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Recognition and Reward Hommage et récompense

by / par **LEN KOULTON**

CAO has participated in many provincial optometric and intraprofessional Optofairs or trade shows with a display booth and we are becoming increasingly noticed! Recently, with our new booth backdrop, informational pamphlets, and retinal photo analysis, we and the Ontario Association of Optometrists made enough of an impression to be voted the 'The Most Innovative Booth' of all the 171 exhibitors at the annual Family Medicine Forum (FMF) in Toronto, Nov 27-29, 2008. This is twice in the past three years (previously in Vancouver 2006) that the joint CAO/ provincial association exhibit booth has won the 'The Most Innovative' award!! This award is determined by attendee family physicians who vote daily on 'best booth' in various categories of displays.

While the big 'Blue Ribbon' is appreciated, of greater significance I think is the fact that our brand is evolving and we are becoming more well known amongst family physicians. There was a lot of positive interaction with FMF delegates who indicated that they were regularly referring to optometrists and appreciated the explanation and interpretation of the fundus photo. Many thanks to Melissa Secord (OAO) and Catherine Heinmiller (CAO) for set-up of the display and attendance for the three days and to Topcon for the use of the fundus camera. Thank you as well to other optometrists who volunteered for a shift at the booth. Much appreciated.

CAO also participated in the Canadian Diabetic Conference in Montreal, October 18, 2008 with a display booth, which was coordinated with participation from CAO staff, members of CAO Council and our CAO diabetes committee. Here again, we talked to many physicians, nurses, endocrinologists, and diabetes educators who were intrigued with the fact that the fundus camera (again, thanks to Topcon) could actually take a picture of the inside of the eye. Attendees were extremely grateful to have a free retinal photo taken as well as discussion on the increased incidence of diabetes and optometry's role in early detection and ongoing management. They confirmed their intent to refer to optometrists because they now recognize our expertise and easy access. This has been a big ship to turn around, but I believe we've rounded that corner on our role recognition, accessibility and availability.

Len Koulton, (President CAO / président de l'ACO) & Catherine Heinmiller (CAO /l'ACO)

Participation as an exhibitor in trade shows is just another way in which CAO is investing resources to achieve improved recognition for optometry. The expense, time and manpower commitment at these booths is significant. It is difficult to put a price tag on these involvements, but the satisfaction, the sense of

net worth and increased recognition for optometry is priceless. I believe it is important to continue cultivating these relationships and communicating (a very important 'Key') one trade show at a time.

White Coat Ceremony

January 28, 2009 was an historic day for Canadian Optometry as the inaugural White Coat Ceremony took place at the School of Optometry, University of Waterloo. One hundred and eighty students (first and second year) were 'coated' that afternoon, symbolically signifying that monumental fundamental transfer from classroom to clinic and seeing their first patients.

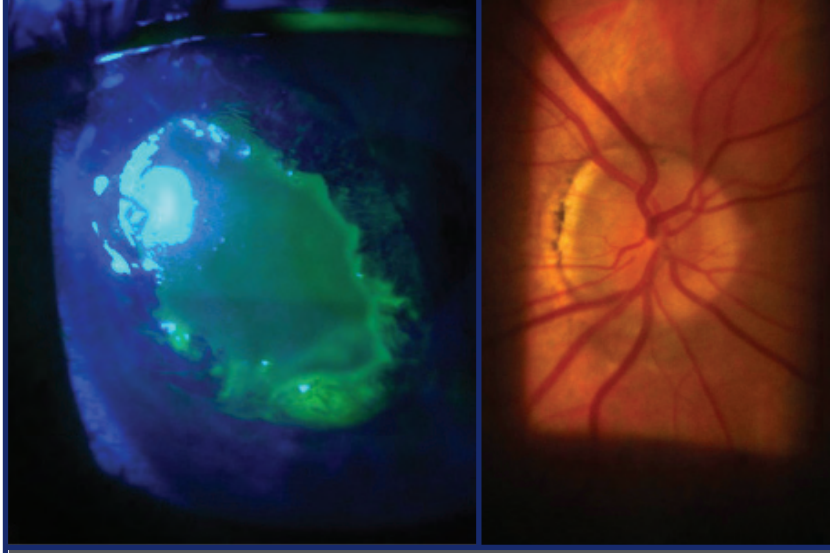
Approximately four hundred and fifty people, including eight provincial optometric presidents, faculty and parents were in attendance, braving a snowstorm with treacherous driving conditions that caused over one hundred flight cancellations that day. The ceremony, moderated by Dr. Marlee Spafford, included speeches from David Johnson, President of the University of Waterloo; Terry McMahon, Dean, Faculty of Science; Dr. Thom Freddo, Director, School of Optometry; and Dr. Len Koltun, President of CAO. The speeches offered greetings and congratulations as well as highlighting the history and the significance of the 'white coat' as a symbol of service and caring for over one hundred years. More recently many university faculties of Medicine, Dentistry and Pharmacy have formalized this important juncture in training with the ceremonial white coat as an 'offering or assignment of trust by faculty and members of the profession, and the receiving or acceptance of trust by the students'. Following these speeches Dr. Koltun led the students in the recitation of the Code of Ethics as adapted from the Canadian Association of Optometrists' Code of Ethics, 2006. The School of Optometry, University of Montréal, has already indicated that it will initiate its inaugural White Coat Ceremony next year.

CAO can be very proud of its investment in the actual purchase of the white coats, suitably designated with the CAO logo prominently but tastefully embroidered on the sleeve, as a tangible and practical connection to our future colleagues. The presentations were well received with many thank yous and photos taking place at the reception afterwards. Unfortunately time and weather concerns did not permit us to participate in late night socializing as we had early flights to catch the next morning to Montréal and the 2009 OLF.

L'ACO a participé à un grand nombre d'optofoires ou d'expositions commerciales optométriques et intraprofessionnelles dans les provinces au moyen de kiosques qui accroissent de plus en plus notre visibilité! Tout récemment, grâce à la nouvelle toile de fond de notre kiosque, à nos dépliants d'information et aux photos rétiniennes, l'Association des optométristes de l'Ontario et nous avons fait une si belle impression que nous avons reçu la mention du kiosque le plus novateur des 171 exposants au Forum en médecine familiale (FMF) qui a eu lieu à Toronto du 27 au 29 novembre 2008. C'est la deuxième fois depuis trois ans (la première fois, c'était à Vancouver en 2006) que le kiosque mixte d'une association provinciale et de l'ACO remporte le prix du kiosque le plus novateur! Ce prix est décerné après comptabilisation des votes quotidiens des médecins de famille qui participent à ce forum.

Même si le « gros ruban bleu » est agréable à recevoir, il me semble plus important de souligner que notre marque de commerce évolue et que nous sommes de plus en plus connus chez les médecins de famille. Il y a eu énormément d'interactions positives avec les délégués du FMF qui, outre le fait qu'ils aient apprécié les explications et interprétations des photos rétiniennes, nous ont indiqué qu'ils dirigeaient régulièrement des patients vers les optométristes. Nous remercions sincèrement Melissa Secord (OAO) et Catherine Heinmiller (ACO) qui ont monté le kiosque et qui ont été présentes pendant les trois jours, ainsi que Topcon qui nous a prêté une caméra rétinienne. Merci également aux autres optométristes qui ont animé le kiosque. Nous l'apprécions énormément!

L'ACO a aussi participé à la conférence de l'Association canadienne du diabète qui a eu lieu à Montréal le 18 octobre 2008, en y présentant un kiosque dont la coordination a été assurée par le personnel de l'ACO, les membres du Conseil de l'ACO et notre comité de l'ACO sur le diabète. Ici encore, nous avons rencontré une foule



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de médecins, infirmières, endocrinologues et éducateurs en diabète qui ont été très étonnés d'apprendre que la caméra rétinienne (nous remercions encore une fois Topcon!) pouvait effectivement prendre une photographie du fond de l'œil. Les personnes présentes ont énormément apprécié voir une photo de leur rétine et aussi discuter de l'incidence accrue du diabète et du rôle de l'optométrie dans le dépistage précoce et la prise en charge de cette maladie. Ils nous ont confirmé qu'ils feraient appel aux optométristes parce qu'ils connaissent maintenant nos compétences et savent qu'ils peuvent y avoir facilement accès. Une telle attitude a été longue à obtenir, mais je crois que nous y sommes parvenus grâce à la disponibilité et à l'accessibilité de notre profession et aussi au rôle qu'on nous reconnaît.

Notre participation à titre d'exposant dans les foires commerciales n'est qu'une autre façon pour l'ACO d'accroître la visibilité de l'optométrie. L'engagement en argent, en temps et en main-d'œuvre que représentent ces kiosques est élevé. Il est difficile de mettre un prix sur une telle participation, mais la satisfaction, le sentiment de valeur nette qui s'en dégage et la reconnaissance accrue qu'en retire l'optométrie n'ont pas de prix. Selon moi, il est important de continuer à cultiver ce type de relation et de poursuivre notre communication (une « clé » très importante) une exposition à la fois.

Cérémonie de la blouse blanche

Le 28 janvier 2009 a été une date mémorable pour l'optométrie canadienne puisque c'est la date à laquelle l'École d'optométrie de l'Université de Waterloo a organisé sa première cérémonie de la blouse blanche. Au total, 180 étudiants (de première et de deuxième année) ont reçu une « blouse blanche » indiquant leur passage symbolique de l'état d'étudiant à celui de professionnel de la santé de l'œil.

Environ 450 personnes, dont huit présidents optométriques provinciaux, des membres du corps professoral et des parents, ont assisté à cette cérémonie, malgré une tempête de neige, des conditions routières dangereuses et l'annulation de plus d'une centaine de vols aériens. L'animatrice de la cérémonie, la Dre Marlee Spafford, a présenté les conférenciers David Johnson, président de

l'Université de Waterloo; Terry McMahon, doyen de la Faculté des sciences; le Dr Thom Freddo, directeur de l'École d'optométrie; et le Dr Len Koltun, président de l'ACO. Les conférenciers ont offert leurs félicitations et ont souligné l'histoire et l'importance de la « blouse blanche » comme symbole des services et des soins depuis plus d'une centaine d'années. Plus récemment, de nombreux professeurs en médecine, art dentaire et pharmacie ont donné à cette importante transition vers la blouse blanche un caractère officiel en la considérant comme une marque de confiance de la part des membres du corps professoral et de la profession et aussi comme l'acceptation d'une telle marque de confiance par les étudiants. Dernier conférencier, le Dr Len Koltun a fait prononcer le code d'éthique aux étudiants, dans sa version 2006 adaptée par l'Association canadienne des optométristes. L'École d'optométrie de l'Université de Montréal a déjà indiqué qu'elle organiserait aussi sa première cérémonie de la blouse blanche l'an prochain.

L'ACO peut être très fière d'avoir acheté les blouses blanches et d'y avoir fait broder en évidence, mais avec goût, le logo de l'ACO sur la manche comme lien concret avec nos futurs collègues. Beaucoup se sont donné la peine de remercier et de photographier les présentateurs à la réception qui a eu lieu par la suite. Malheureusement, l'heure avancée et le mauvais temps ne nous ont pas permis de participer aux activités de fin de soirée puisque nous devions nous envoler tôt le lendemain matin vers Montréal et le FDO de 2009.

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The Optometric Practice in Recessionary Times
Les cabinets optométriques et la récession

by / par **ALPHONSE CAREW**

There appears to be only bad news on the economy these days with a melt-down in the stock market, a toppling in real estate values, a disaster in the banking and financial system, large increases in bankruptcies and unemployment rising to historic heights. Although the brunt of the damage is in the United States, the ripple effects are worldwide, and Canada is certainly not immune to the impact of the failing US economy, it is often said that, "when the US gets the sniffles we get the flu". In some ways however, the effects on the Canadian economy may be tempered somewhat due to the stronger regulations in our banking and insurance industries, along with the stronger social policies (unemployment, universal healthcare, third party insurance plan, etc.). But rest assured, the US is our largest trading partner and our economies are so intertwined the effects will be felt here.

