OPHTHALMOLOGY
& VISUAL SCIENCES

Annual RESEARCH Report

DALHOUSIE UNIVERSITY

2016

Welcome

A message from the Department Head and Chief

I would like to congratulate our research teams for a very successful year in research for our Department. For a small department, where the majority of members are busy clinicians, our research productivity and ability to attract research funding are very impressive.

It gives me particular pleasure to witness the calibre of research being conducted by our trainees, from undergraduate, graduate to post-graduate levels. We are certainly fulfilling one of our main mandates, which is to train the future researchers who will advance our specialty.

Finally, I would like to welcome Dr. Jayme Vianna, the newest member of our research group, joining our faculty as the QEII Foundation Scholar in Glaucoma Research. Dr. Vianna completed his medical and ophthalmological training at the Sao Paulo University in Brazil, before joining our glaucoma research group for a post-doctoral fellowship. We are very pleased to welcome Dr. Vianna to our department.

A message from the Research Director

We are very proud to present the Annual Research Report for 2016. The Department of Ophthalmology and Visual Sciences has a rich tradition in departmental and collaborative research within various faculties and departments at Dalhousie. Our national and international collaborations are resulting in research output of the highest calibre.

There are numerous achievements we can be proud of. In the current difficult funding climate, I am pleased to say that a department of our size is punching well above its weight. Specific highlights are two new awards from the Canadian Institutes of Health Research and one from the Atlantic Innovation Fund on orphan drug development. Our annual research funding for new and ongoing projects is an impressive $4.6 million. Our research productivity is equally impressive with a total of 64 publications for the year.

I invite you to explore our achievements in the various research areas, those of our trainees and the facts and figures for this year. I want to thank Leah Wood, our research manager for compiling this document. Do not hesitate to contact me with any questions, queries or comments (contact information is on the back page). Our objective as always is to improve.

Research Strengths

Glaucoma

Glaucoma is a common eye disease causing irreversible visual loss. We are at the forefront of measuring progressive changes in glaucoma and developing clinically valuable visual field testing and imaging tools to allow ophthalmologists to provide the best care by tracking the disease accurately. We develop and assess new diagnostic tools and therapeutic interventions.

We strive to advance our current knowledge in the following areas:

- root causes
- associated risk factors
- imaging techniques
- disease progression
- non-surgical treatments
- surgical treatments

Pediatric Ophthalmology

Pediatric ophthalmology encompasses a variety of ocular problems ranging from infections of the external eye to serious diseases that can affect ocular structures. Our researchers, and projects, span the range from basic science to clinical research so that we can take the information we learn about the fundamentals of vision function and apply it to providing better care to children at the Izaak Walton Killam Health Centre and around the world.

The Pediatric Vision Science Research Group (PVSRG) collectively has expertise in:

- genetic disorders affecting vision
- cutting edge diagnostic techniques to detect deficiencies in vision function
- the treatment of common pediatric vision problems like amblyopia (lazy eye) and exploring the ways vision is interpreted by the brain to guide movement.

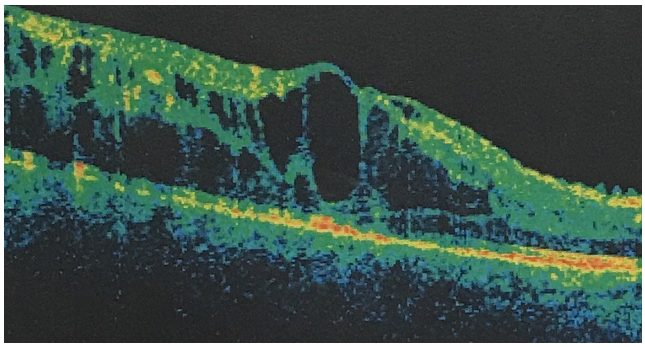
Research Strengths

Retina and Optic Nerve

Research on the basic processes of the retina in health and disease are vital for understanding and treating significant sight-threatening eye diseases. The primary aim of the Retina and Optic Nerve Research Laboratory is to investigate the function of the retina to aid in the discovery of the physiological, pharmacological and anatomical properties of synaptic circuits and receptive fields in the retina. These discoveries also lead to the identification of therapeutic strategies that could reduce, eliminate or slow damage to retinal neurons in diseases such as glaucoma caused by pathological synaptic and ion channel activity.

Clinical Retina

Retinal degenerative diseases such as diabetic retinopathy and age-related macular degeneration are leading causes of blindness. Our clinical retina research team is involved in world-leading clinical trials that aim to develop new treatment approaches that have the potential to halt the disease process and possibly stop vision loss or restore vision. Our researchers use unique and powerful imaging tools such as optical coherence tomography to track the success of novel treatments.



