

● Saving sight. Changing Lives.

# visionary

AUTUMN 2020



## Family matters

What role does your DNA play in eye disease?

## Strengthening the optic nerve

Using gene therapy to fight glaucoma

**WORLD  
GLAUCOMA  
WEEK**

MARCH 8-14



CENTRE FOR  
Eye Research  
Australia



## Welcome to the Autumn issue of *Visionary*.

This edition marks World Glaucoma Week, an event which aims to raise awareness of one of the world's leading causes of vision loss and blindness.

Around 60 million people worldwide have glaucoma, including about 4.5 million who are blind. In Australia about 300,000 people are affected by glaucoma, but about half do not know they have it.

Glaucoma is called the 'silent thief of sight' because frequently by the time someone notices they have a vision problem substantial damage has occurred. Fortunately, this can often be prevented with earlier detection.

I've dedicated my career to developing new treatments for glaucoma and investigating ways to repair the optic nerve and restore sight. In this edition, you can read more about my work, as well as research by my colleagues Professor Ming He, Associate Professor Ian Trounce and Dr Flora Hui.

You can also meet the Logie family, long-time CERA supporters who share their story to launch our annual Glaucoma Appeal. We're extremely grateful to the Logies and all of the generous supporters who make our research possible.

I encourage you to find out more about how you can support the appeal on page 9.

Also, if you know someone who is interested in eye research but no longer able to read because of their failing sight, we are now producing an audio edition of *Visionary*. You can find out more on our website.

Finally, in World Glaucoma Week, I encourage anyone who is overdue for an eye check to make an appointment with an eye care professional today. It could save your sight!

**Professor Keith Martin**

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 Centre for Eye  
Research Australia  
(CERA)







# Small wonders

The tiny powerpacks in our cells could hold vital clues about why some patients continue to lose their sight from glaucoma despite treatment.

If your parents, sister or brother have glaucoma, you are four times more likely to have the disease.

But now research at the Centre for Eye Research Australia is looking at a different genetic link – the role of genes in your mitochondrial DNA, which you inherit from your mum.

Mitochondria are the tiny powerpacks which provide energy to our cells. They have a small but vital set of genes that are inherited from our mothers, which make them different from nuclear genes which we inherit from both parents.

Associate Professor Ian Trounce is investigating how changes in mitochondrial DNA can lead to cell damage in the optic nerve and vision loss in glaucoma.

“Current treatments for glaucoma are aimed

at lowering eye pressure but don't slow vision loss for many patients,” he says.

“There is mounting evidence that defective mitochondria play a role in glaucoma and my research will further investigate that link.”

In 2020 Associate Professor Trounce will work with ophthalmologists in Melbourne to recruit patients and their families to take part in his research.

After the initial analysis of data from 1000 people, a subset of around 5 per cent of patients will be followed up for more intensive investigation.

“The research will help us determine if and what mitochondrial gene changes are contributing to impaired vision in patients with glaucoma,” says Associate Professor Trounce.

“By identifying a new group of glaucoma patients, we will be able to investigate and develop new approaches to slowing vision loss that go beyond reducing eye pressure.”

Associate Professor Trounce's research is supported by the National Health and Medical Research Council and the Kathleen Rankin Bequest.

# Striving to strengthen the optic nerve

For patients who have lost sight to glaucoma, treatments to protect and repair the optic nerve would be life-changing. Professor Keith Martin, CERA's Managing Director, is striving to develop therapies to achieve this.

