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IIT Madras identifies enhanced drug delivery method for eye treatments

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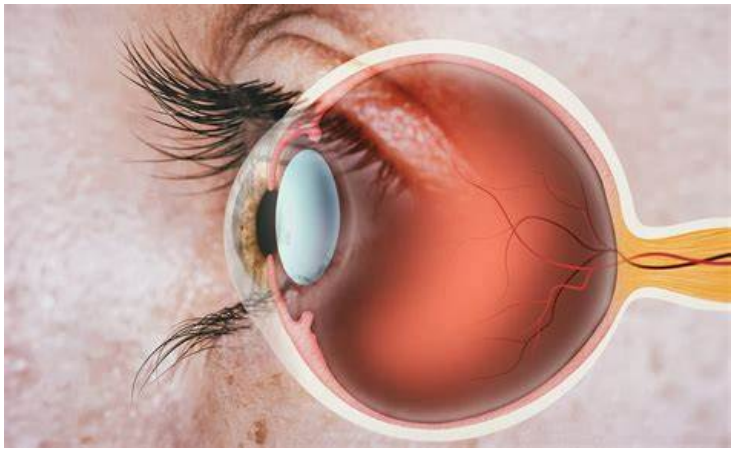
Researchers demonstrate how mild laser-induced convection can enhance the delivery of drugs injected into the eye to the retina



Researchers at the Indian Institute of Technology Madras (IIT-M) have demonstrated how drugs injected in the human eye can be better delivered to the target region through 'convection caused by mild laser heating'. They used simulation and modelling studies to analyse the efficacy of various types of treatments on the human eye, focusing on heat and mass transfer.

With nearly 11 million individuals afflicted by retinal disorders in India, indigenous original research of this nature holds promise for the development and advancement of Laser-based treatments for various eye diseases.

Laser-based retinal treatments are increasingly being used to treat diseases like retinal tears, diabetic retinopathy, macular oedema and retinal vein occlusion. Since the retina is the region of the eye that contains blood vessels and nerves, such treatments must be performed carefully and with precision.

This research was taken up nearly a decade ago by Prof. Arunn Narasimhan, Department of Mechanical Engineering, IIT Madras, who collaborated with Dr Lingam Gopal of Shankar Nethralaya and initiated biothermal research into the effects of laser irradiation on the retina for the first time in India.

Subsequently, the team has performed computer simulations and experiments to analyse different aspects of eye treatments, within the scope of bio-heat and mass transfer.

In patients who have undergone retinal laser surgery, most of the original gel-like vitreous humour could become replaced by body secretions that are less viscous than the original gel.

After surgery, drugs are often injected directly into the vitreous region to treat the retina. To reach the retina, the drug must move through the liquid. Natural diffusion is a slow process, and the drug may take several hours to days to reach effective levels at the target location.

Prof. Arunn Narasimhan designed an experiment using a glass eye mimic geometrically similar to the human eye, water and silicone oil for the vitreous liquid and a heater to simulate laser heating. The researchers injected a dye as a drug mimic at specific points in the vitreous region of the eye, and measured concentrations at different retinal locations with and without heating the vitreous liquid.