Glaucoma Research Society of Canada Awarded $359,393 in Grants to 15 Research Projects in 2024

Establishing the Canadian Pediatric Glaucoma Consortium to Study PCG Genes

Primary congenital glaucoma (PCG) is a severe early-onset form of glaucoma that mainly affects males. Its prevalence in Canada is uncertain. This project calls for a collaborative effort among pediatric ophthalmologists, glaucoma specialists, and ocular geneticists to establish a Canadian Consortium, focusing on inherited forms of childhood glaucoma.

This study will investigate the genomic makeup of PCG in Canada. It will identify inequities, examining how PCG patients are distributed across Canada and explore the prevalence of genetic causes related to laterality, sex, gender, ethnicity, consanguinity and socioeconomic background.

Identifying inequities will guide patient-centered care for Canadian children, and the strict inclusion of participants using the Childhood Glaucoma Research Network guidelines will foster international collaborations. By studying variant distribution among PCG genes, researchers may uncover previously unknown PCG-related genes.

Dr Ellen Zhou, University of Toronto, Toronto ON; Johane Robitaille, Marcelo Nicolela, Dalhousie University, Halifax, NS

Investigating Self-Reported Glaucoma in Canada

In Canada, there isn't enough data about how many people have glaucoma. Researchers often use self-reported questionnaires to study glaucoma prevalence because they're easy, quick, and cost-effective. However, relying solely on self-reports has its challenges. People may misunderstand medical terms, forget details (recall bias), or feel pressure due to social issues (like the fear of losing their driver's license).

This study will compare the accuracy of self-reported glaucoma information to clinical assessments. The researchers will analyze data from the Canadian Health Measures Survey, which includes both self-reported questionnaires and clinical eye exams conducted in mobile clinics between 2016 and 2019. The results of this study will help determine the value of using self-reported questionnaires to study glaucoma in Canada.

Yaping Jin, Dr Yvonne Buys, Dr Ziad Butty, University of Toronto, Toronto ON

Studying the Effects of Age on Retinal Ganglion Cells

Researchers are studying how age affects the function of retinal ganglion cells (RGCs). Earlier research highlighted the influence age has on experimental models of RGC degeneration. Despite age being one of the most influential risk factors for glaucoma development and progression, most research is performed in younger mice which is not representative of human disease.

In this study, the research team will induce glaucoma in both adult and old mice. They expect that equal elevations in intraocular pressure will cause greater RGC loss in the older mice group.

Results will provide evidence to support using aged animals to study age-related diseases. Determining differences between adult and old animals and their response to diseases like glaucoma could be critical when designing treatments and preclinical trails for humans.

Delaney Henderson, Dr. Balwantray Chauhan, Dalhousie University, Halifax NS

Comparing a New Approach with Traditional Eye Drops for Care After Glaucoma Surgery

This study proposes a new way to care for patients after glaucoma surgery. Researchers suggest using a steroid that ophthalmologists often prescribe for other purposes. Instead of following a strict eye drop schedule, patients will receive a higher dose of this steroid directly to the eye.

This approach might lead to similar or even better post-operative outcomes, without the negative effects of frequent preservative-containing eye drops.
Devin Betsch, Dr Marcelo Nicolela, Dr Lesya Shuba, Dr Brennan Eadie, Dr Paul Rafuse, Kevin Hodgson, Dalhousie University, Halifax NS; Dr Matthew Palakkamanil, University of Alberta, Edmonton AB

Investigating Eye Rigidity & Vision Complications After Glaucoma Surgery

Glaucoma filtration surgeries can lead to a serious complication called hypotony maculopathy (HM), which may cause permanent vision loss. This study explores the relationship between ocular rigidity (a measure of eye stability) and post-operative HM.

The study hypothesizes that eyes with lower ocular rigidity (while controlling for intraocular pressure) are more likely to develop hypotony maculopathy. If results show a significant correlation, measuring pre-operative ocular rigidity could help predict which patients are at greater or lesser risk for HM.