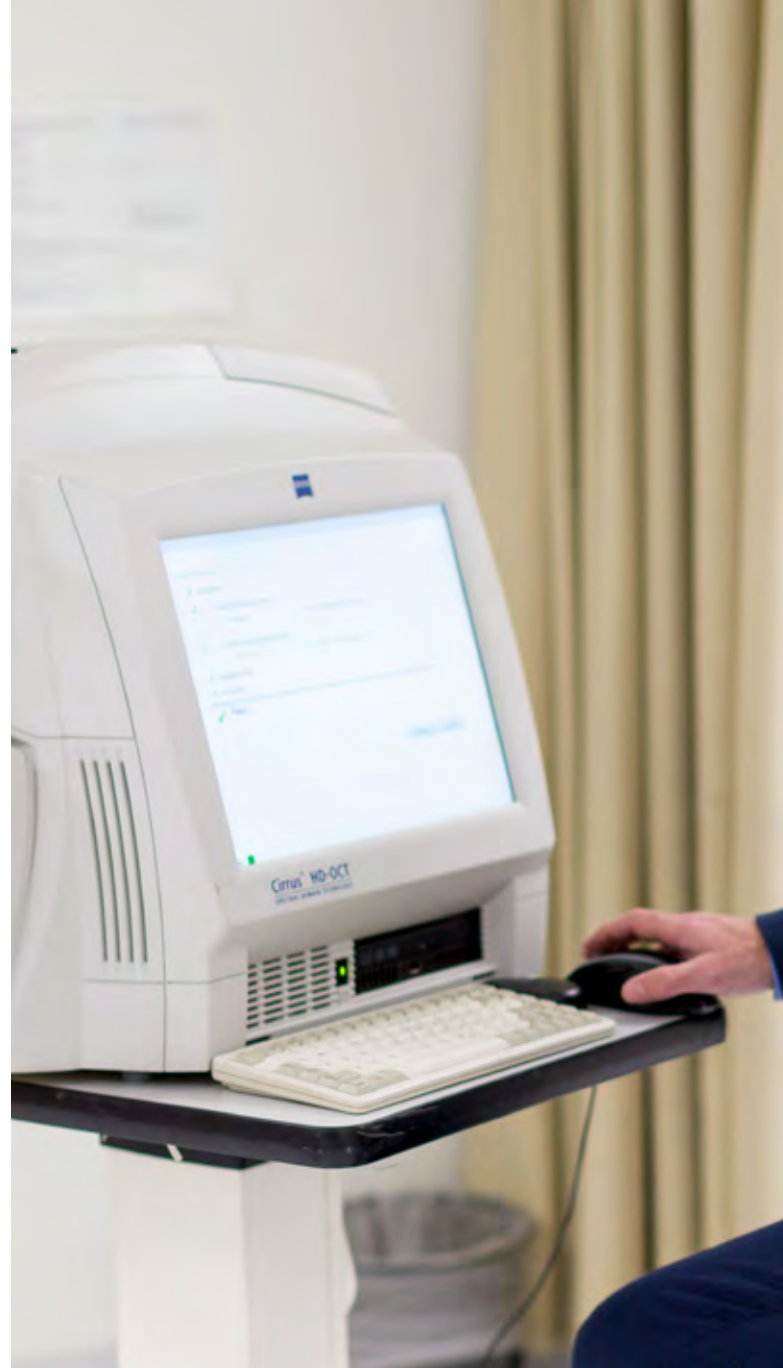
**T**he optic nerve is the connection between the eye and the brain – a bit like a cable that connects a camera to a computer. It plays an essential role in our vision, allowing the brain to receive electrical signals from the back of the eye, so it can interpret them as images.

Glaucoma interrupts this transfer of visual information. As the disease develops, the optic nerve becomes progressively damaged, leading to gradual loss of peripheral vision. If left untreated, it can lead to blindness.

## Could the optic nerve be repaired?

Currently, glaucoma treatment is largely aimed at lowering eye pressure to protect the optic nerve and prevent further damage. This can slow or even stop the progression of vision loss. But for about 15 per cent of patients, vision continues to deteriorate, despite the best available treatments.

Professor Keith Martin, CERA's managing director and one of the world's leading experts in glaucoma, believes gene therapy could change this.



**Gene therapy is offering new potential and hope for patients whose glaucoma does not respond to conventional treatments."**

"Gene therapy is offering new potential and hope for patients whose glaucoma does not respond to conventional treatments," says Professor Martin.

"Gene therapy to treat eye disease is



CERA Managing  
Director Professor  
Keith Martin.  
Picture:  
Anna Carlile.

advancing at a faster pace than arguably in any other branch of medicine.”

In a ground-breaking and ambitious new project, Professor Martin and Professor James Fawcett from the University of Cambridge are striving to develop new treatments, including gene therapy, that could strengthen and repair the optic nerve, potentially restoring lost vision.

Professor Martin is currently building his Melbourne team as the research moves into its next phase.

“Essentially what we’re trying to do is protect the optic nerve from damage but also improve its ability to regenerate after injury,” Professor Martin explains.

