Tuesday 18 Oct 2011

ANTIOXIDANT PREVENTION OF DNA DAMAGE AND CELL DEATH

Dr. Julia Brumaghim
Department of Chemistry, Clemson University

Metal-mediated oxidative DNA damage is the primary cause of cell death under oxidative stress conditions and is an underlying cause of neurodegenerative and cardiovascular diseases, cancer, and aging. Antioxidants are widely studied for prevention of oxidative damage and disease, and studies of antioxidant activity typically focus on scavenging reactive oxygen species. In contrast, we have quantified and compared the abilities of widely-studied sulfur, selenium, and polyphenolic antioxidants to inhibit metal-mediated DNA damage and found that these three classes of antioxidants all prevent DNA damage at biologically-relevant concentrations by directly coordinating the iron and copper ions responsible for oxygen radical generation. Polyphenolic antioxidants are very effective at preventing iron-mediated damage but much less effective at preventing copper-mediated damage, whereas the opposite is true for sulfur and selenium antioxidants. From these studies, we have developed quantitative predictive models for polyphenolic prevention of DNA damage and cell death based on their metal binding properties. In addition, we are synthesizing and characterizing coordination complexes of these antioxidants to elucidate chemical mechanisms for their antioxidant activity. This metal-binding mechanism represents an important shift in thinking about antioxidant activity and has significant implications for future directions in development of antioxidant supplements and therapies.

6:00-6:30 pm Social Half Hour
6:30-7:30 pm Dinner
7:30-8:30 pm Presentation

Oklahoma State University
Murray Parlor, South Murray Hall corner of University & Monroe, Stillwater, OK 74078
(across from Theta Pond)
map: http://osu.okstate.edu/welcome/campusmap.pdf

BBQ Buffet Style
Sliced Brisket and Chicken
Bread, Buns, Pickles, Pepper and Onions
Cowboy Beams & Potato Salad
Unsweetened Ice Tea
Cobbler for Dessert

Cost
$15 members
$5 students
RSVP Deadline
Friday, Oct 14th, 5 pm
Contact: Nick Materer
405-744-8671
materer@okstate.edu

OSU campus map QR code

OSU parking map QR code

RSVP is NOT required to attend the presentation.

Biographical Sketch on next page →

Dr. Brumaghim Biographical Sketch

Dr. Brumaghim first became interested in research chemistry as an undergraduate after conducting undergraduate research in the laboratories of Professors George Whitesides and Andrew Barron at Harvard, and Richard Eisenberg at the University of Rochester, primarily in synthetic inorganic chemistry. During graduate school at the University of Illinois, she worked with Professor Greg Girolami to synthesize and characterize air- and moisture-sensitive osmium complexes containing the pentamethylcyclopentadienyl ligand.

Seeking to focus on biological applications of inorganic chemistry, Dr. Brumaghim was an NIH postdocotoral fellow with Professor Ken Raymond in the Chemistry Department at the University of California at Berkeley. Having assiduously avoided water and oxygen during most of her graduate work, she now performed much of her research in water, synthesizing and resolving chiral Ga(III) hydroxamate complexes. Dr. Brumaghim also studied the incorporation of chiral phosphonium cations and ruthenium catalysts into the Raymond supramolecular assemblies. To gain more experience working with DNA, Dr. Brumaghim accepted a second postdoctoral research position with Professor Stuart Linn in the Molecular and Cellular Biology department at Berkeley. There she studied the effects of iron coordination on oxidative DNA damage and determined sites for iron localization and reduction rates for the biological reductants NAD(P)H.

As a chemistry professor at Clemson University since 2003, Dr. Brumaghim's work focuses on the biological applications of inorganic chemistry, using a wide range of techniques to determine mechanisms of antioxidant activity and prevention of metal-mediated DNA damage. For this work she received the ACS PROGRESS/Dreyfus Lectureship Award from the American Chemical Society and Camille and Henry Dreyfus Foundation in 2004 and an NSF CAREER Award in 2006. In 2008, Dr. Brumaghim won the Award for the Best Paper from A Young Investigator from the Journal of Inorganic Biochemistry and Elsevier Publishers. During her time at Clemson, she has also been active as treasurer of the Western Carolinas local ACS section. More information about Dr. Brumaghim’s research activities can be found on her website at:
http://chemistry.clemson.edu/brumaghimgroup/.