What does this mean for the optometric practice? Thankfully, we enjoy a healthy profession whose demand for services continues to rise steadily. Our practices generally produce high margins and the threat of total loss or bankruptcy is quite low. However, there will be a negative impact on most practices, growth rates will weaken and possibly decline depending on the area of the country where you work. There are a few things you can do to help soften the blow of the looming financial disaster that is playing out.

In good times, and especially in bad times cash is always king. Now is a time to pay close attention to your cash flow. Make certain you are getting paid on time for services and products you provide. Keep the lion's share of your receivables under 30 days and very little over 90 days. At the same time if you can negotiate favourable terms from your suppliers allowing you to "term-out" larger purchases over 2 or 3 months this can help you free up significant cash. Make certain your inventory is at the appropriate age and size. When possible return stale or product that hasn't sold for many months, either for a refund or if that's not possible then for newer product that has a better chance of selling. Never let your inventory increase to a level higher than you absolutely need, this just needlessly ties up cash that could be put to better use.

Now would be a good time to concentrate on your core competencies. For most of us this involves providing a superior patient experience when they seek our care for their vision needs. When money is tight your patients are scrutinizing where they are spending; make certain you are providing a great value in your services

SOMETIMES WE CAN SPREAD OURSELVES TOO THIN AND OFFER EVERYTHING TO EVERYONE WHEN WE WOULD BE BETTER SERVED IF WE STUCK TO WHAT WE KNOW, AND DO, BEST.

and products. Never loose sight of this and always support staff and policies that enhance value and consider terminating those that don't. Sometimes we can spread ourselves too thin and offer everything to everyone when we would be better served if we stuck to what we know, and do, best.

Review your expenses with an eye to cutting those that tend to creep into the practice over time but don't directly support the application of your core competencies. Cut these costs as a way to maintain profitability when your top-line or gross income comes under pressure from a slowing economy. For example, it may seem rational to have the latest magazine subscriptions or weekly office cleanings but if times start to tighten-up then some of this may have to give or at least be cut back. If that isn't possible then perhaps renegotiating contracts with your suppliers is in order. They are feeling the financial pinch as well and will work with you to keep you as a client of theirs.

Cutting staff should be the last resort. Hiring and training people to work in our practice represents a significant cost and once they are in place it is often best to try and retain them. Now, more than ever, it is important to let your staff know they are appreciated and respected, set their mind at ease if lay-offs are not part of your short-term plans. With that being said, if your salary expense is higher than it should be, and if revenue is declining, then such dramatic steps maybe necessary. Be upfront and honest with your staff on this as soon as possible, for if layoffs are necessary, your remaining staff will appreciate your honesty. On the other side of the coin, if you are in need of new staff there maybe a pool of great candidates as other practices and optical shops let people go because of their financial situation.

I'm a big proponent of getting new technology into the practice but do so very careful at this time. Any product or service that adds to the cost for your patients should be reviewed in great detail. Perhaps now is the time to hold off and be certain of where the financial trends of your practice are taking you before you commit to a large purchase. On the flip side, if you are certain that your financial outlook is very positive despite the economic news, then now might be a great time to negotiate for big ticket items.

Much has been written about marketing in slow times but most experts seem to agree that eliminating marketing is a fool's plan. Marketing can be less expensive at this time as media is cheaper to buy. Also, if your competition pulls back their advertising plans then a vacuum exists for you to fill that void and greatly increase your name recognition. As with most marketing programs it's often much cheaper and more effective to market to your existing patient base than to the general public. If you're comfortable with spending more on marketing your practice at this time then seek professional help to make sure you get the best bang for your advertising dollar.

There is strength in numbers and now might be a great time to explore the benefits of joining a buying group, for cost savings and practice management help. Practices in one location may consider joining forces in either a partnership or a cost-sharing arrangement. The healthiest and most profitable practices are multi-doctor ones taking best advantage of economies of scale.

The economy is likely to get worse before it gets better in the coming months. Stay optimistic for it will get better. Planning for the lean times now can make your practice that much healthier when rosier times return.

Ces derniers temps, nous semblons être bombardés uniquement de mauvaises nouvelles économiques : effondrement du marché boursier, basculement de l'immobilier, catastrophe dans le système bancaire et financier, nombre effarant de faillites et taux de chômage atteignant des sommets historiques. Même si les dégâts s'observent surtout aux États-Unis, l'onde de choc se fait sentir partout dans le monde et le Canada n'est certes par prémuni contre les effets d'une économie américaine vacillante. On dit souvent que lorsque les États-Unis éternuent, nous attrapons le rhume. D'une certaine façon, la réglementation plus forte à laquelle est assujetti notre secteur des banques et de l'assurance et nos politiques sociales plus vigoureuses (chômage, régime universel d'assurance-maladie, régime d'assurance de tiers, etc.) aident à tempérer quelque peu les effets sur l'économie canadienne. Mais on peut être certain que le Canada en ressentira les effets, car les États-Unis sont notre plus gros partenaire commercial.

Qu'est-ce que cela signifie pour les cabinets optométriques? Heureusement, nous avons une profession en santé, et la demande de nos services ne cesse d'augmenter. Nos cabinets procurent habituellement des marges élevées, et le risque de perte totale ou de faillite est très faible. Cependant, la récession aura un effet négatif sur la plupart des cabinets et les taux de croissance s'affaibliront et pourraient même diminuer selon la région où vous travaillez. Il y a quelques mesures que vous pouvez prendre pour atténuer le coût de la catastrophe financière qui plane à l'horizon.

En période de vaches grasses, mais surtout de vaches maigres, l'argent est toujours roi. Surveillez de prêt votre trésorerie et faites-vous payer dans les délais pour vos produits et services. Gardez la plus grande partie de vos comptes débiteurs à moins de 30 jours, et très peu à plus de 90 jours. Essayez aussi d'obtenir des modalités favorables de vos fournisseurs afin de pouvoir étaler sur deux ou trois mois vos achats importants et ainsi libérer vos liquidités. Maintenez le volume et l'âge de vos stocks à un volume et à un niveau approprié. Dans la mesure du possible, retournez les produits périmés ou ceux qui ne se vendent pas depuis longtemps soit contre remboursement, soit, si cela n'est pas possible, contre un nouveau produit qui a plus de chance de se vendre. Ne laissez jamais vos stocks augmenter plus que vous n'en avez absolument besoin puisque cela immobilise inutilement des liquidités que vous pourriez mieux utiliser ailleurs.

Pourquoi ne pas en profiter pour vous concentrer sur vos compétences de base. Pour la plupart d'entre nous, cela signifie fournir au patient une meilleure expérience lorsqu'il fait appel à nos soins. Lorsque l'argent se fait rare, vos patients scrutent davantage leurs dépenses. Pour cette raison, assurez-vous de leur fournir des produits et services d'une très grande valeur. Ne perdez jamais cela de vue : favorisez toujours les politiques et le personnel qui augmentent votre valeur et débarrassez-vous de ce qui vous nuit. Parce qu'on veut trop faire, il arrive souvent qu'on se perde, alors qu'il suffirait de s'en tenir à ce qu'on connaît le mieux.

Revoyez vos dépenses en sabrant dans celles qui ont tendance à envahir votre cabinet au fil du temps sans pour autant favoriser directement vos compétences de base. Vous conserverez ainsi votre rentabilité si jamais le ralentissement de l'économie influe sur votre chiffre d'affaires ou sur votre service principal. Par exemple, il peut sembler logique de vous abonner au dernier magazine ou de faire nettoyer votre bureau chaque semaine, mais si la situation commence à se resserrer, vous devrez peut-être supprimer ou à tout le moins diminuer ce type de services. Si ce n'est pas possible, peut-être pourriez-vous renégocier vos contrats avec vos fournisseurs. Comme ils sont dans la même situation financière que vous, ils voudront vous conserver comme client.

Les mises à pied devraient être une mesure de dernier ressort. L'embauchage et la formation représentent un coût important, de sorte qu'il est souvent préférable de retenir son personnel. Plus que jamais, il est important d'exprimer votre satisfaction et votre respect à l'égard de votre personnel et de le rassurer si vous ne comptez pas procéder à des congédiements à court terme. Cela dit, si votre enveloppe salariale est plus élevée qu'elle ne devrait l'être et si vos revenus diminuent, il vous faudra peut-être recourir à de telles mesures radicales. Soyez franc et honnête avec votre personnel à ce sujet dès que possible, car si vous devez faire des mises à pied, le personnel qui restera dans votre cabinet vous

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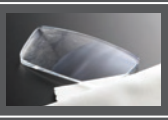
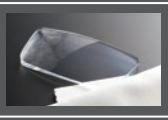
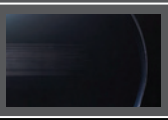
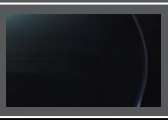
CLEAN Cleaner Twice as Long		
TOUGH Two Times More Scratch Resistant		

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remerciera de votre honnêteté. En revanche, si vous avez besoin de nouveaux employés, pourquoi ne pas faire appel aux excellents candidats que d'autres cabinets et magasins d'optique ont dû laisser aller à cause de la situation financière?

Même si je suis un grand partisan des nouvelles technologies, je vous incite à être très prudent en ce moment. Tout produit ou service qui augmente le coût pour vos patients devrait être examiné soigneusement. Peut-être vaut-il mieux attendre et confirmer d'abord l'orientation financière de votre cabinet avant de vous engager dans des achats importants. À l'inverse, si vos perspectives financières sont très positives malgré la conjoncture économique, peut-être est-il maintenant temps de négocier l'achat de ces technologies coûteuses.

Il s'est écrit beaucoup de choses sur le marketing lorsque l'économie ralentit, mais la plupart des experts semblent d'accord pour dire qu'il serait idiot d'éliminer toute forme de publicité. Il pourrait vous en coûter moins cher en ce moment puisque les supports médiatiques ont diminué de prix. De plus, si vos concurrents retirent leurs annonces, il y a alors un vide à combler qui pourrait mousser énormément votre image. Comme pour la plupart des programmes de marketing, il est souvent moins cher et plus efficace de cibler vos patients actuels que le public en général. Si vous ne craignez pas de dépenser davantage pour faire connaître votre cabinet en ce moment, pourquoi ne pas demander l'aide d'un spécialiste qui vous en donnera pour votre argent.

Comme l'union fait la force, il serait peut-être grand temps d'examiner les avantages d'adhérer à un groupe d'achat pour économiser et obtenir des conseils pour la gestion de votre cabinet. Par exemple, les cabinets d'une région pourraient joindre leurs forces dans un partenariat ou conclure une entente de partage des coûts. Les cabinets les plus dynamiques et les plus rentables regroupent plusieurs professionnels qui profitent au maximum des économies d'échelle.

Il est sans doute vrai de dire que l'économie ira en empirant avant de prendre du mieux dans les mois à venir, mais restez optimiste, car la situation s'améliorera. Prévoir maintenant une période de vaches maigres peut se traduire plus tard par un avantage lorsque le beau temps reviendra.

FEATURE ARTICLE

SOHEL SOMANI MD, ANN HOSKIN-MOTT MD, ADIT MISHRA MD, ALAIN BOIS OD, BRIAN H. BOOK OD, MARK CHUTE OD, RONALD GAUCHER OD, BARRY WINTER OD

Managing patients at risk for age-related macular degeneration: a Canadian strategy

ABSTRACT

Background: To develop a consensus strategy for the management of patients at risk for age-related macular degeneration (AMD) for Canadian ophthalmologists, optometrists and physicians.

Methods: Development of a consensus strategy began with a review of the literature and existing guidelines. A panel of retina specialists, ophthalmologists, and optometrists from across Canada assessed this evidence to distill what was learned and use this knowledge as the basis for developing a consensus strategy for managing patients at risk of AMD.

