More than 100 enzymatic functions depend on the adequate presence of vitamin B6.

An added note is that coincidental supplementation with folic acid reduces the risk of hyperhomocystenemia and thus cardiovascular disease in prone individuals.[178] Most individuals employ two different pathways to metabolize homocysteine. One converts homocysteine back to methionine and is dependent on folic acid and vitamin B12. The other pathway converts excess homocysteine to the amino acid cysteine, which the kidneys flush from the body. This metabolism requires three B vitamin-dependent enzymes, made up of B6, B12 and folate. It has been suggested that the B vitamin, choline and it's metabolite, betaine, are also players in this sophisticated metabolic process.[179-186] One study reports reduced oscillatory potentials suggesting microvascular damage to the retina through homocysteine. Decreased photoreceptor function as well as ganglion cell loss as indicated by pathological flash VEPs may reflect a cytotoxic impact of homocysteine on neurons of the visual pathway. [187]

The phosphate ester derivative pyridoxal 5-phosphate (PLP) is the principal coenzyme form of vitamin B6 and has the most importance in human metabolism.[188] Vitamin B6 deficiency has been associated with impaired immune function, especially in the elderly, because production of immune system white blood cells called lymphocytes, and an anti-inflammatory protein called interleukin-2 (IL-2) are dependent on vitamin B6 intake.

In the brain, the synthesis of the neurotransmitter, serotonin, from the amino acid, tryptophan, is catalyzed by a PLP-dependent enzyme. Other neurotransmitters, such as dopamine, norepinephrine and gamma-aminobutyric acid (GABA), are also synthesized using PLP-dependent enzymes.[189]

Gyrate atrophy of the retina and choroid is a rare autosomal recessive inherited disease, characterized by progressive chorioretinal atrophy

that results in progressive deterioration of peripheral and night vision. Ultimately the condition leads to blindness and is related to hyperornithemia. The exact mechanism of chorioretinal atrophy in hyperornithinemia is not known and a small percentage of the affected people respond to Vitamin B6 supplementation.[190]

It is also recognized that Vitamin B6 is an important co-factor in stimulating the neurotransmitters associated with the blink response and the tear production as well as being a major co-factor in both Omega-6 and Omega-3 fatty acid metabolism. As such, B6 plays a role in maintenance of a healthy tear system.

Vitamin B6 also affects steroid hormones by binding to receptors and inhibiting inappropriate signaling of steroid hormones. There are suggestions that B6 deficiency may be implicated in breast cancer and prostate cancer.[191] Recent studies suggest that women who take birth control pills are almost always deficient in vitamin B6.[192]

Deficiency of vitamin B6 is rare but may occur in conditions related to alcohol excesses. Baked potatoes with skin, bananas, salmon, chicken with no skin, spinach, and avacado all are excellent food sources for vitamin B6. The RDA for adults is about 1.5 to 1.7 mg per day. High doses of pyridoxine (1000 mg/day) may create sensory neuropathy involving pain and numbness in the extremities. The tolerable upper intake level is set at 100 mg/day for adults. [193-194]

Folic Acid

Folic acid and folate both describe the water-soluble B complex vitamin. Folic acid is the more stable form that occurs only rarely in foods or in the body. Folate is the form usually found in foods and the human body.[195] Folate coenzymes mediate the transfer of one-carbon units in a number of reactions critical to the metabolism of nucleic acids and amino acids and play a vital role in DNA metabolism through two different pathways. Those pathways are: 1.) the synthesis of DNA from its precursors (thymidine and purines) is dependent on folate coenzymes; 2.) the synthesis of methionine, and methionine is required for the synthesis of S-adenosylmethionine (SAM).[196] The synthesis of methionine from homocysteine requires the folate coenzyme as well as a vitamin B12-dependent enzyme and as such is intimately involved in hyperhomocysteinemia.

Folate deficiency can result in decreased synthesis of methionine and a buildup of homocysteine. Folic Acid is related to homocysteine levels and elevated homocysteine levels and decreased folic acid levels are related to a number of conditions including dementia. Deficiencies may triple the risk of dementia in the elderly.[197] Vascular disease and elevated homocysteine increase risk for both late-onset depression and Alzheimer's disease and may partly mediate their relationship.[198] Several investigators have described associations between decreased folate levels and cognitive impairment in the elderly.[199-202] In a sample of 1,092

men and women without dementia followed for an average of ten years, those with higher plasma homocysteine levels at baseline had a significantly higher risk of developing Alzheimer's disease and other types of dementia. Those with plasma homocysteine levels greater than 14 micromoles/liter had nearly twice the risk of developing Alzheimer's disease.[203]

The most well-recognized complication of folate deficiency are neural tube defects, anacephaly or spina bifida, in pregnancy. Randomized trials demonstrated 60% to 100% reductions in neural tube defects when women consumed folic acid supplements in the peri-conceptional period. In 1998 there was even FDA legislation mandating folate fortification of all enriched grain products. Unfortunately, compliance is less than ideal resulting in a continuation of a preventable disorder.[204]

Observational studies have found that relatively low folate intake and high alcohol intake are associated with increased incidence of colorectal cancer.[205-206] While dietary folate may be protective against colorectal cancer, high doses may actually accelerate tumor growth in cancer patients with colorectal adenoma.[207] Obviously more research must be performed in this area with better controls for collateral factors. One study reported that women consuming at least one alcoholic drink per day, with folic acid intake of at least 600 mcg daily had about half the risk of breast cancer compared with women who consumed less that 300 mcg of folic acid daily.[208]

Folate deficiency is usually related to dietary insufficiency which may be also associated with mal-absorption issues. Drug interactions may also contribute to deficiencies. NSAIDs in therapeutic dosages may interfere with folate metabolism. Long-term use of anticonvulsants, phenytoin, phenobarbital, and primidone inhibits absorption.[209] Anti-cholesterol agents may also decrease absorption of folate.[210] Methotrexate is a folic acid antagonist which simulates folate deficiency and there is a report of presumed methotrexate induced optic neuropathy reversed with folate supplementation.[211] Trimethoprim, pyrimetamine, triamterene and sulfasalazine may likewise affect absorption.[209]

It is recommended that adults take a 400 mcg supplement of folic acid daily with the tolerable upper limit set at 1000 mcg/day. A supplement regimen of 400 mcg of folic acid, 2 mg of vitamin B6, and 6 mcg of vitamin B12 has been advocated by the American Heart Association if an initial trial of a folate-rich diet is not successful in adequately lowering homocysteine levels.[212] Maximum dosages should not exceed 1 mg/day and all folic acid should be consumed with B12 and B6 to maximize effect and minimize toxicity.

