IN THIS ISSUE

Community joins in the Stem Cell Revolution

Bionic eye on the move

Helping vision-impaired seniors at risk of depression
I hope this latest edition of Visionary finds you well.

2014 has proved to be an extremely busy year so far at the Centre for Eye Research Australia (CERA). Some of you may have attended one or more of our community information sessions on stem cells or diabetic eye disease. Or perhaps you were one of the 804 people who generously donated to our mid-year fundraising appeal, which raised much-needed funds for our stem cell research program.

Maybe you heard about our work on the TV or read about us in the newspaper – CERA has appeared in the media 261 times since the start of the year, reaching a combined audience of nearly 8 million people.

Of course, all of these community activities support the core business of CERA: saving sight and changing lives through eye research.

In this edition of Visionary, you can read about the latest breakthroughs in bionic eye research, keratoconus, behavioural research and glaucoma – all of which were made possible by the ongoing, generous support of people like you.

Thank you for helping us to make a real impact in the fight against eye disease and vision loss.

Sincerely,

Jonathan Crowston
Managing Director
Centre for Eye Research Australia
Annual Review Snapshot 2013

The Centre for Eye Research Australia and University of Melbourne Department of Ophthalmology make up Australia’s leading eye research group.

Exercise can protect the optic nerve against injury. Blocking an enzyme may treat bleeding at the back of the eye.

New genes discovered for AMD and myopia (short-sightedness). New Clinical Trials Research team commenced 5 new trials. CERA has over 250 research trial participants.

Ultrasound used to successfully administer drugs in animals model. Human trial due to commence soon. World-first trial of psychological therapy integrated into low vision rehabilitation services.

Joint project with Baker IDI reporting on the impact of diabetic eye disease in Australia. Our Lions Eye Donation Service staff competency framework was adopted by eye banks across Australia & New Zealand.

Community Engagement

Media

Social Media

Community events

Visionary

Staff & Students

Research output

Fundraising

Thank you to all of our supporters and funders for your commitment to eye research. Together we are making a real difference in the fight against blindness.

Community support

Competitive funding

2.2 million

1,835 generous people donated to CERA in 2013

For more information about our work, or to view the full 2013 Annual Review, please visit www.cera.org.au/about/annual_reports

What happens when a teenage boy suddenly goes blind?

Austin O’Connor-Stubbs was diagnosed with Leber’s Hereditary Optic Neuropathy (LHON) in 2012. “It was a huge shock,” recalls Austin. Despite only having of his 15% vision left, Austin competed in a half-marathon in 2013, raising over $1,000 for CERA. Austin and his mum Maureen are also volunteering in a research trial with CERA’s clinical genetics team, to help our researchers understand the cause of LHON.
What is keratoconus?

Keratoconus is a common degenerative condition of the eye where the cornea (front window of the eye) becomes progressively thinner. As a result of this thinning, the normally round shape of the cornea becomes distorted and a cone-like bulge develops. This results in astigmatism, causing significant visual impairment.

How is it treated?

Initially, glasses can help correct the astigmatism however as the disease progresses, the patient will need rigid contact lenses and eventually, a corneal transplant.

New treatment: corneal collagen crosslinking

Recently a new minor surgical treatment to slow or stop the progression of the disease in younger people has been developed called corneal collagen crosslinking. First, riboflavin [vitamin B2] drops are applied to the patient’s eye. Once the riboflavin has penetrated through the cornea, Ultraviolet A light therapy is applied to induce collagen crosslinking. This is a process where collagen fibres form strong chemical bonds with neighbouring fibres and act like a scaffold to support the cornea and stop it from losing its shape.

Latest research in keratoconus

At CERA, we are undertaking an extensive Australian Study of Keratoconus (ASK) to better understand this condition.

The research involves not only the study of genetic and environmental factors in disease but also the investigation of its economic burden and as well as impact on quality of life on patients. Individuals with keratoconus from anywhere in Australia are invited to participate in this study.

To date, 300 keratoconus patients have been recruited and we would like to thank all the participants who have already donated their time and involvement for this study.

Results so far include:

- Better imaging techniques are helping identify people with early signs of keratoconus
- Vision in a patient’s ‘good eye’ has been found to be associated with their quality of life
- New evidence supporting a genetic basis for keratoconus

For more information about keratoconus or the ASK study, please visit www.cera.org.au or email genes.study@gmail.com.
“When I was diagnosed, I don’t think they even called it AMD,” Gwenneth says. She is talking about the day she was diagnosed with age-related macular degeneration. “I just couldn’t see properly.”

Sadly, with no treatment available at the time, she lost most of the vision in her right eye. “I don’t see terribly well. I can read the headlines in newspapers, but there’s no way I can read the articles or a book.”

