Kathryn Monopoli – *Curriculum Vitae*

EDUCATION

University of Massachusetts Medical School & Worcester Polytechnic Institute
PhD Candidate Computational Biosciences & Bioengineering, GPA 4.0 *2019-present*

University of Massachusetts Amherst

MS Molecular and Cellular Biology*, thesis-based*, GPA 4.0 *2015*
BS Biochemistry & Molecular Biology, Honors College, GPA 4.0, *summa cum laude* *2014*

Colorado School of Mines
Chemical Engineering, GPA: 3.8 *2010-2012*

RESEARCH EXPERIENCE

UMass Medical School & Worcester Polytechnic Institute*, Worcester, MA* *2019-present*
Graduate Researcher
Principal Investigator – Anastasia Khvorova, PhD | UMass Chan | RNA Therapeutics Institute
Co-advisor – Dmitry Korkin, PhD | WPI | Bioinformatics & Computer Science

- Applying advanced machine learning methods to develop algorithms and software for siRNA design
- Built semi-supervised and deep learning models to accurately predict potent siRNAs
- Developed novel siRNA feature representation scheme to improve machine learning model accuracy
- Designed sequences for 1000's of siRNAs for both research and therapeutic applications
- Co-inventor 13 patents & applications – including three licensed – for therapeutic siRNA design
- Published first-author manuscript on machine learning for siRNA design; co-authored five manuscripts

Advirna*, Cambridge, MA* *2016-2018*
Associate Scientist, Bioinformatics
Principal Investigator – Alexey Wolfson, PhD

- Developed database system using SQL to classify large, diverse datasets on the web
- Performed statistical analysis on siRNA efficacy data to identify and evaluate potency predictors
- Published first-author manuscript on siRNA efficacy prediction algorithm development

University of Massachusetts*, Amherst, MA* *2012-2015*
MS Graduate Researcher
Principal Investigator – Alejandro Heuck, PhD

- Developed and applied biophysical assays to probe Type III Secretion System translocon assembly
- Presented work at Biophysical Society Meeting and co-authored publication

Biogen*, Cambridge, MA*
Intern, Antibody Discovery Group *2013*

- Identified and characterized antibodies used to assess patient immune response in a clinical trial
- Developed sequence parser algorithm increasing efficiency of antigen-binding site analysis

PUBLICATIONS

- **Monopoli KR,** Korkin D, Khvorova A. (2023) Asymmetric trichotomous data partitioning enables development of predictive machine learning models using limited siRNA efficacy datasets. *Molecular Therapy of Nucleic Acids.*
- Hariharan VN, Shin M, Chang CW, O'Reilly D, Biscans A, Yamada K, Guo Z, Somasundaran M, Tang Q, **Monopoli KR,** *et al.* (2023) Divalent siRNAs are bioavailable in the lung and efficiently block SARS-CoV-2 infection. *PNAS*.
- Davis SM, Hildebrand S, MacMillan H, **Monopoli KR,** *et al*. (2023) Guidelines for Designing Therapeutic siRNA. *Under review, NAR.*
- O'Reilly D, Belgrad J, *et al. [including* **Monopoli KR***].* (2023) Di-valent siRNA Mediated Silencing of MSH3 Blocks Somatic Repeat Expansion in Mouse Models of Huntington's Disease. *Molecular Therapy*.
- Tang Q, Fakih H, *et al. [including* **Monopoli KR***].* (2023) Rational design of a JAK1-selective siRNA inhibitor for the modulation of autoimmunity in the skin. *Under review, Nature Communications.*
- Tang Q, Sousa J, Echeverria D, Fan X, Hsueah YC, Afshari K, MeHugh N, Cooper DA, Vangjeli L, **Monopoli KR**, *et al.* (2022) RNAi-based modulation of IFN-γ signaling in skin. *Molecular Therapy*.
- Shmushkovich T*, **Monopoli KR***, Homsy D, Leyfer D, Betancur-Boissel M, Khvorova A, Wolfson A. (2018) Functional features defining the efficacy of cholesterol-conjugated, self-deliverable, chemically modified siRNAs. *NAR*. ***equally-contributing first authors***
- Romano FB, Rossi KC, Tang Y, **Monopoli KR**, Ross JL, Heuck AP. (2016) Type 3 Secretion translocators spontaneously assemble a hexadecameric transmembrane complex. *JBC*.