Natural sources of folate include green leafy vegetables (spinach, asparagus), citrus fruit juices, legumes, fortified cereals and grain products. Recently the Food and Nutrition Board of the Institute of Medicine set the new dietary recommendation for folate, introducing a new unit, the Dietary Folate Equivalent (DFE). Implementation of the DFE reflects the higher bioavailability of synthetic folic acid found in supplements and fortified foods compared to that of naturally occurring food folates.[213] For example: 1 microgram (mcg) of food folate provides 1 mcg of DFE, while 1 mcg of folic acid taken with meals or as fortified food provides 1.7 mcg of DFE and 1 mcg of folic acid (supplement) taken on an empty stomach provides 2 mcg of DFE.

Vitamin B12

Vitamin B12 is water-soluble with a very complex chemical structure containing a metal ion, cobalt and as such cobalamin is the term used to refer to compounds having vitamin B12 activity.[214] Methylcobalamin is necessary for the function of the folate-dependent enzyme, methionine synthase and as such is very involved in the homocysteinemia issue. This enzyme is required for the synthesis of the amino acid, methionine, from homocysteine. Methionine in turn is required for the synthesis of S-adenosylmethionine, a methyl group donor used in many biological methylation reactions, including the methylation of a number of sites within DNA and RNA.[215]

Vitamin B12 deficiency is estimated to affect 10%-15% of individuals over the age of 60. Associations with vitamin B12 deficiency are: 1.) an autoimmune condition known as pernicious anemia and; 2.) food-bound vitamin B_{12} mal-absorption. Although both causes become more

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common with increasing age, they are separate conditions.[216] Absorption of vitamin B12 from food requires normal function of the stomach, pancreas, and small intestine. Malabsorption may be associated with issues such as alcoholism and even bariatric surgery. While most address the necessity of avoidance of oral treatment of pernicious anemia, high-dose oral therapy is considered to be as effective as intramuscular injection. [217-220]

Although vitamin B12 deficiency is known to damage the myelin sheath covering cranial, spinal, and peripheral nerves, the biochemical processes leading to neurological damage in B12 deficiency are not well understood. Individuals with Alzheimer's disease often have low blood levels of vitamin B12. One study found lower vitamin B12 levels in the cerebrospinal fluid of patients with Alzheimer's disease than in patients with other types of dementia, though blood levels of vitamin B12 did not differ.[221] Vitamin B12 has demonstrated value in improving retinal function in POAG. Vitamin B12 exerts protective action on glutamate-induced neurotoxicity at the site of the retinal neurons. The signs of nitric oxide neurotoxicity are similar to the nerve impairment and symptoms of a vitamin B12 deficiency that include retinal degeneration and visual loss.[222-227] There are many neurological manifestations of vitamin B12 deficiency. Optic neuropathy is a rare, but important, manifestation of vitamin B12 deficiency that should be suspected in patients with risk factors for malnutrition. Vitamin B12 optic neuropathy is a reversible, treatable cause of vision loss and may be a harbinger for other manifestations of the disease.[228]

The RDA for vitamin B12 is approximately 2.4 mcg/day for adults. No tolerable upper level is set. B12 is synthesized by bacteria present in animal products therefore vegetarians must supplement. Clams, mussels, crab, salmon, rockfish are excellent sources of B12 with beef, chicken, turkey, egg and milk products providing a source as well.

Certain drugs reduce the absorption of B12 and include proton pump inhibitors, gastric acid inhibitors, cholestyramine, chloramphenicol, colchicines and metformin.[229-231] Because vitamin B12 mal-absorption and vitamin B12 deficiency are more common in older adults, some respected nutritionists recommend that adults older than 50 years take up to 100 to 400 mcg/day of supplemental vitamin B12, an amount provided by a number of vitamin B-complex supplements.

Special Topic: Hyperhomocysteinemia as a Systemic and Ocular Risk Factor

Recent studies point to the fact that there is a newly recognized risk factor implicated in systemic vascular disease. This risk factor is homocysteine (Hcy), an amino acid and a basic unit of protein.[232-236] Homocysteine is formed during the metabolism of methionine, an essential amino acid derived from the diet. Mild hyperhomocysteinemia occurs in approximately 5 to 7% of the population who remain asymptomatic until the third or fourth decade when premature coronary artery disease and arterial and venous thrombosis may develop. In the elderly population, hyperhomocysteinemia may be as high as 30 to 40%. A landmark study in 1992 of over 14,000 male physicians found that those with the highest levels of homocysteine had more that three times the risk for heart disease.[237] It has been estimated that hyperhomocysteinemia may be responsible for up to 10% of coronary artery disease (CAD). One study concludes that hyperhomocysteinemia is an independent risk factor for Coronary Artery Disease (CAD) in young patients (below 45 years old) – especially in men – and vitamin B12 deficiency is a preventable cause of hyperhomocysteinemia.[238] Hyperhomocysteinemia, known to be an important risk factor in endothelial dysfunction, seems to be an important determinant in erectile dysfunction (ED). In one study data suggests that slightly elevated homocysteine levels are significantly related with arterial and probably endothelial dysfunction in patients with ED.[239]

Compared with healthy women, those women with rheumatoid arthritis are deficient in vitamin B6 and have elevated levels of homocysteine. This may contribute to the increased risk of cardiovascular events seen with RA. A decrease in RBC folate levels was noted but not plasma levels in RA patients.[240] There is also the link of hyperho-

mocysteinemia to an increase for the risk of hip fracture.[241]

Elevations in homocysteine levels typically are caused by genetic defects in the enzymes involved in homocysteine metabolism or by nutritional defects in vitamin cofactors. Homocystinuria and severe hyperhomocysteinemia are caused by rare inborn errors of metabolism resulting in marked elevations while vitamin deficiencies can raise levels exceeding 100 mmol/L. Homocystinuria is very rare and creates an entirely different clinical picture than hyperhomocysteinemia characterized by mental retardation, skeletal deformities and bilateral lens subluxation.

It is estimated that vitamin deficiency contributes to a considerable number of cases of hyperhomocysteinemia. While there is not definitive evidence whether hyperhomocysteinemia is the cause of complications or if hyperhomocysteinemia is a marker for critical vitamin levels involved in metabolism, current knowledge supports the link to increased vascular risk. Several therapeutic drugs including methotrexate, theophylline, cyclosporine and anticonvulsants also may precipitate hyperhomocysteinemia.

Typically foods rich in Vitamin B12 (Cobalamin), B6 (Pyridoxine) and Folate (Folic Acid) work to keep homocysteine at relatively safe levels. Conversely, low levels of these vitamins correlate to elevated homocysteine levels or hyperhomocysteinemia. Folate seems to be the most effective of the group of three to create a lowering of the homocysteine levels, but synergism with the B vitamin group is critical.