This information would allow for modifying surgical approaches, maximizing patient outcomes. For example, a nearsighted patient with normal tension glaucoma might benefit from personalized surgical adjustments based on their ocular rigidity levels.
Dr Mark Lesk, Dr Santiago Costantino, University of Montreal, Montreal QC

Research Grant Renewal
Enhancing Quality of Life Through Meditation & Breathing Exercises

Glaucoma patients often experience a reduced quality of life due to the stress associated with vision loss. Research has shown that practicing meditation and engaging in breathing exercises can alleviate stress and enhance overall well-being for many glaucoma patients.

With this grant, the team will continue their research with an electronic feasibility study. Participants in the randomized controlled trial will complete 12 weeks of breathing exercises followed by meditation, facilitated virtually by experienced instructors. The study will analyze data collected after in-person follow-up clinic visits at the Ivey Eye Institute at Western University.
Monali Malvankar, Dr Cindy M.L Hutnik, University of Western Ontario, London ON

Assessing Uveolymphatic Outflow in Glaucoma

The eye's intraocular pressure (IOP) is regulated by the aqueous humor. This fluid drains through two pathways: the well-studied trabecular meshwork pathway and the less understood uveoscleral pathway. Recently, lymphatics were discovered in the ciliary body of the eye, suggesting they play a role in uveoscleral drainage.

In this study, researchers will investigate whether the uveolymphatic drainage of aqueous humor is affected in a mouse model of glaucoma. They will use non-invasive imaging techniques to directly and quantitatively assess the flow of aqueous humor through the uveolymphatic drainage pathway. Results of this study will help researchers understand how uveolymphatic outflow contributes to IOP and glaucoma. These findings may inspire new therapies targeting the uveal lymphatics.
Dr Yeni Yücel, Dr Neeru Gupta, Unity Health Toronto, St. Michael's Hospital, Toronto, ON

Investigating Glaucoma Risk in Heart Disease Patients Using CCBs

Calcium channel blockers (CCBs) are commonly prescribed cardiovascular medications in North America. This study will re-examine the link between CCBs and glaucoma, addressing methodological limitations that may have influenced previous findings.

Expected results include: the risk associated with CCBs will be higher than that of angiotensin converting enzyme inhibitors (ACE-Is) or thiazide diuretics; non-cardio-selective CCBs will pose a greater risk of glaucoma than cardio-selective agents; the risk of glaucoma will increase with longer CCB usage; and women using CCBs will face a higher risk of glaucoma compared to men. The results will help clinicians, patients and policy makers make informed decisions on the potential risk of CCBs with glaucoma.
Mahyar Etminan, University of British Columbia, Vancouver BC; Dr Bonnie He, Dr Brennan Eadie, Dalhousie University, Halifax NS; Gareth Leung, University of Ottawa, Ottawa ON

Developing an International Pediatric Glaucoma Biobank

Pediatric glaucoma research lacks comprehensive knowledge about the cytokine profiles within the eye. To address this critical gap, this project proposes creating an International Pediatric Glaucoma Biobank. This biobank will systematically collect biospecimens, data, and images related to pediatric glaucoma. Doing so will stimulate biomarker discovery and enhance understanding of this condition. Analyzing cytokine biomarkers from the biobank will be a significant step forward. It will help doctors manage pediatric glaucoma better and explore potential links between intraocular cytokine levels, structural complications, and visual outcomes after treatment.
Dr Helen Dimaras, Asim Ali, Kamiar Mireskandari, Ashwin Mallipatna, Crystal Cheung, The Hospital for Sick Children; Rajeev Muni, St. Michael's Hospital; Toronto ON

Research Grant Renewal
POAG Molecular Changes

Researchers are studying the molecular changes associated with primary open-angle glaucoma (POAG). Previous studies have identified specific alterations in signaling pathways related to this condition. With this renewed grant, researchers will analyze patient data using advanced bioinformatics techniques. Their goal is to gain valuable insights into the biochemical pathways involved in POAG progression.
Dr Tianwei (Ellen) Zhou, Dr Jeremy Sivak, Department of Ophthalmology & Vision Sciences, University of Toronto, Toronto, ON

Comparing Health Education & Meditation for Patients with Irreversible Age-Related Vision Loss & Their Caregivers

One out of every four Canadians aged 75 and older will experience irreversible age-related vision loss (IARVL). This condition impacts their ability to care for themselves, requiring support from caregivers. Alas, caregiving often leads to high stress and anxiety levels among caregivers.