This loss of vision was a devastating blow for Gwenneth, who spent many years travelling with her husband, including stints living in England and the US.

Eight years ago, Gwenneth became aware of the CERA’s work when she volunteered for a research trial.

“My eye specialist suggested I enrol in one of your macular research trials...I appreciate the work being done by researchers to save sight and want to do my part to help save the sight of others in the future.”

“I want a cure for age-related macular degeneration. That’s my main reason for leaving a gift in my Will to the Centre for Eye Research Australia.”

Like others who have taken the profound step in including a gift in their Will to CERA, Gwenneth understands that her wish will only be realised through research, and that requires funding.

Bequests to the Centre for Eye Research Australia come in all sizes, and guarantee the research you care about now will continue into the future.

For a confidential, no obligation discussion about leaving a gift in your Will to the Centre for Eye Research Australia, please contact Philanthropy Coordinator Bethan Hazell on 1300 737 757 or email bethan.hazell@unimelb.edu.au.

We are holding a Bequest Morning Tea on 8 September 2014 at our headquarters in East Melbourne. To find out more, or to book your place, please contact Bethan on the number above.
After 18 months of laboratory-based testing, bionic eye implants are now being tested in environments that mimic real-world conditions.

Researchers are testing how the bionic eye prototype device improves orientation and mobility for the three patients who received bionic eye prototype implants in 2012. The trials mimic real world situations, but in a controlled way, to allow for rigorous scientific testing.

Associate Professor Nick Barnes, Principal Researcher at NICTA, trialled the use of a new depth camera in NICTA’s Canberra Research Laboratories in April. Patients were required to navigate obstacles using visual information from the camera connected to the bionic eye prototype device.

Dr Dianne Ashworth was the first patient to receive the prototype device and took part in the testing in Canberra. Her bionic eye allows her to see “blob-like” shapes as she navigates across the testing room towards a target. Another patient, Mr Murray Rowland, describes the electrical signals he receives from his bionic eye as appearing like “lightning strikes in a thunderstorm”, highlighting the fact that each user responds slightly differently to the electrical impulses.

The third patient, Mr Maurice Skehan said, “It was really great to see how the technology was going to work without using a guide dog or relying on another person to guide you. There is still a lot of work to be done in the future, to optimise the connections between the device, the eye and the brain, however it’s great to see how the semi-portable device can be used to pick up objects and obstacles.”

These trials will help the researchers fine-tune the device and ensure that the users are receiving useful visual information that will help improve their independence and ability to move around.

CERA leads surgical and clinical research components of the Bionic Vision Australia consortium. Bionic Eye Clinical Research Coordinator, Dr Lauren Ayton said, “The results so far have exceeded our expectations. It’s a very promising start.”
Helping vision-impaired seniors at risk of depression

Elderly adults with low vision who show signs of depression prefer ‘talking therapy’ rather than antidepressants, according to new research by CERA.

The study, published in the *Australasian Journal of Ageing* and led by Dr Gwyn Rees, screened 124 adults over the age of 60 for depressive symptoms when they visited low vision rehabilitation services. Thirty-seven per cent screened positive for signs of depression and took part in a follow-up telephone interview to determine which treatment options were most acceptable from a patient’s perspective.

The preferred treatment options were ‘talking therapy’ from a counsellor or psychologist (29%) and talking therapy in combination with medication (33%). Only 20% preferred medication alone and 18% chose no treatment. The most popular settings for talking therapy were in the patient’s own home (73%) or over the phone (67%). Around half reported they would be happy to receive sessions in a therapist’s office (56%) or a Vision Australia centre (46%).

PhD student Edith Holloway said, "Research has shown that older adults may be reluctant to seek professional help for depression, especially from mental health professionals. This is due to their own reservations [self-stigma] about seeking help for a mental health condition, as well as their perceptions of others’ negative responses [perceived stigma]."

The researchers believe that this may be why therapy in the privacy of a client’s own home was a popular choice. "Older adults have also reported a lack of accessible services, transportation problems and cost as barriers to seeking psychological support," said Edith.

Only 7% of participants were in favour of therapy sessions over the Internet. "Although internet usage has increased among older adults in the last decade, concerns around privacy and security, a preference for personal contact and fear of being unable to correctly navigate and use the web remain barriers," said Edith.

The study also found that characteristics including severe vision loss, a history of depression, previous treatment for depression and having a perceived need for emotional support were all associated with a positive screening result for depression.
Two new Gerard Crock Fellows appointed

CERA is delighted to announce the appointment of two new recipients of the Gerard Crock Fellowship – Dr Kathryn Davidson, Neuroregeneration and Dr Heathcote Wright, Glaucoma Research.