Research in the area of hyperhomocysteinemia suggests that a minimum of 400 mcg of folate in women of childbearing age helps prevent neural tube defects such as spinal bifida and anencephaly in newborns. There is a corollary in vascular disease suggesting that 400 mcg of folate per day is likewise necessary to decrease the levels of homocysteine.[212]

Naturally Occurring Folate

Folate occurs naturally in legumes, leafy green vegetables, liver, some fruits, enriched breakfast cereals, whole grain products, and enriched grain foods. Retention of folate during preparation of foods is critical with freshly prepared foods. Canned foods do not contain similar beneficial levels. The following guidelines should be used in the preparation of foods rich in folate to get the maximum nutritional effect:

- Avoid cutting foods into small pieces
- Cook al dente
- Cook with a minimal amount of water
- Eat foods raw when possible

Hyperhomocysteinemia and Systemic Disease

Elevated homocysteine has been detected in 30% of individuals with coronary vascular disease, 42% of patients with cerebrovascular disease and 28% with peripheral vascular disease.[242-243] Homocysteine has been found to be up to 40 times more predictive than cholesterol in assessing cardiovascular disease risk.[244-245] Damage to blood vessels associated with hyperhomocysteinemia includes injury to arterial endothelial cells and promotion of smooth muscle growth which result in plaque. Hyperhomocysteinemia also disrupts normal blood clotting increasing the risk of thrombi. The strongest links between hyperhomocysteinemia and systemic disease involve the association to vascular occlusive events but other relationships are being discovered. Reports link elevated homocysteine levels to all of the following systemic conditions:[246]

- Increased cardiovascular morbidity and mortality
- 15-30% of patients with premature vascular disease[237]
- 25% of non-diabetic patients under age 55 with heart attacks or stroke have hyperhomocysteinemia versus 5% of those without
- Increased risk of cancer deaths[237]
- Increasing the risk of Alzheimer's disease [247]
- Chronic gastrointestinal disease – irritative bowel disease [248]
- Collagen disorders and osteoporosis [249]
- Chronic renal insufficiency[250]
- Relationship to depression[251-252]

Homocysteine levels should be evaluated in patients with premature ateriovascular disease and a strong family history of:

- Myocardial infarction
- Peripheral vascular disease
- Stroke
- Recurrent pulmonary embolism
- Venous thrombosis

- Renal failure
- Cardiac or renal transplant

Hyperhomocysteinemia and Ocular Disease

Any ocular disease with a relationship to a compromise or alteration of the vascular system system could be implicated in hyperhomocysteinemia. Reports link elevated homocysteine levels to all of the following ocular conditions:

- Primary Open Angle Glaucoma [253]
- Pseudoexfoliation and pseudoexfoliative glaucoma[254] and risk of thromboembolic events in these patients[255]
- Non-arteritic ischemic optic neuropathy especially in younger patients[256-260]
- Neovascular glaucoma in patients with diabetes[261]
- Exudative age related macular degeneration[262-265]
- Retinal vaso-occlusive disease independent of other risk factors especially in younger patients[258, 266-267]
- Retinal emboli[257]
- Behcet's disease[268-273]
- Diabetic retinopathy,[274-276] especially macular edema[277]

Testing for Hyperhomocysteinemia

While some screening tests are available typically the Hcy levels are tested in a fasting plasma situation. After an over-night fast plasma homocysteine levels are measured on a morning specimen collected in a lavender (EDTA) tube. Testing should be done immediately as the blood cells continue to release homocysteine. Enzyme immunoassay is rapid and results in excellent analysis. A methione load challenge may be administered as well in patients suspected of hyperhomocysteinemia but with normal fasting levels.

Optimal levels are considered <10mmol/L but normals usually are considered in the 5 to 15 mmol/L range. Levels over 100 mmol/L are considered severe. Levels tend to increase with age.

Results of a large population-based study have suggested that inflammatory markers are the major determinants of Hcy and vitamin B(6) concentrations. [278]

Recommendations

As a primary eye care practitioner you should be aware of the systemic and ocular health risks of hyperhomocysteinemia. Be aware of the benefits of supplementation and behavioral modification to reduce the health risks associated with the condition. If you as a clinician shy away from recommending vitamin supplements for macular degeneration or are hesitant about recommending lifestyle changes, the work on hyperhomocysteinemia should change your opinion about folate, vitamin B12 and vitamin B6 supplementation. Likewise vitamins E and C are known to work synergistically to facilitate the **folate anti-homocysteine cocktail** If you do nothing else but recommend foods high in the complex supplemented by not more than 400 to 1000 mcg of folic acid per day, 10 to 50 mg of vitamin B6, and 50-300 mcg of vitamin B12 per day, you may impact soundly on ocular and systemic morbidity and mortality in your patients. You should also be aware of the ocular and systemic associations to hyperhomocysteinemia and order blood work on patients with those presentations. In one study folic acid and **N-acetylcysteine** lowered plasma homocysteine levels and improved endothelial function.[279]

It has also been suggested that should folic acid, B12 and B6 not lower homocysteine levels, that 1500 mg of betaine or 2000 mg of choline per day may be of benefit. In a subset of patients, vitamin B2 (riboflavin) was also beneficial in lowering the homocysteine levels.

Along with vitamin supplementation, persons with elevated homocysteine levels should adopt a heart healthy diet and lifestyle including low saturated fat diets, diets low in methionine (meats and eggs), and exercise. Smoking and excessive alcohol consumption may likewise impact negatively on both hyperhomocysteinemia and cardiovascular risk.

Part 3 of this series will be a continuation of the discussion of the specific supplements and their benefits in the management of diseases and disorders.

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Dr. Francis K. Morny

BY / PAR SCOTT D. BRISBIN, OD, LLD, FAAO

The optometric world lost a star this year. Most Canadians have never heard of him. He was Dr. Francis Kojivi Morny. He was the father of African optometry.

I had the privilege of meeting and getting to know him when I was on a 2001 visit to Ghana, as president of the World Council of Optometry. At that time he was 82 years old and had obtained his Doctor of Optometry Degree in Nigeria just four years before. This newly minted OD was no rookie optometrist, however.

As a young man he had taught school on the Gold Coast for a few years before obtaining an ophthalmic optician's diploma from the University of Wales in Cardif. Dr. Morny then followed that up with a post graduate diploma in orthoptics in England. He then traveled to the USA earning his BA and MA degrees by 1955. Through the remainder of the 1950's up to 1962, Francis Morny worked as an optician in both Cardif and Kumasi, Ghana. In 1962, he established the Morny Eye Centre in Kumasi, practicing as an optometrist.

Dr. Morny quickly became a leader in optometry's development not only in Ghana but in Africa as a whole, teaching, establishing schools, writing textbooks, meeting

Dr. Francis K. Morny

with government and academic officials, and relentlessly carving out a future for the profession throughout the continent. He was a tireless advocate – his quiet strength and tenacity won the battles that eventually counted. One of his long fought for goals close to home was the formal legal establishment of optometry as a profession in Ghana. The registration of the Ghana Optometric Association as a registered and recognized professional body by the Government of Ghana, finally became a reality in 2004.