“If you injure your skin, you might have a patch of numbness, but after a while the sensation improves. That’s because the nerves in the peripheral parts of your body can regenerate.

“The optic nerve doesn’t, and we’re trying to work out why.”

### Strengthening nerve ‘transport systems’

To do this, the team is working to improve the ‘transport system’ within the nerve fibres of the eye. They’ve discovered that a molecule called prodrudin may hold the answer.

“We’ve found that if we increase the amount of prodrudin or change the way it’s working, we can improve transportation along the nerve fibres,” says Professor Martin.

“And getting the right molecules to the right place at the right time can improve the ability of that nerve to repair.

“We are still at a relatively early stage, looking at the fundamental mechanisms of how prodrudin is working. But what we’ve seen is the strongest regeneration of any technique we’ve used before.”

This research may even eventually have the potential to improve the success of eye transplants, helping a transplanted eye connect to the brain by growing axons through the optic nerve.

### Hope for the future

Restoring vision may be a long way off – but these early days are showing it is a realistic possibility for the future.

“In the past it seemed impossible that we’d be able to regenerate the optic nerve. We can potentially do this now, but it remains to be seen how much vision can be restored,” says Professor Martin.

“There is still much work to do and we will continue to work hard on this with the help of our supporters.”

This research is supported by funding from UK charity Fight for Sight.



# Using AI to predict glaucoma's path

CERA researchers are developing an artificial intelligence tool that could help predict the progression of eye diseases like glaucoma.

**A**rtificial intelligence – computer programs that are trained to learn and complete tasks that would usually require human intelligence – is changing the landscape of medicine, and eye health is at the forefront.

CERA Principal Investigator Professor Mingguang He and his team have developed a cutting-edge artificial intelligence (AI) screening tool that can detect signs of glaucoma, macular degeneration, diabetic retinopathy and cataracts.

After taking a photo of the back of a patient's eye, the AI system scans for signs of disease, and prints out a report identifying if the patient should be referred to a specialist for further assessment and treatment.

This would allow preliminary eye health screening to be done in a wider range of health settings, such as in GP clinics or by health workers in remote communities.

"Vision impairment and blindness are major public health problems in Australia, with up to 50 per cent of major eye diseases remaining undiagnosed," says Professor He.

"Artificial intelligence has the potential to close the gap in eye care services, considerably



Professor He.  
Picture: Anna Carlile.



increase early diagnosis of the four most common blinding eye diseases, and reduce the burden of vision loss in the Australian communities that need it the most.”

The tool has been found to be highly accurate and is currently being trialled in real-world settings.

### The next step – predicting disease progression

Now, with the support of a National Health and Medical Research Council (NHMRC) Investigator Grant, Professor He is working to evolve this deep learning technology to develop a clinical decision system that is able to predict disease outcomes and prognosis.

“The potential of an AI application such as this is yet to be fully realised,” says Professor He.

“In the next five years, we will develop a system that will help clinicians decide the best treatment option, based on real-world clinical data.”

The current system can make a binary classification of specific eye diseases – for example, it might give a classification of no glaucoma, probable glaucoma or certain glaucoma. However, severity is based on a single image.

The new algorithm Professor He strives to create could provide a more detailed classification – for example, showing what type of glaucoma is present, and how likely it is to progress.

“This development would require access to data from additional imaging methods such as visual field, ocular coherence tomography (OCT), as well as real-world clinical data in text format, and to use this data to train a new AI algorithm to build a clinical decision system,” Professor He says.

“This system will use one particular disease, for example glaucoma, and will further expand to other diseases using the same framework and strategies when validation is proven.”

“The potential of an AI application such as this is yet to be fully realised.”



Beryl Logie with her daughter Wendy and husband Bill.  
Picture: Anna Carlile.



## A focus on the future

Three generations of Beryl Logie's family have been affected by eye disease. She hopes our research will create a brighter future for younger people.

**B**eryl Logie first understood the value of eye research when her mother lost her eyesight to glaucoma in her 90s – but it really hit home when Beryl herself, and then her daughter Wendy were also diagnosed with eye disease.

"We decided that the Centre for Eye Research Australia was so important that we wanted to become donors," says Beryl, who has lived with age-related macular degeneration for more than a decade.

Beryl and her husband Bill have now

donated to CERA for more than 15 years.

