**A Closer Look at Nitric Oxide in Glaucoma**

**Statement of Need
Learning Objectives
Faculty and Disclosure Statements**

[**https://cme.ufl.edu/online-cme/videos-nitric-oxide-in-glaucoma/**](https://cme.ufl.edu/online-cme/videos-nitric-oxide-in-glaucoma/)

**TARGET AUDIENCE**

This educational activity is intended for ophthalmologists and ophthalmologists in residency or fellowship training.

**LEARNING OBJECTIVES**

Upon completion of this series of activities, participants should be able to:

* Explain the role of nitric oxide (NO) in IOP regulation and the pathophysiology of glaucoma.
* Categorize the research on NO and NO-donating drugs in the eye.
* Apply the findings of research on NO in the eye to glaucoma treatment considerations.

**ACTIVITY DIRECTOR**

Louis R. Pasquale, MD, FARVO is professor of ophthalmology and Distinguished Scholar in Ophthalmology at Harvard Medical School and director of the Glaucoma Service at Massachusetts Eye and Ear Infirmary. In addition to co-directing Harvard’s Glaucoma Center of Excellence, he directs the Glaucoma Fellowship Program and the Teleretinal Program at Massachusetts Eye and Ear Infirmary. Dr. Pasquale states that in the last 12 months, he has been a consultant for Bausch + Lomb, Inc. and Eyenovia Inc., and has been on the speakers’ bureau for Alcon.

**ABOUT *A Closer Look at Nitric Oxide in Glaucoma***

*A Closer Look at Nitric Oxide in Glaucoma* is jointly sponsored by Candeo Clinical/Science Communications, LLC, and the University of Florida College of Medicine. This educational activity is administered by an independent editorial board and supported by an unrestricted educational grant from Bausch + Lomb, Inc.

Copyright 2018 Candeo Clinical/Science Communications, LLC. All rights reserved. Neither The University of Florida nor Candeo Clinical/Science Communications, LLC assumes any responsibility for injury or damage to persons or property arising from the use of information or ideas contained in this publication.

**CME REVIEWER**

Matthew J. Gray, MD
University of Florida
Gainesville, FL, USA

**STATEMENT OF NEED**

Primary open-angle glaucoma (POAG) is a complex and typically slowly progressive disease for which intraocular pressure (IOP) is the only known modifiable risk factor. While many aspects of glaucoma pathophysiology and progression remain to be uncovered, it is known that over time, every mm Hg of pressure reduction has an impact.3,4

Research into the mechanisms underlying aqueous humor dynamics, and thus, IOP regulation, points to the trabecular meshwork pathway (the “conventional” pathway) as the primary route of aqueous outflow, and, in POAG, the site of resistance that results in elevated IOP. Research has found that nitric oxide (NO), an endogenous signaling molecule involved in processes throughout the body, also plays a key role in IOP regulation via this outflow pathway.5

NO-donating drugs and other compounds aimed at the NO signaling cascade have been developed for use in cardiovascular and pulmonary diseases, and also represent an important new area of drug development in glaucoma.5 This is particularly the case because most currently available glaucoma treatments bypass the trabecular meshwork altogether, targeting either aqueous humor production or outflow through the uveoscleral (“nonconventional”) pathway.6,7

As at least one drug with an NO-donating moiety (latanoprostene bunod) is poised to enter the glaucoma marketplace, there is a need for ophthalmologists to understand the role of NO in the trabecular meshwork and glaucoma, and the place of NO-donating drugs in practice.8,9

As a leading cause of irreversible vision loss and blindness worldwide, glaucoma is an important part of comprehensive ophthalmology practice; and ophthalmologists, especially those who are not glaucoma specialists, need up-to-date and clearly presented information about new research into the disease and its treatment.10

***A Closer Look at Nitric Oxide in Glaucoma*** will translate the available preclinical and clinical evidence about how NO works in the eye, addressing the mechanism of NO-donating drugs in glaucoma and how the availability of medical glaucoma therapy that targets the trabecular meshwork could factor into treatment decisions.

**References**

1. Accreditation Council for Continuing Medical Education. ACCME Data Report: Growth and evolution in continuing medical education – 2016. <http://www.accme.org/sites/default/files/754_20170712_2016_Data_Report_3.pdf> Accessed August 23, 2017.

2. Young KJ, Kim JJ, Yeung G, Sit C, Tobe SW. Physician preferences for accredited online continuing medical education. *J Contin Educ Health Prof*. 2011;31(4):241-6.

3. The AGIS Investigators. The Advanced Glaucoma Intervention Study (AGIS): 7. The relationship between control of intraocular pressure and visual field deterioration. *Am J Ophthalmol*. 2000;130(4):429-40.

4. Heijl A, Leske MC, Bengtsson B, Hyman L, Bengtsson B, Hussein M; Early Manifest Glaucoma Trial Group. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. *Arch Ophthalmol*. 2002;120(10):1268-79.

5. Stamer WD, Lei Y, Boussommier-Calleja A, Overby DR, Ethier CR. eNOS, a pressure-dependent regulator of intraocular pressure. *Invest Ophthalmol Vis Sci*. 2011;52(13):9438-44.

