

## Kim M. Borges, Ph.D

Warren Wilson College  
Professor of Biochemistry  
P. O. Box 9000  
Asheville, NC 28815  
207-316-7284  
kborges@warren-wilson.edu

### EDUCATION

- Ph.D. Dartmouth College, Hanover, NH** 1990  
Biochemistry  
Thesis title: *Interactions Between the Carcinogen Chromium(VI) and DNA*  
Thesis advisor: Karen E. Wetterhahn, Ph.D
- B.S. Rochester Institute of Technology, Rochester, NY** 1984  
Biology, with high honors
- A.A. Simon's Rock Early College, Great Barrington, MA** 1982  
Science

### FACULTY POSITIONS

- Professor of Biochemistry** 2018 – present  
Warren Wilson College  
Department of Chemistry and Physics

#### *Courses*

General Chemistry II and Laboratory  
Biochemistry I and II  
Biochemistry Laboratory  
Principles of Chemistry  
First Year Seminar: Everybody Needs to Eat – Food and Wellness

#### *Selected Student Research Projects 2018 - 2020*

Isolation and characterization of triterpene glycosides from cultivated black cohosh (*Cimicifuga racemosa*) by HPLC (one senior research student)

Characterization of environmental mycobacteriophages from rivers (one high school student)

Exploring the use of rhubarb (*Rheum rhabarbarum*), pomegranate (*Punica granatum*), and sumac (*Rhus typhina*) as mordants for natural dyeing

<b>Professor</b>	2013 - 2018
University of Maine at Fort Kent Environmental Studies and Biology Programs	
<b>Professor of Environmental Biology</b>	2015 - 2016
Claflin University Department of Biology <i>Courses:</i> Environmental Management and Sustainability (graduate seminar course), General Biology I and II and laboratory, Natural Resources Management and laboratory, Environmental Policy and Regulation Advisor for two research internship students	
<b>Interim Chair</b>	Spring 2015
University of Maine at Fort Kent Division of Arts and Sciences	
<b>Course Mentor</b>	2014 - 2015
Western Governors University Biochemistry Program <i>Course:</i> Biochemistry for RN to BSN students, fully online, synchronous and asynchronous delivery, competency-based course, 600 + students	
<b>Assistant/Associate Professor and Program Coordinator</b>	2000 - 2013
University of Maine at Fort Kent Biology and Environmental Studies Programs	
<b>Adjunct Assistant Professor</b>	1999-2000
University of Maine at Fort Kent <i>Courses:</i> Genetics, Biochemistry, Chemistry 1	
<b>Assistant Professor in Residence</b>	1995-1996
University of Connecticut Department of Molecular and Cell Biology <i>Courses:</i> Fundamentals of Microbiology, Microbial Physiology (graduate seminar) Advisor for undergraduate research projects (three students)	
<b>Visiting Assistant Professor</b>	1994-1995
Hamilton College Biology Department <i>Courses:</i> Microbiology, Introductory Biology, Biochemistry Advisor for senior thesis projects (four students)	
<b>Graduate Teaching Assistant</b>	1984-1986
Dartmouth College Chemistry and Biochemistry Departments <i>Courses:</i> Freshman Chemistry, Honors Chemistry, Biophysical Chemistry	

## RESEARCH POSITIONS

<b>Research Associate</b>	1996-1998
University of Connecticut Department of Molecular and Cell Biology, with Ken Noll, Ph.D Microbial ecology and molecular biology of hyperthermophilic bacteria from hot springs Supervision of undergraduate and graduate student researchers	
<b>Postdoctoral Researcher</b>	1992-1994
University of Maryland Center of Marine Biotechnology, with Frank Robb, Ph.D Molecular biology of hyperthermophilic Archaea from hot springs and deep-sea vents	
<b>Postdoctoral Researcher</b>	1990-1992
University of Auckland, New Zealand Department of Cellular Biology, with Peter Bergquist, Ph.D Basic and applied molecular biology of thermophilic bacteria from hot springs	