More recently, Beryl and Bill's daughter Wendy was treated to prevent glaucoma. Even though glaucoma is hereditary, this came as a shock, says Beryl.

"It's very encouraging to know CERA is investigating glaucoma and macular degeneration," says Beryl. "Down the track, even if it doesn't help me, it's going to help the next lot of people."

Wendy was 54 when a routine eye check found that the pressure in her eyes was



increasing, bringing with it a high risk of glaucoma because of the family history.

### In the family

Wendy has vivid childhood memories of her grandmother losing her sight and the impact it had on her life.

She could no longer garden or sew, and her mobility and safety were hugely compromised as her sight declined.

"She'd fall because she couldn't see," remembers Wendy. "And by the time she was diagnosed, it was too late to do anything."

For Wendy, the diagnosis of her own risk of developing glaucoma came as a surprise. "I wanted to do everything I could to prevent this." She underwent successful laser treatment to create a small hole in each eye to relieve the pressure and prevent potential damage to the optic nerve.

Wendy now has strict biannual checks and considers herself fortunate, and a bit lucky.

"It had been six years since my last check up, and time had got away from me," says Wendy. "If I had left it much longer, who knows what would have happened?"

### Regular eye checks

Wendy's own family is now diligent about regular eye checks.

"We are very aware of eye issues because of what's happened to my grandmother and my mother, and that I was heading that way, as well," says Wendy.

"If there's any message, it's about making sure people get checked, particularly if there's a family history.

"Get onto any problems early and hopefully save a lot of grief at the other end of life."

Beryl has lived with AMD for more than a decade. It affects her left eye only.

"At the beginning I lost colour definition in that eye," she says. "Then it was like looking through murky water, intermittently, until central vision was gone."

Beryl is now being monitored under the care



Clockwise from left: Wendy, Beryl, Beryl's mum Ida and Wendy's daughter Jessica.

## ANNUAL GLAUCOMA APPEAL



To coincide with Glaucoma Week 2020 (8-14 March) we have launched our annual Glaucoma Appeal.

You can donate to support our ground-breaking research into glaucoma and other eye diseases by filling in the donation form enclosed in this edition of *Visionary* or by visiting [www.cera.org.au/donate](http://www.cera.org.au/donate)

of ophthalmologist Professor Robyn Guymer, who is also a Deputy Director at CERA.

"She's very caring, very friendly and someone you have confidence in," says Beryl. "I am so fortunate to have her looking after me." Beryl still has good vision, and she can read and drive, but feels that her depth perception is weak.

"I don't have the confidence to know how far down something is.

"I remember Mum putting her foot out to 'feel' her way. It's what I do, getting off the train or changing surfaces, because you don't trust your eyes to gauge it."

Beryl is an active member of a local osteoporosis support group and a strong advocate of regular eye checks for the elderly.

"So many falls and fractures are caused by poor vision," she says.

"It's important people make sure their vision is as good as it can possibly be."



# Getting to know our supporter community

The feedback from CERA's 2019 supporter survey will help us tailor information, events and communications to our community's needs.

The results are in from our 2019 supporter survey and we are excited to share what we learned about our community.

CERA's Donor Relations Advisor, Elaine Levine, says CERA is extremely fortunate to have such a generous and loyal community of supporters.

"We were delighted to receive almost 500 responses and thank everyone who took the time to fill out the survey," she says.

"Many of our supporters told us they have been personally touched by the hardships associated with eye disease, either directly or within their families and friendship circle.

"That knowledge motivates our researchers to keep striving to find new treatments to prevent vision loss, and hopefully one day cures which will restore vision. It also helps us make sure we are keeping our community up to date with the issues that are important to them."

## What we found out

We learned that 50 per cent of our community are aged 74 and over, and the vast majority (81 per cent) have either been personally affected by eye disease or know someone who has.

Age-related macular degeneration is the eye disease our supporters are most concerned about (45 per cent), closely followed by glaucoma (43 per cent). Cataracts and diabetic eye disease are also significant concerns.

We also wanted to know why our community

chooses to support CERA's work.

It was great to see 66 per cent of respondents agree with the statement "I believe CERA is making progress in the fight against eye disease" and 62 per cent respond, "I care about medical research in general."