Oculogenetics

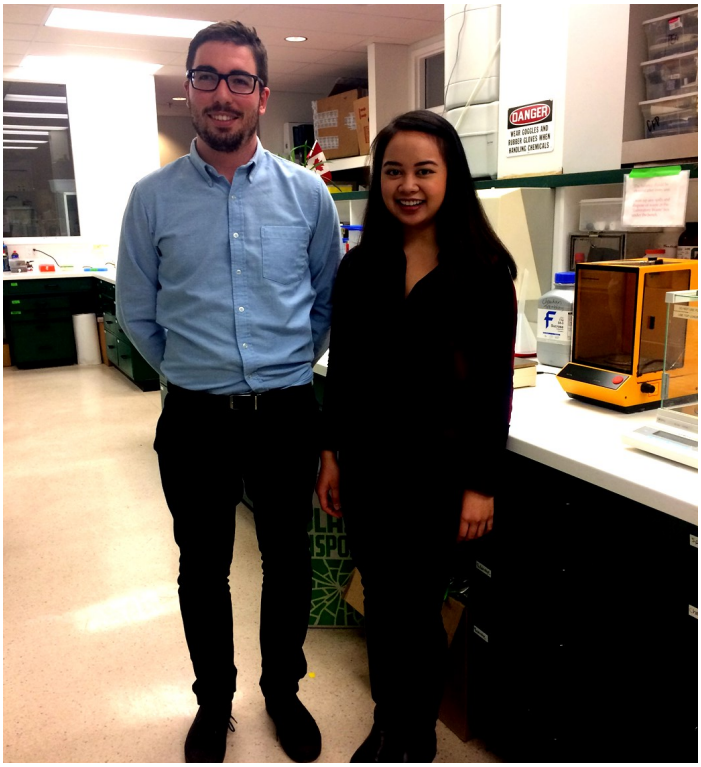
Our oculogenetics team is working to characterize genetic eye diseases in Maritime families and to identify the genes that cause these diseases. They are using this information to test new treatments for hereditary blinding conditions and associated, nonhereditary eye diseases. By making these kinds of discoveries, we will develop new treatments, and offer appropriate counseling and new detection methods.

Awards and Accolades

Finding a Cure for Familial Exudative Vitreoretinopathy (FEVR)

Dr. Johane Robitaille in collaboration with Dr. Chris McMaster and her research team were awarded a $2.75 million award from the Atlantic Canada Opportunities Agency, part of a $4.5 million investment to enable the development of drugs for orphan genetic diseases. Dr. Robitaille and her team discovered a gene causing Familiale Exudative Vitreoretinopathy (FEVR) in 2002. Using this information, the researchers believe that they have discovered a drug that will hopefully be a cure for FEVR. Their current research focus is to test the toxicity and efficacy of a drug to combat FEVR, and then move it into clinical use.

Dr. R. Evatt and Rita Mathers Trainee Awards in Ophthalmology and Visual Sciences



Lianne Esmore and Richard (Ross) Porter were the recipients of the 2016 Dr. Evatt and Rita Mathers Trainee Awards in Ophthalmology and Visual Sciences.

Lianne, under the supervision of Dr. Francois Tremblay, is investigating the mechanism responsible for long-term retinal toxicity caused by vigabatrin, a very potent antiepileptic drug using Multi-Electrode Array technology.

Ross and his supervisor Dr. Melanie Kelly are aiming to identify non-steroidal pharmacological targets to treat ocular inflammation. An emerging target is the endocannabinoid system, specifically the cannabinoid 2 receptor (CB2) which has been shown to be anti-inflammatory in a number of experimental models of disease including ocular inflammation. His research will identify the cell targets (i.e neutrophils, monocytes, endothelium) and associated signalling pathways responsible for CB2-mediated anti-inflammatory actions in the eye.

Awards and Accolades

Awards

Dr. Francois Tremblay: Dr. Ruth Goldbloom, IWK Auxiliary Award - IWK Health Centre

Dr. Darrell Lewis: Global Health Photography Contest, First Prize - Dalhousie University

Dr. Mark Seamone: Award for Excellence in Ophthalmic Research - Canadian Ophthalmological Society

Dr. Jayme Vianna: Annual Translational Science Research Award for Best Paper Published in 2015 for Translational Research in Glaucoma - Canadian Glaucoma Society

Dr. Anuradha Mishra: Royal College Professional Development Grant - Royal College of Physicians and Surgeons of Canada

Ist Place Dalhousie University Global Health Photography Contest - Pediatric Shy-Eye Exam Photo taken in Accra Ghana in 2010 by Darrell Lewis.

Resident Research

Resident Research Project Fund Recipients

Dr. Darrell Lewis, PGY5 was a recipient of a Dalhousie Department of Ophthalmology and Visual Sciences Resident Research Project Grant for his research project titled: "UV-A Cross-Linking of Cryopreserved Donor Corneas". Darryl's research examines whether UV-A corneal cross-linking confers resistance to keratolysis (corneal enzymatic degradation) in fresh donor corneas.

Dr. Mark Seamone, PGY4 received a Dalhousie Department of Ophthalmology and Visual Sciences Resident Research Project Grant for his research project titled: "Anti-VEGF Therapy Reduces Ocular Inflammation in Peptidoglycan and Endotoxin-Induced Uveitis". Mark's research sets out to determine if targeted VEGF-A blockade with intravitreal Bevacizumab (Avastin®) decreases leukocyte-endothelial interactions in Endotoxin-induced uveitis (EIU) and Peptidoglycan-induced uveitis (PIU) as measured by intravital microscopy in BALB/c mice and if the administration of intravitreal Bevacizumab (Avastin®) decreases pro-inflammatory cytokine expression induced by EIU and PIU in eyes of BALB/c mice.