## SELECTED PROFESSIONAL SERVICE

<b><i>Small World Initiative</i></b>	2016 - present
Partner Instructor	
<b><i>U.S. Fish and Wildlife Service</i></b>	2016 - 2018
Maine Water Temperature Working Group – northern Maine stream monitor	
<b><i>Howard Hughes Medical Institute SEA- PHAGES Program</i></b>	2010 – 2018
Associate Faculty Member	
<b><i>Maine Department of Environmental Protection</i></b>	2014 - 2015
ME Healthy Beaches Program Technical Advisory Committee - Water Quality Criteria	

## SELECTED ACADEMIC HONORS

University of Maine System Trustee Professorship	2017
First Year Experience Instructor of the Year (Claflin University, SC)	2016
University of Maine System Trustee Professorship	2013
Nomination, Donald Harward Faculty Award for Service Learning Excellence	2012
Faculty Research Award, UMFK Foundation	2006
Outstanding Faculty Award from Graduating Class	2003

## SELECTED POSTGRADUATE TRAINING

Small World Initiative Program – Crowdsourcing Antibiotic Discovery Faculty Training Workshop – University of Connecticut	2016
U. S. EPA National Beach Conference and Beach Monitoring 101 Workshop Tampa, FL	2011
Howard Hughes Medical Institute National Genomics Research Initiative in Phage Bioinformatics Workshop – HHMI Janelia Farm Research Campus, VA	2011
Howard Hughes Medical Institute National Genomics Research Initiative in Phage Laboratory Workshop – HHMI Janelia Farm Research Campus, VA	2011

## PROFESSIONAL SOCIETIES AND ORGANIZATIONS

American Society for Microbiology  
American Chemical Society

## SCHOLARLY INTERESTS

Ecology and public health issues related to environmental mycobacteria in freshwater systems  
Microbial pathogens and water quality in freshwater systems  
Local foods development in rural communities

## SELECTED PRESENTATIONS AND CONFERENCES (\* Student)

Borges, K., <i>Tiny Earth for Biochemists: Linking Tiny Earth to Antimicrobial Research</i> Presentation at Tiny Earth Symposium 2019, Madison, WI	2019
Borges, K., Johnson, R. *, White, B. *, and Beal, Z. *, <i>Isolation and characterization of non-tuberculous mycobacteria and mycobacteriophages from a South Carolina river.</i> Poster for the UNC Water Microbiology Conference, Chapel Hill, NC.	2017
Daniels, K. * Henderson, C. *, Lucatero, T. *, and Borges, K., <i>Isolation and characterization of mycobacteriophages from rivers in South Carolina and Maine.</i> Poster for the Maine Water and Sustainability Conference, Augusta, ME.	2017
Johnson, R. *, White, B. *, and Borges, K., <i>Isolation and characterization of non-tuberculous Mycobacteria and Mycobacteriophages from water and soil.</i> Abstract for the South Carolina Academy of Sciences Annual Meeting – Winthrop University, Rock Hill, SC.	2016

