

Maureen McKeague, PhD

Stanford University Bioengineering Department
Room 244 Shriram Center, MC 4245
443 Via Ortega, Stanford, CA 94305
P: (408) 329-2484
mmckeagu@stanford.edu

EDUCATION

PhD, Chemistry, Carleton University, Ottawa, Canada 2012
Thesis title: Use and improvement of the systematic evolution of ligands by exponential enrichment (SELEX) process to develop aptamers for mycotoxins and other small molecules

Bachelor Honors Science, Carleton University, Ottawa, Canada 2007
Biochemistry and Biotechnology

RESEARCH EXPERIENCE

NSERC Postdoctoral Fellow, Bioengineering Department, Stanford University 2012-present
Mentor: Dr. Christina Smolke
Research: Design, selection, and characterization of RNA-based molecular tools for engineering biology. Developed and tested high-throughput methods (e.g., next generation sequencing, surface plasmon resonance) for engineering novel in vivo biosensors to probe biological systems
Supervised and mentored 2 undergraduate and 2 graduate students in an official capacity

PhD Candidate, Department of Chemistry, Carleton University 2007-2012
Mentor: Dr. Maria DeRosa
Research: Advanced novel methods for discovering DNA-based biosensors (aptamers) for use in rapid, efficient, cost-effective food safety testing
Supervised and mentored a postdoctoral fellow, 2 exchange students, 11 undergraduate students, 6 graduate students, and 2 visiting researchers
Coordinated lab operations, ordering, and equipment maintenance while supervisor was on maternity leave

Research Assistant, Natural Resources Canada, Government of Canada 2007
Supervisor: Dr. Bernard Vigneault
Research: Performed and analyzed mine wastewater toxicity testing on water fleas and duckweeds which contributed to the publication *Environ. Toxicol. Chem.* 27: 1659-1667.

Research Assistant, Department of Chemistry, Carleton University 2005-2006
Mentor: Dr. Sean Barry
Research: Designed and characterized novel aluminum metal precursors for microelectronic production

FELLOWSHIPS AND AWARDS

NSERC Postdoctoral Fellowship (Government of Canada) 2013-2015
Oral Presentation Award (Ottawa Carleton Chemistry Institute) 2012
Poster Award (5th International Meeting on Synthetic Biology; Stanford University) 2011
Oral Presentation Award (94th Canadian Chemistry Conference and Exhibition) 2011
Ontario Graduate Scholarship (Government of Ontario) 2011

Young Researcher Travel Award (BioBricks Foundation)	2011
Outstanding Young Researcher Poster Award (Pacifichem Conference)	2010
Apsimon Travel Grant (Carleton University)	2010
Oral Presentation Award (Canadian Society for Chemistry)	2010
Molecular Recognition Award (Carleton University)	2010
Poster Award (92 nd Canadian Chemistry Conference and Exhibition)	2009
Poster Award (Ottawa Carleton Chemistry Institute)	2009
Graduate Entrance Scholarship (Carleton University)	2007