Results: The expert panel has developed a series of recommendations for Canadian eyecare providers (eg. ophthalmologists, optometrists) and physicians to adopt as a preventive strategy for patients at risk of AMD.

Interpretation: This consensus strategy is a practical guideline that can be adopted in the office setting to manage patients at risk of AMD and to advise patients with questions and concerns about AMD.

PAINTING: **BOOBA**, BY ADAM HAHN

Age-related macular degeneration (AMD) is an incurable, degenerative disease and the leading cause of blindness in adults >50 years in developed countries.[1] It has an appreciable socioeconomic impact that will only increase as our population ages, unless a way is found to prevent AMD or halt its progression.

There are two major types of AMD. Neovascular, also called "exudative" and "wet", AMD is characterized by the development of choroidal neovascular membranes, subretinal hemorrhage and/or fluid, and fibrosis at the advanced stage. The more common form, dry and atrophic, accounts for about 85% of AMD. It is characterized by drusen and/or retinal pigment epithelial irregularities, often progressing to atrophic areas.[2] A small percentage of dry AMD progresses to neovascular AMD.[2]

AMD has a complex natural history that is poorly understood, although various risk factors have been identified. There is no cure for AMD, but

current developments have made the management of AMD increasingly possible. Furthermore, insights into prevention and risk factors have aided the development of other important management strategies.

In 2007, in Toronto, an expert panel of Canadian ophthalmologists and optometrists met with several objectives:

- to understand the current best practices in managing patients at risk for AMD;
- to understand the current challenges in helping patients at risk in order to reduce the incidence of this debilitating disease and prevent its progression to advanced stages;
- to develop practical guidelines to help to prevent the progression of AMD in at-risk patients.

The purpose of presentations and subsequent discussions at this meeting was to supply background, perspective, and information from the existing literature and clinical practice to serve as a basis for the definition of a consensus strategy for the management of people at risk for AMD.

Incidence and Prevalence of AMD

No specific figures are available for the prevalence of AMD in Canada; however, it is not unreasonable to extrapolate from an important U.S. initiative: the Beaver Dam Eye Study. During the first study (1988–1990), Klein et al[3] determined that signs of age-related maculopathy were present in 8.5% of people from 43 to 54 years and most common among people ≥75 years (36.8%). In the next study (2003–2005), Klein et al[4] reported that the 15-year cumulative incidence of early AMD was 14.3% in adults >43 years; for late AMD, it was 3.1%. Among people ≥75 years, the 15-year cumulative incidence of late AMD was 8%. Extrapolating the initial findings of the Beaver Eye Dam Study to the Canadian population determines that nearly 2.2 million Canadians may have some stage of AMD (Table 1).

With a decreasing birth rate and increasing life expectancy, the proportion of older Canadian adults is increasing more rapidly than other age groups.[5] In 2005, the number of Canadian seniors (>65 years) was projected to increase from 4.2 million to 9.8 million in 2036, almost doubling the percentage of seniors in the Canadian population from 13.2% to 24.5%.[5]

Burden of Illness

Brown et al[6] reported that even a mild case of AMD (20/20 to 20/40 in the better-seeing eye) lessens quality of life for the average patient by 17%, similar to the impact of moderate cardiac angina or symptomatic HIV. Moderate AMD (20/50 to 20/100 in the better-seeing eye) causes a 32% decrease in quality of life, similar to the impact of severe cardiac angina or a fractured hip. Severe AMD (≤20/200 in the better-seeing eye) decreases quality of life by 53%, which is a greater impact than kidney dialysis. Those with very severe AMD (≤20/800 in the better-seeing eye) reported a 60% decrease in quality of life, similar to the impact of end-stage prostate cancer or a catastrophic stroke. Of interest, Brown et al[6] also reported that ophthalmologists dramatically underestimated the quality of life of patients with moderate and severe AMD.

These authors also reported that wet and dry AMD have an annual negative impact of approximately U.S.$30 billion on the U.S. gross domestic product.[6] A more recent economic analysis has estimated the indirect cost of wet AMD as U.S.$2.5 billion per year in lost productivity.[7] For dry AMD, indirect costs are measured at U.S.$24.4 billion.[7]

Pathogenesis of AMD

The pathogenesis of AMD is multifactorial, involving genetic and environmental factors. It is associated with interactions in several biological processes, including oxidative stress and inflammation, leading to dysfunction of the retinal pigment epithelium (RPE), Bruchs membrane, and photoreceptor complex. Activation of these processes initiates a chain of events (Figure 1), manifested by the hallmarks of AMD:[4]

- Large numbers of small hard drusen appear between the RPE, Bruchs membrane, and the choroid.
- The drusen become larger and more confluent ("softer"). Pigmentary abnormalities (hyperpigmentation and atrophy) occur and lipofuscin increases in the RPE.
- Over time, central geographic atrophy of the RPE and/or angiogenesis may follow.

Oxidative stress and antioxidants

The RPE is a monolayer of unique cells that manages the flow of nutrients to photoreceptors, digests waste (outer rod and cone segments) from photoreceptors, and controls metabolism for the retina.[8] The retina has high concentrations of oxygen, polyunsaturated fatty acids, and photosensitizers. These substances, combined with light exposure, make the retina susceptible to oxidative stress.[9] How this works precisely is unknown, but one theory suggests that, as the rate of digestion of outer rod and cone segments decreases within the RPE, lipofuscin formation increases.

A recent study, which found oxidized phospholipids in photoreceptors and RPE cells, reported that the amount of these phospholipids increased with age.[10] They also found that eyes with AMD were more intensely immunoreactive for oxidized phospholipids than age-matched normal eyes. They concluded that oxidative damage to photoreceptors and RPE cells may be the mechanism for these changes. This conclusion was reinforced by Kamei et al[11], who found that macrophages and RPE express cell surface scavenger receptors for oxidized lipoproteins. These studies noted that the pathophysiology of AMD has some similarities to that of atherosclerosis, but the ramifications of this hypothesis have yet to be fully explored.

Oxidative stress can be exacerbated by external factors, particularly smoking and perhaps excessive sunlight exposure.[9,12-14] Low levels of antioxidants and minerals upset the natural balance that normally neutralizes free radicals. Free-radical formation appears to impair the RPE's ability to function properly. In the macula, a healthy RPE contains high concentrations of natural antioxidants, such as vitamin C, glutathione, vitamin E, retinoids, carotenoids, and enzymes, such as superoxide dismutase and phospholipid hydroperoxide glutathione peroxidase (PHGPx). In diets with a low antioxidant intake, providing adequate antioxidant supplementation could be a key line of defence.

Specific nutrients in AMD

The benefits of nutritional supplementation in AMD are rooted in the AREDS trial.[12,15,16] In this trial, high doses of Vitamins C and E, zinc, and beta-carotene have shown a benefit in retarding the progression of AMD in patients with moderate to advanced disease.

Lutein and zeaxanthin were not available at the time of the first AREDS trial, so definitive conclusions as to their benefits are still unknown. Both lutein and zeaxanthin, which give the macula a yellow colour, play a protective role as antioxidants and filter short-wavelength light. Various studies suggest a benefit for these carotenoids in the treatment of AMD. Observational data from the AREDS 22,[16] Blue Mountain Eye Study,[17] CAREDS,[18] and POLA[19] studies have associated a higher dietary intake of carotenoids with a lower incidence of AMD progression. Furthermore, Seddon et al[20] have shown that patients taking 5.8 mg/day of lutein had a 43% lower risk of wet AMD. AREDS-2 will further define the role of these carotenoids in a randomized, controlled trial.

There is a suggestion that vitamin supplementation may help in the primary prevention of incident AMD. Van Leeuwen et al have specifically established their ability to protect against AMD, finding that "a high dietary intake of beta carotene, vitamins C and E, and zinc together was associated with a substantially reduced risk of AMD in elderly persons."[9]

This statement seems to contradict a recent meta-analysis in the *British Medical Journal*, which reported the individual effects of dietary antioxidants on primary prevention of AMD.[21] It concluded that, individually, insufficient evidence supports the role of dietary antioxidants, including the use of dietary antioxidant supplements, for the primary prevention of early AMD. One limitation of this meta-analysis, which the authors noted, is that they did not look at the effects of antioxidants in combination.

The Rotterdam Study, a prospective cohort study, has compared the effects of antioxidants individually and in combination. It reported that the results for individual antioxidants were not as strong as the benefit reported when all four antioxidant supplements were taken together.[9] This finding was similar to the AREDS trial, which reported significant reductions in the risk of progression to advanced AMD in

the antioxidant arm (17%), zinc arm (21%), and antioxidant plus zinc arm (25% after 6.3 years and 27% in the 10-year extension).[15] Perhaps benefits in both studies are attributable to the synergistic effects of antioxidants taken in combination rather than isolation.

Another limitation of the meta-analysis is that a large portion of the study population worked in the healthcare industry and therefore may not be indicative of the normal population.[21]

Risk factors

Precisely how the pathological process in AMD is initiated and progresses is not fully understood, but several risk factors have been identified. They are divisible into two groups: unmodifiable and modifiable.

Unmodifiable risk factors

Age: The Beaver Dam Eye Study, among others, has established that the incidence and the severity of AMD increase with age.[4]

Genetics: Based on twin and family studies, there appears to be strong evidence for a genetic component in the risk of developing AMD.[2,22] Recent genome-wide linkage and association studies have focused on finding candidate genes for AMD. Among the loci of interest are 1q32 (complement factor H gene) and a region of 10q26 (LOC387715). Although the exact mechanism of how these single nucleotide polymorphisms lead to AMD is unknown, they appear to play a part in the inflammatory cascade and oxidative stress models of injury, respectively.[23]

Gender: Women are at slightly higher risk of having one or more intermediate drusen, extensive small drusen, or RPE pigmentary abnormalities.[12]

Race: AREDS 3 found a higher frequency of choroidal neovascularization among Caucasians, who had a higher frequency of one or more large drusen (>125 μm) and extensive intermediate drusen.[12] The authors speculated that increased melanin in RPE cells, acting as a free radical scavenger or simply as a filter for ultraviolet radiation, protects the RPE cells and Bruchs membrane, reducing the risk of developing large drusen and RPE pigmentary changes and therefore reducing the risk of geographic atrophy, choroidal neovascularization, or both.[12]

Eye colour: Hyman et al[24] found that brown eye colour was associated with less AMD. Frank et al[25] concluded that Caucasians with light-coloured irides have a higher prevalence of AMD than people with darker coloured irides.

Concurrent conditions: AREDS investigators found a correlation between AMD and concurrent conditions, such as hyperopia,[12] diabetes,[26] and a history of cardiovascular disease.[26]

Modifiable risk factors

Smoking: Of all modifiable risk factors, smoking is the most important. AREDS 3 and 19 found that smoking was associated with more severe cases of AMD (wet and dry).[12,20] The exact mechanism of damage is unknown, but AREDS 3 authors noted that smoking lowers levels of circulating antioxidants.[12] They proposed an underlying vascular basis for AMD, because smoking may damage choroidal vessels and alter choroidal blood flow, thus promoting atherosclerotic and hypoxic changes in the choroidal vessels. Smoking may directly cause vasoconstriction, increasing hypoxia and oxidative stress.[12]

Lifestyle factors: Lifestyle factors, such as diet, fitness, obesity, and socioeconomic factors, play a role in AMD.[20]

Sunlight: Another modifiable risk factor is exposure to ultraviolet solar radiation. Although evidence for the pathogenic role of sunlight exposure in AMD is controversial, it cannot be ignored.[9,13,14]

Consensus

- AMD is a multifactorial disease. The relative impact of environmental and genetic risk factors is unknown.
- Many risk factors for AMD are well known, as shown in the medical literature.
- There is a lack of clinical evidence to show that management of risk factors can prevent the progression of early AMD. Randomized controlled trials, such as AREDS, have not made any conclusive recommendations for patients with early (category 1 or 2) AMD.
- Randomized clinical trials, such as AREDS, have shown that the management of modifiable risk factors has an impact on advanced AMD.