- Borges, K., J., O'Malley, M, Sanders, J., and Yatherajam, G. *Best Practices in Biochemistry Teaching Online*, Presentation for the Western Governor's University Annual Mentor Conference – Los Angeles, CA 2015
- Tardif, C. \*, Gushee, J. \*, McNally, A. \*, Michaud, D. \*, Murphy, R. \*, Rochester, J. \*, Toby, D. \*, Yandell, M. \*, Beal, Z. \*, Carapellucci, S. \*, Chasse, J. \*, Dyke, G. \*, Essome, O., Gabriel, A.\*, Hafford, A.\*, Gabriel, A.\*, Kostenbader, L.\*, Linnell, M.\*, Ouellette, T.\*, Richard, C., Sablan, Y.\*, Van Anglen, S.\*, Selva, S., and Borges, K., *Isolation and genomic characterization of Popcicle, a novel cluster A3 mycobacteriophage from northern Maine*. Poster for the HHMI-SEA 5th Annual SEA-Phages Symposium – HHMI Janelia Farm Research Center, VA. 2013
- Botting, C., Cote, D.\*, Michaud, D.\*, Murphy, R.\*, Pelletier, T.\*, Proulx, W., Borges, K., Roe, J., and Coffman, J., *The effect of hypoxia on nodal expression and development of the oral-aboral axis in embryos of Strongylocentrotus purpuratus*. Poster for the 40<sup>th</sup> Maine Biological and Medical Sciences Symposium, Mount Desert Island Biological Laboratory, Salisbury Cove, ME. 2013
- SENCER-IZING Your Curriculum: Best Practices for Linking STEM Education and Civic Engagement* – invited participant, University of Maine, Orono. 2013
- Borges, K., *Tracking microbial contamination of a river as a service-learning project*. American Society for Microbiology Council on Undergraduate Education Annual Meeting San Francisco, CA. 2012
- Leibowitz, N. \*, Jandreau, K. \*, Ash, S. \*, Caballero, A. \*, Charette, A. \*, Cote, D. \*, Cyr, M. \*, Daigle, Z. \*, A., Martin, M. \*, Marucci, M. \*, Peace, D. \*, Tracy, C. \*, Whalen, J., Young, Q.\*, Selva, S., and Borges, K., *Isolation and genomic characterization of Dumbo, a novel cluster E mycobacteriophage from northern Maine*. Poster for the HHMI-SEA 4th Annual SEA-Phages Symposium, HHMI Janelia Farm Research Center, VA. 2012
- Borges, K., *Maine Healthy Beaches Program microbial source tracking pilot study 2011*. Invited talk for the Maine Department of Environmental Protection, Augusta, ME. 2012
- 39<sup>th</sup> Maine Biological and Medical Sciences Symposium* Mt. Desert Island Biological Laboratory, Salisbury Cove, ME – session moderator 2012
- Albert, Andrew\*, Armstrong, Shanae\*, Hafford, Kerry\*, O'Donnell, Cara, and Borges, K., *Detection of fecal contamination in the Meduxnekeag River using microbial source tracking of Bacteroides bacteria and human polyomavirus*. Poster for the 38<sup>th</sup> Maine Biological and Medical Sciences Symposium, Salisbury Cove, ME. 2011
- Teaching for a Sustainable Future: Community and Problem-Based Learning Workshop* University of Maine Farmington – selected participant 2011
- Decotes, H\*., and Borges, K., *Microbial source tracking of the human polyomavirus to detect fecal contamination in the South Perley Brook, Fort Kent, Maine*. Poster for 2010

the Maine Water Conference, Augusta, ME.

*NSF – Funded Introductory Biology Project (IBP) Workshop* 2010  
San Diego, CA – selected participant

*American Society for Microbiology Undergraduate Education Conference* 2010  
San Diego, CA - presenter

Daigle, J\*., and Borges, K., *Correlation of E. coli levels with land use in the South Perley Brook watershed, Maine*. Poster for the Maine INBRE (IDeA Network of Biomedical Research Excellence) State House Presentations, Augusta, ME. 2009

*American Public Health Association National Meeting: Water and Public Health* 2009  
Philadelphia, PA – with Environmental Studies Senior Project student

*Maine INBRE (IDeA Network of Biomedical Research Excellence) State House Reception* 2009  
Maine State House, Augusta, ME – invited participant/presenter

Daigle, J\*., and Borges, K., *Correlation of E. coli levels with land use in the Perley Brook watershed, Aroostook County*. Poster for the Maine Water Conference, Augusta, ME. 2005

#### **PUBLICATIONS AND REPORTS (\* Student)**

Harwood, V., Staley, C., Badgely, B., Borges, K., and Korajkic, A. (2014) *Microbial source tracking markers for detection of fecal contamination in environmental waters: relationships to pathogens and human health outcomes*, invited review for *FEMS Microbiol. Rev.*38, 1-40.

