



CENTRE FOR
Eye Research
Australia

VISION FOR THE FUTURE

STRATEGIC PLAN
2020-25



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ABOUT CERA

The Centre for Eye Research Australia is an international leader in eye research with real world impact.

We are an independent Medical Research Institute closely affiliated with the University of Melbourne within the discipline of ophthalmology in the Department of Surgery, Melbourne Medical School and co-located at the Royal Victorian Eye and Ear Hospital.

Our researchers are working to:

- understand the causes of eye disease
- inform disease prevention, and;
- improve the diagnosis and treatment of disease.

VISION

A world free from vision loss and blindness.

MISSION

CERA works to eliminate the major eye diseases that cause vision loss and blindness and to reduce their impact on people's lives.

OUR VALUES

INTEGRITY: We are accountable and honest in the work we do. Credible, ethical and responsible research is our priority.

UNITY: We work together for the greater good.

AGILITY: We work with ambition, tenacity, innovation and creativity. We are nimble and responsive in the pursuit of excellence.

MAKING A DIFFERENCE:

We value collaborating and sharing knowledge with each other and our community to make a real difference in the world. We never waiver from our goal of saving sight and changing people's lives for the better.

MESSAGE FROM MANAGING DIRECTOR, PROFESSOR KEITH MARTIN

The year 2020 marks the start of a new decade and an exciting era for vision research.

Our Strategy 2020-25 has been developed with a strong focus on emerging opportunities in a changing research landscape locally, nationally and internationally.

Around the world, rapid advances in gene and cell therapies and the increasing sophistication of devices such as the bionic eye make restoring sight – once considered a distant goal – a real possibility.

Big data is giving us unparalleled insights into

public health challenges. Combining this knowledge with advanced artificial intelligence capabilities, new imaging techniques, diagnostic tools and biomarkers, these new technologies can make a real difference in helping detect disease earlier, treat it more effectively and ultimately prevent it.

CERA is fortunate to be part of a collaborative and thriving biomedical research ecosystem in Melbourne, home to Australia's greatest concentration of Medical Research Institutes. An ambitious infrastructure program with major

developments under way at the Parkville precinct of the University of Melbourne and at the Royal Victorian Eye and Ear Hospital will enable our researchers to take advantage of first-class medical research facilities.

Nationally, the Medical Research Future Fund is providing new opportunities for research with a strong focus on major projects, clinical trials and collaboration.

Our high-quality research, with its unique mix of fundamental and translational approaches, coupled with our proximity to patients, clinical trials experience and ability

to translate what we learn in the lab into treatments and tests puts us in a prime position to capitalise on these opportunities.

Our Strategy 2020-25 harnesses the capabilities of our team in a broad range of disciplines around three key themes:



PROF. KEITH MARTIN'S MESSAGE CONT.

INNOVATIVE DIAGNOSTICS AND TREATMENTS –

Developing new methods to diagnose, prevent and treat vision loss, including a flagship project to establish a Melbourne Centre for Ocular Gene and Cell Therapy.

REGENERATING VISION –

Drawing on the potential of new therapies to restore lost vision, continuing to advance the trial and development of devices to restore vision, and playing a founding role in an international collaboration to regenerate the optic nerve.

UNDERSTANDING EYE HEALTH –

Using data

to identify public health challenges and deploying artificial intelligence and other technologies to increase access to screening programs, promote earlier detection and prevent disease progression.

Globally, more than 1.3 billion people are experiencing vision loss and 36 million are blind. With a rapidly ageing global population, unequal access to screening programs and the growing burden of diabetes – millions more are at risk of losing their sight.

Vision is precious and our research plays a vital role in



helping improve the lives of individuals experiencing vision loss, reducing the global burden of blindness and enabling healthy ageing.

At CERA we look forward to working with our partners in Australia and internationally to deliver research that takes us

one step closer to a world free from vision loss and blindness.

Keith Martin
Managing Director
CERA

KEY RESEARCH DOMAINS

1 Novel imaging, diagnostic techniques, biomarkers and treatments.

Melbourne Centre for Ocular Gene and Cell Therapy.

New devices to slow vision loss.

2 International collaboration to regenerate the optic nerve.

Insights from mitochondrial biology and neuronal regeneration to develop new therapies to restore vision.

3 Use big data and AI to tackle public health problems.

Measure effectiveness of new treatments and services.

Trial and validate new screening programs and diagnostic tools.

Research to repair the cornea, retinal pigment epithelium and optic nerve.



STRATEGIC PRIORITIES



INVESTING IN PEOPLE

Recruiting and retaining talent.