Being personally affected by eye disease or having a loved one who is affected by eye disease was another big motivator for supporting CERA.

More than two thirds (68 per cent) told us they wanted to learn about the latest in eye research. Information on keeping your eyes healthy (44 per cent), learning how to manage vision loss (26 per cent), and meet and greets with researchers (25 per cent) were also areas of great interest. We will strive to deliver this through our program of community events this year and beyond.

## Gifts in wills

CERA would like to thank those supporters who indicated their intention to leave a gift to CERA in their will. This generous act will ensure continued support for our researchers to find cures for eye disease for future generations.

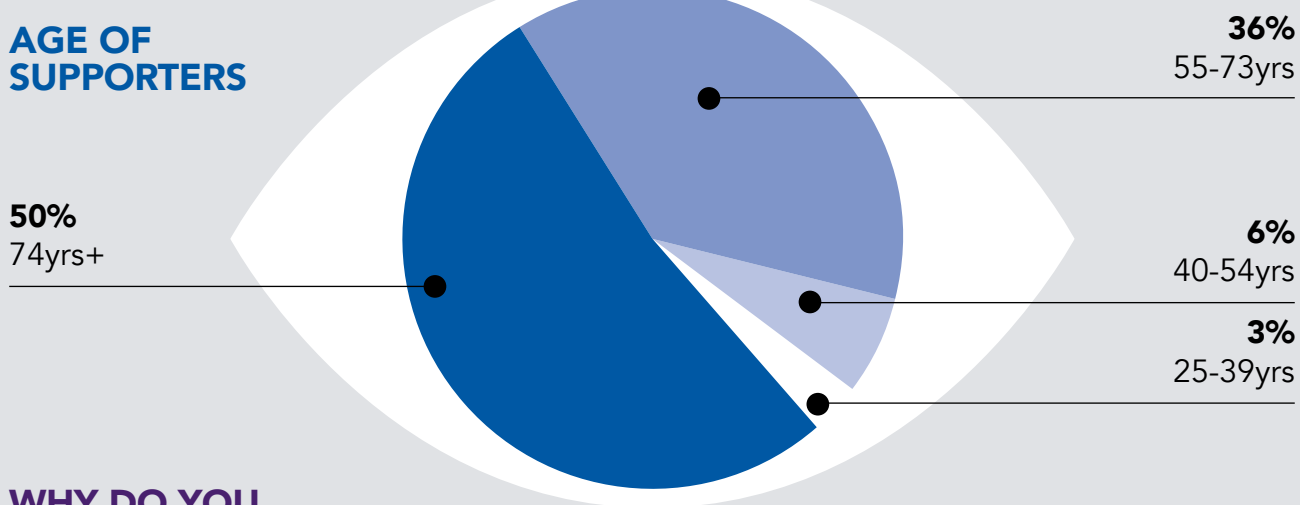
## Thank you

"We would like to thank everyone for their generosity in sharing their answers. The feedback we received will truly guide our organisational strategies over the coming years."

