

Brett Babin

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EDUCATION

California Institute of Technology

Ph.D. Chemical Engineering

Advisors: Dave Tirrell and Dianne Newman

Thesis: Bioorthogonal Noncanonical Amino Acid Tagging for Selective Analysis of the *Pseudomonas aeruginosa* Proteome

September 2009 to May 2016

University of Massachusetts Amherst

B.S. Chemical Engineering; Bioengineering Certificate; Philosophy Minor

Commonwealth College Honors Program

September 2005 to May 2009

PUBLICATIONS AND PATENTS

BM Babin, L Atangcho, MB van Eldijk, MJ Sweredoski, A Moradian, S Hess, T Tolker-Nielsen, DK Newman, and DA Tirrell. Selective proteomic analysis of an antibiotic-tolerant biofilm subpopulation. (submitted to *mBio*).

BM Babin*, M Bergkessel*, MJ Sweredoski, A Moradian, S Hess, DK Newman, and DA Tirrell. SutA is a bacterial transcription factor expressed during slow growth in *Pseudomonas aeruginosa*. *Proceedings of the National Academy of Sciences, USA*, 2016; 113: E597-E605.

H Hatzenpichler, S Scheller, PL Tavormina, **BM Babin**, DA Tirrell, and VJ Orphan. *In situ* visualization of newly synthesized proteins in environmental microbes using amino acid tagging and click chemistry. *Environmental Microbiology*, 2014; 16(8): 2568-2590.

JT Ngo, **BM Babin**, JA Champion, EM Schuman, and DA Tirrell. State-selective metabolic labeling of cellular proteins. *ACS Chemical Biology*. 2012; 7: 1326-1330.

L Solorio, **BM Babin**, RB Patel, J Mach, N Azar, and AA Exner. Noninvasive characterization of in situ forming implants using diagnostic ultrasound. *Journal of Controlled Release*. 2010; 143(2):183-190.

CL Walsh, **BM Babin**, RW Kasinskas, JA Foster, MJ McGarry, and NS Forbes. A multipurpose microfluidic device designed to mimic microenvironment gradients and develop targeted cancer therapeutics. *Lab on a Chip*. 2009; 9(4):545-554.

NS Forbes, RW Kasinskas, CL Walsh, **BM Babin**, and BJ Toley. Multipurpose microfluidic device for mimicking a microenvironment within a tumor. U.S. Patent April 2011, filed October 2009.

*equal contributions

RESEARCH

Stanford School of Medicine **Postdoctoral Scholar** **September 2016 – present**
Advisor: Matt Bogyo

Established high throughput screens for small molecule inhibitors of bacterial persistence. Performed substrate specificity screens for bacterial proteases.

California Institute of Technology **Ph.D. Candidate** **January 2010 – June 2016**
Advisors: David Tirrell and Dianne Newman

Adapted a method for time- and cell-selective proteomics to the study of bacterial slow growth. Performed selective proteomic analyses of *Pseudomonas aeruginosa* during anaerobic dormancy and of phenotypic subpopulations in heterogeneous biofilms. Discovered and characterized a new RNA polymerase-binding transcriptional regulator.

Copenhagen University **Visiting Researcher** **June 2012 – August 2012**
Advisor: Tim Tolker-Nielsen

Learned specialized techniques for growing, imaging, and extracting protein lysates from bacterial biofilms.

University of Massachusetts Amherst **Undergraduate Researcher** **June 2007- August 2009**
Advisor: Neil S. Forbes

Designed, built, and characterized a microfluidic device for culture of a tumor tissue model. Used photolithography for fabrication and fluorescence microscopy to evaluate cellular viability within the device. Quantified tumor cell death in response to treatment with therapeutic bacteria.

Case Western Reserve University **Undergraduate Researcher** **Summer 2008**
Advisor: Agata A. Exner

Visualized and quantified the phase inversion dynamics of an injectable polymeric drug delivery system for tumor therapy. Performed multi-modal imaging (ultrasound, MRI) and analytical (UV/vis spectroscopy) techniques to measure drug release. Developed MATLAB scripts for high-throughput software-aided image analysis.

TEACHING AND MENTORING

Instructor **California Institute of Technology** **Spring 2015**
Mass spectrometry-based proteomics for biological discovery
Created, designed, and taught a new literature review course for graduate students and postdocs.

Undergraduate Mentor **California Institute of Technology** **Summer 2013**
Supervised a visiting undergraduate summer researcher.

