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Mary A. Johnson, PhD

Academic Title:

Associate Professor

Primary Appointment:

Ophthalmology and Visual Sciences

Additional Title:

Director, Visual Electrodiagnostics Laboratory

Email:

maryjohnson@som.umaryland.edu

Location:

10 S. Pine St. Baltimore, MD 21201

Phone (Primary):

(410) 706-1780

Fax:

(410) 706-7507

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Education and Training

- University of Delaware Newark, Delaware B.A. with Distinction 1977 Biology & Psychology
- Johns Hopkins University Baltimore, MD M.A. 1980 Physiological Psychology
- Johns Hopkins University Baltimore, MD Ph.D. 1982 Physiological Psychology
- Wilmer Eye Institute, Johns Hopkins University School of Medicine Post-doctoral fellowship 1982-1983 Ophthalmology

Biosketch

Dr. Johnson is a vision scientist, specializing in clinical applications of electrophysiology and psychophysics. She uses these techniques to study how disease affects visual function, and from these data develops insights into the mechanisms of damage. She is best known for her work in retinal disease caused by poor vascular perfusion to the eye. Over the years there have been numerous studies on risk factors for developing the blinding complication of neovascularization (NV) in ischemic retinopathies such as central retinal vein occlusion (CRVO), diabetic retinopathy and ocular ischemic syndrome. However, Dr. Johnson provided the unifying concept explaining that all patients at risk, regardless of the type of disorder they had, had large reductions in retinal sensitivity, and suggested that these areas of compromised tissue generate a diffusible substance encouraging new vessel growth. Using Bayesian analysis, she determined the percent chance that a given CRVO eye would develop NVI given sensitivity-related changes in one electroretinogram (ERG), recorded at the patient's initial presentation. These values predicted who would develop NV with higher sensitivity and specificity than all of the clinical measures used to evaluate these patients. It was not until 2011 that intraocular levels of the vascular growth factor VEGF were discovered to correlate with ERG-determined sensitivity loss in CRVO, over 20 years after her studies were published. Today, a device that she helped develop to estimate ERG-reflected sensitivity loss is used around the world to identify diabetic patients that require urgent ophthalmic intervention. As another example of how understanding mechanisms of function loss aid in disease management, Dr. Johnson showed that the anti-epileptic drug vigabatrin was preferentially toxic to intraretinal neurons connected to cone photoreceptors, producing irreversible cone sensitivity loss throughout the visual field. She identified an ERG protocol that is now used as a surrogate for visual field loss in patients taking vigabatrin that cannot perform a visual field test.

Dr. Johnson applies what she has learned in her studies directly to patient care, as director of the Visual Electrodiagnostics laboratory. This has resulted in the identification of several new or exceedingly rare disorders among patients referred for unexplained vision loss.

Dr. Johnson is internationally-recognized for her work: She was elected a fellow of the Optical Society of America for her contributions and has held a number of leadership roles in this organization. She is also a fellow of the Association for Research in Vision and Ophthalmology. Currently, she serves on the Board of Directors of the International Society for the Clinical Electrophysiology of Vision, and is a member of the editorial board of its journal, Documenta Ophthalmologica. Her current studies include identifying occult retinal damage from traumatic brain injury, developing neuroprotective/neuroregenerative treatments in nonarteritic anterior ischemic optic neuropathy (NAION), and investigating a putative biomarker for Huntington's disease, so that treatment trials can be run with more rigor.

Research/Clinical Keywords

retinal ischemia, central retinal vein occlusion (CRVO), diabetic retinopathy, diabetic choroidopathy, nonarteritic anterior ischemic optic neuropathy (NAION), vigabatrin toxicity, electroretinogram (ERG), visual evoked potential (VEP), pattern ERG (PERG)

Highlighted Publications

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Johnson, M.A., Krauss, G.L., Miller, N.R., Medura, M., Paul, S.R.: Visual function loss from vigabatrin: Effect of stopping the drug. Neurology 55: 40-45 (2000).

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