Dr Davidson is a stem cell scientist who has been working at CERA and the Department of Ophthalmology since 2013. Her research involves creating induced pluripotent stem cells in the laboratory, using skin cells taken from patients at high risk for Age-related Macular Degeneration (AMD).

These lab-made stem cells are coaxed into becoming retinal cells in a dish, so that Dr Davidson can assess the cellular functions and dissect the signals and mechanisms involved in the progression of AMD, which is not yet well-understood.

Dr Heathcote Wright completed his PhD with CERA/Department of Ophthalmology in 2006 under the supervision of CERA founder Professor Hugh R Taylor AC. Having since undergone Ophthalmology training at the Royal Victorian Eye and Ear Hospital and Bristol Eye Hospital, UK, Dr Wright has returned to CERA as a Principal Investigator in a Virtual Glaucoma Referral Gateway project.

With the award of the Gerard Crock Fellowship, Dr Wright intends to evaluate a pilot program for a new glaucoma referral pathway using an online system.

Dr Kathryn Davidson   (Photo courtesy of NSCFA)

Dr Heathcote Wright

Online referrals save time and money

In an Australian-first, plans for a new online referral system for suspected glaucoma patients are underway at CERA, led by Gerard Crock Fellow Dr Heathcote Wright.

“Currently, suspected cases of glaucoma are identified by optometrists during routine check-ups and referred to ophthalmologists for diagnosis. About a third of these patients turn out to not to have glaucoma, meaning that expensive specialist assessment may not have been necessary,” explains Dr Wright.

Dr Wright and his collaborators are developing an online referral system, where optometrists will be able to upload their patients’ scans and medical history to a secure webpage for ophthalmologists to assess.

“The ophthalmologist will be able to tell just by looking at the patient’s test results online whether or not they need to come in for a face-to-face consultation. This will save a lot of time and money for patients, and will hopefully cut down the waiting lists for specialists,” said Dr Wright.

As part of the evaluation process, safeguards will be put in place to ensure no patients are “missed” using this new system. This will include a quality control check by a second ophthalmologist and face-to-face appointments wherever an online diagnosis is not possible, due to borderline or unclear test results.

“This system will streamline the referral process and enable optometrists and ophthalmologists to work together to diagnose glaucoma quickly and accurately,” said Dr Wright.
It is a well established fact that exercise has enormous health benefits; protecting us against obesity, heart disease and some cancers. Now new research from CERA’s glaucoma team proves that exercise is also good for our optic nerve and may even reverse the effects of ageing.

Research Fellow Dr Vicki Chrysostomou found that older animals that underwent exercise regimes recovered faster from optic nerve damage compared to animals that were not exercised. “The recovery rate in the exercise group was similar to what you might see in much younger animals,” explained Dr Chrysostomou.

“Not only that, we also found an improved recovery rate in animals that were exercised after sustaining the injury. We now want to find out how this improved recovery actually happens, with the hope that this might lead us to new treatment targets down the track.”

“There is evidence that exercise protects nerve cells in the brain during ageing, after injury and in conditions such as Alzheimer’s, but this is the first study to show a positive effect on the optic nerve and vision,” said Dr Chrysostomou.

The most common optic nerve disease, glaucoma affects approximately 300,000 Australians and causes irreversible blindness if not detected and treated early. Current treatment options - including eye drops, laser and surgery - focus of lowering intraocular pressure and reducing the pressure on the optic nerve. Despite these treatment options, some patients’ vision will still deteriorate so researchers are keen to discover other methods for protecting the optic nerve.

The study was published in the Neurobiology of Aging journal in early 2014.
Eye research around the world

Contact lens to measure blood sugar

Imagine a contact lens that can measure blood sugar concentration in your tears using tiny wireless chips and glucose sensors. The prototype was developed by Google[x], the research division of internet company Google, and announced early in 2014. The creators claim the contact lens can continually monitor the glucose level in a diabetic patient’s tears, eliminating the need for regular finger prick tests and alerting the patient if sugar levels are too high or low.

The technology is still in its early stages and requires further testing and safety approval however CERA researcher Dr Mo Dirani believes the concept shows promise and technology is certainly the way forward in healthcare. “We know that achieving optimal diabetes control and having regular screening is critical for preventing complications, including diabetic retinopathy,” he said.

“Almost 1.5 million Australians currently have diabetes and this number is expected to double by the year 2025, therefore any new medical devices that allow people to safely and efficiently monitor their sugar levels (coupled with regular eye screening) will lead to better diabetes management and substantially reduce the risk of avoidable vision impairment and blindness.”

Too much screen time bad for our eyes?

Staring at a computer screen won’t make your eyes square – but it may cause symptoms similar to the medical condition ‘dry eye’, according to new research published in JAMA Ophthalmology in June 2014.

