

Plastic membrane to treat age-related macular degeneration

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A porous polymeric scaffold might be the answer to a sight problem that afflicts millions of older people every year, age-related macular degeneration. Researchers writing in the *International Journal of Biomedical Engineering and Technology*, discuss in detail their modelling and simulation analysis of these materials, which might be used as a prosthetic for the eye's Bruch's membrane.

Age-related macular degeneration is a [medical condition](#) that occurs when the macula of the retina is damaged through oxidative processes usually associated with age but also in tobacco smokers. The macula is an oval-shaped, pigmented area at the centre of the retina so deterioration of this region leads to blurred or no vision in the centre of the visual field. Initially, there are no symptoms but vision in the afflicted person will suffer and loss of central vision occurs making it hard to recognize faces, drive, read, or perform other activities of daily life. At present, there is no treatment for macular degeneration and while not smoking is a good preventative measure, avoidance of the other main risk factors—ageing and genetics—cannot be avoided.

Bruch's membrane is the innermost layer of the choroid, the layer between the retina and the outer layer of the eye, the sclera. It is sometimes referred to as the vitreous lamina because it is a glass-like layer, some two to four micrometres thick. Changes in this membrane are often the underlying cause of the blindness seen in AMD as errant blood vessel growth occurs in this membrane in the condition. More specifically, AMD is characterized by extracellular deposits that

accumulate between the [retinal pigment epithelium](#) (RPE) and the inner collagenous layer of Bruch's membrane, causing the death of RPE cells and subsequent loss of photoreceptor cells.

As such, materials to engineer the structure of the membrane and preclude abnormal blood vessel growth might offer a way to slow or even halt progression of the disease once diagnosed.

Susan Immanuel, Aswin Bob Ignatius, and Alagappan Muthuppalaniappan of the PSG College of Technology, in Coimbatore, Tamilnadu, India, have designed a prosthetic Bruch's membrane, which is based on porous polycaprolactone (PCL). The artificial membrane was designed using the COMSOL Multiphysics tool. Its properties, including [structural integrity](#) and [fluid flow](#), were analysed using Brinkman's equation.

"The results show that the scaffold with higher porosity has a lower pressure gradient which is necessary for [retinal pigment epithelial](#) adherence and is mechanically stable," the team writes. "This proves that a PCL scaffold with higher porosity is a potential replacement for Bruch's [membrane](#)."

More information: Susan Immanuel et al. Modelling and simulation analysis of porous polymeric scaffold for the replacement of Bruch's membrane as a therapy for age-related macular degeneration, *International Journal of Biomedical Engineering and Technology* (2020). [DOI: 10.1504/IJBET.2020.107762](https://doi.org/10.1504/IJBET.2020.107762)

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