

Autumn 2021

# visionary

Hope in sight™

→ How research is helping Irene see clearly

→ Vitamin B3 study shows promise

→ Gene therapy research repairs optic nerve



CENTRE FOR  
**Eye Research  
Australia**

**World Glaucoma Week**  
7-13 March 2021

# Help us bring hope to people with glaucoma



Each year in World Glaucoma Week, CERA joins the international effort to shed light on the world's leading cause of irreversible blindness.

I've dedicated my research career to fighting this insidious cause of vision loss which affects more than 70 million people worldwide, including more than 300,000 Australians.

I'm proud to lead a research institute with such an extensive glaucoma research program.

CERA researchers are tackling glaucoma from all angles – from investigating the genetic causes of the disease to developing new treatments that will improve the lives of glaucoma patients.

Despite the challenges of the COVID-19 pandemic, we continued to advance our research in 2020. Dr Flora Hui published the highly anticipated results of her research into the role of vitamin B3 in preventing nerve cell damage in glaucoma (Story, pages 3-5). And I was proud to

lead an international pre-clinical study which used gene therapy to successfully regenerate damaged optic nerves (See pages 12-13).

You can read more about both projects in this edition of *Visionary*. You can also meet Irene Athanassiou who is sharing her story to help us launch our annual Glaucoma Appeal (pages 8-9).

I encourage you to support our 2021 World Glaucoma Week Appeal. Your generosity makes our research possible and helps us develop new treatments that will save the sight of people with glaucoma.

**Professor Keith Martin**  
**Managing Director**  
**Centre for Eye Research Australia**

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# Vitamin B3 trial's next phase

**Promising results from CERA's clinical trial investigating the role of vitamin B3 in preventing nerve cell damage from glaucoma has sparked plans for a follow-up study.**

**T**he potential of vitamin B3 (nicotinamide) to slow the progression of glaucoma will be tested in a large international clinical trial following promising results in an earlier trial led by CERA.

Dr Flora Hui and Professor Keith Martin will lead the TAMING (Targeting Metabolic Insufficiency in Glaucoma) trial which will involve more than 150 patients in Melbourne, along with patients from interstate and overseas.

It will investigate the effect of vitamin B3 on visual function in patients who are over 60 and have moderate to severe primary open angle glaucoma.

Plans for the new trial follow promising results from CERA's world-first clinical trial,

led by Dr Hui and former CERA Managing Director Professor Jonathan Crowston, published in *Clinical and Experimental Ophthalmology* last year. The study showed 'significant improvement' in the visual function of glaucoma patients who received a high daily dose of 3 grams of vitamin B3 over 12 weeks in addition to their regular treatment to reduce eye pressure.

Dr Hui says a large, international trial will determine if the improvement shown in the earlier study can be sustained over the longer term.

"By conducting a longer-term study, we will be able to determine whether vitamin B3 should be taken on an ongoing basis by glaucoma patients."

(Continued page 4)



Picture: Anna Carlile

### **Trial results**

The study published in *Clinical and Experimental Ophthalmology* followed 57 patients, all of whom received both placebo and vitamin B3 at different times over the course of the study.

The visual function of patients was tested using electroretinography, a diagnostic test which measures electrical activity in the cells of the retina, and visual field testing to determine any changes that occurred.

It found that in some people, high-dose nicotinamide significantly improved how nerve cells were functioning in the eye.

Vision loss occurs in glaucoma when the retinal ganglion cells of the optic nerve, which help transfer signals from the eye to the brain, are damaged.

Traditional treatments involve lowering eye pressure to prevent further damage, but

some patients continue to lose their sight – raising hopes that vitamin B3 could provide a new therapy for this group.

“As a safe therapy that is well tolerated by patients, vitamin B3 has potential as a clinical supplement to support patients who are receiving glaucoma treatment,” says Dr Hui.

“The findings provide hope for a treatment that could protect nerve cells and help those that have already been damaged to function better.”