Japanese researchers measured a tear film protein in the eyes of 96 office workers. The tear film is responsible for keeping our eyes lubricated, which protects against eye strain, blurred vision and pain, stinging and grittiness in the eye. Workers who spent more than 7 hours a day in front of a computer had a lower concentration of protein compared to those who spent less than 5 hours a day.

“When we stare at a computer screen, we tend to open our eyes wider and blink less,” explained CERA Research Fellow Dr Suki Sandhu. “This causes the tears to evaporate, leaving our eyes prone to the symptoms associated with dry eye.”

To prevent the symptoms of dry eye, people who use a computer for long periods of time should make an effort to blink consciously, take regular breaks and use lubricating eye drops if they feel the need.

Cells clean up their neighbour’s rubbish

When parts of a healthy cell start to wear out or malfunction, the cell will ‘clean up’ or destroy these parts so they don’t cause damage. Now, researchers at Johns Hopkins Medical School in the US have discovered cells at the head of the optic nerve may export these damaged parts - especially the energy-generating mitochondria - to neighbouring cells to degrade, rather than disposing of their own junk.

“Because optic nerve cells have a very energy-intensive job, their mitochondria are under constant stress and defective ones need to be removed,” said CERA researcher A/Prof Ian Trounce.

The axon (thin tail of the optic nerve) is like a busy freeway with mitochondria being transported up and down. If the axon gets clogged with broken mitochondria, the freeway shuts down.

This study suggests these ‘junk’ mitochondria are routinely removed by neighbouring cells. “The question now is whether problems with cleaning up the neighbour’s junk mitochondria could contribute to glaucoma and other neurodegenerative diseases,” said A/Prof Trounce.
Community joins in the Stem Cell Revolution

It began in March, when Dr Alice Pébay hosted CERA’s first ever Stem Cell Community Information Forum. Joined by stem cell scientist Dr Raymond Wong, ophthalmologist Dr Alex Hewitt and Stem Cells Australia’s A/Prof Megan Munsie, Dr Pébay helped answer some of your most common questions about stem cells:

- What are stem cells and why are they so important?
- What are the facts?
- What does stem cell science mean for eye disease?

Stem Cell Revolutions – the movie

Following the success of the community information forum, CERA and Stem Cells Australia hosted a special screening of “Stem Cell Revolutions”, a documentary film featuring interviews with eminent scientists and experts in the field of stem cells. Stem Cell Revolutions charts the history and scientific evolution of stem cell research – from the earliest experiments that first revealed stem cells in the body, to leading current scientific and clinical developments.

With a particular focus on the use of stem cells for restoring sight, this film was of great interest to many of our attendees who were affected by eye disease. Following the screening, there was a discussion panel featuring experts from CERA and Stem Cells Australia.

Stem Cell Revolutions hits the road

CERA supporter Linda Nancarrow was so impressed with the film, she asked CERA and Stem Cells Australia to take the show on the road and host a screening in her home town of Bendigo.

“I found the film both informative and encouraging,” said Linda. “It not only explained the science behind stem cells in easy-to-understand language, it also covered their potential to help treat a range of health problems, particularly eye conditions.”

Fifty members of the Bendigo community attended a screening at the Latrobe University Visual Arts Centre, followed by an expert panel discussion.

You can preview, buy or rent a copy of the film at the official website www.stemcellrevolutions.com
## What’s on at CERA?

Please save the dates in your diary now!

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Sept</td>
<td>Bequest morning tea</td>
<td>10.00am</td>
</tr>
<tr>
<td>11 Sept</td>
<td>Glaucoma Information Forum</td>
<td>10.30am</td>
</tr>
<tr>
<td>9 Oct</td>
<td>Macular Degeneration Information Forum</td>
<td>10.30am</td>
</tr>
<tr>
<td>22 Oct</td>
<td>2014 Gerard Crock Lecture</td>
<td>5.15pm</td>
</tr>
</tbody>
</table>

These free events are designed for general audiences. All are welcome and bookings are essential. Additional information on these events will be provided as available.

**Phone:** 1300 737 757  
**Email:** cera-community@unimelb.edu.au  
**Website:** www.cera.org.au

---

**Thank you for your generous support of our Tax Appeal!**

In May we reached out to our supporters to help fund crucial research into saving and restoring sight. We were overwhelmed by your response! Thank you.

The Tax Appeal focused on the ground-breaking research carried out by our Neuroregeneration Research group, who are using lab-grown stem cells to better understand what goes wrong in eye diseases like glaucoma and age-related macular degeneration.

---

**Stay in touch with CERA!**

- Follow us on Twitter
- Like us on Facebook
- Join us on LinkedIn

To sign up for monthly email Eye-news, visit www.cera.org.au