Better infrastructure and research support services.

Cultivating next generation leaders.



FUTURE SUSTAINABILITY

Grow and diversify income through philanthropic, industry and commercial partnerships.

Develop culture of philanthropy.

Boost innovation.



COLLABORATION & RELATIONSHIPS

Strengthen partnerships with University of Melbourne and Royal Victorian Eye and Ear Hospital.

Partner with other research institutes and industry, locally and internationally.

Build our presence in Victoria's unique bio-tech ecosystem.



COMMERCIALISATION & TRANSLATION

Build capabilities in clinical trials and translational research.

Actively support commercialisation of promising research.

OUR STRATEGY

Our *Vision for the Future:* CERA Strategy 2020-25 describes CERA's key research domains and focus areas as we seek to achieve our long term goal of a world free from vision loss and blindness.

CERA is Australia's leading eye research institute and among the world's top five for research output.

This places us in a unique position to work with others to prevent vision loss, improve the lives of people when they experience vision loss and blindness and to improve understanding of eye health in Australia and globally.

We are entering an exciting new era in eye research.

Our world-leading research can make a real difference to the eye health of Australians – including Indigenous Australians who experience vision impairment and blindness at three times the rate of non-Indigenous Australians – and the 1.3 billion people affected by eye disease worldwide. Increasingly, we can also utilise our knowledge of the eye to understand other chronic diseases of the body and brain, such as Alzheimer's disease.



**We work together for
the greater good**

1 INNOVATIVE DIAGNOSTICS & TREATMENTS

We will develop innovative new ways to detect, diagnose, treat and prevent vision loss for people with ageing eye disease such as glaucoma and age-related macular degeneration as well as diabetic eye disease and inherited retinal diseases.

We will lead the development of new devices and novel treatments to slow the progression of vision loss.

Our fundamental research in mitochondrial and stem cell biology and pre-clinical models of eye disease will provide new insights into the causes of eye disease.

We will lead a flagship project to establish the Melbourne Centre for Ocular Gene and Cell Therapy in collaboration with the University of Melbourne and the Royal Victorian Eye and Ear Hospital. We will consolidate our position as a leading centre for clinical trials in Australia.

Centre for Ocular Gene & Cell Therapy

Advances in gene and cell therapies are bringing new hope to patients with inherited retinal diseases that have until now been considered untreatable.

A clinical trial of the first ocular gene therapy has been approved in the US, and a raft of other potential treatments are expected to become available in the next few years.

We want to give Australian patients access to these trials by harnessing the expertise of our research team and our partners at the University of Melbourne and Royal Victorian Eye and Ear Hospital to establish the Melbourne Centre for Ocular Gene and Cell Therapy.

The Centre will develop a



comprehensive database of people with inherited eye diseases who may benefit from upcoming gene and cell therapies, to allow Australians access to the newest technologies.

It will provide high quality

precision medicine and counselling to patients.

It will also support local researchers developing gene and cell therapies with a direct pipeline through clinical trials, regulatory processes and commercialisation.