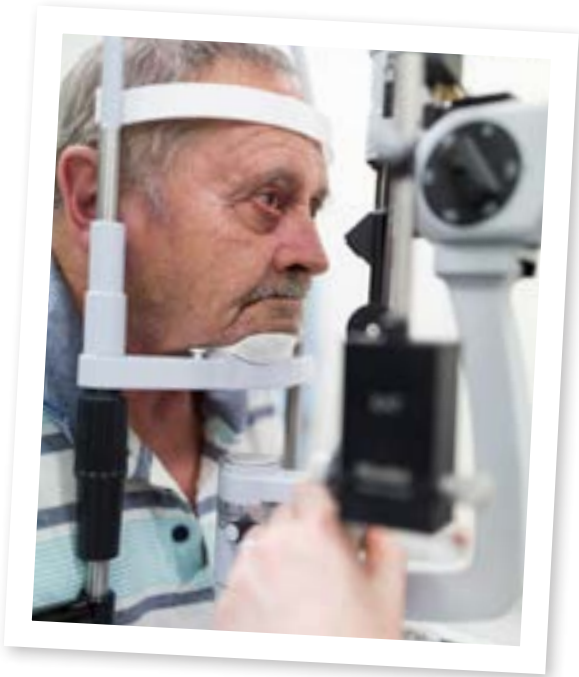
### **Research supporters**

Plans for the follow-up trial have been supported by Glaucoma Australia, which in 2020 awarded its annual Quinlivan Research Grant to Dr Hui.

CERA Managing Director Professor Keith Martin welcomed Glaucoma Australia’s support of the research and says it will



Dr Flora Hui will lead a new, larger study into the effectiveness of vitamin B3 in treating glaucoma.



be critical in kick-starting the next stage of research.

“We are excited that Dr Hui and the team will be able to continue this exciting research, which offers the potential to transform patient treatment and potentially even reverse some of the damage to the retinal ganglion cells caused by glaucoma,” he says.

“We know that our early findings have been of great interest to eye care professionals, patients and many of CERA’s supporters and we are grateful for Glaucoma Australia’s support.”

**Earlier stages of the research were supported by the Jean Miller Foundation, Connie and Craig Kimberley Foundation, the Ophthalmic Research Institute of Australia, Jack Brockhoff Foundation, Marian and EH Flack Trust, Fund and Board of Research Faculty (Karolinska Institutet).**

# Q&As

## Should I take vitamin B3?

Since the release of last year’s study, Dr Hui has been approached by many patients who have asked if they should take vitamin B3.

“At this stage we still need to do more research before we can recommend that glaucoma patients take vitamin B3 on an ongoing basis,” she says.

“Anyone with glaucoma should talk to their GP or eye doctor before taking vitamin B3 – or any other supplement – to make sure it will not cause any problems with other medications they are taking or any other medical conditions they have.

“They should also stick to the treatment plan for glaucoma prescribed by their ophthalmologist.”

## Can I take part in the next trial?

Recruitment has not started for the next stage of the vitamin B3 research. However, if you want to be considered for future studies about glaucoma or any other research at CERA you can register your details at [cera.org.au/register-your-interest-in-trials](http://cera.org.au/register-your-interest-in-trials)

Your doctor can also refer you at [cera.org.au/refer-a-patient](http://cera.org.au/refer-a-patient)

## Where can I read the research paper?

You can read the full study – Hui F, et al *Improvement in Inner Retinal Function in Glaucoma with Nicotinamide (Vitamin B3) Supplementation: A Crossover Randomised Clinical Trial. Clinical and Experimental Ophthalmology.* doi.org/10.1111/ceo.13818

**“Artificial intelligence will also play an increasingly important role in detecting eye diseases.”**

**– Principal Investigator  
Peter Larsen**

# Detecting the undiagnosed 50%

**CERA’s new Health Services Research Unit has a mission to eliminate undetected glaucoma in the community and prevent irreversible vision loss.**

**T**here have been many advances in glaucoma treatment in recent years but one statistic about the disease remains stubbornly persistent. Glaucoma is the world’s leading cause of irreversible blindness – but at least half of the people living with the disease don’t know they have it.

In Australia, it’s estimated about 150,000 people with glaucoma are undiagnosed and missing out on treatment to save their sight.