Resident Research Projects

Name	Year	Supervisor	Project Title
Dr. Darrell Lewis	PGY 5	Dr. Christopher Seamone	UV-A cross-linking of cryopreserved donor corneas
Dr. Mark Seamone	PGY 4	Dr. Alan Cruess	Intravitreal anti-VEGF therapy reduces ocular inflammation in peptidoglycan and endotoxin induced uveitis
Dr. Amr Zaki	PGY 4	Dr. Rishi Gupta	Assessment of anxiety and pain associated with intravitreal injections
Dr. Claire Hamilton	PGY 4	Dr. Lesya Shuba	Comparison of outcomes of trabeculectomy with subconjunctival injection of mitomycin C versus topical application with cellulose sponge
Dr. William Best	PGY 3	Dr. Daniel Belliveau	Dalhousie medicine undergraduate ophthalmology education: Targeted needs assessment
Dr. Aaron Winter	PGY 3	Dr. Alon Friedman	Traumatic brain injury and retinal vascular pathology
Dr. Wesley Chan	PGY 2	Dr. Jai Shankar	Transverse venous sinuous stenosis on magnetic resonance imaging in patients with idiopathic intracranial hypertension– A pilot study
Dr. Harald Gerde	PGY 2	Dr. Johane Robitaille & Dr. Jason Bergman	The utility of a FZD4 knockdown zebrafish model for an efficacious drug screen
Dr. Tom Zhao	PGY 2	Dr. Steve Barnes & Dr. Francois Tremblay	DENAQ photoswitch as a chemical visual prosthesis in a model of acquired retinal degeneration

Trainee Research

Glaucoma Research Society of Canada Research Grant

Dr. Jayme Vianna, a Glaucoma Research Fellow in the Department of Ophthalmology and Visual Sciences, was a 2016 recipient of a Glaucoma Research Society of Canada Research Grant for his research project entitled "Changes in Lamina Cribrosa Depth as an Early Marker of Glaucoma Progression". Dr. Vianna's research uses Optical Coherence Tomography and newly developed software to analyze changes in the lamina cribrosa depth. His study aims to test if changes in the lamina cribrosa depth can be detected earlier in glaucoma progression than other previously known markers of glaucoma damage such as retinal nerve fiber layer and Bruch's membrane opening-minimal rim width.

Trainee Research Projects

Name	Program	Supervisor	Project Title
Stephanie Blandford	MSc Medical Neuroscience	Dr. William Baldridge & Dr. Spring Farrell	Retinal characterization of the THY1-GCAMP3 mouse after optic nerve transection
Philip Bobbie-Ansah	MSc Clinical Vision Science	Prof. Emeritus Donald Mitchell & Dr. Kevin Duffy	Is the rapid visual recovery in the amblyopic eye of kittens following a short period of darkness guided by vision in the non-deprived eye?
Elizabeth Cairns	PhD Pharmacology	Dr. Melanie Kelly & Dr. William Baldridge	Neuroprotective therapies for glaucoma
Dr. Vishva Danthurebandara	Research Fellow	Dr. Balwantray Chauhan	Cost-effectiveness analysis of following patients with glaucoma
Lianne Ophel Esmores	MSc Clinical Vision Sciences	Dr. Francois Tremblay	Short- vs long-term changes in retinal activity induced by vigabatrin, a potent anti-epileptic drug.
Tenille Fleischhaker	MSc Clinical Vision Science	Dr. Johane Robitaille & Dr. Jason Bergman	Utilizing zebrafish to characterize a novel childhood blinding disorder familial exudative vitreoretinopathy (FEVR) gene and test novel therapeutics
Heather Gerrie	BSc Neuroscience	Dr. Steven Barnes	Restoration of damaged retinal visual responsivity with an optochemical channel activator
John Gobran	BSc Pharmacy	Dr. Balwantray Chauhan & Dr. Spring Farrell	Effects of 3D Stratification of Retinal Ganglion Cells in Sholl Analysis
Delaney Henderson	BSc Medical Sciences	Dr. Balwantray Chauhan & Dr. Spring Farrell	Characterizing longitudinal in vivo changes of RGC dendrites after retinal injury
Annie Li	BSc Medical Sciences	Dr. Steven Barnes	Calcium influx in retinal ganglion cells mediated by calcium-permeable AMPA receptors
Skye McIntosh	BSc Neuroscience	Dr. William Baldridge	Retinomotor movements in flat fish
Syed Mohammad	BSc Medicine	Dr. Balwantray Chauhan & Dr. Spring Farrell	In vivo labelling and imaging of retinal ganglion cells
Dr. Michael Hung Ngo	Postdoctoral Fellow Pharmacology and Visual Sciences	Dr. Johane Robitaille	Familiale exudative vitreoretinopathy
Andrea Nuschke	PhD Physiology and Biophysics	Dr. Balwantray Chauhan	Spatiotemporal assessment of axonal transport and cytoskeletal structure in retinal ganglion cells following acute elevated intraocular pressure in the rat

Trainee Research

Trainee Research Projects (continued)

Name	Program	Supervisor	Project Title
Ross Porter	MSc Pharmacology	Dr. Melanie Kelly	Cannabinoid 2 receptor signalling during ocular inflammation
Benjamin J. Smith	PhD. Biological Sciences	Dr. Francois Tremblay	Implication of voltage-gated sodium channels in inner retina processing
Corey Smith	PhD Physiology and Biophysics	Dr. Balwantray Chauhan	In vivo labeling and imaging of retinal ganglion cells
Jin Soo Andy Song	MedII Student, Queen's University	Dr. Marcelo Nicolela	Efficacy of selective laser trabeculoplasty versus argon laser trabeculoplasty in patients with pseudoexfoliative glaucoma
Justine Sy	MSc Clinical Vision Sciences	Dr. Balwantray Chauhan & Dr. Spring Farrell	Retinal ganglion cell counting: Comparing sampling vs entire retina
Dinesh Thapa	MSc Pharmacology	Dr. Melanie Kelly	Cannabinoid therapeutics for ocular pain and inflammation
Sophie Thapa	MSc. Anatomy and Neurobiology	Dr. William Baldridge	The role of tyrosinase in the time course of light-induced cone movements in the goldfish retina
Dr. J. Thomas Toguri	Postdoctoral Fellow Pharmacology	Dr. Melanie Kelly & Dr. Eileen Denovan-Wright	Cannabinoid receptor modulation for the treatment of ocular pain and inflammation
Dr. Lucas Torres	Glaucoma Research Fellow	Dr. Balwantray Chauhan	Non-retinal nerve fibre layers within the optic nerve head neuroretinal rim
Dr. Jayme Vianna	Glaucoma Research Fellow	Dr. Balwantray Chauhan	Serial changes in lamina cribrosa depth and neuroretinal parameters in glaucoma. Impact of choroidal thickness
Tareq Yousef	MSc Medical Neuroscience	Dr. William Baldridge	Dopaminergic signalling and ipRGCs
Adel Zrein	MSc Pharmacology	Dr. Melanie Kelly	Endothelin receptor heterodimerization inhibit β-arrestin function