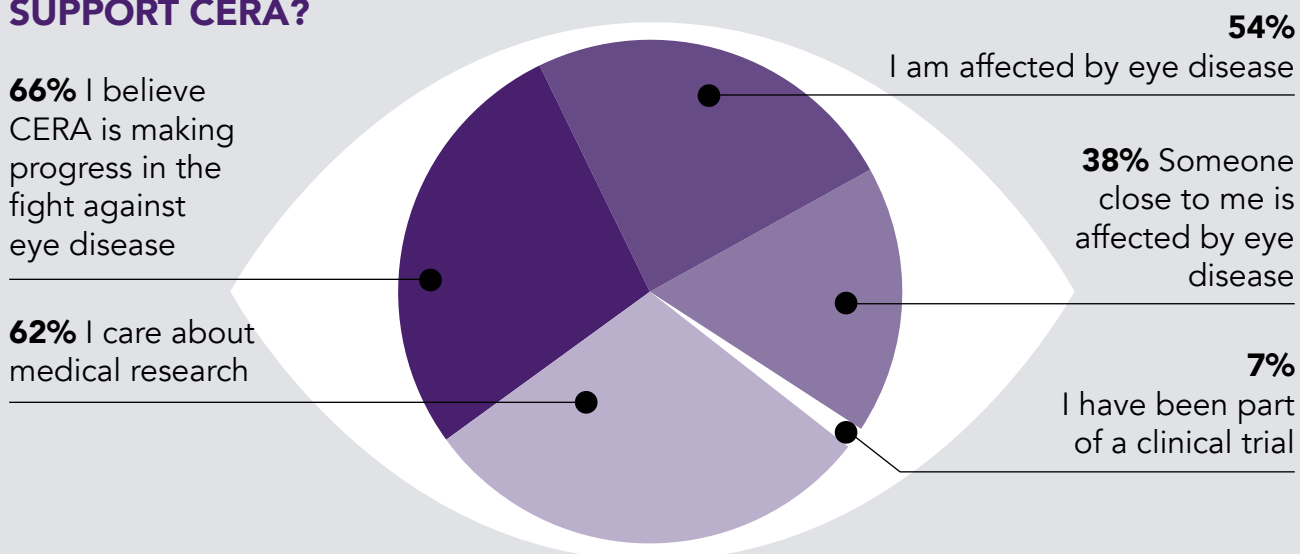




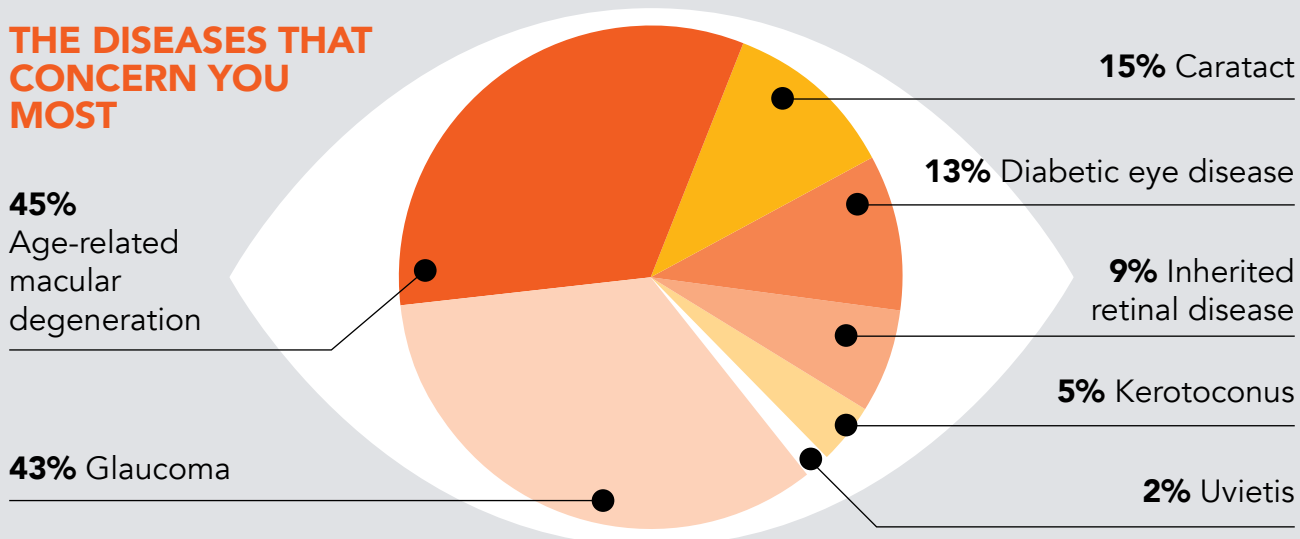
## AGE OF SUPPORTERS



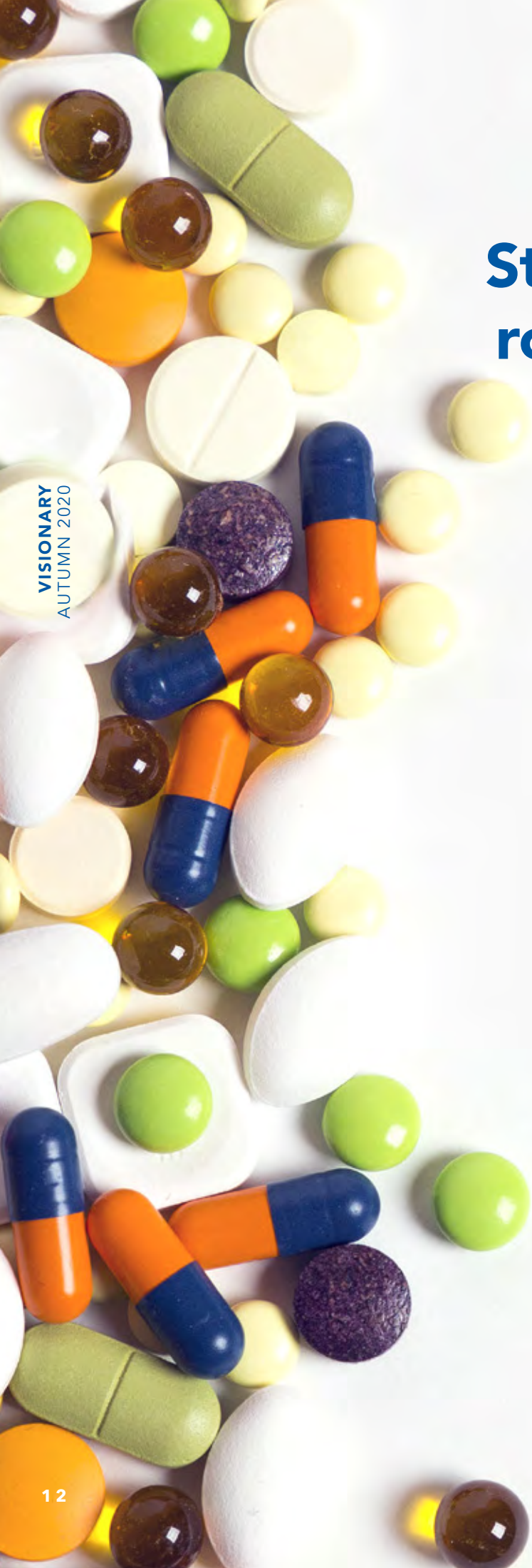
## WHY DO YOU SUPPORT CERA?



## THE DISEASES THAT CONCERN YOU MOST



NB. Some figures do not add up to exactly 100% because respondents gave more than one answer or did not answer a question.



# Study investigates role of vitamin B3

Could a high dose of a humble vitamin support existing glaucoma therapies?

Like oil that keeps a car engine running smoothly, CERA research is investigating whether vitamin B3 could help protect nerve cells against damage in glaucoma.

Researcher Dr Flora Hui has been at the forefront of a world-first clinical trial which has examined the impact of giving patients a high dose of daily vitamin B3 in addition to their usual treatment to lower eye pressure.

Results of the highly anticipated study will be released this year.

The study, initiated by our former Managing Director Professor Jonathan Crowston and continued in partnership with him in his new role in Singapore, aimed to determine if therapeutic use of a high dose of the vitamin could be used to support existing therapies such as daily eye drops, or in severe cases, surgery.

“Our research has investigated if there is a way to protect nerve cells from further damage in glaucoma and also whether this treatment can support sick nerve cells to help them work better,” says Dr Hui.