Often called the ‘silent thief of sight’ because it has no symptoms in its early stages, glaucoma can be difficult to diagnose and by the time a patient notices vision loss, irreversible damage has occurred.

But now a new Health Services Research Unit at CERA is investigating new ways of screening for glaucoma to improve detection rates, enable earlier treatment and prevent blindness.

“We want our research to have a tangible impact, so that in the future when eye health is measured in national surveys we will see fewer undiagnosed individuals,” says Principal Investigator Peter Larsen.

“Our mission is to help our current eye health services find those 150,000 Australians with undiagnosed glaucoma.”

## **Systemic approach**

While encouraging people over 40 to have regular eye examinations is one way of improving detection, another is a

more systemic and consistent approach to glaucoma screening across the eye health sector.

Larsen says the potential to lift glaucoma detection rates is illustrated by Medicare figures which show that the utilisation of visual field tests in optometry – a key clinical test employed to facilitate diagnosing and monitoring glaucoma – is low compared to the expected prevalence of the disease in the community.

In his former role as Group Eye Director with Specsavers, Larsen oversaw the introduction of new systems and approaches including clinical benchmarking for optometry, which improved detection and referral rates for glaucoma and diabetic eye disease.

Now his team at CERA will analyse de-identified data gleaned from more than 1.6 million optometry examinations from Specsavers to determine a more effective methodology for identifying glaucoma earlier.

Evidence generated from the research will be used to formulate recommendations on how the eye care sector can evolve to improve eye health outcomes.

Further studies will also investigate new approaches to detecting and treating other eye diseases including diabetic retinopathy, age-related macular degeneration and cataracts.

### **Early diagnosis**

Larsen says one of the challenges for optometrists in diagnosing the early stages of glaucoma is that most patients attending a typical practice will not have the disease.

“By having access to such a massive amount of data, our research can provide a framework for detecting glaucoma and help optometry practices measure patient outcomes and set benchmarks,” he says.

“Most optometry practices will see less than one person a week with glaucoma, so the benefit of providing access to this aggregate data about glaucoma is that it provides a framework for a smaller practice to follow.

“We also hope it will encourage more optometry practices to collect data about their own patient outcomes and review them against benchmarks.”

Larsen says another difficulty in detecting glaucoma early is that many people with undiagnosed disease have normal eye pressure.

“In early glaucoma there can be subtle changes in the optic nerve without any increase in eye pressure – and this the most prevalent form of undiagnosed glaucoma,” he says.

“So, while eye pressure is an important part of diagnosing glaucoma, it should not necessarily be the lead indicator.”

### **Understanding technology**

Larsen says new technologies are also transforming diagnosis and becoming increasingly important in primary eye care settings like optometry.

“Optical coherence tomography (OCT) scanning can pick up structure change in the eye before there is any measurable functional loss,” he says.

“Visual field tests are getting quicker and easier and able to pick up vision loss at a lower threshold.

“Artificial intelligence will also play an increasingly important role in detecting eye diseases – and while all of these technologies offer exciting possibilities, we also need to have the right systems and processes in place.”



Picture: Mathew Lynn

# Seeing clearly

**Glaucoma surgery gave Irene Athanassiou the precious gift of keeping her sight, allowing her to continue doing all things she loves – like going out dancing with her husband, George.**

**F**or Irene Athanassiou, seeing clearly makes all the simple things in life shine brighter.

Whether she's cooking delicious foods from her Greek heritage, going out dancing with her husband and their friends, knitting a scarf for her daughter, or just reading a magazine, she thanks her glaucoma surgery for saving her vision and allowing her to experience the full richness of everyday life.

“My vision is now even better than it was before,” she says.

A dressmaker by trade, with a wonderful skill for beading, Irene came to Australia

from Egypt in 1960. Here she married her husband, George, and had a daughter, Yvonne.

About five years ago, Irene was having her routine eye check when her optometrist found that something wasn't quite right.

Like many people over the age of 50, Irene had signs of glaucoma, a common ageing eye condition that affects the optic nerve, the connection between the eye and the brain. If left untreated, it can lead to vision loss and eventually blindness.