TALKS

- **Monopoli, KR,** Korkin, D, Khvorova, A. Trichotomous classification on small, limited datasets enables predictive model development for therapeutic small interfering RNA. Talk presented at the Conference on Intelligent Systems for Molecular Biology; 2022 Jul 10; Madison, WI.
- **Monopoli, KR,** Korkin, D, Khvorova, A. Evaluation-centric method for extracting base preferences from siRNA prediction models identifies features consistent with established mechanisms and is adaptable to examine any machine learning model. Talk presented at the RNA Therapeutics Symposium; 2022 Jun 22; Worcester, MA.
- **Monopoli, KR,** Korkin, D, Khvorova, A. Methods to apply and evaluate machine learning models on limited biological datasets through the lens of siRNA design. Invited talk presented at Oligonucleotide Therapeutics Society Webinar; 2021 Oct 29.

HONORS & AWARDS

iRNA COSI Travel Fellowship - ISMB 2022 Conference	*2022*
Poster Award – Oligonucleotide Therapeutics Society Annual Meeting	*2021*
Fuller Scholarship	*2017*
Presidential Fellowship, Georgia Institute of Technology *(declined)*	*2016*
Graduate Top Scholar Award, University of Washington *(declined)*	*2016*
Biophysical Society Travel Award	*2015*
Phi Beta Kappa	*2015*
Henry Little Award for Excellence in Research and Academics	*2014*
Honors Research Grant – UMass Amherst	*2014*
Phi Kappa Phi	*2013*
Dean's List and President's List – UMass Amherst	*2012-2014*
Undergraduate Research Assistant Fellowship – UMass Amherst	*2012*
Kappa Mu Epsilon – Honors Society for Mathematics	*2012*
Dean's List – Colorado School of Mines	*2011-2012*
Most Excellent Student in Organic Chemistry	*2012*
Presidential Scholarship – Colorado School of Mines	*2010*

PATENTS & APPLICATIONS

- Oligonucleotides for MAPT Modulation - US Utility Patent Application No. 62/991,405 *3/18/2020*
- Oligonucleotides for SNCA Modulation - US Utility Patent Application No. 62/991,406 *3/18/202*
- Oligonucleotides for MSH3 Modulation - US Patent Application No. 63/012,603 *4/20/2020*
- Oligonucleotides for MAPT Modulation - US Utility Patent Application No. 63/071,106 *8/27/202*
- Oligonucleotides for SNCA Modulation - US Utility Patent Application No. 63/071,115 *8/27/2020*
- Oligonucleotides for SARS-CoV-2 Modulation - US Utility Patent Application No. 63/031,222 *5/28/202*
- Oligonucleotides for SARS-CoV-2 Modulation - US Utility Patent Application No. 63/084,817 *9/29/202*
- Oligonucleotides for MAPT Modulation - US Patent Application No. 17/204,480 *3/17/202*
- Oligonucleotides for MAPT Modulation - Intl Patent Application No. PCT/US2021/022688 *3/17/202*
- Oligonucleotides for SNCA Modulation - US Patent Application No. 17/204,483 *3/17/202*
- Oligonucleotides for SNCA Modulation - Intl Patent Application No. PCT/US2021/022748 *3/17/202*
- Oligonucleotides for SARS-CoV-2 Modulation - US Patent Application No. 17/333,839 *5/28/202*
- Oligonucleotides for SARS-CoV-2 Modulation - Intl Patent App No. PCT/US2021/035002 *5/28/2021*

TEACHING EXPERIENCE

Computer Science Teaching Assistant – Worcester Polytechnic Institute

- Introduction to Programming Design – held recitations, lectured *2018*
- Object Oriented Program Design – developed lesson plans, held recitations *2018*

Biochemistry Teaching Assistant – University of Massachusetts Amherst

- Physical Chemistry – team-based learning instructor *2014*
- General Genetics – held recitations, lectured *2013*

Instructor – Biogen Community Lab

- Instructed high school students in lab-based molecular biology project *2013*

THESES

Monopoli KR. Advised by Prof. Alejandro Heuck. (2015) Characterization of the Reconstituted and Native *Pseudomonas aeruginosa* Type III Secretion System Translocon. Master's thesis. University of Massachusetts Amherst.

Monopoli KR. Advised by Prof. Alejandro Heuck. (2014) Characterization of the *Pseudomonas aeruginosa* Type III Secretion System Translocon in Model Membranes. Honors undergraduate thesis. University of Massachusetts Amherst.