For patients with category 3 or 4 AMD, the standard of care includes the management of modifiable risk factors.

- Despite evidence from randomized controlled trials, many people remain unconvinced about the importance of risk-factor management.
- Unmodifiable risk factors, such as age, genetics, gender, race, eye colour, and concurrent conditions, continue to be studied.
- The importance of modifiable risk factors, such as smoking, nutrition (including antioxidants, such as vitamin C, E, lutein, beta carotene, zeaxanthin, and zinc), lifestyle factors, and sunlight exposure need to be reinforced for patient awareness.
- The educational role of eyecare professionals in reinforcing the importance of modifiable risk factors is vital.

The dietary problem

Canada's Food Guide 2007 recommends seven (7) servings of fruit and vegetables daily for adults >51 years.[27] Fruit and vegetables are excellent natural sources of lutein and other antioxidants; however, a large proportion of Canadians >50 years are not consuming the recommended daily allowances (Table 2).[28] Antioxidant supplementation may be the answer, as the Rotterdam Eye Study and AREDS studies suggest.[9, 12,15,16]

Consensus

The incidence of AMD is predicted to increase dramatically in coming years due to the aging of Canada's population.

The poor nutritional habits of older Canadians may compound the predicted increase of AMD due to aging.

A large proportion of Canadians are not ingesting the recommended daily allowance of fruit and vegetables.

Age may affect the absorption of nutrients.

Recommendations

Based on current knowledge:

- Physicians and eyecare professionals should educate adults ≥55 years about the risk factors for AMD.
- Physicians and eyecare professionals should forward risk-factor management strategies for the prevention of AMD to patients at risk.
- Physicians and eyecare professionals should counsel patients to stop smoking, minimize sunlight exposure, and maintain a healthy diet.
- The Rotterdam Eye Study suggests that regular dietary intake of specific antioxidant vitamins and minerals may benefit patients at risk of early AMD and those with a family history of AMD. When diet is unable to meet daily vitamin and mineral requirements that may reduce the risk of AMD progression, supplementation is an option for patients at risk. Physicians and eyecare professionals should ascertain patients' normal intake of supplements before recommending further supplements for AMD.
- More research is necessary to examine the benefits, risks, and optimal dosages of vitamin and mineral supplements in patients at risk of AMD.

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Key words: *age-related macular degeneration, prevention, degenerative eye disease, antioxidant supplements, ocular supplements, risk factors, consensus, guideline*

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The paintings used to illustrate this article, are by Adam Hahn. For more information about his work on macular degeneration, please see page 40.

Table 1: Estimated Number of Canadians affected by AMD

Age (Years)	Percentage(%) with AMD	Canadians with AMD*
43 – 53	8.5	467,500
55 – 64	14.4	529,126
65 – 74	19.4	440,768
≥75	36.8	748,512
Estimated total		2,185,906

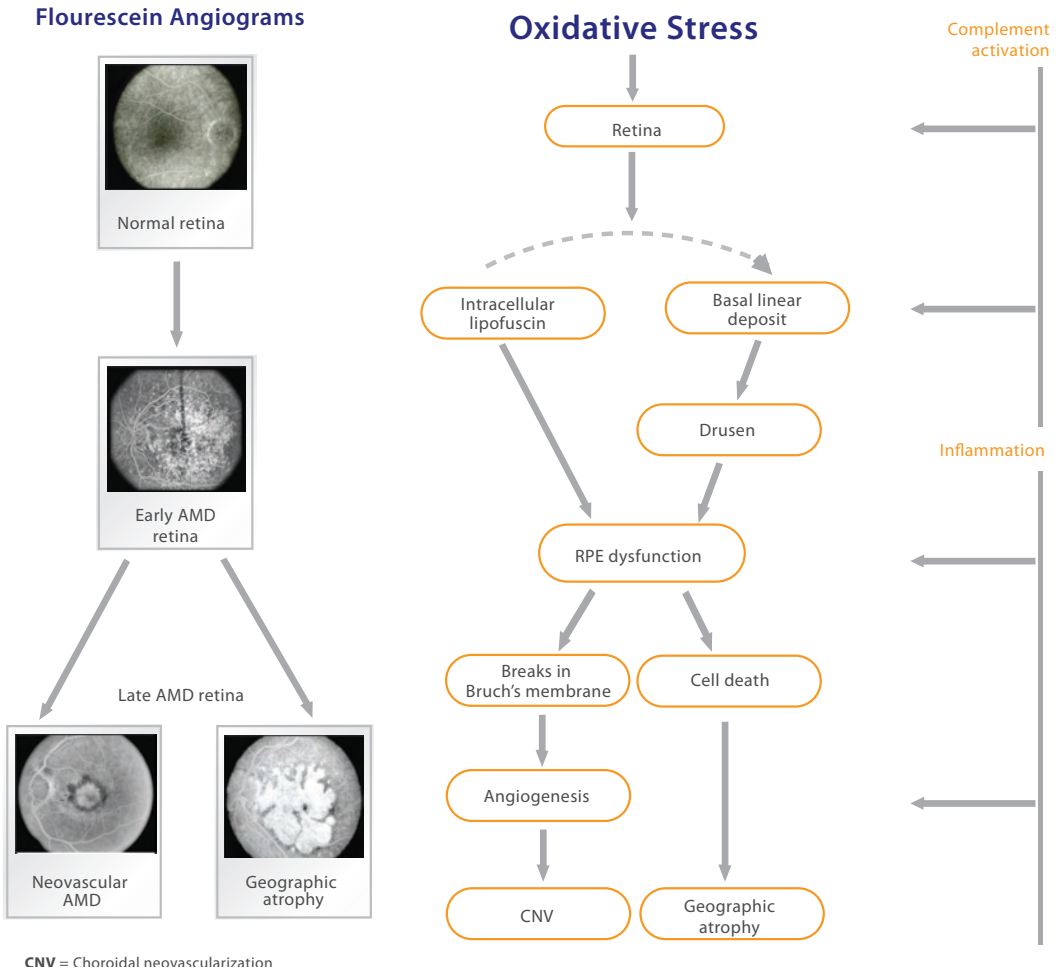
** Extrapolated from Beaver Dam Eye Study 1988-1990[3]*
Population statistics for age groups <65: Statistics Canada 2006 Census;
For age groups >65, Statistics Canada projections (medium growth), 2005

Table 2: Percentage of Canadians in 2005 who ate <5 servings/day of fruit and vegetables

Age (Years)	Percentage(%)
45 – 54	56.8
55 – 64	52.3
65 – 74	48.5
≥75	39.4

Statistics Canada. Table 105-0449[28]

Pathogenesis of AMD



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Gestion des patients à risque de dégénérescence maculaire liée à l'âge : une stratégie canadienne

RÉSUMÉ

Contexte : Élaborer une stratégie consensuelle pour la gestion des patients à risque de dégénérescence maculaire liée à l'âge (DMLA) à l'intention des ophtalmologistes, optométristes et médecins du Canada.

Méthodes : L'élaboration d'une stratégie consensuelle a débuté avec la recension des textes et un examen des lignes directrices existantes. Un groupe de spécialistes de la rétine, d'ophtalmologistes et d'optométristes provenant d'un bout à l'autre du Canada a évalué cette information probante pour distiller ce qui a été appris et utiliser ces connaissances comme point de départ pour l'élaboration d'une stratégie consensuelle pour la gestion des patients à risque de DMLA.

Résultats : Le groupe d'experts a élaboré une série de recommandations à l'intention des fournisseurs de soins oculovisuels (p. ex., ophtalmologistes, optométristes) et médecins du Canada pour l'adoption d'une stratégie préventive dans le cas des patients à risque de DMLA.

Interprétation : La présente stratégie consensuelle est une ligne directrice pratique qui peut être adoptée dans un bureau pour gérer les patients à risque de DMLA et pour informer les patients qui ont des questions ou des préoccupations relatives à la DMLA.

La dégénérescence maculaire liée à l'âge (DMLA) est une maladie dégénérative incurable et la cause principale de la cécité chez les adultes de plus de 50 ans dans les pays développés[1]. Elle a des conséquences socioéconomiques appréciables qui continueront de prendre de l'ampleur avec le vieillissement de notre population, à moins de trouver une façon de prévenir la DMLA ou d'arrêter sa progression.

Il y a deux types de DMLA. La DMLA néovasculaire, aussi appelée « exsudative » et « humide », est caractérisée par l'apparition de membranes néovasculaires choroïdiennes, d'hémorragie et/ou de fluide sousrétinien, puis de fibrose, au stade avancé. La forme la plus courante, sèche et atrophique, représente environ 85 % des cas de DMLA. Elle est caractérisée par des drusens et/ou des irrégularités épithéliales pigmentaires de la rétine, qui progressent souvent aux régions atrophiées[2]. Un faible pourcentage des cas de DMLA sèche évoluent en DMLA néovasculaire[2].

L'histoire naturelle de la DMLA est complexe et mal comprise, bien que divers facteurs de risque aient été déterminés. La DMLA est incurable mais les récentes découvertes permettent de plus en plus de la gérer. En outre, un aperçu de la prévention et des facteurs de risque a aidé à l'élaboration d'autres stratégies importantes de gestion.

À Toronto en 2007, un groupe d'experts formé d'ophtalmologistes et d'optométristes du Canada s'est réuni pour atteindre les objectifs suivants :

- Comprendre les pratiques exemplaires actuelles en matière de gestion des patients à risque de DMLA.
- Comprendre les défis actuels en matière d'aide aux patients à risque afin de réduire l'incidence de cette maladie débilitante et de prévenir sa progression aux stades avancés.
- Élaborer des lignes directrices pratiques pour aider à prévenir la progression de la DMLA chez les patients à risque.

Le but des présentations et des discussions subséquentes à la réunion était de présenter un contexte, un point de vue et de l'information tirée de la documentation existante et de la pratique clinique pour servir de base à la définition d'une straté-

gie consensuelle pour la gestion des personnes à risque de DMLA.

Incidence et prévalence de la DMLA

On ne dispose pas de chiffres précis sur la prévalence de la DMLA au Canada; toutefois, il n'est pas déraisonnable d'extrapoler à partir d'une importante initiative américaine : the Beaver Dam Eye Study. Durant la première étude (1988–1990), Klein et al[3] ont déterminé qu'il existait des signes de maculopathie liée à l'âge chez 8,5 % des personnes de 43 à 54 ans, et que ces signes étaient plus courants chez les personnes de 75 ans et plus (36,8 %). Dans l'étude suivante (2003–2005), Klein et al[4] ont rapporté que l'incidence cumulative sur 15 ans de la DMLA au stade précoce était de 14,3 % chez les adultes de moins de 43 ans; alors que l'incidence de la DMLA au stade avancé était de 3,1 %. Parmi les personnes de 75 ans et plus, l'incidence cumulative sur 15 ans de la DMLA au stade avancé correspondait à 8 %. L'extrapolation des constatations initiales de la Beaver Eye Dam Study à la population canadienne permet d'établir que presque 2,2 millions de Canadiens pourraient souffrir de DMLA à un stade plus ou moins avancé (tableau 1).