From his first tiny optometry school's two year course with barely enough text books to share, Dr. Morny watched his efforts grow into a four year degree, but he wanted even more for his students and lobbied hard for further expansion. I was present in Accra when it was announced that his efforts would result in a brand new six year OD program at Cape Coast University. Kumasi would be following suit in short order so that now there would be two Doctor of Optometry University programs in Ghana – the same number we have in Canada! Those first graduates are now an active part of Ghana's optometric profession. Although Dr. Morny has received awards and honours too numerous to list, I suspect that these graduates sum up his accomplishments very well. He did not live to see that first graduation day at Cape Coast University. He died just a few months before it. I am, however, certain that his son, Enyam, felt his father's pride as he walked across the stage to receive his Doctor of Optometry Degree. Enyam was part of that historic class.

Dr. Morny did not devote all his energy to optometry. He was very proud of his extremely success-

FROM HIS FIRST TINY OPTOMETRY SCHOOL'S TWO YEAR COURSE WITH BARELY ENOUGH TEXT BOOKS TO SHARE, DR. MORNY WATCHED HIS EFFORTS GROW INTO A FOUR YEAR DEGREE, BUT HE WANTED EVEN MORE FOR HIS STUDENTS AND LOBBIED HARD FOR FURTHER EXPANSION.

ful clinic, of course, but he also gave back to his community in many ways and many times over. He established the first secondary school in his native area and was an inspiration to many as he was also the first university graduate from his community. He deftly used his determination and diplomatic skills to bring electrical power and telephone service to whole areas of his country.

I had the honour of visiting this gentle man and meeting many members of his family in his home in Accra. He was the consummate host and a regal presence in his traditional clothing. Never once did he tire of answering questions from guests who had arrived from near and far, or from a few of us foreigners who were there that evening.

When I left, I was deeply impressed and most grateful to have had the chance to meet Africa's Father of Optometry, Dr. Francis Morny. He will be greatly missed by so many . . .

Although African optometry has had some extremely impressive leaders, the consensus now is that the profession probably exists in Africa because of Francis Kojivi Morny.

Le monde optométrique a perdu récemment une étoile. La plupart des Canadiens n'ont jamais entendu parler de lui. Il s'agit du Dr Francis Kojivi Morny, père de l'optométrie africaine.

J'ai eu le privilège de le rencontrer et de le connaître lors de ma visite au Ghana en 2001 à titre de président du Conseil mondial de l'optométrie. À ce moment-là, il avait 82 ans et avait obtenu son doctorat en optométrie du Nigéria tout juste quatre ans auparavant. Cet optométriste tout nouvellement diplômé n'était cependant pas une recrue.

Dans ses jeunes années, il avait enseigné sur la Côte d'Or pendant quelques années avant d'obtenir un diplôme d'opticien ophtalmique de l'Université du Pays de Galles, à Cardif. Le Dr Morny a ensuite obtenu un diplôme de deuxième cycle en orthoptique, en Angleterre, puis il est allé étudier aux États-Unis en vue de son baccalauréat et de sa maîtrise qu'il a obtenus vers 1955. Pendant le reste des années 50 et jusqu'en 1962, Francis Morny a travaillé comme opticien à Cardif et à Kumasi (Ghana). En 1962, il mettait sur pied le Centre oculovisuel Morny au Kumasi et y pratiquait à titre d'optométriste.

Le Dr Morny est vite devenu un chef de file du développement optométrique non seulement au Ghana, mais aussi dans l'ensemble de l'Afrique, enseignant, créant des écoles, rédigeant des manuels, rencontrant des représentants d'universités et d'administrations publiques et façonnant sans relâche l'avenir de la profession partout sur le continent. C'était un défenseur infatigable – sa force paisible et sa ténacité lui ont permis de remporter les batailles qui ont pris plus tard de l'importance. L'un des objectifs pour lesquels il a longtemps combattu près de chez lui était l'établissement officiel et légal de l'optométrie comme profession au Ghana. L'enregistrement de l'Association optométrique du Ghana comme organe professionnel reconnu par le gouvernement du Ghana est devenu une réalité en 2004.

De son tout menu cours de deux ans à son école d'optométrie où il avait tout juste assez de manuels scolaires pour ses étudiants, le Dr Morny a eu le plaisir de voir ses efforts déboucher sur un cours de quatre ans menant à un diplôme, mais comme il voulait plus pour ses étudiants, il a travaillé d'arrache-pied auprès des gouvernements pour étendre son programme d'études. J'étais présent à Accra lorsqu'on a annoncé que ses efforts donneraient lieu à un tout nouveau programme d'optométrie de six ans à l'Université de Cape Coast. Kumasi suivrait peu de temps après de sorte qu'il y aurait dorénavant deux programmes d'études universitaires menant au grade de docteur en optométrie au Ghana – le même nombre qu'au Canada! Ces premiers diplômés font maintenant activement partie de la profession optométrique du Ghana. Même si le Dr Morny a reçu des distinctions et des honneurs trop nombreux pour être énumérés, je soupçonne que ces diplômés résument très bien ses réalisations. Il n'a pas vécu assez longtemps pour voir la première collation de grades à l'Université de Cape Coast. Il est décédé quelques

mois seulement avant cet événement. Toutefois, je suis certain que son fils, Enyam, a senti la fierté de son père lorsqu'il a accepté son diplôme de docteur en optométrie. Enyam faisait partie de cette promotion historique.

Le Dr Morny n'a pas consacré toutes ses énergies à l'optométrie. Bien sûr, il était très fier de sa clinique extrêmement prospère, mais il a aussi maintes fois redonné amplement à sa collectivité. Il a créé la première école secondaire dans sa région natale et il a été une inspiration pour beaucoup de gens puisqu'il a aussi été le premier diplômé universitaire de sa collectivité. Il a habilement utilisé sa détermination et sa diplomatie pour amener l'énergie électrique et le service téléphonique à de grandes régions de son pays.

J'ai eu l'honneur de rendre visite à cet homme doux et de rencontrer une bonne partie des membres de sa famille à son domicile à Accra. Il était un hôte consommé et il avait une présence majestueuse dans ses habits traditionnels. Pas une fois ne s'est-il lassé de répondre aux questions des invités qui étaient venus le voir de proche ou de loin, ou des quelques étrangers qui lui avaient rendu visite ce soir-là.

Lorsque je l'ai quitté, j'étais très impressionné et très reconnaissant d'avoir eu l'occasion de rencontrer le Dr Francis Morny, le père de l'optométrie en Afrique. Tellement de gens le manqueront…

Même si l'optométrie africaine a eu des dirigeants extrêmement impressionnants, il est maintenant généralement accepté que si la profession existe en Afrique, c'est probablement à cause de Francis Kojivi Morny.

Dr. Scott D. Brisbin
Past President / Ancien président
World Council of Optometry /
Conseil mondial de l'optométrie

CANADIANS &SCREEN TIME BE KIND TO YOUR EYES

OCTOBER IS EYE HEALTH MONTH

your eyes deserve an optometrist®

What is Eye Health Month?