Dalhousie University Clinical Vision Science students.

Research Events

On April 18, 2016, faculty and trainees attended the **27th Annual Department of Ophthalmology and Visual Sciences Research Day**, a full-day symposium at the Lord Nelson Hotel & Suites. This event showcased the current basic science and clinical research that is being carried out in our department and beyond, and how it will impact eye care in our patient population.

The keynote speaker, Dr. Douglas Jabs, from The Mount Sinai Hospital, provided expert commentary and compelling presentations titled "Systemic Treatment of Uveitides" and "Approach to the Diagnosis of the Uveitides".

Congratulations to the 2016 Research Day Award winners:

Resident Category

1st Prize: **Dr. Mark Seamone** "VEGF-A is increased in exogenous endophthalmitis: A potential target for immunomodulation"
2nd Prize: **Dr. Darrell Lewis** "Resistance to enzymatic dissoluation of donor corneas cross-linked under variable UV-A fluence"

Non-Resident Category

1st Prize: **Dr. Vishva Danthurebandara** "Cost-effective analysis of following patients with glaucoma"
2nd Prize: **Corey Smith** "Fluorescence labeling of retinal ganglion cells with adeno-associated viral vectors for longitudinal imaging"

Research Events

The Dalhousie University Department of Ophthalmology and Visual Sciences hosted the **7th Biennial Form & Function in Ocular Disease Symposium** on October 28-29, 2016. This multi-disciplinary clinical and basic science symposium featured local and guest faculty who are world-class leaders in diverse areas of ophthalmology and vision research ranging from vision restoration in retinal disease to ocular surface health. This year's guest faculty included:

Jose-Alain Sahel, M.D., UPMC-Sorbonne Universités
Vision restoration in retinal degenerations
Steven Pflugfelder, M.D., Baylor College of Medicine
Conjunctival goblet cell - the least recognized but most important cell for ocular surface health
Peter Tse, Ph.D., Dartmouth College
Where visual illusions come from
Johane Robitaille, M.D., Dalhousie University
Genomics enhanced therapeutics for familial exudative vitreoretinopathy
Emily Chew, M.D., National Eye Institute
Nutrition and age-related macular degeneration: You are what you eat!
Claude Burgoyne, M.D., Devers Eye Institute
Why optic nerve head aging is our only normal tension glaucoma model
Kwoon Wong, Ph.D., University of Michigan
Intrinsically photosensitive retinal ganglion cells and their relevance to health
Michael Wall, M.D., University of Iowa
What have we learned from the Idiopathic Intracranial Hypertension Treatment Trial

Congratulations to the 2016 trainee award winners:

Corey Smith, M.E.Sc., Dalhousie University
Quantitative analysis of fluorescently labelled RGCs in living retina
Vasiliki Tellios, B.Sc., Western University
Nitric oxide, administered using novel copper-chitosan derivatives, accelerates corneal epithelial wound healing
Delaney Henderson, Dalhousie University
The effects of IOP elevation on the structure of Thy-1 YFP retinal ganglion cells
Alex Baldwin, Ph.D., McGill University
Using short-term patching to shift ocular dominance

Facts and Figures

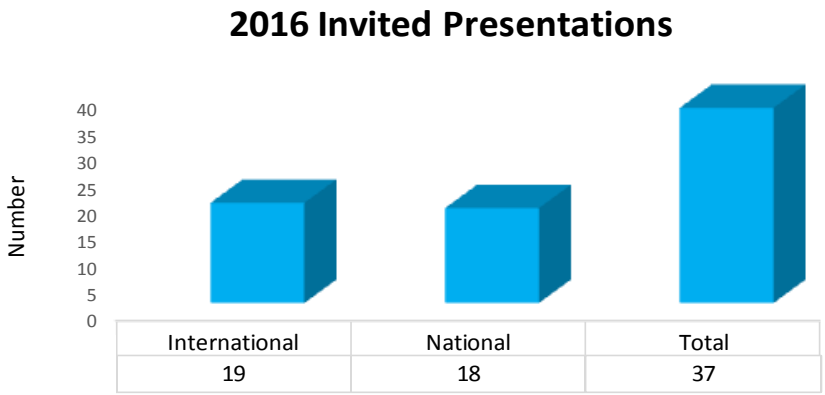
Number of peer-reviewed manuscripts, book chapters, and abstracts published in 2016.

Invited presentations by Department members

Peer reviewed manuscripts published

33

Peer reviewed abstracts published



Number of international and national invited presentations by department members in 2016.