RESEARCH ARTICLES

1. **McKeague M**, Wang YH, Smolke CD. Screening and modeling of RNA-based gene expression control. *Submitted to ACS Chem. Biol.*
2. **McKeague M**, De Girolamo A, Valenzano S, Pascale M, Ruscito A, Velu R, Frost NR, Hill K, Smith M, DeRosa MC. Comprehensive analytical comparison of strategies used for aptamer evaluation. *Accepted, Analytical Chemistry* - **article selected as ACS Editors' Choice.**
3. Frost NR, **McKeague M**, Falcioni D, DeRosa MC. An in solution assay for parallel interrogation of structure and affinity of small molecule-binding aptamers. *In review, Analyst.*
4. **McKeague M**, Velu R, Hill K, Bardozy V, Meszaros T, DeRosa MC. 2014. Selection and characterization of a novel DNA aptamer for label-free fluorescence biosensing of ochratoxin A. *Toxins*. 6: 2435-2452.
5. Chang AL*, **McKeague M***, Liang JC, Smolke CD. 2014. Kinetic and equilibrium binding characterization of aptamers to small molecules using a label-free, sensitive, and scalable platform. *Analytical Chemistry*. 86: 3273–3278.
6. Mastronardi E, **McKeague M**, Monreal C, DeRosa MC. 2013. Development and application of crop exudate specific aptamers. *Journal of Biomolecular Structure and Dynamics*. 31: 89.
7. **McKeague M**, Foster A, Miguel Y, Giamberardino A, Verdin C, Chan JY, DeRosa MC. 2013. Development of a DNA aptamer for direct and selective homocysteine detection in human serum. *RSC Advances*. 3: 24415-24422.
8. Cruz-Toledo J*, **McKeague M***, Zhang X, Giamberardino A, McConnell E, Francis T, DeRosa MC, Dumontier M. 2012. Aptamer Base: A collaborative knowledge base to describe aptamers and SELEX experiments. *Database: Journal of Biological Databases and Curation*.
9. De Girolamo A, **McKeague M**, Miller JD, DeRosa MC, Visconti A. 2011. Determination of ochratoxin A in wheat after clean-up through a DNA aptamer-based solid phase extraction column. *Food Chemistry*. 127: 1378-1384.
10. **McKeague M**, Bradley CR, De Girolamo A, Visconti A, Miller JD, DeRosa MC. 2010. Screening and initial binding assessment of fumonisin B₁ aptamers. *International Journal of Molecular Sciences*. 11: 4864-4881.
11. Luo X*, **McKeague M***, Pitre S, Dumontier M, Green J, Golshani A, DeRosa MC, Dehne F. 2010. Computational approaches toward the design of pools for the in vitro selection of complex aptamers. *RNA*. 16: 2252-2262 - **article recommended on Faculty 1000.**
*denotes equal authorship

REVIEWS AND BOOK CHAPTERS

1. Chang AL, **McKeague M**, Smolke CD. 2014. Facile characterization of aptamer kinetic and equilibrium binding properties using surface plasmon resonance. In: Burke-Aguero D, editor. *Methods in Enzymology*. 549: 451-466.
2. **McKeague M**, DeRosa MC. 2014. Aptamers and SELEX: Tools for the development of transformative molecular recognition technology. *Aptamers and Synthetic Antibodies*. 1: 12-16.

3. **McKeague M**, DeRosa, MC. 2012. Challenges and opportunities for small molecule aptamer development. *Journal of Nucleic Acids, special issue*. ID 748913.
4. **McKeague M**, Giamberardino A, DeRosa MC. 2011. Advances in aptamer-based biosensors for food safety. *Environmental Biosensors*. Vernon Somerset (Ed.) ISBN: 9789533074863.