“Our study hopes to confirm that vitamin B3 can protect nerve cells from dying, in a similar way that adding oil to a faulty car engine can still allow it to run more smoothly.”

Glaucoma leads to vision loss when cells in the retina and optic nerve are damaged and stop functioning. Current treatments aim to lower pressure rather than protecting or repairing cell damage.





Recent research has shown that in the early stages after injury to nerve cells, visual function can recover but that this ability diminished with age.”



Dr Flora Hui.  
Picture: Anna Carlile.

Earlier pre-clinical research in the US showed that vitamin B3 could prevent optic nerve degeneration – and the CERA research is the first time this approach has been trialed in humans.

“Recent research has shown that in the early stages after injury to nerve cells, visual function can recover but that this ability diminished with

age,” she says.

“We are now investigating treatments that could boost this recovery.”

The research is generously supported by the Ophthalmic Research Institute of Australia, Jack Brockhoff Foundation, Marian and EH Flack Trust, Jean Miller Foundation and Connie and Craig Kimberley Fund.

## BE THE FIRST TO KNOW

To learn more about the results of this study keep an eye on the CERA website or subscribe to our monthly Eye-News emails at [www.cera.org.au](http://www.cera.org.au)

You can also follow us on social media on Twitter @EyeResearchAus, Facebook @CERA.ey and LinkedIn Centre for Eye Research Australia.