Étant donné la baisse du taux de natalité et la prolongation de l'espérance de vie, la proportion d'adultes canadiens plus âgés s'accroît plus rapidement que celle des autres groupes d'âge[5]. En 2005, on prévoyait que le nombre de Canadiens âgés (de plus de 65 ans) s'accroîtrait, et passerait de 4,2 millions à 9,2 millions en 2036, doublant presque le pourcentage de personnes âgées dans la population canadienne, en passant de 13,2 % à 24,5 %.[5]

Le fardeau de la maldie

Brown et al[6] ont rapporté que même un cas léger de DMLA (20/20 à 20/40 dans l'œil qui voit le mieux) diminue la qualité de vie de 17 % chez le patient moyen, des conséquences semblables à celles d'une angine cardiaque modérée ou du VIH symptomatique. La DMLA modérée (20/50 à 20/100 dans l'œil qui voit le mieux) entraîne une diminution de 32 % de la qualité de vie, des conséquences semblables à celles d'une angine cardiaque grave ou d'une fracture de la hanche. La DMLA grave (≤20/200 dans l'œil qui voit le mieux) diminue la qualité de vie de 53 %, ce qui correspond à des conséquences plus importantes que celles de la dialyse rénale. Les personnes souffrant de DMLA très grave (≤20/800 dans l'œil qui voit le mieux) ont déclaré une diminution de 60 % de leur qualité de vie, des conséquences semblables à celles du cancer de la prostate au stade terminal ou d'un accident vasculaire cérébral invalidant. Il convient de souligner que Brown et al[6] ont affirmé que les ophtalmologistes sous-estimaient énormément la qualité de vie des patients souffrant de DMLA modérée à grave.

Ces auteurs ont aussi rapporté que les formes humide et sèche de la DMLA ont des retombées négatives annuelles qui se chiffrent à approximativement 30 milliards de dollars américains sur le produit intérieur brut des États-Unis[6]. Une analyse économique plus récente a estimé le coût indirect de la DMLA humide à 2,5 milliards de dollars américains par année en perte de productivité[7]. Pour la forme sèche de la DMLA, les coûts indirects se chiffrent à 24,4 milliards de dollars américains[7].

Pathogénèse de la DMLA

La pathogenèse de la DMLA est multifactorielle et elle dépend de facteurs génétiques et environnementaux. Elle est associée à des interactions de plusieurs processus biologiques, incluant le stress oxydatif et l'inflammation, qui entraînent une dysfonction de l'épithélium pigmentaire de la rétine (EPR), de la membrane de Bruch et du complexe photorécepteur. L'activation de ces processus provoque une chaîne d'événements (figure 1), dont les manifestations constituent les caractéristiques de la DMLA[4] :

- L'apparition d'un grand nombre de petits drusens durs entre l'EPR, la membrane de Bruch et la choroïde.
- Les drusens deviennent plus gros et plus confluents (« plus mous »). Il se produit des anomalies pigmentaires (hyperpigmentation et atrophie) et la lipofuscine augmente dans l'EPR.
- Au fil du temps, l'atrophie géographique centrale de l'EPR et/ou l'angiogénèse peut suivre.

Stress oxydatif et antioxydants

L'EPR est une monocouche de cellules uniques qui gère le flux de nutriments vers les photorécepteurs, digère les déchets (des segments externes des bâtonnets et des cônes) des photorécepteurs, et contrôle le métabolisme pour la rétine[8]. La rétine contient de fortes concentrations d'oxygène, d'acides gras polyinsaturés et de photosensibilisateurs. Ces substances, combinées à l'exposition à la lumière, rendent la rétine sensible au stress oxydatif[9]. Le fonctionnement précis de ce processus est inconnu mais une théorie laisse entendre que, quand le taux de digestion des segments externes des bâtonnets et des cônes diminue dans l'EPR, la formation de lipofuscine augmente.

Dans le cadre d'une récente étude, dans laquelle on a constaté la présence de phospholipides oxydés dans les photorécepteurs et dans les cellules EPR, on a rapporté que la quantité de ces phospholipides augmentait avec l'âge[10]. On a aussi constaté que les yeux touchés par la DMLA étaient plus intensément immunoréactifs aux phospholipides oxydés que les yeux normaux des sujets du même âge. Les chercheurs ont conclu que les dommages oxydatifs aux photorécepteurs et aux cellules EPR pourraient être à l'origine de ces changements. Cette conclusion a été renforcée par Kamei et al[11], qui ont constaté que les macrophages et l'EPR expriment des récepteurs phagocytes de surface cellulaire pour les lipoprotéines oxydées. Ces études ont fait ressortir que la pathophysiologie de la DMLA possède certaines similitudes à celle de l'athérosclérose mais les ramifications de cette hypothèse n'ont pas été explorées complètement.

Le stress oxydatif peut être exacerbé par des facteurs externes, particulièrement le tabagisme, et peut-être une exposition excessive au soleil[9,12-14]. De faibles niveaux d'antioxydants et de minéraux dérangent l'équilibre naturel qui neutralise normalement les radicaux libres. La formation de radicaux libres semble nuire à la capacité de l'EPR de fonctionner convenablement. Dans la macula, un EPR sain contient de fortes concentrations d'antioxydants naturels, comme la vitamine C, le glutathion, la vitamine E, les rétinoïdes, les caroténoïdes et les enzymes, comme la superoxydedismutase et le glutathion peroxydase hydroperoxydephospholipide (PHGPx). Dans le cas d'un régime alimentaire à faible apport en antioxydants, la prise d'un supplément adéquat d'antioxydants pourrait être un moyen de défense clé.

Les nutriments liés à la DMLA

Les bienfaits de la supplémentation alimentaire pour la DMLA sont tirés de l'essai AREDS[12,15,16]. Dans le cadre de cet essai, on a observé que de fortes doses de vitamines C et E, de zinc et de bétacarotène contribuaient à retarder la progression de la DMLA chez les patients souffrant de la forme modérée ou avancée de la maladie.

La lutéine et la zéaxanthine n'étaient pas disponibles au moment du premier essai AREDS, par conséquent on ne dispose d'aucune conclusion définitive quant à leurs effets bénéfiques. La lutéine et la zéaxanthine, qui donnent une couleur jaune à la macule, jouent un rôle de protection à titre d'antioxydants et de filtre pour la lumière à courtes longueurs d'onde. Diverses études laissent entendre qu'elles ont un effet bénéfique pour les caroténoïdes dans le traitement de la DMLA. Les données d'observation des études AREDS 22[16], Blue Mountain Eye Study[17], CAREDS[18], et POLA[19] ont associé une ingestion alimentaire plus élevée de caroténoïdes à une plus faible incidence de la progression de la DMLA. En outre, Seddon et al[20] ont montré que chez les patients qui prennent 5,8 mg/jour de lutéine, le risque de contracter la DMLA humide était moindre dans une proportion de 43 %. L'essai AREDS-2 définira davantage le rôle de ces caroténoïdes dans une étude sur échantillon aléatoire et contrôlé.

Certains suggèrent que les suppléments vitaminiques peuvent aider à la prévention primaire de la DMLA incidente. Van Leeuwen et al ont établi précisément leur capacité d'offrir une protection contre la DMLA, quand ils ont constaté qu'un apport alimentaire élevé de bétacarotène, de vitamines C et E, et de zinc était associé à un risque considérablement réduit de DMLA chez les personnes âgées[9].

Cet énoncé semble contredire une métaanalyse récente dans le *British Medical Journal*, laquelle rendait compte des effets particuliers des antioxydants alimentaires sur la prévention primaire de la DMLA[21].

L'analyse permettait de conclure que, lorsque considérés séparément, il n'y a pas assez d'éléments probants qui appuient le rôle des antioxydants alimentaires, incluant l'utilisation de suppléments alimentaires antioxydants, dans la prévention primaire de la DMLA au stade précoce. Les auteurs faisaient remarquer que la métaanalyse présentait une restriction, à savoir qu'ils n'avaient nullement examiné les effets des antioxydants combinés.

L'étude de Rotterdam, une étude de cohortes prospective, a permis de comparer les effets des antioxydants pris séparément et combinés. On a rapporté que les résultats pour les antioxydants pris séparément n'étaient pas aussi forts que l'effet bénéfique rapporté quand on prenait les quatre suppléments antioxydants combinés[9]. Cette constatation était semblable à celle de l'étude AREDS, où l'on rapportait d'importantes réductions du risque de la progression de la DMLA avancée dans la branche des antioxydants (17 %), la branche du zinc (21 %) et la branche antioxydants et zinc (25 % après 6,3 ans et 27 % dans la prolongation de 10 ans)[15].

Peutêtre que les effets bénéfiques dans les deux études sont attribuables aux effets synergiques des antioxydants pris ensemble que séparément.

Le fait qu'une grande partie de la population observée pendant l'étude travaillait dans le secteur des soins de santé, et qu'elle pourrait par conséquent ne pas être représentative de la population normale[21], est une autre restriction de la métaanalyse.

Les facteurs de risque

On ne comprend pas entièrement de manière précise comment débute et progresse le processus pathologique de la DMLA mais plusieurs facteurs de risque ont été déterminés. Ils peuvent être répartis en deux groupes, les facteurs non modifiables et les facteurs modifiables.

Les facteurs de risque non modifiables

L'âge : La Beaver Dam Eye Study, entre autres, a permis d'établir que l'incidence et la gravité de la DMLA augmentent avec l'âge[4].

La génétique : Selon des études de jumeaux et de familles, il semble y avoir de solides éléments probants appuyant l'existence d'une composante génétique dans le risque de souffrir de DMLA[2,22]. De récentes études sur les liens et les associations génomiques se sont concentrées sur la découverte de gènes candidats pour la DMLA. Parmi les loci d'intérêt se trouvent 1q32 (gène complément du facteur H) et une région de 10q26 (LOC387715). Bien qu'on ne connaisse pas le mécanisme exact selon lequel ces polymorphismes de nucléotides simples prédisposent à la DMLA, ils semblent jouer un rôle dans les modèles de cascade inflammatoire et de stress oxydatif d'une blessure, respectivement[23].

Le sexe : Les femmes sont légèrement plus à risque de développer un ou plusieurs drusens intermédiaires, de petits drusens généralisés, ou des anomalies pigmentaires de l'EPR[12].