Cote, D., ...Borges, K.M., and 46 others (2014) *GenBank submission for Mycobacterium phage Sheen*, Accession #KP273225, [http://www.ncbi.nlm.nih.gov/nuccore/NC\\_021306.1](http://www.ncbi.nlm.nih.gov/nuccore/NC_021306.1).

Borges, K.M., Charette, A.\*, Jandreau, K.\*, Leibowitz, N.\*, Marucci, M.\*, Selva, S.B., Bradley, K.W., Khaja, R., Lewis, M.F., Barker, L.P., Asai, D.J., Bowman, C.J., Russell, D.A., Pope, W.H., Jacobs-Sera, D., Hendrix, R.W., and Hatfull, G.F. (2013) *GenBank submission for Mycobacterium phage Dumbo*, Accession #NC\_021306, <https://www.ncbi.nlm.nih.gov/nuccore/KP273225>.

Chick, S.\*, Bristol, K.\*, Trudel, J., and Borges, K.M. (2012) *A campus greenhouse for year-round food production in northern Maine – challenges and celebrations from the first year*. Abstract for the Association for Environmental Studies and Sciences (AESS) 2012 Conference, Santa Clara, CA.

Korber, J., ...Borges, K.M., and 83 others (2012) *GenBank submission for Mycobacterium phage Spartacus*, Accession #JQ300538, [http://www.ncbi.nlm.nih.gov/nuccore/JQ\\_300538](http://www.ncbi.nlm.nih.gov/nuccore/JQ_300538).

Borges, K. (2011) *Microbial source tracking to identify human sources of fecal contamination in coastal York County in summer 2011: Maine Healthy Beaches Program (MHBP) pilot study 2011*. Maine Department of Environmental Protection Beach Monitoring and Notification Program Development Grants 2011 – 2012 Technical Report.

- Borges, K. (2008) *Greenhouse gas emissions report for University of Maine at Fort Kent* – submitted in compliance with ACUPCC Presidents Climate Commitment. Published online at ACUPCC website. Data obtained by UMFK students.
- Daigle, J\*, and Borges, K. (2005) *Correlation of E. coli levels with land use in the South Perley Brook watershed, Aroostook County, Maine*. Abstract for the Maine Water Conference, Augusta, ME.
- Robb, F. T., Maeder, D. L., DiRuggiero, J., Borges, K. M., and Tolliday, N. (2001) *Glutamate dehydrogenases from hyperthermophiles*, *Methods in Enzymology*, 331, 26-41.
- Nguyen, T. N., Borges, K. M., Romano, A. H., and Noll, K. N. (2001) *Differential gene expression in Thermotoga neapolitana in response to growth substrate*, *FEMS Microbiol. Lett.*, 195, 79-83.
- Gonzalez, J.M., Sheckells, D., Viebahn, M., Krupatkina, D., Borges, K.M., and F.T. Robb (1999) *Thermococcus waiotapuensis sp. nov.*, an extremely thermophilic archaeon isolated from a freshwater hot spring, *Arch. Microbiol.*, 172, 95 – 101.
- Borges, K.M., A. Bergerat, A.M. Bogert, J. DiRuggiero, P. Forterre, and F.T. Robb (1997) *Characterization of the Reverse Gyrase from the hyperthermophilic archaeon Pyrococcus furiosus*, *J. Bacteriol.*, 179, 1721-1726.
- Borges, K.M., S. R. Brummet, A. Bogert, M. C. Davis, K. M. Huker, S. T. Domke, J. Szasz, J. Ravel, J. DiRuggiero, C. Fuller, J. W. Chase, and F. T. Robb (1996) *A survey of the genome of the hyperthermophilic archaeon, Pyrococcus furiosus*, *Genome Science and Technology*, 1, 37-46.
- Britton, K.L., Baker, P.J., Borges, K.M., Engel, P.C., Pasquo, A., Rice, D.W., Robb, F.T., Scandurra, R., Stillman, T.J., and K.S. Yip (1995) *Insights into thermal stability from a comparison of the glutamate dehydrogenases from Pyrococcus furiosus and Thermococcus litoralis*, *European J. Biochem.*, 229, 688-695.
- Rodrigo, A.G., K.M. Borges, and P.L. Bergquist (1994) *Pulse-field gel electrophoresis of genomic digests of Thermus strains and its implications for taxonomic and evolutionary studies*, *Int. J. Syst. Bacteriol.*, 44, 547-552.
- DiRuggiero, J., F.T. Robb, R. Jagus, H.H. Klump, K.M. Borges, M. Kessel, M. Xuhong, and M.W.W. Adams (1993) *Characterization, cloning, and in vitro expression of an extremely thermostable glutamate dehydrogenase from a novel hyperthermophilic Archaeon, ES4*, *J. Biol. Chem.*, 268, 17767-17774.
- Saul, D.J., A. Rodrigo, R.A. Reeves, L.C. Williams, K.M. Borges, and P.L. Bergquist (1993) *Phylogeny of twenty Thermus isolates constructed from 16s rRNA gene sequence*, *Int. J. Syst. Bacteriol.*, 43, 754-760.
- Borges, K.M., and P.L. Bergquist (1993) *Pulsed-field gel electrophoresis study of the genome of Caldocellum saccharolyticum*, *Current Microbiol.*, 27, 15-20.
- Borges, K.M., and P.L. Bergquist (1993) *Genomic restriction map of the extremely thermophilic bacterium Thermus thermophilus HB8*, *J. Bacteriol.*, 175, 103-110.