CONFERENCE PRESENTATIONS

1. **McKeague M**, Smolke CD. Advancing a development pipeline for RNA switches through scalable measurement platforms. *Aptamers 2015*. Oxford University, UK, April 1, 2015 - **invited speaker**.
2. **McKeague M**, Smolke CD. An SPR-based platform for rapid characterization of aptamers for small molecules. *Bay Area Biacore User Group meeting 2014*. San Francisco, CA, October 18, 2014 - **invited speaker**.
3. Ranganathan V, **McKeague M**, Ruscito A, Hill K, Falcioni D, De Girolamo A, Miller J D, Visconti A, DeRosa MC. Aptamers as mycotoxin recognition agents. *Gordon Research Conference on Mycotoxins and Phycotoxins*. Stonehill College, Easton, MA, June 18, 2013.
4. Ranganathan V, **McKeague M**, Ruscito A, Hill K, Falcioni D, De Girolamo A, Miller JD, Visconti A, DeRosa MC. New aptamers for mycotoxins: applications and future trends. *Mycored 2013*. Martina Franca, Italy, May 30, 2013.
5. **McKeague M**, Cruz-Toledo J, Dumontier M, DeRosa MC. Trends in aptamer selections for small molecule targets. *96th Canadian Chemistry Conference and Exhibition*. Quebec City, Canada, May 30, 2013 - **invited speaker**.
6. **McKeague M**, Cruz-Toledo J, Dumontier M, DeRosa MC. Trends in aptamer selection for small molecular targets. *20th International Roundtable on Nucleosides, Nucleotides and Nucleic Acids*. Montreal, Canada, August, 2012.
7. **McKeague M**, Schena R, Meszaros T, Visconti A, Miller JD, DeGirolamo A, DeRosa MC. Aptamer technology for mycotoxin analysis. *MycRed North America*. Ottawa, Canada, June 26, 2012.
8. **McKeague M**, Foster A, Miguel Y, Giamberardino A, Verdin C, Chan J, DeRosa MC. Development of high affinity aptamers for homocysteine. *Ottawa Carleton Chemistry Institute Day*, Ottawa, Canada, May 2012 –**oral presentation award**.
9. Cruz-Toledo J, **McKeague M**, Zhang X, Giamberardino A, McConnell E, Francis T, DeRosa MC, Dumontier M. Aptamer Base: a collaborative knowledge base to describe aptamers and SELEX experiments. *The Fifth International Biocuration Conference*. Washington, DC, April 2012.
10. DeGirolamo A, Schena R, **McKeague M**, DeRosa MC, Miller JD, Visconti A. DNA aptamers for mycotoxins: application of ochratoxin A aptamer to wheat analysis. *5th International Symposium on Recent Advances in Food Analysis*. Prague, Czech Republic, November, 2011.
11. **McKeague M**, DeGirolamo A, Luo X, Cruz-Toledo J, Dumontier M, Dehne F, Visconti A, Miller JD, DeRosa MC. Development of mycotoxin aptamers using modified SELEX methods. *Technological Advances in RNA Therapy Symposium*. Montreal, Canada, June 2011.
12. DeGirolamo A, Schena R, **McKeague M**, DeRosa MC, Miller JD, Visconti A. Recent advances on the use of DNA-aptamers for the analysis of mycotoxins (ochratoxin and fumonisin) in cereals. *MycRed International Workshop Reduction of Mycotoxins in Production Chains of EU Russia: Modern Investigations and Practical Features*. Moscow, Russia, June, 2011.
13. **McKeague M**, DeGirolamo A, Meszaros T, Visconti A, Miller JD, DeRosa MC. Detection of mycotoxins using aptamers. *94th Canadian Chemistry Conference and Exhibition*. Montreal, Canada, June 2011 – **oral presentation award**.
14. **McKeague M**, Luo X, Dehne F, DeRosa MC. Computational design of structurally complex aptamer pools. *93rd Canadian Chemistry Conference and Exhibition*. Toronto, Canada, June, 2010.
15. **McKeague M**, Luo X, Dehne F, DeRosa MC. Computational design of SELEX DNA libraries exhibiting higher structural complexity. *Ottawa Carleton Chemistry Institute Day*. Ottawa, Canada, May 2010 –**oral presentation award**.

SELECTED POSTER PRESENTATIONS (Selected from 25 poster presentations)

1. **McKeague M**, Smolke CD. Expediting aptamer and RNA switch development with a rapid surface plasmon resonance assay. *Gordon Research Conference: Nucleosides, Nucleotides and Oligonucleotides*. Salve Regina University, RI, June 28-July 4, 2015.
2. **McKeague M**, Dumontier M, DeRosa MC. Using a collaborative database for an in-depth analysis of trends in aptamer selection. *10th Annual Meeting of the Oligonucleotide Therapeutics Society*. San Diego, CA, October 12-15, 2014.
3. **McKeague M**, Chang AL, Smolke CD. A rapid, label-free, and scalable method for characterizing binding properties of small molecule aptamers. *Synthetic Biology: Engineering, Evolution & Design (SEED)*. Manhattan Beach, CA, July 14-17, 2014.
4. Falcioni D, **McKeague M**, McConnell E, DeRosa MC. Optimization of techniques for determination of dissociation constants of novel fumonisin B₁ aptamers. *Carleton University Undergraduate Research Day*. Ottawa, Canada, April 12, 2013 – **poster presentation award**.
5. **McKeague M**, DeGirolamo A, Visconti A, Meszaros T, Miller JD, DeRosa MC. Selection of DNA aptamers displaying high affinity to mycotoxins. *MycRed North America*. Ottawa, Canada, June, 2012.
6. **McKeague M**, DeGirolamo A, Luo X, Dehne F, Visconti A, Miller JD, DeRosa MC. Improving and applying SELEX for the development of mycotoxin aptamers. *SB5.0 The Fifth International Meeting on Synthetic Biology*. Stanford University, USA, June, 2011 – **poster presentation award**.
7. **McKeague M**, Bradley C, DeGirolamo A, Visconti A, Miller JD, DeRosa MC. Development of aptamer probes for fumonisin B₁ detection. *The International Chemical Congress of Pacific Basin Societies (Pacifichem 2010)*. Honolulu, HA, Dec 2010 – **poster presentation award**.
8. **McKeague M**, DeRosa MC. Development of an aptamer for fumonisin B₁. *92nd Canadian Chemistry Conference and Exhibition*. Hamilton, Canada, June, 2009 – **poster presentation award**.
9. **McKeague M**, DeRosa MC. Development of aptamers for medically relevant targets. *Ottawa Carleton Chemistry Institute Day*. Ottawa, Canada, May, 2008 – **poster presentation award**.