IARVL is linked to elevated inflammation and cortisol dysregulation, which can harm the vascular and sympathetic nervous systems. Nervous system damage may contribute to conditions like glaucoma and optic neuropathy, which can lead to complete vision loss. However, mind-body interventions, such as meditation, can trigger a relaxation response that reduces stress and enhances overall quality of life.

This study will assess the feasibility of providing meditation to glaucoma patients with IARVL and their caregivers. It will also investigate whether meditation improves health-related quality of life, reduces depression and anxiety, enhances sleep quality, and lessens caregiver burden when compared to a health enhancement program.
Monali Malvankar, Dr Cindy M.L. Hutnik, University of Western Ontario,

Studying PXF Fibrils in the Eye

In pseudoexfoliation (PXF) syndrome insoluble protein aggregates form in the eye. These fibrils can clog the trabecular meshwork, which affects fluid drainage and increases intraocular pressure, raising the risk of glaucoma.

PXF glaucoma is the most common cause of open-angle glaucoma. Currently no preventive treatments are available. Researchers are exploring a novel approach using targeted magnetic nanoparticles and an alternating magnetic field. This technique aims to break down PXF materials, allowing the eye's natural processes to clear them. The study will test this method using samples from cataract surgery patients' lens capsules. If successful, this research could lead to a potential treatment for PXF glaucoma.

Jessica Chin, Larry D. Unsworth, University of Alberta, Edmonton AB

Investigating Vision Changes & Low IOP Rates After Glaucoma Surgery

This research project aims to review all studies related to vision changes in patients who have undergone Trans Scleral Cyclophotocoagulation (TSCPC). It will also analyze studies that report rates of low intraocular pressure (IOP) in patients with refractory glaucoma who have also undergone TSCPC.

The expected results from this review include identifying significant differences that might have otherwise been overlooked in individual studies. Researchers will use the Grading of Recommendations, Assessment, Development, and Evaluation system to assess the quality of evidence for all outcomes and evaluate the risk of bias. If needed, they may also employ The Risk of Bias in Non-randomized Studies of Interventions assessment tool.

Chris Zajner, University of Western Ontario, London ON; Michael Balas, Dr David Mathew, University of Toronto, Toronto ON

Measuring Immune Response in Retinal Ganglion Cell Loss

In glaucoma, the cells that die are retinal ganglion cells (RGCs). The most common approach to protect RGCs is to reduce intraocular pressure.

Previous studies used different animal models to induce RGC death. However, understanding the immune response to these models remains incomplete. It's important to grasp the immune reactions occurring during RGC loss as they directly impact cell health.

In this project, researchers will compare immune responses across various mouse models of RGC death and glaucoma. They'll investigate how and where the immune system reacts within the eye during cell death.

This comprehensive investigation aims to provide valuable insights into modulating the immune response, ultimately enhancing RGC survival in glaucoma. If successful, this work could significantly advance understanding of glaucoma in both animal models and human patients.

Dr Corey Smith, Dr Balwantray Chauhan, Dalhousie University, Halifax NS

Evaluating Side Effects of PGAs in Patients with Glaucoma

This research aims to understand the side effects of prostaglandin analogues (PGAs) in patients newly diagnosed with primary open-angle glaucoma (POAG).

The study will establish standard methods for assessing these side effects.

Researchers expect that patients treated with PGAs will show significant, measurable changes in their eyes compared to control groups. Over time, these changes are expected to become more pronounced, providing clear evidence of the impact of PGA therapy on ocular characteristics.

Dr Michael Balas, Dr David Mathew, University of Toronto, Toronto ON