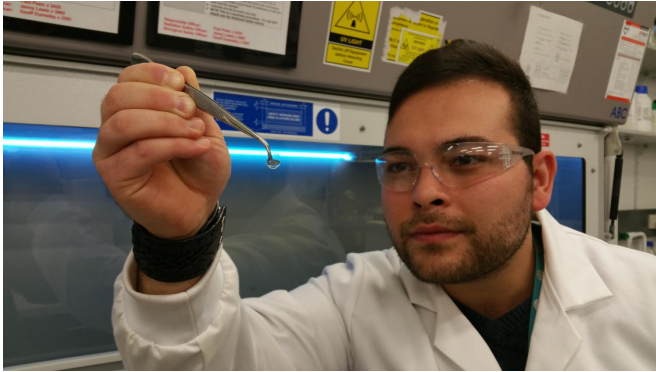


Curing blindness by repairing corneas with invisible films

15 August 2016



Credit: Fresh Science

A patented treatment could restore eyesight for millions of sufferers of corneal disease.

The University of Melbourne–led team of researchers have grown [corneal cells](#) on a layer of film that can be implanted in the eye to help the cornea heal itself. They have successfully restored vision in animal trials and are aiming to move to human trials next year.

Victor Fortmann's vision in one eye failed following a condition called bullous keratopathy. Two donated cornea transplants restored his sight for a period, but he now needs a third to restore his vision in that eye.

Over 2000 corneal transplants are conducted in Australia each year. But globally there's a shortage of donated corneas, and the resulting loss in vision affects about 10 million people worldwide.

"We believe that our new treatment performs better than a donated cornea, and we hope to eventually use the patient's own cells, reducing the risk of rejection," says Berkay Ozcelik who developed the film working at the University of Melbourne.

"Further trials are required but we hope to see the treatment trialled in patients next year," he says.

The cornea is the transparent layer at the front of the eye. To remain healthy and transparent, the cornea must remain thin. A layer of specialised cells ([corneal endothelial cells](#)) on its inner surface maintain the cornea's moistness by 'pumping' water out of it.

However, trauma, disease and aging can reduce the numbers of these cells, eventually causing the cornea to become swollen and cloudy, leading to vision deterioration and blindness.

The cells cannot regenerate or repair themselves. The only treatment available requires donor corneas to be transplanted into the patient's eyes. But there's a worldwide shortage of donor corneas. The transplant process damages some corneal endothelial cells, and the [donor cornea](#) may still be rejected by the patient's immune system.

Berkay and his colleagues grew corneal cells on a specially developed synthetic film that could then be implanted into a patient's eye.

"The hydrogel film we have developed allows us to grow a layer of corneal cells in the laboratory," says Berkay. "Then, we can implant that film on the [inner surface](#) of a patient's cornea, within the eye, via a very small incision." Once in place the new cells restore the cornea's vital water-pumping activity, so that the cornea once more becomes transparent.

Thinner than a human hair (50µm), the hydrogel film is perfectly transparent when implanted, and allows the flow of water between the cornea and the interior of the eye. The film completely biodegrades within two months and causes no adverse immune reactions.

Berkay developed the synthetic film used to culture new corneal cells at the Polymer Science Group

(the University of Melbourne), working with the Centre for Eye Research Australia. Berkay is now working in a similar field at CSIRO and is still active with the corneal film project as an Honorary Post-doctoral Fellow at the University.

Provided by Fresh Science

APA citation: Curing blindness by repairing corneas with invisible films (2016, August 15) retrieved 9 July 2022 from <https://medicalxpress.com/news/2016-08-corneas-invisible.html>

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