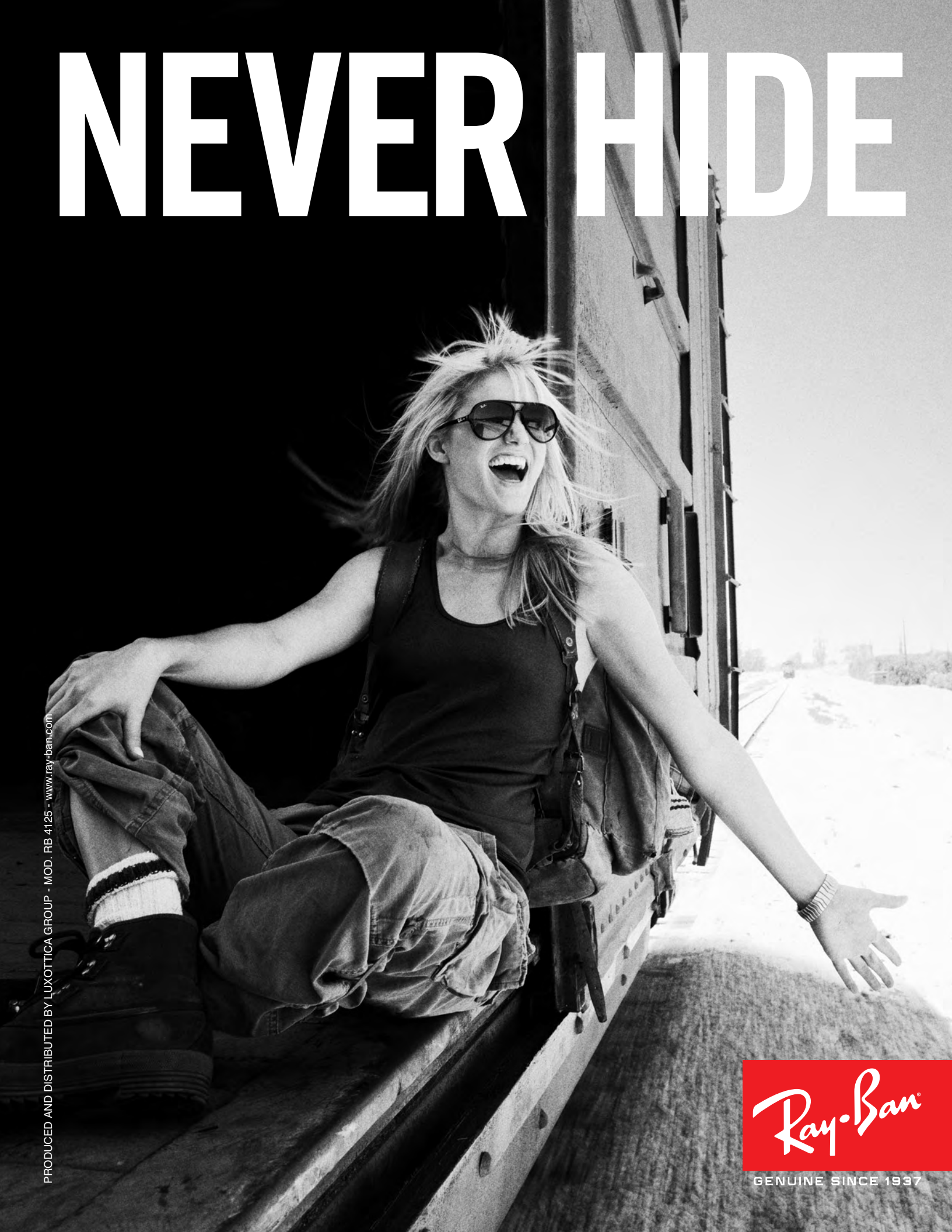
La race : L'AREDS 3 a permis de trouver une plus haute fréquence de néovascularisation choroïdienne chez les personnes de race blanche, chez qui on avait plus fréquemment observé un ou plusieurs grands drusens (>125 μm) et une grande quantité de drusens intermédiaires[12]. Les auteurs ont avancé l'hypothèse qu'une augmentation de mélanine dans les cellules EPR, qui agit comme un capteur de radicaux libres ou simplement comme un filtre pour les rayons ultraviolets, protège les cellules EPR et la membrane de Bruch, réduisant ainsi le risque de développer de grands drusens et de modifications pigmentaires de l'EPR et réduisant, de cette façon, le risque d'atrophie géographique, de néovascularisation choroïdienne, ou les deux[12].

La couleur des yeux : Hyman et al[24] ont constaté un lien entre les yeux bruns et une plus faible DMLA. Frank et al[25] ont conclu qu'il y avait une plus grande prévalence de DMLA chez les personnes de race blanche qui ont un iris de couleur pâle que chez les personnes dont l'iris est de couleur plus foncée.

Les affections concomitantes : Les chercheurs de l'étude AREDS ont trouvé une corrélation entre la DMLA et les affections concomitantes, comme l'hypermétropie[12], le diabète[26], et des antécédents de maladie cardiovasculaire[26].

Les facteurs de risque modifiables

Le tabagisme : De tous les facteurs de risque modifiables, le tabagisme est le plus important. Les études AREDS 3 et 19 ont permis de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constater que le tabagisme était associé à des cas plus graves de DMLA (humide et sèche)[12,20]. On ne connaît pas exactement le mécanisme de la détérioration mais les auteurs de l'étude AREDS 3 ont fait remarquer que le tabagisme diminue les niveaux d'antioxydants en circulation[12]. Ils ont proposé une raison vasculaire sous-jacente à la DMLA parce que le tabagisme peut détériorer les vaisseaux choroïdiens et altérer le débit sanguin choroïdien, favorisant ainsi des changements athéroscléreux et hypoxiques dans les vaisseaux choroïdiens. Le tabagisme peut entraîner directement la vasoconstriction, augmentant l'hypoxémie et le stress oxydatif[12].

Les facteurs liés au style de vie : Les facteurs liés au style de vie, comme le régime alimentaire, la forme physique, l'obésité et les facteurs socioéconomiques jouent un rôle dans la DMLA[20].

L'exposition au soleil : L'exposition aux rayons solaires ultraviolets est un autre facteur de risque modifiable. Bien que la preuve du rôle pathogène de l'exposition solaire dans la DMLA soit controversée, elle ne peut être ignorée[9,13,14].

Consensus

- La DMLA est une maladie plurifactorielle. Les effets relatifs des facteurs de risque environnementaux et génétiques sont inconnus.
- De nombreux facteurs de risque de DMLA sont bien connus, comme en témoignent les publications médicales.
- Il manque de données cliniques probantes pour conclure que la gestion des facteurs de risque peut prévenir la progression de la DMLA au stade précoce. Les essais contrôlés randomisés, comme l'étude AREDS, n'ont pas formulé de recommandations conclusives pour les patients au stade précoce de la DMLA (catégorie 1 ou 2).
- Les essais contrôlés randomisés, comme l'étude AREDS, ont montré que la gestion des facteurs de risque modifiables a un effet sur la DMLA au stade avancé. Chez les patients des catégories 3 et 4 de la DMLA, la norme de soins inclut la gestion des facteurs de risque modifiables.
- Malgré les données probantes provenant des essais contrôlés randomisés, bon nombre de personnes ne sont pas convaincues de l'importance de la gestion des facteurs de risque.
- Les facteurs de risque non modifiables comme l'âge, la génétique, le sexe, la race, la couleur des yeux et les affectations concomitantes, font toujours l'objet d'études.

L'importance des facteurs de risque modifiables, comme le tabagisme, la nutrition (incluant les antioxydants comme les vitamines C et E, la lutéine, la bétacarotène, la zéaxanthine et le zinc), les facteurs liés au style de vie et l'exposition au soleil, doit être renforcée pour sensibiliser les patients.

- Le rôle éducatif des professionnels des soins oculovisuels en ce qui a trait au renforcement de l'importance des facteurs de risque modifiables est fondamental.

Le problème alimentaire

Le Guide alimentaire canadien de 2007 recommande sept (7) portions de fruits et légumes quotidiennement pour les adultes de plus de 51 ans[27]. Les fruits et légumes sont d'excellentes sources naturelles de lutéine et autres antioxydants; cependant, une grande proportion de Canadiens de plus de 50 ans ne consomment pas les rations quotidiennes recommandées (tableau 2)[28]. Les suppléments d'antioxydants peuvent être la réponse, comme le laissent entendre les études Rotterdam Eye Study et AREDS[9,12,15,16].

Consensus

- On prévoit que l'incidence de la DMLA augmentera considérablement dans les années à venir en raison du vieillissement de la population du Canada.
- Les mauvaises habitudes alimentaires des Canadiens plus âgés pourraient aggraver la progression prévue de la DMLA en raison du vieillissement.
- Une grande proportion de Canadiens ne consomment pas les rations quotidiennes recommandées de fruits et légumes.
- L'âge peut influer sur l'absorption des nutriments.

Recommandations

En fonction des connaissances actuelles :

- Les médecins et les professionnels des soins de la vue devraient informer les adultes de 55 ans et plus des facteurs de risque liés à la DMLA.

- Les médecins et les professionnels des soins de la vue devraient transmettre les stratégies de gestion des facteurs de risque pour la prévention de la DMLA aux patients à risque.
- Les médecins et les professionnels des soins de la vue devraient conseiller aux patients d'arrêter de fumer, de réduire au minimum l'exposition au soleil et d'adopter une saine alimentation
- L'étude Rotterdam Eye Study laisse entendre que l'apport alimentaire régulier de certaines vitamines antioxydantes et minéraux peut être profitable aux patients à risque DMLA précoce et à ceux qui ont des antécédents familiaux de DMLA. Quand le régime alimentaire ne peut satisfaire aux exigences quotidiennes en vitamines et minéraux pour réduire le risque de progression de la DMLA, les suppléments peuvent être une solution pour les patients à risque. Les médecins et les professionnels des soins de la vue devraient vérifier la consommation régulière de suppléments des patients avant de recommander d'autres suppléments contre la DMLA.
- Il faut poursuivre la recherche pour examiner les effets bénéfiques, les risques, et les doses idéales des suppléments de vitamines et de minéraux pour les patients à risque de DMLA.

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Mots clés : *dégénérescence maculaire liée à l'âge, prévention, maladie oculaire dégénérative, suppléments d'antioxydants, suppléments oculaires, facteurs de risque, consensus, ligne directrice*

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Tableau 1 : Nombre estimé de Canadiens affectés par la DMLA

Âge (années)	Pourcentage (%) de personnes souffrant de DMLA	Canadiens souffrant de DMLA*
43 – 53	8.5	467,500
55 – 64	14.4	529,126
65 – 74	19.4	440,768
≥75	36.8	748,512
Total estimé		2,185,906

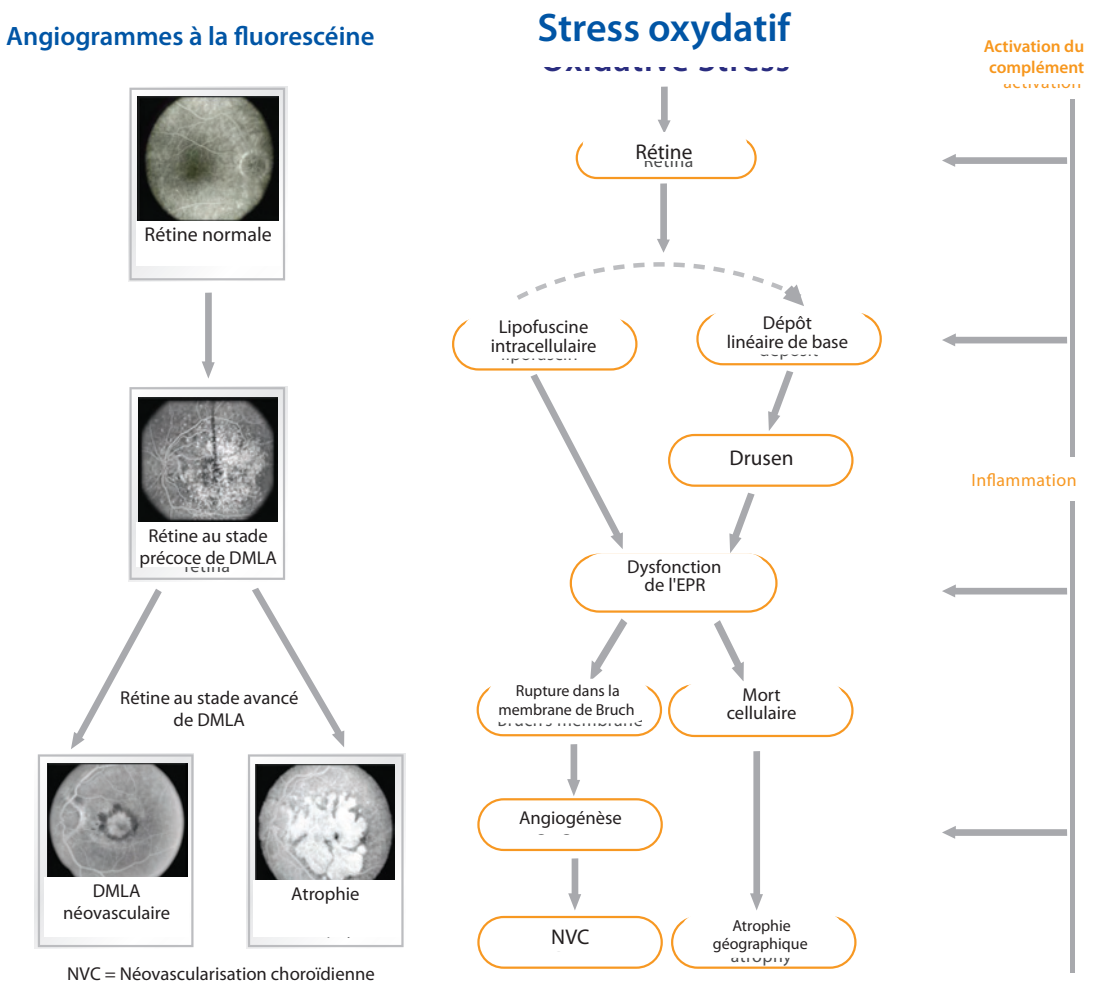
** Extrapolation à partir des données de la Beaver Dam Eye Study 1988-1990[3] Statistiques démographiques pour les groupes d'âge de moins de 65 ans : Recensement de 2006 de Statistique Canada; pour les groupes d'âge de plus de 65 ans, prévisions de Statistique Canada (croissance moyenne), 2005*

Tableau 2 - Pourcentage de Canadiens en 2005 qui ont consommé moins de cinq portions/jour de fruits et légumes

Âge (années)	Pourcentage(%)
45 – 54	56.8
55 – 64	52.3
65 – 74	48.5
≥75	39.4

Statistique Canada, tableau 105-0449[28]

Figure 1 – Pathogénèse de la DMLA



NVC = Néovascularisation choroïdienne

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1. A total of 100 adapted wearers of Focus Dailies lenses completed a 1-week clinical investigation of SofLens® Daily Disposable contact lenses. Patients were instructed to wear the lenses on a daily wear, daily disposable basis. At the completion of the study, patients completed a product attribute rating questionnaire.

