Christopher N. Johnson, Ph.D.

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Education and Training

Vanderbilt University; Nashville, TN (2011)
- Postdoctoral research scientist, advisor: Walter J. Chazin

Ph.D. Georgia State University; Atlanta, GA (2012)
- Biophysical chemistry, graduate advisor: Markus W. Germann
- Dissertation: *Nucleic Acid Substrates; Investigation of Structural and Dynamic Features that Influence Enzyme Activity*

M.S. Georgia State University; Atlanta, GA (2008)
- Biochemistry

B.S. State University of New York at Fredonia; Fredonia, NY (2005)
- Chemistry

Fellowships & Awards

- **NIH F32 NRSA Fellowship** 2014 - 2015
- **American Heart Association Fellowship** 2012 - 2014
- **F.A.S.E.B. Ion Channel Conference Travel Award** 2013
- **William N. Pearson Fellowship** (Vanderbilt University) 2012 - 2014
- **NIH T32 NRSA Training Grant Award** 2011 - 2012
- **Georgia State University Neuroscience Brains and Behavior Fellowship** 2008 - 2011
- **Outstanding Graduate Instruction Award** (Georgia State University) - 2009

Publications

- **Johnson C.N**., Damo S.M., Chazin W.J., EF-hand Calcium Binding Proteins (2014) *Elcyclopedia of Life Sciences*
- Makita N., Yahihara N., Crotti L., **Johnson, C. N.**, ... (2014) Divergent regulation of ryanodine receptor 2 calcium release channels by arrhythmogenic human calmodulin missense mutants. *Circulation Research, 114* (7), 1114–24
- Hwang H. S., Nitu F. R., Cornea R. V., Yang Y., Walweel K., **Johnson C. N.**[*]**,** Faggioni M., Chazin W. J., Laver D., George A. L., Cornea R. L., Bers D. M., Knollmann B. C., Divergent Regulation of RyR2 channels by arrhythmogenic human calmodulin mutants, *Circ. Cardiovasc. Genet.*, doi:10.1161/CIRCGENETICS.113.000459
- Crotti L., **Johnson C. N.,** Graf E., De Ferrari G. M., ... (2013) Calmodulin Mutations Association with Recurrent Cardiac Arrest in Infants, *Circulation*, *127*, 1009-1017.
- **Johnson C. N**., Spring A. M., Desai S., Cunningham R. P., Germann M. W. (2011) DNA sequence context conceals alpha anomeric lesions, *J. Mol. Biol*., *416*, 425-437.
- **Johnson C. N.,**[+] Spring A. M., Shaw B. R., Germann M. W. (2011) Structural basis of the RNase H1 activity on stereo regular borano phosphonate DNA / RNA hybrids**,** *Biochemistry*, *50*, 3903-3912.
- Germann M., **Johnson C**., Spring A. (2012) Recognition of damaged DNA: structure and dynamic markers, *Med. Res. Rev. 32*, 659-683. (available online Nov. 2010)
- Germann M. W., **Johnson C. N**., Spring A. M. (2009) Unusual DNA structure and DNA damage recognition: structure and dynamic markers, *CHIMIA, 63*, 731-736.
- Mazurek A., **Johnson C. N**., Germann M. W., and Fishel, R. (2009) Sequence context effect for hMSH2-hMSH6 mismatched-dependent activation, *Proc. Nat. Acad. U.S.A, 106*, 4177-4182.

* Authors contributed equally to this work
[+]Abstract featured in Global Medical Discovery

Seminar Presentations

- A Cardiac Channel, Calcium Regulation and Calmodulin Mutations. Molecular Biophysics Training Program, Vanderbilt University, Nashville TN, October 2013.
- Physical Basis for Defects in Calmodulin: Mutations Associated with Life Threatening Heart Arrhythmias in Infants. F.A.S.E.B Ion Channel Regulation, Nassau, Bahamas, June 2013.

- From Macroscopic to Molecular; A Story about Modified Substrates for RNase H1. Brains and Behavior Neuroscience Spring Retreat, Georgia State University, Atlanta, GA, March 2011.

Research

The human cardiac sodium channel ($Na_V1.5$) plays a critical role in heart contraction. Perturbation of the channel function can result in arrhythmias and in some cases stroke or death. Previous work has shown channel inactivation utilizes specific elements of the $Na_V1.5$ C-terminus and the ubiquitous calcium sensing protein calmodulin to translate changes in intracellular calcium. Currently there are conflicting views in the literature for how this occurs and the molecular details of these interactions remain largely unknown. Using a compliment of biophsyical techniques with electrophysiology this work is focused on understanding molecular details that are essential for proper $Na_V1.5$ function. These results allow for the design of structure-based mutantions that provide insight into the molecular basis of specific cardiac life threatening arrhythmias.