If you are reading *Visionary* for the first time, visit our website to sign up for your free copy.



# Tips for healthy ageing eyes

Regular check-ups are essential to prevent vision loss.

**O**ur vision is precious. As we get older, changes to our eyes mean our sight becomes more vulnerable.

Almost all of us will experience some presbyopia – difficulty focusing on close objects or reading small print. This is caused by a natural loss of elasticity in the eye’s lens. Luckily, reading glasses provide a simple solution.

But getting older also brings a risk of more serious conditions such as age-related macular degeneration, glaucoma, cataract and diabetic retinopathy. If left untreated, these diseases can lead to significant vision loss and blindness.

Most vision loss can be prevented if caught early, but many conditions have no symptoms until the disease has advanced. That’s why regular eye check-ups are essential.

## HOW TO PREVENT VISION LOSS

### Wear sun protection

Like your skin, your eyes are vulnerable to sun damage. “There is some evidence that too much exposure to UV light over time can increase your risk of cataracts,” says Professor Robyn Guymer, Deputy Director of CERA.

Wear a wide-brimmed hat and good sunglasses outdoors.

Download CERA’s  
Healthy Ageing Eyes  
Guide or an Amsler grid  
from our website at  
[www.cera.org.au](http://www.cera.org.au)



### Get regular eye health checks

“Everyone over 50 should have an eye exam once a year or every two years,” says Professor Guymer.

“If you just buy your reading glasses online or at the chemist, you miss the chance to get checked by an eye care professional. And once you have vision loss, it’s harder for us to treat than if we could stop you from losing it in the first place.”

### Don’t smoke

“Smoking is a big risk factor for a number of eye diseases. It increases your risk of age-related macular degeneration six-fold,” Professor Guymer says. Talk to your GP or contact Quitline.

### Eat a healthy, balanced diet

Good nutrition benefits your whole body. “For the eyes, there is some evidence that dark leafy greens like spinach and silverbeet and yellow vegetables like corn may be beneficial. Omega 3 fatty acids like fish oil may also help,” says Professor Guymer.

### Monitor your vision at home

If you have early signs of AMD, you can monitor your vision with a simple test called an Amsler grid. Once a week, cover one eye and look at the grid, then swap to the other eye.

“The big worry sign is distortion,” Professor Guymer says. “If you notice any significant vision changes like wavy, distorted or blurred lines, or dark areas or ‘holes’ in the grid, that are consistently there, see your eye care professional.”





## Glaucoma Community Forum

**Wednesday 11 March | 10:30am – 12:00noon**

Join Managing Director Professor Keith Martin and researchers Associate Professor Ian Trounce and Dr Jennifer Fan Gaskin during World Glaucoma Week to learn about how to detect glaucoma, living with the condition, what treatment is available and the latest glaucoma research.

*NEW LOCATION: Melbourne Town Hall, Melbourne CBD*  
*RSVP essential*



## CERA's 2020 Vision Expo

**Thursday 14 May | 5:30pm – 8:30pm**

Meet Australia's top experts and rising stars in eye research, learn about the latest research advances in the prevention and treatment of eye diseases and see how CERA's research is translating into treatments for patients.

*Woodward Centre, University of Melbourne, Parkville*  
*RSVP essential*



## Ageing Eyes Community Forum (Box Hill)

**Thursday 17 September | 10:30am – 12:00noon**

Join us as we discuss the latest research to improve diagnosis and treatment of ageing eye diseases and give you some top tips to keep your eyes healthy as you get older.

*NEW LOCATION: Box Hill Town Hall, Box Hill*  
*RSVP essential*




## Gerard Crock Lecture

**Thursday 19 November | 5:15pm – 7:30pm**

Harold Mitchell Professor of Indigenous Eye Health Professor Hugh Taylor AC to present.

*University of Melbourne, Parkville*  
*RSVP essential*



**Where  
there's a  
will, there's  
a way to  
help save  
sight**

**Because of people like you, every gift we receive is unique,  
and each one helps in the fight to conquer eye disease.**

A gift in your will, however large or small, will make this possible  
long into the future.

**For a confidential chat, please call:**

**03 9929 8424**

**[cera.org.au](http://cera.org.au)**



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**Eye Research  
Australia**