- Eye Health Month is held annually in October by the Canadian Association of Optometrists (CAO) to promote the need for preventive eye care examinations;
- Provincial Optometrists Associations and CAO members play a crucial role during Eye Health Month;
- Nationally coordinated activities include media outreach, television advertising and special programs.

2009 Eye Health Month Theme

Canadians and Screen Time – Be Kind to Your Eyes

This year's campaign will highlight computer vision syndrome as a result of high digital screen time use by Canadians. A survey conducted by Leger Marketing examined Canadian screen time use with a closer look at the Canadian baby boomer population. The survey demonstrated that baby boomers are spending at least seven hours in front of digital screens, with female baby boomers reporting higher usage of digital screens and more eye and vision ailments as a result. Data from the Leger Marketing survey, as well as feedback from a survey conducted by a group of Canadian optometrists was integrated into the media materials, including news releases, key messages and matte stories to be distributed throughout Canada. As well, the materials discuss the rise of computer vision syndrome and encourage comprehensive eye exams. The video news release and audio news release will also be developed in conjunction with the storyline.

Eye Health Month Objectives

- Promote Optometrists as key experts on eye health while providing tips to minimize strain and damage to the eyes;
- Promote practical tips to ease computer eye strain and the advice from Optometrists about relieving tired and irritated eyes.

Topics:

- Computer Eye Strain: Steps for Relief;
- Computer Vision Syndrome and Computer Glasses;
- Worker productivity and Computer Vision Syndrome;
- Children and Computer Vision Syndrome.

Eye Health Month 2009

Public Relations Activities

With the assistance of a public relations firm, CAO will coordinate a range of PR activities leading up to and during Eye Health Month, including:

- National media relations campaign during October including lifestyle publications;

continued on next page

EYE DARE YOU 2008 Winner

Last year's winner, Dr. Elaine Kerr, of Coastal Eyecare Centres hosted the 10th annual Vision Fair in the Comox Valley on Vancouver Island to coincide with Eye Health Month. Six OD's as well as laser centres and ophthalmologists were on-site to answer questions. They also raised funds towards an overseas eye-care project, as well as collecting glasses for it.

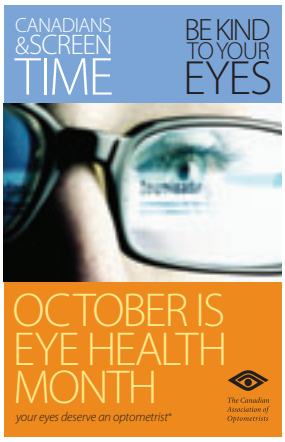
BCAO has promoted more activity in conjunction with Eye Health Month than any other province for three consecutive years.

EXAMPLES OF A FEW OF THE EYE HEALTH MONTH RESOURCES

Print Ad (5" W x 4" H)

Patient Recall Card (5.5" W x 3.5" H)

Poster for Open House (17" W x 11" H)



Theme Poster (5" W x 3.5" H)

- Matte Stories – prepared stories to be available for community newspapers;
- Video News Release – prepared coverage available to television news;
- Audio News Release – prepared coverage available to radio stations;
- Online outreach to parent bloggers, tech bloggers.

In addition, the national television campaign *Your Optometrist Knows Your Eyes Inside and Out* will run in the Fall, 2009 with increased advertising during the entire month of October.

What can CAO members do to promote 2009 Eye Health Month?

CAO members are encouraged to plan activities during Eye Health Month. Meet with colleagues in your practice or community to share ideas and execute! Hold a staff meeting and solicit ideas. We have developed several resources based on this year's Eye Health Month theme which may be downloaded from the CAO Member Portal as follows:

- Hold an Open House – opportunity to profile your practice and promote services/products related to the 2009 EHM theme (download poster and postcard invitation);
- Media Coverage – approach the local media about doing a story on Eye Health Month. Invite the media to visit your practice (download news release templates);
- Advertise as an individual or with your colleagues (download print ads – various sizes);
- Patient recall card – send a recall card using the 2009 EHM theme (download recall card);
- Powerpoint – make a presentation based on 2009 EHM theme (download template for PPT);
- Poster – download a 11x17 or 18x24 Eye Health Month poster and print locally (download posters).

Please email dircomm@opto.ca if you have any problems with the downloads or their specifications.

The member portal has other electronic resources that can be found in the: benefits – resources/public-patient – education section. These may be used for other activities during Eye Health Month.

Eye Dare You Contest

Your participation during Eye Health Month makes you eligible to enter the Eye Dare You Contest. Send an email to dircomm@opto.ca describing what you did to promote Eye Health Month and your name will be entered for every activity. (Three activities means your name is entered three times.) All CAO members who enter are eligible to win a $500 VISA gift certificate.

In addition, the province with the most active members will be given bragging rights as the provincial winner of the Eye Dare You Contest.

The BC Association of Optometrists has won the Eye Dare You Contest for the past 3 years.

MATTE STORY FOR THE MEDIA

Be Kind to Your Eyes

Tips for Minimizing Computer Vision Syndrome

Computer Vision Syndrome or CVS is a condition described by the Canadian Association of Optometrists as various eye and vision symptoms associated with prolonged exposure to digital screens, including computers, television, Blackberries, and cell phones. Symptoms of computer vision syndrome can include eye strain and fatigue, blurred, irritated and dry eyes, double vision and headaches. The majority of Canadians may not even realize they have this condition.

With the evolution of technology, more and more Canadians are spending time on digital screens, a significant increase from five years ago. While it's difficult to avoid the modern day conveniences these technological devices provide, it's important to minimize any strain to your eyes.

Consider these suggestions and give your eyes the break they need.

Follow the 20-20-20 Rule

The Canadian Association of Optometrists recommends for every 20 minutes of screen time, take a 20 second break to blink and focus your eyes on something 20 feet away. This will give your eyes a much-needed break and reduce some of the symptoms mentioned earlier.

Screen Smarts

Take a few seconds to adjust the brightness and contrast of your digital screen. The brightness and contrast should be set at comfortable intensity so that the letters are easily read.

Lighting can make all the difference

Room lighting should be diffused to reduce glare and reflections from your screen. Diffused lighting will help minimize screen glares that may cause squinting and eye strain.

Press "OFF"

If you experience any CVS symptoms, turn off your digital screen and visit your optometrist for a comprehensive eye exam. Ask your optometrist if your glasses are up to date and describe any symptoms you may be experiencing. Your eyes will thank you.

For more information on computer vision syndrome, or to find an optometrist in your area, please visit **www.opto.ca**

Recommended Components of an Eye/Vision Examination for Computer Operators

The unique characteristics and high visual demands of computer work make eye and vision problems the most frequent health related problem experienced by computer operators. Uncorrected vision conditions, poor computer design and workplace ergonomics, and a highly demanding visual task can all contribute to the development of visual symptoms.