TEACHING EXPERIENCE

Co-instructor, Introduction to Inorganic & Bioinorganic Chemistry, Carleton University 2011-2012
Prepared and gave lectures to 150 upper-level undergraduate students
Designed and ran a new tutorial session component of the course

Head Teaching Assistant, Organic Chemistry I and II, Carleton University 2007-2012
Sophomore level undergraduate practical laboratory course
Responsible for 24 students each semester (12 semesters)
Prepared and presented online pre-laboratory videos as a learning aid for students and other TAs

Certificate in Teaching Skills, Carleton Educational Development Centre 2008

Teaching Assistant, Chemistry for Engineers, Carleton University 2007
Freshman-level undergraduate introductory practical laboratory course
Taught and evaluated 96 students each semester

TEACHING AND SCIENCE OUTREACH AWARDS

Outstanding Teaching Assistant Award (Carleton University) 2011
Science Magazine Dance Your PhD Winner, 168000 views (<http://vimeo.com/14528924>) 2010
Don Wiles Teaching Assistant Award (Chemistry Department, Carleton University) 2009

MENTORING EXPERIENCE

Undergraduate Student Mentor (Biomedical Engineering Society, Stanford)	2014-present
Graduate Student Mentor (Association for Women in Science, Stanford University)	2012-present
Project Mentor (University of Ottawa iGEM team)	2014
TA mentor (Chemistry Department, Carleton University)	2010-2012

SERVICE AND OUTREACH

Journal Reviewer (Database; Curr. Top. Med. Chem.; J. Microbiol. Methods)	2015
Editor and Reviewer (International Society on Aptamers)	2015
Featured Member (Oligonucleotide Therapeutics Society)	2015
Postdoctoral Fellow Program Leader (Bioengineering Department, Stanford University)	2015
Engineering Outreach Volunteer (AAAS Public Science Day, San Jose)	2015
Orientation Leader for Postdocs (Office of Postdoctoral Affairs, Stanford University)	2014-present
Journal Reviewer <i>through</i> PI (Met. Eng.; PNAS; Nat. Chem. Biol.; JACS)	2014-present
Program Co-chair (Association for Women in Science, Stanford University)	2013-present
Science Magazine Judge (Dance Your PhD Competition)	2012-present
Science Outreach Volunteer (Girl Scouts of Northern California Career Day)	2013
International Conference Co-organizer (MycoRed North America)	2012
Conference Co-organizer (Ottawa Carleton Chemistry Institute Day)	2012
Chemistry Outreach Volunteer (Girl Guides of Canada and Virtual Ventures Camp)	2011-2012
Outreach Program Co-organizer (Carleton University Chemistry Magic Show)	2010-2012
Committee Member, Student Representative (Chemical Institute of Canada)	2009-2012
Poster Presentation Judge (Carleton University Undergraduate Research Day)	2008-2012
Science Society President (Carleton Chemistry and Biochemistry Society)	2004-2012
Chemistry of Chocolate Lecturer (Carleton University Alumni Event)	2011
Public Outreach Chemistry Presenter (Carleton University Science Café)	2011
Science Project Judge (Ottawa High School Science Fair)	2011
Session Chair (Ottawa Carleton Chemistry Institute Day)	2010
Seminar Speaker (Let's Talk Science Carleton University)	2006-2007

MEMBERSHIP

Oligonucleotide Therapeutics Society	2014-present
International Society of Nucleosides, Nucleotides & Nucleic Acids	2012-present
American Chemical Society	2010-present
Chemical Institute of Canada	2008-2011