Catching glaucoma early gives you the best chance of saving your sight. Irene went to a specialist and started eye drop





*Successful glaucoma surgery helped Irene Athanassiou, pictured with husband George, continue doing the things she loves.*

medication, which aims to lower the fluid pressure in the eye. For many patients, this can be an effective way to slow or even stop vision loss.

Unfortunately, for Irene the eye drops weren't enough to slow the progression of her condition. The next recommended treatment option for her was surgery, which was performed by Dr Jennifer Fan Gaskin, a glaucoma specialist who leads CERA's ocular fibrosis research.

### **A challenging surgery with great results**

Like the eye drop medication, glaucoma surgery aims to reduce fluid pressure in the eye to protect the optic nerve from further damage. To do this, surgeons create a new 'drain' in the eye that can help release the excess fluid.

This surgery is usually very effective, but like all surgeries, it comes with risks. For Irene, going ahead with the operation was a big decision.

"There was a risk that I would lose my sight, because one of my eyes did not have very good vision anyway. It was my good eye that they were trying to fix," Irene says. "It was stressful at the time, but Jennifer explained everything and made me feel calm and comfortable."

The operation was challenging, but Irene recovered fully and is thrilled with the results.

"I am very happy with my surgery and I am glad that I did it. For me, the benefits far outweighed the risks."

Her daughter, Yvonne, agrees. "She does a lot of activities like knitting, cooking and



reading, and it really shows how good her vision is now," she says. "We go out and she can read street signs clearly – it's amazing."

### **Research to improve glaucoma surgery**

Seeing patients like Irene enjoy their vision is what drives Dr Fan Gaskin's passion for her work.

"I'm determined to do everything in my power to stop people with glaucoma from losing their sight," she says. "My research aims to find new treatments and discover new ways to improve glaucoma surgery by controlling scarring, which will give patients a better chance of a successful outcome."

Irene says she is extremely grateful for Dr Fan Gaskin's care, and for ongoing research that will help other people with glaucoma in the future.

Now she's spreading the word about the importance of glaucoma screening, to make sure others can catch it early and benefit from treatment like she did.

"I tell all my friends to make sure they have regular eye checks," Irene says. "Vision is so important and I am very happy that surgery could help me."

### **World Glaucoma Week Appeal**

Help our research team develop life-changing therapies so more people with glaucoma like Irene can see clearly.

You can donate on the form enclosed with this edition of *Visionary*, or online at [cera.org.au/donate](https://cera.org.au/donate)



Picture: Mathew Lynn

# Stopping scarring to save sight

**New research is striving to find safe and effective ways to stop scarring after glaucoma surgery, which can prevent the treatment from working.**

**D**r Jennifer Fan Gaskin, who leads CERA's ocular fibrosis research, is devoted to discovering new ways to control scarring after glaucoma surgery, giving patients the best chance of keeping their sight.

"Any vision loss from glaucoma is irreversible, so it's essential that we do everything we can to slow or stop the progression of the disease, protecting the sight the patient has left," Dr Fan Gaskin says. "My research aims to find new glaucoma treatments that can prevent blindness and maintain a patient's quality of life."

## **Reducing eye pressure through surgery**

Glaucoma is a common ageing eye condition that affects the optic nerve, the connection between the eye and brain. The most common cause is too much fluid pressure build up in the eye, which applies pressure on the optic nerve, causing injury.

The first line of treatment for glaucoma is usually medicated eye drops or laser therapy to reduce this eye pressure. For some patients, however, filtration surgery may be necessary.



*Glaucoma surgeon and researcher Dr Jennifer Fan Gaskin is looking for new solutions to prevent scarring from glaucoma surgery.*

In this procedure, surgeons create an extra 'drain' in the eye that can release excess fluid, reducing pressure and protecting the optic nerve from further damage.

While glaucoma surgery is generally a very effective treatment, the body's natural healing response – forming scar tissue – can block the newly created drain, causing it to fail.

"This is one instance where we don't want this natural scarring response – we need the drain to stay open and keep working," Dr Fan Gaskin says.

"If scarring causes the surgery to fail, then the eye pressure will go back up, the disease will progress, and the patient could continue to lose vision and eventually go blind.

"Unfortunately, then we're not left with many options for treatment for the patient."