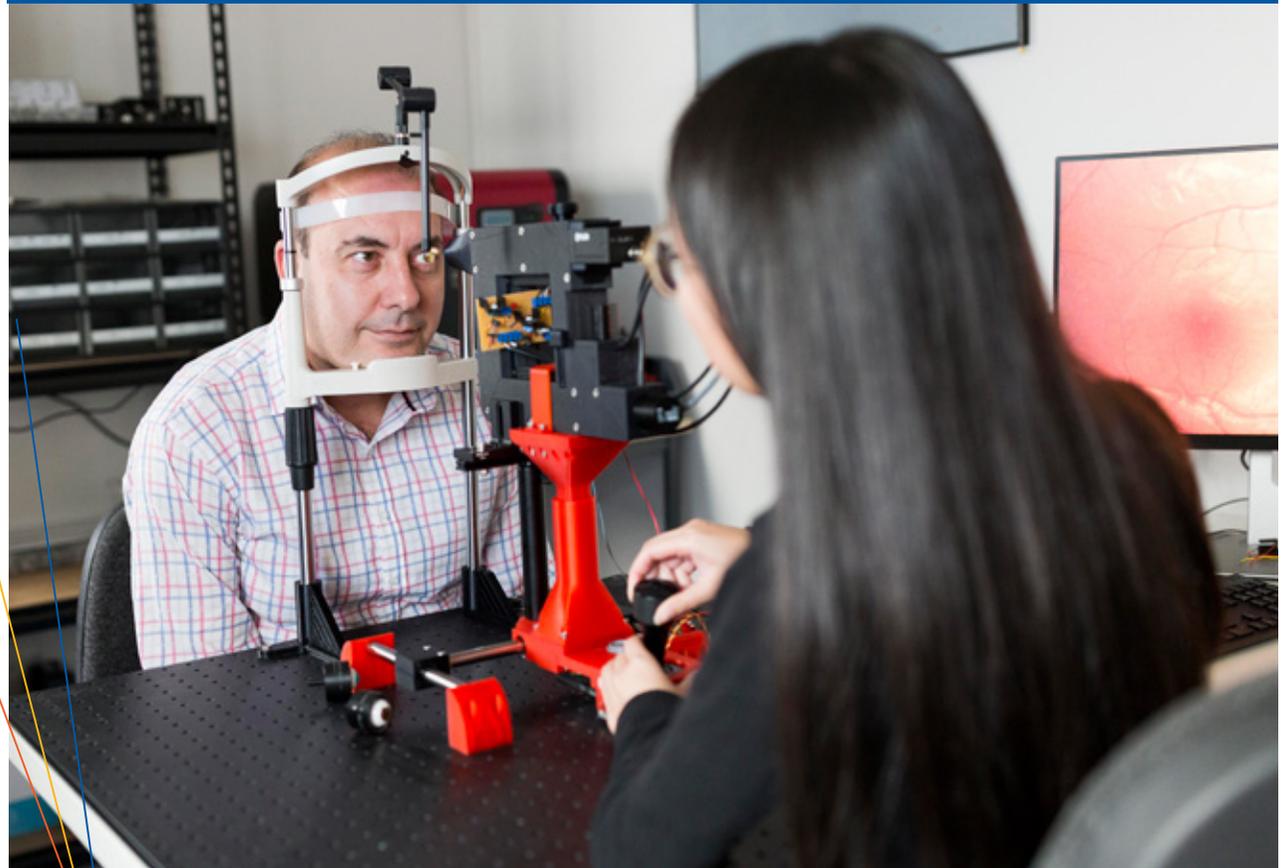
A simple test for Alzheimer's disease

CERA's team are using their unique knowledge of the eye to advance understanding of diseases of the brain.

Researchers are developing a simple test that could lead to earlier diagnosis of Alzheimer's disease, with eye scans utilising imaging techniques similar to that used in NASA satellites.

Deposits of a protein, known as amyloid beta, build up in the brain many years before the onset of Alzheimer's disease. Recent research also shows they accumulate on the retina at the back of the eye.

Using specialised imaging cameras developed by CERA, the team will measure amyloid beta in the retina in the hope of detecting



the protein many years before symptoms of Alzheimer's appear.

The approach, being trialled with participants in the Healthy Brain Project at the Florey Institute of Neuroscience and Mental Health, has the potential to revolutionise the

diagnosis of Alzheimer's disease.

It could also accelerate research efforts to delay, prevent or even cure the disease, as individuals at risk of the disease could be identified for inclusion in trials of new treatments at an early stage, before irreversible damage occurs.

2 REGENERATING VISION

We will use insights from our work on the biology of mitochondrial dysfunction and neuronal regeneration to help develop new therapies to restore lost vision and repair damage that causes blindness.

We will leverage our expertise in genetics, gene and cell therapies and ageing eye diseases to advance the development and trial of new treatments to preserve and restore vision. This will include research to repair the cornea, retina and optic nerve.

We will play a founding role in an international collaboration with other researchers in developing cutting edge treatments to regenerate the optic nerve and continue to lead studies in sub threshold laser induced rejuvenation of the retinal pigment epithelium, which supports the photoreceptors for essential vision.

Repairing the optic nerve

Researchers from CERA and the University of Cambridge are investigating a new technique that could help heal and regrow damaged optic nerve cells, potentially restoring sight loss from glaucoma.

The optic nerve connects the eye to the brain – similar to 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.

Currently, glaucoma treatment is largely aimed at protecting the optic nerve and preventing further damage, slowing the deterioration of vision.

A new project is taking a different



approach – trying to repair the optic nerve to restore lost sight.

The study will investigate the role of a ‘scaffolding molecule’ called protrudin in helping to regenerate nerve fibres to reconnect the retina to the brain.

Our researchers have found that increasing the amount of protrudin or changing the way it’s working, can improve transportation along the nerve fibres and that getting the right molecules to the right place at the right time can improve the ability of that nerve to repair.

The research is at a relatively early stage, looking at the fundamental mechanisms of how protrudin is working.

However, the aim is to use this knowledge to help repair the damaged optic nerve and restore vision in the future.