- Borges, K.M., and P.L. Bergquist (1992) *A rapid method for preparation of bacterial chromosomal DNA in agarose plugs using Thermus Rt41A proteinase*, *BioTechniques*, 12, 222-223.
- Borges, K.M., and K.E. Wetterhahn (1991) *Chromium bound to DNA alters cleavage by restriction endonucleases*, *Chem. Res. Toxicol.*, 4, 638-641.
- Borges, K.M., J.S. Boswell, R.H. Liebross, and K.E. Wetterhahn (1991) *Activation of chromium(VI) by thiols results in chromium(V) formation, chromium binding to DNA and altered DNA conformation*, *Carcinogenesis*, 12, 551-561.
- Borges, K.M., and K.E. Wetterhahn (1989) *Chromium cross-links glutathione and cysteine to DNA*, *Carcinogenesis*, 10, 2165-2168.
- Wetterhahn, K.E., J.W. Hamilton, J.A. Aiyar, K.M. Borges, and R. Floyd (1989) *Mechanism of chromium(VI) carcinogenesis: reactive intermediates and effect on gene expression*. *Biol. Trace Element Res.*, 21, 405-411.
- Aiyar, J., K.M. Borges, R.A. Floyd, and K.E. Wetterhahn (1988) *Role of chromium(V), glutathione thiol and hydroxyl radical intermediates in chromium(VI)-induced DNA damage*. *J. Toxicol. Environ. Chem.*, 22, 135-148.
- Fini, M.E., M.J. Karmilowicz, P.L. Ruby, A.M. Beeman, K. Borges, and C.E. Brinckerhoff (1987) *Cloning of a complementary DNA for rabbit proactivator*, *Arthritis and Rheumatism*. 30, 1254-1264.
- Brinckerhoff, C.E., M.E. Fini, P.L. Ruby, I.M. Plucinska, K. Borges, and M.J. Karmilowicz (1987) *Coordinate regulation of gene expression in synovial cells*, in *Development and Diseases of Cartilage and Bone Matrix*. New York, Alan R. Liss, Inc., pages 299-317.