Teaching and Mentoring Experience

Vanderbilt University: Mentoring

- Jennifer Sun, Beckman Scholars Program Undergraduate Fellowship Recipient 2013-2015
- Michelle Roh - undergraduate, her work was included in the recently published Circulation Cardiovascular Genetics paper
- Diana Tafoya - Graduate Rotation Student

Georgia State University: Instructor of Record

- Analytical Chemistry Laboratory (2009 Graduate Award for Outstanding Instruction)

Georgia State University: Teaching Assistant

- Spectroscopy
- Chromatography
- Physical Chemistry Tutorial
- Writing Across the Curriculum - Laboratory Writing Advisor
- Analytical Chemistry Laboratory & Tutorial
- General Chemistry Laboratory I & II

Selected Poster Presentations

- Physical Basis for Defects in Calmodulin: Mutations Associated with Life Threatening Heart Arrhythmias in Infants. Christopher N. Johnson, Michael D. Feldkamp, Subodh G. Rath, Al George Jr., and Walter J. Chazin F.A.S.E.B Ion Channel Regulation, Nassau, Bahamas, June 2013.

- Structural / Functional Basis of Human Cardiac Sodium Channel Fast Inactivation. Christopher N. Johnson, Michael D. Feldkamp, Al George Jr., and Walter J. Chazin, Frontiers in Biomolecular NMR, Vanderbilt University, Nashville, TN, April 2012.

- NMR Studies of Improved DNA/RNA Hybrids. Christopher N. Johnson, Alexander M. Spring, Barbara Shaw and Markus W. Germann, Southeastern Magnetic Resonance Conference, Gainesville, FL, October 2010.

- Local Base Pair Dynamics Determine Mismatch Repair Efficiency. Christopher N. Johnson, Anthony Mazurek, Richard Fishel and Markus W. Germann, Winship's 6th Annual Scientific Research Symposium, Emory University, Atlanta, GA, April 2009.

- Modulation of Recognition & Repair of Mismatched DNA. Christopher N. Johnson, Anthony Mazurek, Richard Fishel and Markus W. Germann, SERMACS, Nashville, TN, November 2008.

- Chemical Shift Calculations of the Anomeric Carbon in DNA: Developing a Scale for Honing in on Potential Local Structural Perturbations. Alexander M. Spring, Christopher N. Johnson & Markus W. Germann, Biotech Symposium, Atlanta, GA, August 2008.

- Recognition and Repair of Damaged DNA Local Structural Perturbations Due to a Unique Flanking Sequence Surrounding an α-Anomeric Damaged Site. Christopher N. Johnson, Richard Cunningham and Markus W. Germann, Georgia Institute of Technology, Suddath Symposium, Atlanta, GA, March 2008.

- Flanking Sequences Modulate DNA Recognition Repair of an Alpha Anomeric Adenosine Lesion: Correlation of Enzymatic Data with Local DNA Structure. Christopher N. Johnson, Richard Cunningham and Markus W. Germann. Georgia Life Sciences Summit, Atlanta, GA, October 2007.

- DNA Damage Recognition by Endonuclease IV: Flanking Sequence Effects on Structure, Dynamics Stability and Repair. Christopher N. Johnson, Alexander Spring, Galen Collier, Richard Cunningham and Markus W. Germann. The 15th Annual

Suddath Symposium, Atlanta, GA, March 2007.

- Deoxyribose Sugar Puckering Analysis using Heteronuclear NMR data. Gaurav Arora, Christopher N. Johnson and Markus W. Germann. GSU Department of Biology Symposium, Atlanta, GA, March 2006.

Specialty Laboratory Skills

- Sub-cloning
- Protein & peptide production in *E. coli*
- X-Ray crystallography
- Isothermal Titration Calorimetery
- Determination of Ca^{2+} binding affinity using intrinsic fluorescence
- Solid phase DNA synthesis
- Gel electrophoresis
- Chromatography - size exclusion, ion exchange, Ni^{2+} affinity, HPLC
- UV / VIS Spectroscopy
- Concentration dependent oligonucleotide melting profile studies
- Advanced NMR Spectroscopy
    - Hetero nuclear ^{11}B, ^{13}C, ^{15}N, ^{23}Na, ^{31}P
    - Constant Time NOESY - determination of nucleic acid torsion angle epsilon
    - HPCOR - assignment of ^{31}P spectra via sugar H3' and H4'
    - MARDIGRAS analysis of NOESY spectra - derive quantitative distance restraints
    - Residual Dipolar Coupling - pf1 bacterial phage, determination of dipolar couplings
    - DNA Base Opening Studies - extrapolation of base opening rates
    - CORMA analysis - back calculation of theoretical spectra based on given structure - used to compare final structure to experimental data

Computer Skills

- AMBER
- Topspin / SPARKY
- CORMA / MARDIGRAS
- CCP4
- PHENIX
- Spartan
- Pymol, VMD and other visualization programs

Professional Memberships

- American Heart Association - Council on Basic Cardiovascular Sciences
- American Chemical Society - Biophysical Division