### **Finding better anti-scarring agents**

Currently, anti-cancer drugs are used to control scarring in glaucoma surgery. While these are effective, there are some downsides to this approach.

"Because these drugs are harsh and non-specific, they have some unfavourable risks and can damage the healthy tissue around it," Dr Fan Gaskin explains.

"Our goal is to find a less toxic, more specific and highly effective anti-scarring medication to improve the safety and efficacy of glaucoma surgery."



The team at CERA is investigating several possible drugs, including an antioxidant compound.

While this research is still in the laboratory phase, Dr Fan Gaskin is hopeful that an effective solution will be available in the not-too-distant future.

"Blindness from glaucoma can be prevented, but it has taken the sight of more Australians than any other disease," she says.

"Improving glaucoma surgery is one important way we can help change this in the future."

**Dr Fan Gaskin's research is supported by an Ophthalmic Research Institute of Australia grant.**



# Advancing gene therapy

Picture: Anna Carlile

**A research team led by CERA Managing Director Professor Keith Martin has used gene therapy to regenerate damaged optic nerve cells in a pre-clinical study, raising hopes for future glaucoma treatments.**

**W**hen a patient is diagnosed with glaucoma their treatment will focus on slowing down or stopping the disease to prevent vision loss.

Glaucoma causes progressive damage to the optic nerve, the vital transport system which sends visual information from the eye to the brain.

“If glaucoma is left untreated or detected late it can lead to irreversible vision loss,” explains CERA Managing Director and world-renowned glaucoma researcher Professor Keith Martin.

“Currently, most glaucoma treatment focuses on reducing eye pressure to prevent damage to the optic nerve.

“But these treatments don’t work for about 15 per cent of patients and there is nothing we can do to repair the damage to the optic nerve once it has occurred – or to restore vision that has been lost.”

## **New promise**

However, promising new research has moved scientists one step closer to developing treatments which could in the future restore lost vision.

In a pre-clinical study published in *Nature Communications*, Professor Martin and his research partners used gene therapy to regenerate damaged optic nerve cells and prevent them from dying after injury.

**“What we have seen in this study is by far the most powerful of any of the regeneration techniques we have tried.”**

**– Professor Keith Martin**



*Professor Keith Martin is part of an international team that has repaired optic nerve cells.*

Professor Martin, who led the study with Dr Richard Eva, Dr Veselina Petrova and Professor James Fawcett from the John van Geest Centre for Brain Repair at the University of Cambridge, says the findings are a potential game-changer for the treatment of glaucoma.

“It raises real hope of future treatments which could restore damage to the optic nerve and potentially even restore sight,” says Professor Martin.

### **About the research**

The team tested whether a gene responsible for producing a protein known as protrudin could stimulate the regeneration of nerve cells and stop them from dying when they were injured.

They used a cell culture system to grow brain cells in the lab and then injured them using a laser before introducing a gene to increase the amount of protrudin in the cells, vastly increasing their ability to repair and regenerate.

Tests of eye and optic nerve cells found the protein enabled significant regeneration weeks after a crush injury to the optic nerve.

The research demonstrated almost complete protection of nerve cells from a mouse retina growing in cell culture, a technique which would usually be expected to result in extensive cell death.

### **Powerful technique**

Professor Martin says although the research is still in pre-clinical stage and more work needs to be done, early results are extremely encouraging.

“What we have seen in this study is by far the most powerful of any of the regeneration techniques we have tried,” says Professor Martin.

The international team is continuing its collaboration in Melbourne and Cambridge, and Professor Martin says future research will test the ability of protrudin to protect and regenerate human retinal cells.

Ultimately, the team hope to test the technique in clinical trial – although this is still several years away.

The international research was supported in the UK by the Medical Research Council, Fight for Sight, the Bill and Melinda Gates Foundation, Cambridge Eye Trust and National Eye Research Council.