List of Publications

Peer Reviewed Journal Publications

Baril C, **Vianna JR**, **Shuba LM**, **Rafuse PE**, **Chauhan BC**, **Nicolela MT** (2016). Rates of glaucomatous visual field change after trabeculectomy. *Br J Ophthalmol*. 2016, 27811280.

Blandford SN, **Baldridge WH** (2016). The effect of glutamate receptor agonists on mouse retinal astrocyte [Ca(2+)]i. *Biomed Res Int*. 2016, 8178162.

Cairns EA, **Baldridge WH**, Kelly ME (2016). The Endocannabinoid system as a therapeutic target in glaucoma. *Neural plast*. 2016, 9364091.

Croft DE, Wykoff CC, Michels S, Chakravarthy U, **Cruess AF** (2016). Regulatory factors influencing usage of retinal pharmaceuticals: A look both home and abroad. *Am J Ophthalmol*.169, 14-16.

Danthurebandara VM, **Vianna JR**, Sharpe GP, Hutchison DM, Belliveau AC, **Shuba LM**, **Nicolela MT**, **Chauhan BC** (2016). Diagnostic accuracy of glaucoma with sector-based and a new total profile-based analysis of neuroretinal rim and retinal nerve fiber layer thickness. *Invest Ophthalmol Vis Sci*. 57, 181-7.

Gupta RR, Choudhry N. (2016). Spontaneous resolution of optic disc pit maculopathy after posterior vitreous detachment. *Can J Ophthalmol*. 51, e24 - 27.

Hamilton C, **Seamone CD**, Darvish M, **Gupta RR**. (2016). Multiple parallel line endotheliitis - case report and literature review of an emerging entity. *Can J Ophthalmol*. 51, 89-92.

Hirano AA, Liu, X, Boulter J, Grove J, Pérez de Sevilla Müller L, **Barnes S**, Brecha NC. (2016). Targeted deletion of vesicular GABA transporter from retinal horizontal cells eliminates feedback modulation of photoreceptor calcium signaling. *eNeuro*. 3, e0148 - 15. 2016 1 - 13.

Iordanous Y, Sharan S, **Robitaille J,** Walsh L, LaRoche GR (2016). Predictability of horizontal versus vertical muscle surgery outcomes in thyroid eye disease. *Int Ophthalmol.* 36, 487-91.

Liu X, Hirano AA, Brecha NC, **Barnes S**. (2016). Dopamine modulation of calcium channel currents in horizontal cells of mouse retina. *J Neurophysiol*. 116, 686-97.

Luke M, LeVatte T, Rutishauser U, **Tremblay F**, and Clarke D (2016). PSA-NCAM protects against light-induced retinal degeneration. *Invest Ophthalmol Vis Sci*. 57, 5066-5075.

Luke MP, LeVatte TL, O'Reilly AM, Smith BJ, **Tremblay F**, Brown BE, Clarke DB. (2016). Effect of NCAM on aged-related deterioration in vision. *Neurobiol Aging*. 41, 93-106.

Malik R, Belliveau AC, Sharpe GP, **Shuba LM**, **Chauhan BC**, **Nicolela MT** (2016). Diagnostic accuracy of optical coherence tomography and scanning laser tomography for identifying glaucoma in myopic eyes. *Ophthalmology*. 123, 1181-9.

Malik R, O'Leary N, Mikelberg FS, Balazsi AG, LeBlanc RP, Lesk MR, **Nicolela MT**, Trope GE, **Chauhan BC** (2016). Neuroretinal rim area change in glaucoma patients with visual field progression endpoints and intraocular pressure reduction. The Canadian Glaucoma Study: 4. *Am J Ophthalmol*. 163, 140-147.

Matynia A, Nguyen E, Sun XP, Parikh S, Kessler J, Pérez de Sevilla Müller L, Habib S, Kim P, Wang Z, Rodriguez A, Charles A, Nusinowitz S, **Barnes S**, Brecha NC, Gorin MB. (2016). Peripheral sensory neurons expressing melanopsin respond to light. *Front Neurosci*. 10, 60.

Mishra A, Jackson M (2016). Translational vision rehabilitation: From eccentric fixation to reading rehabilitation. *Semin Ophthalmol*. 31, 169-77.

Morgan WH, House PH, Hazelton ML, Betz-Stablein BD, **Chauhan BC**, Vishwanathan A, Yu D-Y (2016). Intraocular pressure reduction is associated with reduced venous pulsation pressure. *PLoS ONE*. 11, e0147915.

List of Publications

Peer Reviewed Journal Publications (continued)

Ngo M, Borowska-Fielding J, **Heathcote G**, Nejat S, Kelly M, McMaster C, **Robitaille JM** (2016). iFzd4 haploinsufficiency delays retinal revascularization in the mouse model of oxygen induced retinopathy. *PLoS ONE*. 11, e0158320.

Saiz A, Bermel R, Klistorner A, Petzold A, Schippling S, Costello F, Aktas O, Vermersch P, Oreja-Guevara C, Comi G, Leocani L, Garcia-Martin E, Paul F, Havrdova E, Frohman E, Balcer LJ, Green AJ, Calabresi PA, Villoslada P; **IMSVISUAL consortium**. (2016). Retinal thickness measured by optical coherence tomography and risk of disability worsening in multiple sclerosis. *Lancet Neurol*. 15, 574–584.

Seamone ME, Choudhry N, Chen J, Galic J, **Gupta RR** (2016). Quizzical optical coherence tomography. *Can J Ophthalmol*. 51, e152.