6. Stamer WD, Acott TS. Current understanding of conventional outflow dysfunction in glaucoma. *Curr Opin Ophthalmol*. 2012;23:135-43.

7. Weinreb RN, Aung T, Medeiros FA. The pathophysiology and treatment of glaucoma: a review. *JAMA*. 2014;311(18):1901-11.

8. Weinreb RN, Ong T, Scassellati Sforzolini B, et al, for the VOYAGER study group. A randomised, controlled comparison of latanoprostene bunod and latanoprost 0.005% in the treatment of ocular hypertension and open angle glaucoma: the VOYAGER study. *British Journal of Ophthalmology*2015;99:738-45.

9. Cavet ME, Vollmer TR, Harrington KL, et al. Regulation of endothelin-1-induced trabecular meshwork cell contractility by latanoprostene bunod. *Invest Ophthalmol Vis Sci*. 2015;56(6):4108-16.

10. Kapetanakis VV, Chan MPY, Foster PJ, Cook DG, Owen CG, Rudnicka AJ. Global variations and time trends in the prevalence of primary open angle glaucoma (POAG): a systematic review and analysis. *Br J Ophthalmol*. 2016;100:86-93.

**Off-label Use Statement:** This work may discuss off-label uses of medications.

**GENERAL INFORMATION**

**General Information:** This CME activity is sponsored by the University of Florida College of Medicine and is supported by an unrestricted educational grant from Bausch + Lomb, Inc.

**Directions:** Select one answer to each question in the exam (questions 1–5). Please take the evaluation at the end of the quiz.

The University of Florida College of Medicine designates this activity for a maximum of 0.25 *AMA PRA Category 1 Credit*TM. There is no fee to participate in this activity. In order to receive CME credit, participants should watch the video, and then take the posttest. A score of 80% is required to qualify for CME credit. Take the test online at **https://cme.ufl.edu/online-cme/videos-nitric-oxide-in-glaucoma/**.

System requirements for this activity are: *For PC users:* Windows® 2000, XP, 2003 Server, or Vista; Internet Explorer® 6.0 or newer, or Mozilla® Firefox® 2.0 or newer (JavaScriptTM and JavaTM enabled). *For Mac® users:* Mac OS® X 10.4 (Tiger®) or newer; SafariTM 3.0 or newer, Mozilla® Firefox® 2.0 or newer; (JavaScriptTM and JavaTM enabled).

Internet connection required: Cable modem, DSL, or better.

**DATE OF ORIGINAL RELEASE** November 2018. Approved for a period of 12 months.

**ACCREDITATION STATEMENT**

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the University of Florida College of Medicine and Candeo Clinical/Science Communications, LLC. The University of Florida College of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

**CREDIT DESIGNATION STATEMENT**

The University of Florida College of Medicine designates this enduring material for a maximum of 0.25 *AMA PRA Category 1 Credit*TM. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

**FACULTY AND DISCLOSURE STATEMENTS**

**Activity Director: Louis R. Pasquale, MD, FARVO**

Louis R. Pasquale, MD, FARVO is professor of ophthalmology and Distinguished Scholar in Ophthalmology at Harvard Medical School and director of the Glaucoma Service at Massachusetts Eye and Ear Infirmary. In addition to co-directing Harvard’s Glaucoma Center of Excellence, he directs the Glaucoma Fellowship Program and the Teleretinal Program at Massachusetts Eye and Ear Infirmary. Dr. Pasquale states that in the last 12 months, he has been a consultant for Bausch + Lomb, Inc. and Eyenovia Inc., and has been on the speakers’ bureau for Alcon.

**CME Reviewer: Matthew J. Gray, MD**

Matthew J. Gray, MD is a professor at the University of Florida College of Medicine Department of ophthalmology. He states that in the past 12 months, he has not had a financial relationship with any commercial organization that produces, markets, resells, or distributes healthcare goods or services consumed by or used on patients relevant to this manuscript.

**Video Presenter: James C. Tsai, MD, MBA**

James C. Tsai, MD, MBA, is the president of New York Eye and Ear Infirmary of Mount Sinai; Delafield-Rodgers, professor of ophthalmology at the Icahn School of Medicine at Mount Sinai, and system chair of ophthalmology for the Mount Sinai Health System. Dr. Tsai states that in the last 12 months, he has received grant and research support from Bausch + Lomb, Inc. and has been a consultant for Eyenovia Inc., Nektar Therapeutics, and Shire.

**Disclaimer:** Participants have an implied responsibility to use the newly acquired information to enhance patient outcomes and professional development. The information presented in this activity is not meant to serve as a guideline for patient care. Procedures, medications, and other courses of diagnosis and treatment discussed or suggested in this activity should not be used by clinicians without evaluation of their patients’ conditions and possible contraindications or dangers in use, applicable manufacturer’s product information, and comparison with recommendations of other authorities.

**Commercial Supporters:** This activity is supported by an unrestricted educational grant from Bausch + Lomb, Inc.