### **Read the full study**

Read the full study at *Petrova, V et al. Protrudin functions from the endoplasmic reticulum to support axon regeneration in the adult CNS. Nat Comms; 5 Nov 2020; doi: 10.1038/s41467-020-19436-y*



# Betty's gift

**CERA is incredibly grateful to Elizabeth “Betty” Mary Gibson (1936-2019) for her generous bequest for research into retinitis pigmentosa.**

**B**etty Gibson lost her sight at age 16, but she never let it hold her back from living a full and vibrant life.

Born in 1936, Betty spent most of her life in Monteagle, a small farming village outside Young, New South Wales. She grew up with a loving family – parents Margaretha and William, younger brother Maurice, and lots of cousins, with whom she loved to play games and swim in the local dam.

As a teenager, Betty's eyesight started to deteriorate, causing her to leave high school in her second year. At age 16, she was diagnosed with retinitis pigmentosa, an inherited condition that causes serious vision loss and blindness.

While the diagnosis was upsetting for the whole family, Betty remained positive and always wanted to be involved in the social life of the village.

“Betty's sight did not stop her. She loved swimming, she took piano lessons and she

loved dancing,” says Barbara Ringwood, one of Betty's first cousins.

“Most of all she enjoyed family holidays to Bondi and the south coast of New South Wales, where she could feel the sand on her feet, and the sea breeze on her face, and the sun on her skin.”

## **A loving family and social life**

Betty's mother, Margaretha, was a wonderful support to her. She helped Betty walk through the town and read to her from newspapers and magazines, so she was always up to date with the current news and trends.

“Betty's mother became her eyes, and through her other senses she knew all about the latest fashions and the colours and textures of clothing,” Barbara remembers.

“Betty knew what clothes she had, what colour they were, and how they were made. She knew exactly where they were in her



*Betty Gibson pictured at different stages of her life, and, right, with NSW Premier Gladys Berejiklian.*

wardrobe – and heaven help anyone who moved them!”

Throughout her life, Betty was well loved in her community and was actively involved in the church, the CWA/Red Cross and other local groups and activities. She loved to knit, play cards and board games, and go for walks with good friends.

“She lived a full life – it was very hard and sad at times, but she always had family around her,” Barbara says. “She was an integral part of our family. She was always there and wanting to do things.”

Tracey Porrett, another first cousin, remembers Betty as a ‘gentle lady’ who was always ‘young at heart’.

“Betty loved babies and children and I can remember them sitting on her knee as she lovingly stroked their little faces and tiny hands and feet,” she says.

“All of us have our own special memories of Betty, as she devoted her life to family and building personal relationships with each of us. She may not have had the use of her eyes, but her gentle fingertips drew pictures in her mind even more beautiful than we may ever know.”

### **A generous gift to retinitis pigmentosa research**

Betty passed away peacefully in 2019 at age 83. As part of her legacy, she wished to donate money to Vision Australia for



the training of guide dogs for children, and for research that could help cure retinitis pigmentosa.

To fulfil this wish, Vision Australia and Betty’s family referred part of this gift on CERA to support visionary new stem cell research.

Retinitis pigmentosa causes vision loss and blindness due to the loss of photoreceptors, the light-sensing cells in the back of the eye. There is currently no cure.

Betty’s generous gift will help CERA researchers develop a new gene therapy that could treat retinitis pigmentosa patients by stimulating the stem cells within the retina to regenerate new photoreceptors.

“We are incredibly grateful for this support from the Estate of Betty Gibson, which will help us in optimising the technique for this new regenerative therapy,” says Dr Raymond Wong, Head of Cellular Reprogramming at CERA.

For those affected by blindness like Betty, this research has the potential to make a real difference, bringing us one step closer to CERA’s vision of a world free from vision loss and blindness.



To learn more about leaving a gift in your will for vision research, visit [cera.org.au/gifts-in-wills](https://cera.org.au/gifts-in-wills) or call us on **1300 737 757** for a confidential discussion with a member of the Philanthropy Team.

**Where  
there's  
a will,  
there's  
hope in  
sight**



**Because of people like you, we're at the forefront of new discoveries and treatments to prevent vision loss and blindness.**

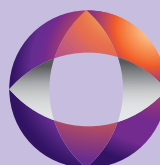
A gift in your will, however large or small helps us save sight and offer hope to people affected by vision loss.

For a free confidential chat, please call:

**1300 737 757**

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

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