Seamone ME, Choudhry N, Kapusta M, Baig K, Chen J, Galic J, **Gupta RR** (2016). Eye love you. *Can J Ophthalmol*. 51, e3 - 4.

Serlin Y, Shafat T, Levy J, **Winter A**, Shneck M, Knyazer B, Parmet Y, Shalev H, Ur E, Friedman A. (2016). Angiographic evidence of proliferative retinopathy predicts neuropsychiatric morbidity in diabetic patients. *Psychoneuroendocrinology*. 67, 163 - 170.

Sharpe GP, **Danthurebandara VM**, **Vianna JR**, Alotaibi N, Hutchison DM, Belliveau AC, **Shuba LM**, **Nicolela MT**, **Chauhan BC** (2016). Optic disc hemorrhages and laminar disinsertions in glaucoma. *Ophthalmology*. 123, 1949-56.

Seamone ME, Choudhry N, Kapusta M, Baig K, Chen J, Galic J, Gupta RR (2016). Eye love you. *Can J Ophthalmol*, 51(1), e3 - 4.

Sivachandran N, Noble J, Dollin M, O'Connor MD, **Gupta RR** (2016). Trends in subspecialty training by canadian ophthalmology graduates. *Can J Ophthalmol*. 51, 201-206.

Vianna JR, Malik R, **Danthurebandara VM**, Sharpe GP, Belliveau AC, **Shuba LM**, **Chauhan BC**, **Nicolela MT** (2016). Beta and gamma peripapillary atrophy in myopic eyes with and without glaucoma. *Invest Ophthalmol Vis Sci*. 57, 3103-11.

Books and Chapters

Chauhan BC (2016). Visual Field. Field Interpretation. In: Giaconi JA, Law SK, Coleman AL and Caprioli J (Eds), *Pearls of Glaucoma Management* (pp. 163-172). Springer-Verlag: Berlin, Germany.

LaRoche GR (2016). Diagnostic challenges in acquired non-accommodative esotropia. In: Elias I Traboulsi Virginia Utz (Ed), *Practical Management of Pediatric Ocular Disorders and Strabismus* (pp. 491-495). Springer: New York, New York.

Nicolela MT, Reis AS, **Vianna JR** (2016) Emergencias em glaucoma (Emergencies in glaucoma) [Book Chapter]. In: Pimentel S (Ed), *Emergencias Oftalmologicas (Ophthalmological Emergencies)*. Verlag-Springer GmbH: Berlin and Heidelberg. In Press.

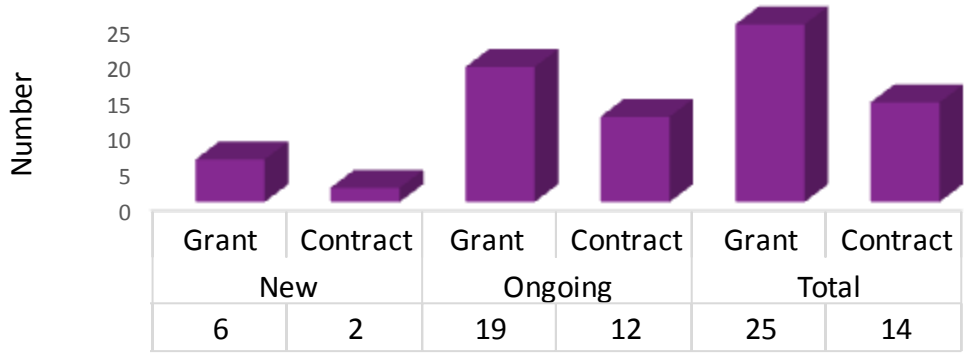
Nicolela MT, **Vianna JR** (2016). Optic nerve: Clinical examination. In: Giaconi JA, Law SK, Coleman AL, Caprioli J (Eds), *Pearls of Glaucoma Management* (pp. 17-26). Springer-Verlag: Berlin and Heidelberg.

Robitaille JM (2016). Other non-ROP vascular disorders. In: Elias I Traboulsi Virginia Utz (Ed), *Practical Management of Pediatric Ocular Disorders and Strabismus* (pp. 353-357). Springer: New York, New York.

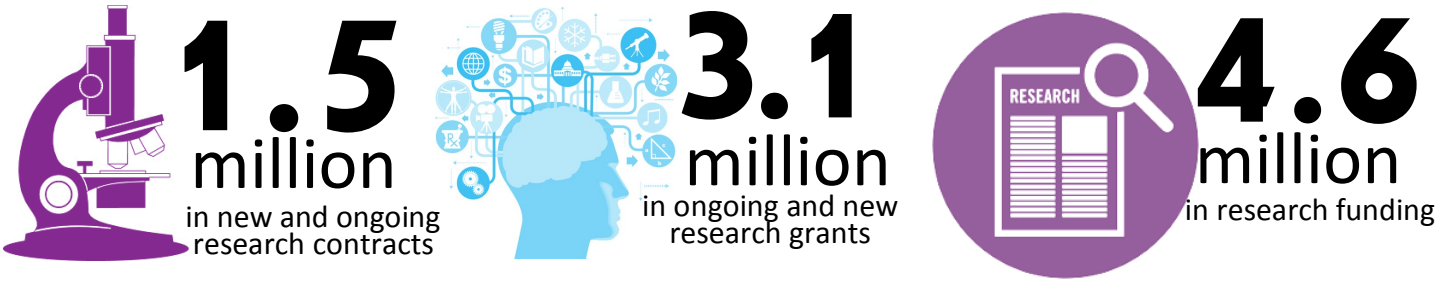
Shuba LM and Kwon YH (2016). Uveitic glaucoma. In: *Frequently asked questions in glaucoma*. Springer Publishers: New York City, NY. In Press.