Bionic Eye Project

A new bionic eye prototype has improved a sense of vision in four blind people who are currently using the device in their everyday lives.

The four patients, aged 42 to 65, are part of a clinical trial funded by the National Health and Medical Research Council and commercial partner Bionic Vision Technologies and Bionics Institute. All have an inherited retinal condition called retinitis pigmentosa.

This progressive, presently untreatable condition is one of the most common causes of blindness in working-age people in the developed world, and it has life-changing consequences.

The latest bionic eye prototype is permanent, portable and stable,



improving on the useability, size and function of an earlier 2012 version.

Now being tested outside the laboratory, it is getting very close to clinical translation.

Before using the device at home, the four patients undertook several months of training in the lab to learn

how to interpret the visual information provided by the bionic eye and to have the software fine-tuned.

Each patient has their own wish list of what they would like to achieve, such as visiting the neighbours or the local shopping centre, or sorting washing, and they are making tangible progress.

3 UNDERSTANDING EYE HEALTH

Our research will improve understanding of the burden eye disease has on communities at local, national and international levels.

We will build on our capabilities to utilise big data and artificial intelligence to identify and tackle public health problems and develop more precise diagnostic tools that enable the earlier detection of disease and more easily identify those at greatest risk.

We will continue to measure and evaluate the effectiveness of new treatments and services in the community and advocate for effective, evidence-based eye programs that improve eye health.

Artificial intelligence to detect eye disease

Our research is testing the effectiveness of an artificial intelligence-based technology in helping to provide much-needed eye screening services in remote and regional Australia.

Our researchers aim to increase access to eye checks for people who are currently missing out, including Indigenous Australians and people in remote and regional communities.

The research project is trialling the clinical effectiveness of this new technology and the acceptance by patients and health professionals.

Primary care services in regional and remote Australia will take part in the trial, using an algorithm developed by researchers to test for signs of common blinding



eye diseases, including diabetic retinopathy, glaucoma, age-related macular degeneration (AMD) and cataracts, when applied to standard retinal photographs.

Seconds after taking a photo of the eye, a report will be generated from the artificial intelligence system, indicating whether the patient needs to be referred to a specialist for further assessment and treatment.

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

Artificial intelligence could close the significant gap in eye care services and considerably 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.

Preserving vision with KeepSight

Our expertise in understanding the scope of eye health problems and ways to prevent blindness can inform public health policy.

CERA's work on the National Eye Health Survey along with Vision 2020 Australia identified major shortfalls in the number of Australians with diabetes having eye checks and highlighted the need for a national eye testing scheme.

The research found too many Australians with diabetes were at risk of avoidable blindness because they were not having regular eye tests.

Wanting to solve this problem, CERA joined forces with Diabetes Australia to lead a collaboration with Vision 2020 Australia, the Royal



Australian and New Zealand College of Ophthalmologists and Optometry Australia, to design a national eye screening program for Australians with diabetes.

And in 2018, after continued advocacy reinforcing the survey results and the need for change, the Commonwealth Government announced it would fund KeepSight.

The program serves as a

recall and reminder system for the 1.3 million Australians with diabetes, to reduce the chance of people forgetting to have checks. Oculo, a cloud-based clinical communications network between eye care providers that was spun out of CERA in 2015, serves as a technology partner for the program.

CERA will play a key role in evaluating the effectiveness of the project.

STRATEGIC PRIORITIES

Over the next five years we will build CERA's capacity to deliver impactful research and ensure our staff have access to the resources, support services and environment that enables them to succeed and contribute to our strategic goals.

Our strategic priorities are:

INVESTING IN PEOPLE –

Building the best teams by recruiting new researchers and support professionals of the highest calibre and investing in the development of our existing teams.

Ensuring that our staff have access to the infrastructure and support services that they need to excel.

Cultivating the next generation of eye health research leaders.

FUTURE SUSTAINABILITY –

Building long-term philanthropic, commercial and industry partnerships to grow existing income streams and identify new income opportunities, to enable us to invest in people, amplify our impact and ensure the long-term sustainability of our world-class research.

COLLABORATION AND RELATIONSHIPS –

Collaborating nationally and internationally with others to tackle the burden of blindness and maximising the impact of our research.

Capitalising on the unique biomedical ecosystem in Victoria and our strong relationships with the RVEEH, University of Melbourne, other MRIs and industry partners.

COMMERCIALISATION AND TRANSLATION –

Further building our strong innovation culture, actively supporting the commercialisation of promising research findings to accelerate the translation of new treatments and technologies from the lab to the clinic to improve eye health care.



**We are actively working
toward a world free from
vision loss and blindness**