The examination should include:

1. A general systemic and ocular health history.
2. A specific patient history relating to computer use. It is recommended that the patient be prepared to provide the following information.
   A. Type of computer work and nature of visual demands.
   B. Number of hours, continuity and time of day for computer work.
   C. Size and color of screen and screen characters.
   D. Position and working distances of computer screen and other visual tasks.
   E. General characteristics of light sources and their locations within the work area.
   F. Nature, severity and frequency of symptoms associated with computer work.
3. Measurement of unaided and aided visual acuity at distance and appropriate near working distances.
4. Evaluation of internal and external eye health, (e.g., ophthalmoscopy, biomicroscopy, tonometry, visual fields, tear analysis, etc.)
5. Refraction at distance and near working distances.
6. Assessment of eye focusing (e.g., accommodative amplitude and facility).
7. Evaluation of eye coordination and eye movement skills (e.g., binocular vision analysis, ocular motility).

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La sixième journée scientifique de l'École d'optométrie | 6th School of Optometry Science Day

« Plasticité et substitution sensorielle » / "Plasticity and Sensory Substitution"

PAR / BY CLAUDE J. GIASSON, OD, PHD
CHRISTIAN CASANOVA, PHD

La sixième journée scientifique de l'École d'optométrie s'est tenue le 3 avril dernier au hall d'honneur et à l'amphithéâtre Ernest-Cormier du pavillon Roger-Gaudry de l'Université de Montréal. Pour une seconde année consécutive, la journée scientifique était organisée conjointement avec le Groupe de Recherche en Sciences de la Vision (GRSV), groupe constitué de chercheurs de l'École d'optométrie et des unités de pédiatrie, pathologie et biologie cellulaire, psychologie, kinésiologie et de génie biomédical de l'Université de Montréal ainsi que du département d'ophtalmologie de l'Université McGill.

Le thème de la journée, « Plasticité et substitution sensorielle » était un coup de chapeau au conférencier invité, le professeur Stephen G. Lomber, PhD professeur agrégé au département de Physiologie et de Pharmacologie et au département de Psychologie du *Centre for Brain and Mind National Centre for Audiology* de l'Université Western Ontario à London. La conférence avait pour titre, « Neuroplasticité adaptative sous-tendant l'organisation cérébrale suite à des lésions centrales et périphériques » Les travaux du laboratoire du professeur Lomber sont guidés par la question : « Quels changements salutaires le cortex cérébral est-il capable d'accomplir afin de préserver la fonction lors de lésions centrales ou périphériques ? » Les trois avenues de recherche suivantes font actuellement l'objet des travaux du laboratoire du professeur Lomber: 1) La réorganisation du cortex visuel après un dommage cérébral pré-ou périnatal; 2) La réorganisation du cortex visuel après des lésions cérébrales chez l'adulte; 3) La réorganisation intermodale du cortex auditif suite à la surdité. La conférence donnée à la journée scientifique qui traitait des performances visuelles améliorées qui sont observées chez des sujets sourds a démontré que ces habiletés visuelles sont le fruit d'une réorganisation intermodale dans le cortex auditif du sourd. De plus, le professeur Lomber a fait l'élégante démonstration de la localisation et dissociation possibles de différents aspects de la fonction visuelle dans le cortex auditif réorganisé du sujet sourd.

Le professeur Lomber a publié plus d'une cinquantaine de publications dans des revues très prestigieuses comme *Nature Neuroscience, Nature reviews in Neuroscience, Experimental Brain Research, Journal of Neurophysiology, Brain, Journal of Comparative Neurology, et Proceedings of the National Academy of Science.*

Les 14 autres conférences et 31 affiches au programme de la journée (figure 2) ont été présentées par des étudiants en optométrie ou des étudiants gradués. Les tableaux 1, 2 et 3 énumèrent ces présentations selon qu'il s'agit d'une conférence ou d'une affiche présentée par un étudiant gradué ou par un étudiant de premier cycle en optométrie.

Cet évènement a été rendu possible grâce à la généreuse contribution des sociétés ou organisations suivantes : Novartis, la caisse Desjardins de Côte-des-Neiges, le Réseau FRSQ de Recherche en Santé de la Vision du Québec et le Groupe de Recherche en Sciences de la Vision (GRSV). De plus, la générosité des commanditaires a permis de distribuer des prix à huit étudiants pour l'excellence de leur travail. La sélection des gagnants a été exécutée par consensus auprès

Photos : Denis Latendress

Conférencier invité de la journée, le Dr. Stephan Lomber / Guest lecturer, Dr. Stephen Lomber

de différents jurys pour chaque catégorie d'étudiants.

Le prix d'excellence du Réseau FRSQ a été décerné à l'étudiant à la maîtrise, Gabriel Duff (MSc), pour sa conférence sur « Le récepteur CB2 et son implication dans le développement du système visuel ». Le prix de la Caisse populaire Desjardins de la Côte-des-Neiges pour la meilleure affiche de recherche clinique a été remporté par Andrée Mainville et Nathalie Trottier (doctorat en optométrie) pour leur affiche : « Tonométrie Goldmann chez les porteurs de lentilles cornéennes en silicone-hydrogel ». Frédéric Lebrun-Julien (doctorat) s'est mérité le prix du Groupe de Recherche en Sciences de la Vision pour la meilleure présentation orale pour sa conférence intitulée « La mort par excitotoxicité des neurones rétiniens est un mécanisme cellulaire non autonome ». « Expression des nétrines dans la rétine de souris adulte » par – Mathieu Simard (maîtrise) a été choisie comme la meilleure présentation par affiches par le GRSV. Quant au prix de l'École d'optométrie pour la meilleure affiche scientifique il a été décerné à l'équipe de Jean-Robert Lalonde et Stéphane Rivard (doctorat en optométrie) pour leur présentation intitulée « Étude du seuil à la résistance aux éclats de trois matériaux ophtalmiques – ». Enfin, le prix du public de l'École d'optométrie pour la présentation recueillant le plus de suffrages populaires a été accordé à Jean-Marie Hanssens (doctorat) pour la présentation « Mes lunettes me font-elles tomber ? ».

The School of Optometry held its sixth Science Day on April 3 at Université de Montréal, in the Hall of Honour and the Ernest Cormier Amphitheatre of the university's Roger Gaudry Building. For the second consecutive year, the event was jointly organized with the Groupe de Recherche en Sciences de la Vision (GRSV), a group composed of researchers from Université de Montréal's School of Optometry and pediatric, cell pathology and biology, psychology, kinesiology and biomedical engineering units, as well as McGill University's Department of Ophthalmology.