Facts and Figures

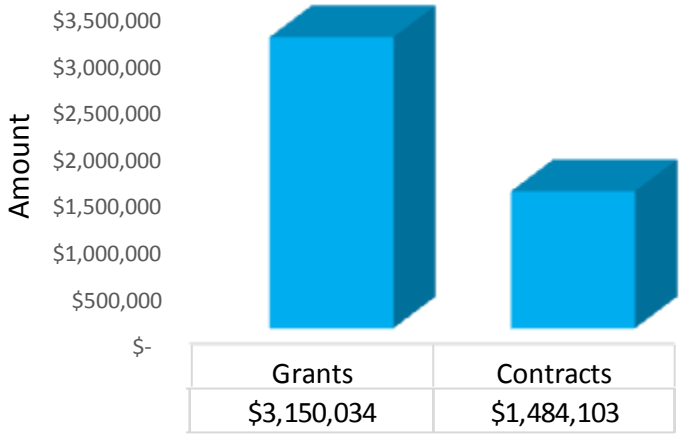
2016 Grants and Contracts



Number of newly acquired and continuing research grants and contracts in 2016. All research projects in which a



2016 Research Funding



The value of research funding including revenue from all awards generating funds in that year (for multi-year awards, the revenue is reported the year it is budgeted).

Research Grants and Contracts

***Note: The amounts listed are the total value of the award whereby annual departmental amounts are provided in the figures.**

New Research Grants and Contracts

Chauhan BC, (2016 - 2021). Structural and functional changes in the retina and optic nerve in experimental glaucoma - *Canadian Institutes of Health Research* - $672,760.

Cruess A, **Gupta RR** (2016 - 2020). Safety and efficacy of abicipar pegol (AGN-150998) in patients with neovascular age-related macular degeneration (SEQUOIA) - *Allergan* - $506,315.

McMaster C, **Robitaille JM**, Berman J, Hoffman E, Kanneboyina Nagaraju, Dalhousie University Industry Liaison and Innovation, the Centre for Drug Research and Development, AGADA Biosciences Inc (2016 - 2021). A scientific and clinical hub for orphan drug development - *Atlantic Innovation Fund* - $4,505,000.

McMaster C, **Robitaille JM** (2016 - 2021). A treatment for the inherited childhood blinding disorder familial exudative vitreoretinopathy - *Canadian Institutes of Health Research* - $750,000.

Robitaille JM, Berman J (2016-2017). Familial exudative vitreoretinopathy zebrafish model development for gene discovery and therapeutics development - *Canadian Rare Diseases Models and Mechanisms (RDMM) Network* - $25,000

Shuba LM, **Nicolela MT** (2016-present). A prospective, double-masked, randomized, multi-center, active-controlled, parallel-group, 3-month study assessing the safety and ocular hypotensive efficacy of PG324 ophthalmic solution 0.02% and latanoprost ophthalmic solution 0.005% in subjects with elevated intraocular pressure - *Aerie Pharmaceuticals Inc.* - $118,475.

Tremblay F, **Barnes S** (2016 - 2017). Multi electrode array head stage replacement - *Dalhousie University* - $17,684.

Vianna JR, **Nicolela MT**, **Chauhan BC** (2016 - 2017). Changes in lamina cribrosa depth as an early marker of glaucoma progression - *Glaucoma Research Society of Canada* - $19,530.

Continuing Research Grants and Contracts

Baldridge WH (2011 - 2016). Modulation of horizontal cells in the vertebrate retina - *Natural Science and Engineering Research Council* - $155,000.

Baldridge WH (2015 - 2016). Retinal ganglion cell calcium levels during diabetic retinopathy - *Nova Scotia Health Research Foundation* - $15,000.

Baldridge WH, Kelly M and Cairns E (2015 - 2016). Neuroprotective strategies in glaucoma: Cannabinoid modulation of RGC calcium dynamics - *Glaucoma Research Society of Canada* - $15,000.

Barnes S (2011 - 2016). The formation of receptive fields in the retina: Dual inhibitory output pathways from horizontal cells - *National Science and Engineering Research Council of Canada* - $155,000.

Birt C, Crichton A, Damji K, Hutnik C, Koval J, Malvankar M, **Nicolela MT**, Hodge W (2012 - 2015). A randomized clinical trial of selective laser trabeculoplasty (SLT) in open angle glaucoma who have been previously treated with complete SLT - *Canadian Institute of Health Research* - $756,475.

Burgoyne CF, Yang H, Fortune B, Demirel S, Gardiner SK, **Chauhan BC**, Mansberger SL, Reynaud, JF (2014 - 2018). Optic nerve head SDOCT imaging in glaucoma - *National Institutes of Health/National Eye Institute* - $2,604,636 (USD).

Chauhan BC, **Baldridge WH**, Awatramani GB, Yu D-Y, Zinser G (2011 - 2016). Imaging retinal neurons - *Atlantic Innovation Fund* - $2,570,078.

Research Grants and Contracts

Continuing Research Grants and Contracts (continued)

Chauhan BC (2013 - 2018). Optic nerve changes in glaucoma - *Heidelberg Engineering* - $677,500.

Chauhan BC (2015 - 2020). Alcon Research Institute Award and Matching Funds from QEII Foundation - *Alcon Research Institute* - $225,800.