Student indebtedness amongst graduates from Canadian Optometry Schools

ETTY BITTON, OD, MSC, FAAO, Ecole d'optometrie, Universite de Montreal, Montreal, Quebec
DEBORAH JONES FCOPTOM, FAAO, School of Optometry, University of Waterloo, Waterloo, Ontario

RÉSUMÉ / ABSTRACT

Objet : Cette étude avait pour but d'examiner le niveau d'endettement des diplômés des deux écoles d'optométrie canadiennes (Montréal et Waterloo). Un second objectif consistait à évaluer l'incidence financière du stage clinique sur l'endettement global.

Méthodes : La promotion de 2007 a fait l'objet d'une enquête anonyme au cours de laquelle on a recueilli des données démographiques et des renseignements sur le nombre d'années d'études et les frais de stage ainsi qu'une estimation du niveau de l'endettement global à l'obtention du diplôme.

Résultats : L'endettement global moyen s'échelonnait entre zéro et cent cinquante mille dollars (150 000 $ CAD), la moyenne étant plus élevée chez les étudiants de l'UW (UM 26 750 $; UW 75 165 $; p<0,05). La dette a été beaucoup plus élevée chez les diplômés que chez leurs collègues de sexe féminin à l'une ou l'autre des écoles (F 48 200 $ contre H 59 231 $; p<0,05).

Conclusions : Cette étude est la première qui traite de l'endettement des étudiants en optométrie au Canada. La compréhension des facteurs qui contribuent à l'endettement des étudiants en optométrie est la première étape qui permet de saisir le fardeau financier des étudiants dans les écoles d'optométrie au Canada.

Purpose: The objective of this study was to investigate the level of student indebtedness amongst the graduates from the two Canadian optometry schools (Montreal and Waterloo). A secondary objective was to investigate the financial impact of the clinical externship program on the overall student debt.

Methods: The 2007 graduating class was surveyed anonymously. Information was obtained on demographics, number of years of study, expenses related to externships and the overall estimated level of debt upon graduation.

Results: The mean overall debt varied between zero and one hundred and fifty thousand ($150,000 Cdn), with UW students having a higher mean debt (UM $26,750; UW $75,165 Cdn; p<0.05). Males had a significantly higher debt than females at either school (F $48,200 vs M $59,231; p<0.05).

Conclusions: This is the first report of Canadian optometry student indebtedness. Understanding the factors that contribute to the optometry student indebtedness is the first step in understanding the financial burden of students attending Canadian optometry schools.

Introduction

Student indebtedness has been a growing concern in many professions,[1, 2] including those studying at optometry schools.[3-6] Previous reports estimate the debt amongst optometry students to be greater than one hundred thousand dollars upon graduation.[7, 8] The financial burden that new graduates bear may influence their choice of practice modality.[5, 8, 9] Student debt is such a substantial part of the educational process, that several north American schools have a dedicated financial aid office and guide students towards eligible financial resources.[10] By the time a student graduates from optometry school, their average age is in the mid twenties and for most, this is concomitant with other major life changes such as marriage, owning a home and starting a family.

Although university education in Canada is quite affordable as compared to the US, the rising cost of education is a concern for all

students attending university. As a result, Canadian students incur a level of debt, albeit less than those studying in the US, that is parallel with the growth of education costs. Optometry students are not immune to these rising costs, since their expenses include tuition, books, equipment and travel costs related to clinical externship programs. The level of indebtedness amongst US optometry students has been reported to be well above $100,000 U.S.[7] and continues to steadily rise. Although the trend is likely similar in Canada, the level of indebtedness amongst Canadian optometry students remains unknown.

As part of the clinical curriculum of all 19 North American schools/colleges of optometry, final year students are required to participate in a clinical externship program, of 8-12 weeks duration. For Canadian students, these are held away from the school and often out of country, which entails additional travel and housing expense for the students.

The objective of this study was to investigate the level of overall student indebtedness amongst students graduating from the two Canadian optometry schools, namely University of Montreal and University of Waterloo. As a secondary objective, the expenses related to externships and how this related to the overall student debt was also investigated.

Materials and Methods

Optometry students from the 2007 graduating class of the University of Montreal (UM) and University of Waterloo (UW) were surveyed anonymously about their estimated level of debt upon graduation. A bilingual survey (French/English) (Appendix 1) was developed to assess different aspects of student demographics and to investigate the level of debt related to externships and overall debt. Demographics, such as age, gender and years of study at university were included. Specific expenses relating to the externship program were also investigated, as well as the financial resources that the students used during their years of study (ie. Provincial/federal loans, scholarships, financial assistance from parents/family, bank loans, etc). Surveys were returned anonymously and the results were tabulated and analyzed by the department of statistics at UM (SPSS version 15, Chicago, IL, USA). All reported dollar amounts are in Canadian funds. Descriptive statistics such as averages, standard deviation and confidence intervals were determined where appropriate. Non-parametric data (ie. financial resources) were calculated as a percentage of financial resources used by each student. Statistical significance was set at $p<0.05$.

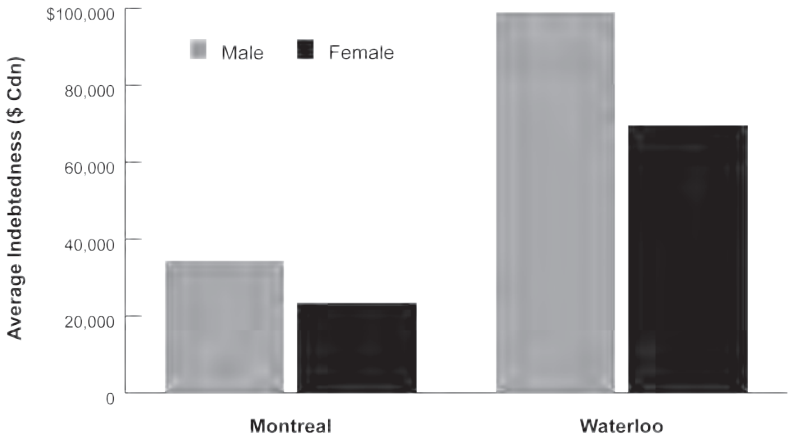

Figure 1: *Student debt ($Cdn) by gender and school (UM-Montreal; UW-Waterloo)*

Results

Twenty six (n=26) students from each school (out of a class size of 38 for UM and 72 for UW) responded to the survey. The gender, age and years of study demographics and overall student indebtedness are summarized for each school in Tables 1 and 2. The average age of the new graduates did not differ significantly between the two schools (UM 24.8 ± 2.2 (yrs ± SD) vs UW 25.5 ± 1.2; $p>0.05$). A significant difference existed in the number of years of study between the two institutions (UM 5.9 yrs versus UW 7.5 yrs; $p<0.001$), however there was no significant correlation found between the number of years of study and the level of debt for UW (Pearson correlation r=0.127,

	Participants (class size)	F : M	Avg Age (yrs ± SD)	Avg yrs of study (yrs)
UM	26 (38)	18 F: 8 M	F: 24.7 ± 1.8 M: 25.1 ± 3.1	F: 5.6 ± 1.3 M: 6.5 ± 2.3
			Total 24.8 ± 2.2	Total: 5.9 ± 1.7
UW	26 (72)	21 F: 5 M	F: 25.4 ± 1.2 M: 26.2 ± 1.3	F: 7.3 ± 1.0 M: 8.6 ± 1.1
			Total 25.5 ± 1.2	Total: 7.5 ± 1.1
Canadian Average	52 (110)	39 F: 13 M	Total 25.05	Total: 6.7

Table 1: *Student demographics including number of participants, age, gender and total years of university studies are showed for each institution (UM-Montreal; UW-Waterloo; F-female; M-male)*

	Mean total debt	Range
UM	$26,750	$0 – 115,000
UW	$75,165	$3,300 – 150,000
Female	$48,200	$0 – 150,000
Male	$59,231	$0 – 150,000
Canadian Average	$50,958	$0 – 150,000

Table 2: *Overall student debt presented by institution and by gender (UM-Montreal; UW-Waterloo)*

p=0.54)., whereas there was a difference for UM (Pearson correlation r=0.524, p=0.006). Table 2 and Figure 1 reveal the overall student debt for each University, which varied between zero and one hundred and fifty thousand ($150,000), with a significant difference between institutions (UM $26,750 vs UW $75,165; p<0.05) and between genders (M $59,231 vs F $48,200; p<0.05). Amongst the respondents, the average student graduating was 25.05 years of age, with 6.7 years of University study and an average debt of $51,000.

UM has one externship rotation of 10-12 weeks, with sites mainly in the US, as compared with UW, which has two 15 week rotations (therapeutic and private practice rotations) throughout North America. The average expense related to the externship at UM was $3,596, which represented 25% of the total student debt. At UW, the private practice externship represented 6% ($2,626) and the therapeutic rotation represented 8% ($5,300), for a total of 14% ($7,926) of the total debt incurred during the time of study.

A compilation of the individualized educational expenses for each optometry program, detailing tuition, books and instruments, is summarized for each school in Table 3. The cumulative tuition, optometric equipment and books for the entire program were higher for UW ($52,877) than for UM ($21,666) students (p<0.001). The largest difference was for tuition, with $13,200 and $39,670 for UM and UW, respectively. Although computers are not currently "required" for either program, most university students have one and this cost contributes to the total education expenses.

Table 4 illustrates the percentage of students that used a variety of available financial resources. Students used a variety of financial resources, including provincial and federal loans, assistance from parents/family, personal money, bursaries and other (such as bank loans and lines of credit). All students used at least one resource, with the majority using four resources. There was no significant correlation between the amount of resources used and the overall debt (Pearson correlation, r=0.184; p=0.19). No significant trend was identified between genders as to the amount of resources used (females used on average 3.7 resources vs males 4.1; p>0.05).

Discussion

The educational system in Canada is different to that in the US in many respects. Education is governed at a provincial level and hence each province is slightly different from

another. In Quebec, high school ends at grade 11, this is followed by a two year junior college program (CEGEP) prior to entering University. In the rest of Canada, high school ends at grade 12 and students enter a University Bachelor's degree program thereafter.

To attend optometry school at the UM, the minimal requirements are to obtain the junior college diploma. Eligible students arre required to complete a University pre-optometry year prior to the full four-year program. The optometry program is divided into semesters, a fall and a winter semester, with a summer semester between the third and fourth year of the program. Hence upon graduation, students attending the optometry program at UM have completed a *minimum* of nine semesters to complete the requirements for the doctor of optometry (OD) degree.

Students with a bachelor or masters degrees have more years of university prior to entering optometry school. Depending on their discipline of study, they may be granted equivalence for the courses given in pre-optometry.