The event's theme, "Plasticity and Sensory Substitution", was the subject of an excellent address by guest lecturer Professor Stephen G. Lomber, Ph.D, an associate professor in the Department of Physiology and Pharmacology and the Department of Psychology at the University of Western Ontario's *Centre for Brain and Mind National Centre for Audiology*. The title of the conference was "Adaptive Neuroplasticity Underlying Cerebral Organization following Central and Peripheral Brain Injuries". Professor Lomber's laboratory work is guided by the question: "What beneficial changes is the cerebral cortex capable of making to preserve function following

Présentation des affiches dans le hall d'honneur de l'Université de Montréal. / Presentation of posters in Universitè de Montréal Hall of Honour.

a central or peripheral brain injury?" His current laboratory work consists of the following three avenues of research: 1) Reorganization of the visual cortex following pre-or perinatal brain damage; 2) Reorganization of the visual cortex following brain injury in adults; and 3) Intermodal reorganization of the auditory cortex after the onset of deafness. The Science Day conference, which concerned improved visual performance in deaf subjects, demonstrated that these visual abilities are the result of an intermodal reorganization in the deaf person's auditory cortex. Professor Lomber also elegantly demonstrated the possible location and dissociation of different aspects of the visual function in a deaf subject's reorganized auditory cortex.

Professor Lomber has published more than 50 articles in prestigious journals such as *Nature Neuroscience, Nature Reviews in Neuroscience, Experimental Brain Research, Journal of Neurophysiology, Brain, Journal of Comparative Neurology,* and *Proceedings of the National Academy of Science.*

The event's other 14 conferences and 31 posters were presented by optometry undergraduate students or graduate students. Tables 1, 2 and 3 provide a list of these presentations.

This event was made possible by the generous contribution of the following companies or organizations: Novartis; the *Caisse Desjardins de Côte-des-Neiges*; the FRSQ's *Réseau de Recherche en Santé de la Vision*; and the *Groupe de Recherche en Sciences de la Vision* (GRSV). The generosity of

TABLEAU 1 / TABLE 1

Communications orales réalisées par des étudiants gradués / Graduate Student Oral Presentations

TITRE DE LA PRÉSENTATION / PRESENTATION TITLE	ÉTUDIANT / STUDENT
A – Where is the a-wave?	Marie-Lou Garon
B – Les cannabinoïdes modulent la formation de synapses dans le cortex cérébral au cours du développement (Cannabinoids Alter Cerebral Cortex Synapse Formation during Development)	Pierre-Camille Gillet
C – Corrélats neuronaux des habiletés du déplacement spatial chez l'aveugle de naissance (Neuronal Correlates in Spatial Orientation Abilities among People Blind from Birth)	Daniel-Robert Chebat
D – Succinate et GPR91 ; rôle dans la revascularisation cérébrale (Succinate and GPR91: Role in Cerebral Revascularization)	David Hamel
E – Régulation de l'oxygénation du sang choroïdien : comparaison de différents stimuli couramment utilisés (Regulating the Oxygenation of Choroidal Blood: Comparison of Various Currently Used Stimuli)	Pierre-Jean Bernard
F – Mesures d'oxygénation sur les vaisseaux sanguins de la région fovéale par spectroréflectométrie (Measuring the Oxygenation of Foveal Region Blood Vessels by Spectral Reflectometry)	Valentina Vucea
G – Réalité virtuelle en immersion totale, perception du mouvement biologique et vieillissement (Full Immersion Virtual Reality, Perception of Biological Movement and Ageing)	Isabelle Legault
H – Les habiletés navigationnelles des aveugles de naissance ; résolution de labyrinthes tactiles (Navigational Abilities in People Blind from Birth: Solving Tactile Labyrinths)	Léa Gagnon
I – Anatomical Interaction among Cholinergic Fibers, Dopaminergic Fibers, and Pyramidal Cells in the Rat Medial Prefrontal Cortex	Zi Wei Zhang
J – Kinetics of the Light-Induced Retinopathy in Juvenile Albino Sprague Dawley Rats	Wenwen Liu
K – Le récepteur CB2 et son implication dans le développement du système visuel (The CB2 Receptor and its Role in Visual System Development)	Gabriel Duff
L – La mort par excitotoxicité des neurones rétiniens est un mécanisme cellulaire non autonome (Retinal Neuron Death by Excitotoxicity is a Non-Cell-Autonomous Mechanism)	Frédéric Lebrun-Julien
M – La synchronisation des décharges de paires de neurones dans V1 est associée à des configurations spécifiques de stimuli en mouvement (Synchronization of V1 Neuron Pair Discharges is Associated with Specific Motion Stimuli Configurations)	Abdellatif Nemri
N – Étude du débit sanguin rétinien en conditions hypercapniques chez le rat par débimétrie au laser par effet Doppler (LDF) (Study of Retinal Blood Flow in Hypercapnic Conditions among Rats, by Laser Doppler Flowmetry (LDF))	Simon Hétu

the sponsors also allowed us to award prizes to eight students for their excellent work. Winners were chosen by consensus by different panels of judges for each student category.

The FRSQ Award of Excellence went to Master's student Gabriel Duff (M.Sc.), for his conference entitled « Le récepteur CB2 et son implication dans le développement du système visuel (The CB2 Receptor and its Role in Visual System Development) ». The Caisse populaire Desjardins de la Côte-des-Neiges award for best clinical research poster went to Andrée Mainville and Nathalie Trottier (Optometry Ph.D. students) for their poster: « Tonométrie Goldmann chez les porteurs de lentilles cornéennes en silicone-hydrogel (Goldmann Tonometry in Wearers of Silicone Hydrogel Contact Lenses) ». Frédéric Lebrun-Julien (Ph.D. student) received the Groupe de Recherche en Sciences de la Vision award for best oral presentation for his conference entitled « La mort par excitotoxicité des neurones rétiniens est un mécanisme cellulaire non autonome (Retinal Neuron Death

by Excitotoxicity is a Non-Cell-Autonomous Mechanism) », while « Expression des nétrines dans la rétine de souris adulte (Netrin Expression in the Retina of Adult Mice) » by Mathieu Simard (Master's student) was the GRSV's choice as best poster presentation. The School of Optometry award for best science poster went to the team of Jean-Robert Lalonde and Stéphane Rivard (optometry Ph.D. students), for their presentation entitled « Étude du seuil à la résistance aux éclats de trois matériaux ophtalmiques (Study of Resistance Thresholds to the Flashes of Three Ophthalmic Materials) ». Lastly, the School of Optometry award for most popular presentation went to Jean-Marie Hanssens (Ph.D. student) for « Mes lunettes me font-elles tomber (Do my Glasses Make me Fall)? ».