Cruess A (2013 - 2016). Canadian treat and extend analysis trial with ranibizumab - *Novartis* - $291,140.

Cruess A, **Gupta RR**, **Dickinson J** (2015 - 2018). A phase III, multicenter, randomized, double-masked, sham-controlled study to assess the effiacy and safety of Lampalizumab administered intravitreally to patients with geographic atrophy secondary to age-related macular degeneration (CHROMA GX29176) - *Hoffmann-La Roche Ltd.* - $348,680.

Cruess A, **Gupta RR** (2015 - 2019). A two-year, randomized, double masked, multicenter, three-arm study comparing the efficacy and safety of RTH258 versus Aflibercept (Eylea®) in subjects with neovascular age-related macular degeneration (HAWK) - *Alcon Research Ltd.* - $488,774.

Dickinson J, **Cruess A**, **Samad A**, **Hoskin-Mott A**, **Kozousek V** (2013 - 2016). A phase 3 randomized, double-masked, controlled trial to establish the safety and efficacy of intravitreous administration of FovistaTM (Anti PDGF-B pegylated aptamer) administered in combination with Lucentis® compared to Lucentis® monotherapy - *Ophthotech* - $358,623.

Dickinson J, **Cruess A**, **Gupta RR** (2015 - 2017). Open-label phase-4 study to examine the change of vision-related quality of life in subjects with diabetic macular edema (DME) during treatment with intravitreal injections of 2 mg Aflibercept according to EU label for the first year of treatment (AQUA) - *Bayer* - $257,072.

Dickinson J, **Cruess A**, **Gupta RR** (2015 - 2020). A multicenter, prospective epidemiologic study of the progression of geographic atrophy secondary to age–related macular degeneration (PROXIMA B) - *F. Hoffmann-La Roche Ltd.* - $169,812.

Fleishhacker T, **Robitaille JM**, Berman J (2015 - 2016). Small molecule screen utilizing mutant FZD4 zebrafish for novel therapeutic targets - *Dr. R. Evatt and Rita Mathers Trainee Awards in Ophthalmology and Visual Sciences, Dalhousie University* - $20,000.

Kwofie MK, Uppal V, Szerb J, **Baldridge WH**, ZHou J, Sandeski R (2015 - 2016). Incidence of subepineurial injection with ultrasound-guided supraclavicular brachial plexus block in cadavers – *Nova Scotia Health Research Foundation* - $14,233.

Lee Jampol, **Cruess A**, **Gupta RR**, **Kozousek V**, **Dickinson J**, Diabetic Retinopathy Clinical Research Network, (2015 - 2020). Peripheral diabetic retinopathy (DR) lesions on ultrawide-field fundus images and risk of DR worsening over time - *JAEB Center for Health Research National Eye Institute/National Institutes of Health (NEI/NIH)* - $124,700.

Nicolela MT (2014 - present). A double-masked, randomized, mutlicentre, active-controlled, parallel, 12 month study assessing the safety of AR-13324 Ophthalmic Solution, 0.2% q.d.and b.i.d. compared to Timolol Maleate Ophthalmic Solution, 0.5% b.i.d. in patients with elevated intraocular pressure - *Aerie Pharmaceuticals Inc.* - $152,140.

Nicolela MT (2015 - present). Additive effect of twice-daily brinzolamide 1% /Brimonidine 0.2% fixed dose combination as adjunctive therapy to a prostaglandin analogue - *Alcon Research Ltd.* - $50,900.

Nicolela MT (2015 - present). The efficacy and safety of Bimatoprost SR in patients with open-angle glaucoma or ocular hypertension - *Allergan Inc.* - $404,862 (USD).

Robitaille JM, Berman J (2015 - 2016). Familial exudative vitreoretinopathy zebrafish model development for gene discovery and therapeutics development - *Canadian Rare Diseases Models and Mechanisms Network* - $25,000.

Research Grants and Contracts

Continuing Research Grants and Contracts (continued)

Robitaille JM, McMaster C (2015 - 2016). A treatment for familial exudative vitreoretinopathy and similar ocular disorders - *Early Stage Commercialization Fund* - $50,000.

Robitaille JM, McMaster C (2015 - 2016). A treatment for familial exudative vitreoretinopathy and similar ocular disorders - *Early Stage Commercialization Fund: Emerging Medical Technologies and Therapeutics* - $70,000.

Robitaille JM, McMaster C (2015 - 2016). A treatment for familial exudative vitreoretinopathy and similar ocular disorders - *Springboard Proof of Concept Award* - $30,000.

Samad A, **Cruess A** (2014 - 2016). Assessment of anatomical and functional outcomes in patients treated with ocriplasmin for vitreomacular traction/symptomatic vitreomacular adhesion (VMT/sVMA) - *Alcon Research Ltd* - $42,624.

Seamone M (2015 - 2016). The Role of the innate immune system in exogenous endophthalmitis - *Nova Scotia Health Authority* - $5,000.

Tremblay F (2015 - 2017). Short- vs long-term retinal challenges by antiepileptic Vigabatrin - *IWK* - $14,689.

Tremblay F (2015 - 2020). Determinants of signal characteristics in a retinal network: Contribution of local field potentials and spike trains - *Natural Sciences and Engineering Research Council of Canada* - $120,000.

Vianna JR, **Nicolela MT**, **Chauhan BC** (2015 - 2016). Enhancing glaucoma diagnosis in myopic eyes - *Dr. R. Evatt & Rita Mathers Fellowship Awards in Ophthalmology & Visual Sciences, Dalhousie University* - $50,000.

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