At the time of the survey, a minimum of 2 years of university was necessary to complete the requirements to attend optometry school at UW. This has since been modified to three years. The UW optometry program works on a similar semester system, with a fall and winter semester per year for the first three years and three semesters in the final year of the program.

In assessing the differences in the two optometry programs, students attending UM are potentially younger upon entering the program, since they can enter directly from junior college and hence may have less years of university study than their UW counterparts. This is well reflected in the data presented in this study, with UM having an average of 5.9 yrs of study versus the 7.5 yrs for UW (Table 1). It would seem logical that an increase in the years of study would be reflected by an increase in the expenses incurred and therefore an increase in the amount of debt. However, this study failed to identify any trend between the years of study and the overall debt for UW students ($p>0.05$). This can be explained partly by the limited variance of years of study for those students which ranged only between 6 and 9 years. Separating debt upon entering optometry school versus debt incurred while at optometry school, and identifying if they have a previous university degree, may better reflect the correlation between years of study and incurred debt.

The increased female presence in optometry schools is a trend that has been observed over the past two decades. For the 2007 graduating class 71 % of the UM class and 75% of the UW class were women. This trend has continued, the 2012 class at UW has 76% female (69 out of a class of 90). This is a trend that is mirrored in the US schools, with geographical differences across the country.[11] Although more females responded to the survey than males at both institutions, this respected the class demographics.

This study revealed a higher debt for students attending UW than UM (Table 2 and Figure 1). Part of the difference can be explained by the differences in academic costs between the two institutions, especially those directly related to tuition

	Tuition	Equipment	Books	Computer	Total
UM	$13,200	$6,096	$2,370	NR*	$21,666
UW	$39,670	$8,810	$4,397	NR*	$52,877

*NR = not formally required

Table 3: *Academic costs for Canadian optometry programs detailing tuition, equipment and books (UM-Montreal; UW-Waterloo)*

	Provincial loans	Federal loans	Parents / family	Personal Money	Bursary	Other
UM	80.8%	15.4%	57.7%	80.8%	80.8%	38.5%
UW	100%	69.2%	53.8%	46.2%	92.3%	42.3%

Table 4: *Percentage of students using different financial resources for each institution (UM-Montreal; UW-Waterloo)*

(Table 3). Other factors influencing the differences are equipment and books that are required to be purchased. For example, UW students are required to purchase their own trial lens sets and Goldmann tonometer probes. At UM this is not a requirement.

UM is the only French speaking optometry school in Canada and attracts mainly resident French speaking students. UW is the only English optometry school in the country and hence attracts a more diverse English-speaking pool of applicants from across the country. Many students are non-resident to Ontario and as a consequence may have higher travel expenses, which may further explain the difference between the debt of students attending the two Canadian optometry schools. Out of province students attending UM are subject to higher fees than resident Quebec students. International students are subjected to considerably higher fees at both institutions.[12, 13] This survey was not able to differentiate between students from within or outside of province. Future studies will address this question in more depth.

The range of debt was surprisingly large for both schools, (0 to $150,000). Although the average debt (UM – $26,750; UW – $75,165) seems low from a US perspective, these are considered high values when taken within the Canadian context. The overall tuition for an American optometry school program varies from around $60,000 for a public school to $90,000 US for a private institution.[14] It is noteworthy that a new graduate in Canada can expect an average gross salary of $80,000.[15, 16] From that, housing, income taxes and transportation costs need to be deducted prior to paying down student debt. It is equally noteworthy that in Quebec and Ontario an income between $70,000-80,000 Cdn places the graduate around the 45% income tax bracket. This taxing structure lengthens repayment of student loans, since other living expenses need to also be considered (housing, food, transportation, etc.) and those often coincide with major life milestones such as marriage, purchasing a home/car, and starting a family.

Gender differences in overall debt were also identified (Table 2, Figure 1) with males having, on average, a $10,000 higher debt than women. The questionnaire used in this study was not able to identify the reason for this difference. Males from both schools had more years of study than their female counterparts (Table 1) which is most likely a contributory factor to the gender difference observed. More research is needed to identify lifestyle differences, spending habits (housing, food, transportation, entertainment) and the entering debt prior to attending optometry school.

Externships have become an important aspect of the clinical curriculum at all the North American schools and colleges of optometry. Some of the North American schools have between 4 and 6 rotations in their final year, often off campus. These departures from campus have considerable associated costs but were not previously reported for the Canadian optometry schools. Due to the short duration of the externship rotation (often under 12 weeks), students may maintain their housing near the optometry school and incur additional housing cost at the externship site. Short term housing can be expensive and varies geographically. The lack of break between 3rd and 4th year leads to students being unable to work in the summer and earn money to support their studies

The single externship rotation at UM represents 25% of the total student debt, while at UW the combination of the two externship rotations represented 14% of the total debt, . Becoming aware of the financial impact that externships have on the student's debt is helpful for future planning of financial assistance for these programs. In addition, the student may better prepare their finances in light of that heavy burden in their final year.

Conclusion

Identifying student debt amongst Canadian optometry students is an important step in understanding the financial burden that new graduates face. Clearly, more research is needed to uncover the contributing factors that affect the level of student indebtedness between genders and between institutions. This is the first report of student indebtedness in Canadian optometry schools. This information is valuable for prospective optometry students, program administrators, legislators and current students within the program.

Phase II of this project is ongoing and will survey the 2008 graduating class of the two Canadian optometry schools, with a more elaborate survey investigating academic costs, housing, travel and personal lifestyles for the new graduates.

Acknowledgements

We would like to acknowledge M. Chagnon from the department of Statistics from the *Université de Montréal* for assistance with the statistical analysis of the data and M. Latendresse for his assistance with tables and figures.

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Appendix 1.
Indebtedness survey

1. Age at graduation : ____ years old
2. Gender ☐ Male ☐ Female
3. How many years of University will you have completed in total by the time you graduate from Optometry School ? (include other university studies ex. BSc, BA, MSc. etc) ___ years
4. By the time you graduate, can you estimate your level of indebtness (how much money will you owe to pay back loans that you've incured for your studies)
   ☐ I will have no debts by the time I graduate
   ☐ my estimate my debt to be around _____ $ Cdn
5. Estimate your total expenses related ONLY to your therapeutic externship rotation. _____ $ Cdn
6. Estimate your total expenses related ONLY to your practice externship rotation _____ $ Cdn
7. What has been the sources of your financial assistance while at Optometry school ? (check all that apply)
   ☐ provincial loans
   ☐ federal loans
   ☐ parent's assistance
   ☐ personal money
   ☐ bursary/grants (do not need to pay back)
   ☐ other (specify) _____

Appendix

Appendix 1: Survey on student indebtedness distributed to the 2007 graduating class of both Canadian optometry schools. The survey was available in both French and English.

Key words: *student indebtedness, Canadian optometry students*

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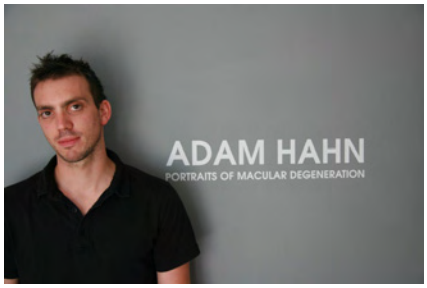

Adam Hahn graciously allowed us to use his work to accompany the feature article on age-related macular degeneration.

Adam Hahn is an established portrait painter who has twice been selected for the BP Portrait Award at the National Portrait Gallery in London, England. He studied at the Glasgow School of Fine Arts and the Prague Academy of Arts, Architecture and Design.

With the assistance of The London (UK) Project to Cure Blindness he spent a year with his portrait subjects for this project, patients suffering from macular degeneration. His series captures the subjects as they see themselves – through the fog of partial blindness. The viewer is engaged in trying to understand how someone with macular degeneration sees the world.

To see more of Adam's work:
www.adamhahn.co.uk

The inspiration for the work was my grandmother. She had MD for the last eight years of her life but like so many people with MD she never really spoke about it so we never really knew what she could or couldn't see. We would read her newspaper articles, help her with her post and finances but she was an incredibly independent person who could do more in one day than I could in a week! Although she couldn't recognize faces or read type, she never let her eye sight interfere with her life. She was constantly on the go, walking up to eight miles every Sunday, forever going to concerts, theatres, music groups, classes, exhibitions, and cinema, and she also helped as a volunteer at her local hospital.

So after she died (almost three years ago) I decided to do something in her memory by raising awareness of MD. I contacted the Institute of Ophthalmology and the London Project who gave me the scientific information necessary to understand the disease, but I needed people's experiences to truly understand what it's like to live with MD. The MD Society put me in touch with two of their members and the MD group in Tunbridge Wells, southeast of London.

On meeting each person I asked them to describe in as much detail what they saw of me. I kept the distance constant for each sitter to get a clear idea of the information their eyes received. After taking photographs at the sitting, I transferred this information by manipulating the image to a level of vision described by each sitter. In the case of my grandmother's portrait Booba, (*see page 14*). I worked on the basis of what other sitters had told me of their vision and how that related to what she saw and how she used her peripheral vision. Not only was I trying to raise awareness but I was also challenging the scientific images where MD vision is represented as a circular black hole in the centre of one's vision, that no sitter related to.

Adam Hahn

'Richard', by Adam Hahn

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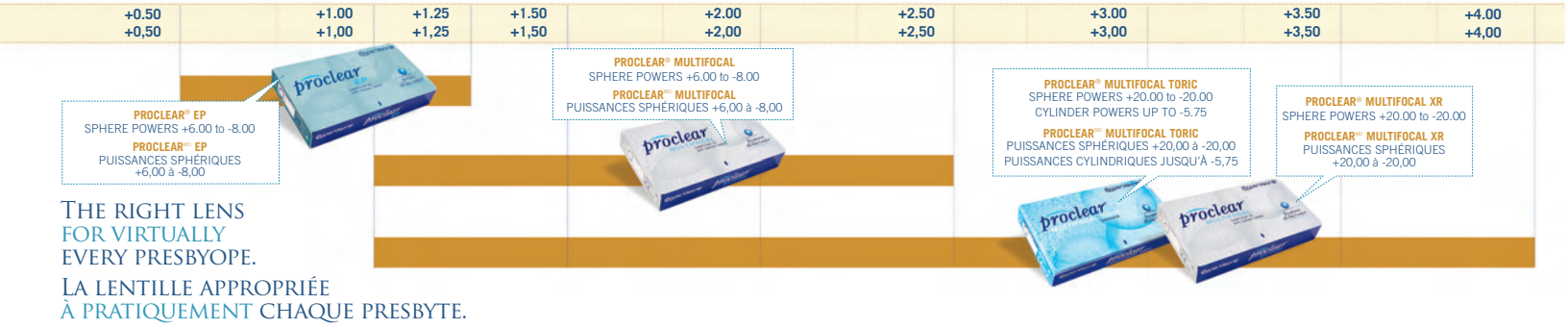

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Introducing the AQUA Moisture System

Lubricates A new, unique moisture agent for comfort on contact

Maintains A patented lens material to help maintain moisture‡2 for comfort all day

Sustains An ultra-smooth surface with superior wettability§3 and excellent deposit resistance4 for comfort every day

Call your CIBA VISION representative or visit mycibavision.com.

†Compared with O_2OTIX®. * AIR OPTIX AQUA: Dk/t 138@ -3.00D. Other factors may impact eye health.
‡ Based on in vitro measurements compared with high-water content (>50%) hydrogel lenses.
§ In vitro measurement compared with ACUVUE® OASYS™, ACUVUE® ADVANCE™, Biofinity®, and PureVision®.

References: 1. CIBA VISION, data on file, 2007. **2**. CIBA VISION, data on file, 2004. **3**. CIBA VISION, data on file, 2007. **4**. CIBA VISION, data on file, 2007.