EXTRACURRICULAR ACTIVITIES & SERVICE

Oligonucleotide Therapeutics Society, mentee	*2022-present*
Girls Who Code, instructor and program coordinator	*2022-present*
Worcester YMCA Minority Achievers Program, mentor and instructor	*2021*
WPI Touch Tomorrow, instructor	*2019-present*
Wachusett Regional High School Science Fair, judge	*2019*
Bright Spot Therapy Dogs, dog handler	*2014-present*
Hector Reyes House Worcester, volunteer	*2017-present*
Worcester Roller Derby, skater	*2017-present*
Harrington Health Care System, volunteer	*2017*
UMass STEM mentor	*2014-2015*
UMass Biochemistry Club, volunteer	*2012-2015*
Engineering Projects in Community Service Program, designer	*2010-2011*

CONFERENCE POSTERS

- **Monopoli KR**, Korkin D, Khvorova A. Method for encapsulating transcript sequence environment information boosts siRNA potency prediction accuracy of supervised machine learning models. Poster presented at the RNA Therapeutics Symposium; 2023 Jun 23; Worcester, MA.
- **Monopoli KR,** Korkin D, Khvorova A. Trichotomous classification on small, limited datasets enables predictive model development for therapeutic small interfering RNA. Poster presented at the Conference on Intelligent Systems for Molecular Biology; 2022 Jul 11; Madison, WI.
- **Monopoli KR,** Korkin D, Khvorova A. Data Partitioning to Enable Application of Machine Learning Models to Limited Biological Datasets Using SiRNA Design as an Example Case. Poster at the Oligonucleotide Therapeutics Society Meeting; Sep 2021; virtual.
- **Monopoli KR**, siRNA Screening Consortium, Korkin D, Khvorova A. Predicting siRNA Silencing Efficacy using Supervised Machine Learning. Poster presented at the RNA Therapeutics Symposium; 2021 Jun 22; Worcester, MA.
- **Monopoli KR**, Heuck AP. PopB and PopD interact simultaneously when forming the putative translocon in the *Pseudomonas aeruginosa* Type III Secretion System. Poster presentation at the Molecular and Cellular Biology Program Annual Retreat; 2015 Feb 28; Amherst, MA.
- **Monopoli KR**, Heuck AP. Forming the *Pseudomonas aeruginosa* translocon requires simultaneous incorporation of PopB and PopD. Poster presentation at the Biophysical Society Annual Meeting; 2015 Feb 6-11; Baltimore, MD.
- **Monopoli KR**, Romano FB, Heuck AP. Characterization of membrane-assembled *Pseudomonas aeruginosa* Type III Secretion System Translocon. Poster presented at the Models to Medicine Conference; 2014 May 2; Amherst, MA.
- **Monopoli KR**, Romano FB, Heuck AP. Structural Studies of the Membrane Bound Translocon of the *Pseudomonas aeruginosa* Type III Secretion System. Poster presented at the Undergraduate Symposium for the American Chemical Society; 2014 April 26; Amherst, MA.
- **Monopoli KR**, Romano FB, Heuck AP. Characterization of the *Pseudomonas aeruginosa* Type III Secretion Translocon in Model Membranes. Poster presented at the Massachusetts Undergraduate Statewide Research Conference; 2014 April 25; Amherst, MA.
- **Monopoli KR**, Romano FB, Heuck AP. PopB modulates the interaction of PopD with membranes. Poster presented at UMass Homecoming Poster Session; 2013 Oct 18; Amherst, MA.
- **Monopoli KR**, Pearse BR. Generating antibody repertoire for clinical assay development by phage display. Poster presented at Biogen Intern Poster Session; 2013 Aug 22; Cambridge, MA.

TECHNICAL SKILLS

Computational Skills

- *Languages***:**
  Advanced (5+ years): Java, Python, R, Bash
  Intermediate/Proficient (<3 years): C++, SQL, Perl
- *Software/Tools***:**
  AWS, Adobe Illustrator, Vim, Git, Django, Scikit-Learn, Mathematica, MATLAB, SolidWorks

Laboratory Skills

qPCR, mammalian cell culture, fluorescence spectroscopy, Bio-layer interferometry, protein purification, western blot, ELISA, phage display, Blue Native PAGE

PROFESSIONAL SOCIETY MEMBERSHIPS

International Society for Computational Biology
Oligonucleotide Therapeutics Society
Association for Women in Computing
Biophysical Society
Society for Women Engineers