

# Researchers discover novel circulation in human eye, new glaucoma treatment target

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Researchers at the University of Toronto, St. Michael's Hospital and Sunnybrook Health Sciences Centre have discovered a previously unidentified form of circulation within the human eye which may provide important new insights into glaucoma, a leading cause of blindness.

For over a century, the [eye](#) has been considered to lack lymphatics, a circulation responsible for pumping fluid and waste out of tissues. The inability to clear that fluid from the eye is linked to glaucoma, a leading cause of irreversible blindness affecting over 66 million people worldwide.

"We challenged this assumption about a lack of lymphatics and discovered specialized lymphatic channels in the human eye," said Prof. Yeni Yücel, a pathologist-scientist in U of T's Faculty of Medicine and St. Michael's Hospital, and lead author of the study which appears in the current issue of *Experimental Eye Research*.

Glaucoma is a degenerative disease believed to be caused by the death of [nerve cells](#) at the back of the eye and in vision centers of the brain. It is often associated with elevated pressure in the eye. Current treatments for glaucoma rely on eye drops or surgery to lower eye pressure either by reducing fluid formation or improving fluid drainage from the eye.

"Good vision depends on the stable flow of fluid into and out of the eye. Any disturbance of this delicate fluid balance can lead to high eye

pressure and irreversible glaucoma damage," said study co-author Dr. Neeru Gupta, Director of the Glaucoma Unit and Nerve Protection Unit at St. Michael's Hospital and Professor of Ophthalmology at U of T.

The lymphatic circulation, distinct from [blood circulation](#), carries a colorless fluid called, lymph containing extra water, proteins and antigens through lymphatic vessels to lymph nodes and then to the blood stream. This circulation is critical for the drainage of the fluid from tissues, clearance of proteins and immune monitoring of the tissue.

Using molecular tools and three-dimensional reconstruction, the team of researchers identified a rich network of lymphatic channels in the ciliary body of the human eye. These studies were confirmed by electron microscopy.

The discovery of a lymphatic circulation in the eye overthrows the idea that the eye is an immune privileged site due to the lack of lymphatics and has major implications for understanding eye inflammations and eye tumor spread, among other eye disorders.

"This 'uveolymphatic' circulation plays a role in the clearance of fluid from the eye, making it highly relevant to glaucoma. This discovery is exciting because it means we can focus on innovative treatment strategies for patients with glaucoma by specifically targeting this new circulation to lower eye pressure," said Dr. Gupta.

According to the researchers, future studies will be directed at better understanding how to manipulate the lymphatic circulation in the eye. "It's clear that if we want to develop new strategies to prevent [blindness](#), we need to challenge existing beliefs, and hopefully open the door to new treatments for eye disease," said Prof. Yücel, who also serves as Director of the Ophthalmic Pathology Laboratory in U of T's Department of Ophthalmology and research Scientist at the Keenan

Research Center at Li Ka Shing Knowledge Institute, SMH.

Glaucoma is expected to affect 80 million people worldwide by 2020. Although the disease can affect anybody, those with elevated eye pressure, the elderly, blacks and persons with a family member with glaucoma are at greatest risk. Other risk factors that may be associated with [glaucoma](#) include diabetes, high blood pressure and near-sightedness.

Source: University of Toronto ([news](#) : [web](#))

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