Teaching Assistant **California Institute of Technology** **Spring 2011 and 2012**
Biomolecular engineering laboratory
Served, in subsequent years, as a project leader and then as the head teaching assistant. Designed and presented laboratory lectures. Supervised ordering and preparation of all laboratory supplies. Helped students to develop a project design, implement their plan, analyze data, and communicate their results. Focused on improving students' scientific writing and presentation skills.

Undergraduate Mentor **California Institute of Technology** **Summer 2011 – Spring 2012**
Supervised an undergraduate student throughout a summer research project and senior thesis.

PRESENTATIONS

BM Babin, M Bogyo. The role of Lon protease in bacterial persistence. Stanford ChEM-H Postdoc Retreat, Rohnert Park, CA. 2017.

BM Babin. Noncanonical amino acids for selective proteomics in *Pseudomonas aeruginosa*. Stanford University Seminar in Prokaryotic Molecular Biology, Stanford, CA. 2016.

BM Babin, DK Newman, and DA Tirrell. Non-canonical amino acids for selective proteomics: Physiology of an antibiotic-tolerant biofilm subpopulation. Gordon Research Seminar: Microbial Stress Response, Mount Holyoke, MA. 2016.

BM Babin. Noncanonical amino acids for selective proteomics in *Pseudomonas aeruginosa*. Pacific Coast Protease Meeting, Desert Hot Springs, CA. 2016.

BM Babin, M Bergkessel, DK Newman, and DA Tirrell. Non-canonical amino acids for selective proteomics and discovery of a new slow growth transcriptional regulator. West Coast Bacterial Physiologists Conference, Pacific Grove, CA. 2015.

BM Babin, M Bergkessel, DK Newman, and DA Tirrell. Selective proteomics of bacterial dormancy: Enrichment of proteins synthesized by *Pseudomonas aeruginosa* reveals a novel regulator of transcription. American Institute of Chemical Engineers Annual Meeting, Atlanta, GA. 2014.

BM Babin, M Bergkessel, L Atangcho, DK Newman, and DA Tirrell. Non-canonical amino acids for selective proteomics of bacteria under stress (poster). Gordon Research Conference: Microbial Stress Response, Mount Holyoke, MA. 2014.

BM Babin. Selective proteomics for investigating bacterial dormancy: Enrichment of proteins synthesized by dormant *Pseudomonas aeruginosa* reveals a novel transcriptional regulator. University of Copenhagen. Copenhagen, Denmark. 2014.

BM Babin, M Bergkessel, DK Newman, and DA Tirrell. Proteomic analysis of dormant *Pseudomonas aeruginosa* reveals regulators involved in biofilm formation. Caltech Department of Chemistry and Chemical Engineering Student Seminar Day, Pasadena, CA. 2013.

BM Babin, M Bergkessel, DK Newman, and DA Tirrell. Proteins Synthesized by anaerobic, non-growing *Pseudomonas aeruginosa* are required for biofilm formation (poster). The Protein Society Symposium, Boston, MA. 2013.

BM Babin, DK Newman, and DA Tirrell. Phenotype-selective protein labeling in heterogeneous *Pseudomonas aeruginosa* biofilms. American Society for Microbiology General Meeting, San Francisco, CA. 2012.

BM Babin, A Mahdavi, JT Ngo, and DA Tirrell. Dissecting the behavior of bacterial biofilms with non-canonical amino acids (poster). Institute for Collaborative Biotechnologies Army-Industry Collaboration Conference, Santa Barbara, CA. 2012.

A Mahdavi, **BM Babin**, KP Yuet, J Bagert, J Szychowski, JT Ngo, and DA Tirrell. Noncanonical amino acids for proteomic profiling (poster). Institute for Collaborative Biotechnologies Army-Industry Collaboration Conference, Santa Barbara, CA. 2011.

BM Babin, CL Walsh, BJ Toley, and NS Forbes. Quantifying bacteria-induced apoptosis in a microfluidic tumor-mimicking bioreactor (poster). Frontiers of Cellular Imaging, University of Massachusetts Amherst, Amherst, MA. 2010.

AWARDS

California Institute of Technology Center for Environmental Microbiology Travel Grant (2015)

Protein Society Symposium Student Travel Grant (2013)

Whitaker International Summer Program Travel Grant (2012)

American Society of Microbiology General Meeting Student Travel Grant (2012)

Commonwealth College Research Grant (2008)

Commonwealth College Research Fellowship (2008)

University of Massachusetts Amherst Department of Chemistry: CRC Freshman Chemistry Award (2006)