TABLEAU 2 / TABLE 2

Affiches réalisées par des étudiants gradués / Graduate Student Posters

TITRE DE LA PRÉSENTATION / PRESENTATION TITLE	ÉTUDIANT / STUDENT
1 – Expression des nétrines dans la rétine de souris adulte (Netrin Expression in the Retina of Adult Mice)	Mathieu Simard
2 – Is there a Relationship between Neuronal and Vascular Protection in Experimental Glaucoma?	Mohammadali Almasieh
3 – Localisation du système des endocannabinoïdes dans la rétine du primate non humain (Location of the Endocannabinoid System in the Retina of Non-Human Primates)	Joseph Bouskila
4 – Le récepteur CB1 module le développement des projections rétiniennes (The CB1 Receptor Alters the Development of Retinal Projections)	Anteneh Argaw
5 – Dendritic Remodeling of Retinal Ganglion Cell Precedes Neuronal Death in the Injured Adult Eye in Vivo	Barbara J. Morquette
6 – Mise en evidence par l'imagerie optique de l'organisation modulaire de l'aire corticale 21a chez le chat (Use of Optical Imagery to Highlight the Modular Organization of Cortical Area 21a in Cats)	Matthieu Vanni
7 – Effet de l'hyperoxie systémique sur les potentiels oscillatoires émis par la rétine humaine adaptée à l'obscurité (Effect of Systemic Hyperoxia on Oscillatory Potentials in Dark-Adapted Human Retinas)	Guillaume Carcenac
8 – Hierarchical Linear Modeling of Anatomical Change Over Time: Bevacizumab with or without PDT	Sara Dubuc
9 – Developmental Expression of the NAPE-PLD, CB1 Receptors, and FAAH in Rat Retina	Nawal A. Zabouri
10 – Mes lunettes me font-elles tomber (Do my Glasses Make me Fall)?	Jean-Marie Hanssens

TABLEAU 3 / TABLE 3

Affiches réalisées par des étudiants de quatrième année en optométrie / Fourth-Year Optometry Student Posters

TITRE DE LA PRÉSENTATION / PRESENTATION TITLE	ÉTUDIANT / STUDENT
11 – Étude sur l'efficacité de la LIO Tecnis MF® en comparaison avec la LIO AcrySof ReSTOR +3D® (Study on the Effectiveness of Tecnis MF® IOL vs. AcrySof ReSTOR +3D® IOL)	É. Bednikoff, M. Koala
12 – Comparaison des performances de deux lentilles cornéennes faites de silicone hydrogel (Comparing the Performance of Two Silicone Hydrogel Contact Lenses)	J. Bélanger, A. Raymond

TABLEAU 3 / TABLE 3 (continu /continued)

TITRE DE LA PRÉSENTATION / PRESENTATION TITLE	ÉTUDIANT / STUDENT
13 – Étude comparative des lentilles cornéennes en silicone hydrogel A et lotrafilcon B dans le soulagement de l'oeil sec (Comparative Study of Silicone Hydrogel A vs. Lotrafilcon B Contact Lenses in the Relief of Dry Eyes)	V. Bougie-Bastien, M. Coronati
14 – L'effet des aberrations monochromatiques de troisième et de quatrième ordre sur la sensibilité au contraste (Effect of Third- and Fourth-Order Monochromatic Aberrations on Contrast Sensitivity)	S. Bourget-Coulombe, S. Caron
*15 – Temps requis pour obtenir une cycloplégie complète chez les enfants (Time Required to Obtain Full Cycloplegia in Children)	M. Brousseau, T. Fisher
16 – Optimisation de l'usage prophylactique d'Acétate de prednisolone 1% pour la prévention de la kératite diffuse lamellaire suite au LASIK (Optimizing the Prophylactic use of Prednisolone Acetate 1% to Prevent Diffuse Lamellar Keratitis following LASIK Treatment)	S. Djouahra, C. Poisson
17 – Étude comparative de l'adaptation personnalisée vs courante des lentilles cornéennes souples (Comparative Study of Custom vs. Regular Fitting for Soft Contact Lenses)	J. Doucet, S. Hurens
18 – Étude comparative de la performance des lentilles Pure Vision™ adaptées en monovision ou en multifocales chez des patients presbytes (Comparative Study of the Performance of Pure Vision™ Monovision vs. Multifocal Lenses in Presbyopic Patients)	C. Lavoie, MÈ. Magnan
19 – Comparaison des différentes méthodes de mesure de l'hétérophorie subjective (Comparison of Different Methods for Measuring Subjective Heterophoria)	S. Lefebvre, AA. Masse
20 – Tonométrie Goldmann chez les porteurs de lentilles cornéennes en silicone-hydrogel (Goldmann Tonometry in Wearers of Silicone Hydrogel Contact Lenses)	A. Mainville, N. Trottier
21 – La différence de grandeur entre le diamètre de la pupille et la zone d'ablation est-elle liée à la perception des halos suite à un LASIK (Is Size Difference between Pupil Diameter and Ablation zone Related to the Seeing of Halos following LASIK Treatment)?	TH. Nguyen, A. Sun
22 – Sensibilité d'une méthode psychophysique pour la mesure des aberrations d'ordre supérieur des lentilles ophtalmiques (Sensitivity of a Psychophysical Method for Measuring Significant Ophthalmic Lens Aberrations)	L. Boudreau, C. Michon
23 – Étude des troubles du sommeil chez les enfants atteints de dystrophies rétiniennes héréditaires : le rôle des gènes rétiniens exprimés dans la glande pinéale (Study of Sleep Disturbances in Children with Hereditary Retinal Dystrophy: the Role of Retinal Genes Expressed in the Pineal Gland)	E. Chriqui Benchluch, M. Keyeutat-Tondji
24 – Aberrations du front d'onde chez des porteurs de lentilles cornéennes souples asphériques et des porteurs de lentilles cornéennes souples sphériques (Wavefront Aberrations among Wearers of Spherical and Aspherical Soft Contact Lenses)	A. Fraser, V. Lambert
25 – Investigation sur la densité optique du photo-pigment des photorécepteurs trichromates versus dichromates (Study of Photopigment Optical Density of Trichromate vs. Dichromate Photoreceptors)	G. Gagné, C. Lalancette
26 – L'endettement des étudiants on optométrie (Optometry Student Debt Levels)	C. Gemme, A. St-Jean
27 – Effet de la posture sur le mouvement oeil-tête (Effect of Posture on Eye-Head Movement)	V. Gougeon, I. Papathanasiou
28 – Pourquoi les handicapés visuels ne consultent pas toujours les centres spécialisés (Why do the Visually Impaired not Always Consult Specialized Centres)?	J. Laliberté, É. Tremblay
29 – Étude du seuil à la résistance aux éclats de trois matériaux ophtalmiques (Study of Resistance Thresholds to the Flashes of Three Ophthalmic Materials)	JR. Lalonde, S. Rivard
30 – Questionnaire sur le dépistage visuel en milieu scolaire (Questionnaire on Vision Screening in Schools)	F. Leroux, N. Rail
31 – Méthode évaluative de la mesure des aberrations sphériques à l'aide de l'aberromètre OPD-Scan (Evaluative Method for Measuring Spherical Aberrations Using an OPD-Scan Aberrometer)	A. Saulnier, J. Savard

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