

EDUCATION

Johns Hopkins University, Baltimore, MD 08/02 – 05/09*
*Ph.D. Biology/Biophysics - Cell, Molecular, Developmental Biology and Biophysics Program (*Defended 05/08)*

Syracuse University, Syracuse, NY 08/98 – 05/02
B.S. Biochemistry

RESEARCH EXPERIENCE

Assistant Research Professor, co-lead of the Nickerson-Barrila laboratory 09/13 - present
Biodesign Center for Fundamental and Applied Microbiomics, Arizona State University
Biodesign Center for Immunotherapy, Vaccine and Virotherapy, Arizona State University

- Principal Investigator/PI, Co-PI, or Co-Investigator on a diverse portfolio of 3-D tissue engineering and infectious disease projects to investigate microbial physiology, host-microbe and habitat-microbe interactions.
- Senior leadership role on several advanced biomedical experiments performed aboard the International Space Station (ISS) and ground-based studies to support astronaut health and mission success.
- Responsible for project management (design, planning and oversight), grant/manuscript writing, preparation of technical reports to funding agencies, co-mentoring and training of postdocs, students, and staff.

Assistant Research Scientist 12/10 – 08/13
Center for Infectious Diseases and Vaccinology, The Biodesign Institute, Arizona State University

- Used the spaceflight platform to facilitate the design and development of next generation Recombinant Attenuated *Salmonella* vaccines (RASVs) with the goal of improving efficacy and protective immune responses of RASVs targeting pneumococcal pneumonia (RASV; STS-135, Space Shuttle Atlantis)
- Assisted with securing and managing grant-based research funding (Co-Investigator). Co-supervised students (Ph.D., undergraduate) and research technicians

Postdoctoral Researcher 06/08 – 12/10
Center for Infectious Diseases and Vaccinology, The Biodesign Institute, Arizona State University
Advisor: Dr. Cheryl Nickerson

- Identified unique transcriptomic and proteomic alterations in human intestinal epithelial cells infected with *S. Typhimurium* during microgravity culture aboard Space Shuttle Discovery (STS-131). STL-IMMUNE was the first experiment to profile the impact of the microgravity environment on the host-pathogen interaction using human cells.
- Assisted with securing grant-based funding. Co-supervised students (Ph.D., undergrad) and research technicians

Graduate Researcher 05/03 – 05/08
Cell, Molecular, Developmental Biology and Biophysics Program, Johns Hopkins University
Advisor: Dr. Ernesto Freire

- Doctoral Thesis: "Dimerization of the SARS coronavirus 3CL protease is controlled through long-range interactions"
- Structurally characterized the main viral protease from the SARS coronavirus (SARS 3CL^{pro}) during and after the 2003 outbreak, leading to the identification of key regions of the protease that could be targeted for drug development
- Co-crystallized lead small molecule inhibitors with the 3CL protease to facilitate structure-based drug design

Undergraduate Researcher 01/01 – 05/02
Department of Biology, Syracuse University
Advisor: Dr. David T. Sullivan

- Applied a genetic approach toward the analysis of *in vivo* protein-protein interactions using *Drosophila melanogaster* as a host model organism

Summer Undergraduate Researcher 06/99 – 08/99
Pfizer Inc. (Groton, CT) through Manpower Temporary Agency (New London, CT)
Supervisor: Dr. Russell Poe, Analytical Research and Development

- Performed HPLC analysis to assess the purity of drug samples in a highly regulated environment

HONORS AND ACHIEVEMENTS

- 2019 Presidential Early Career Award for Scientists and Engineers (PECASE) - *NASA and the White House*
- 2014 Thora W. Halstead Young Investigator's Award, American Society for Gravitational and Space Research (ASGSR)
- 2006 Johns Hopkins University Dean's Teaching Fellowship for "Stem Cell Biology in Development and Disease"
- 2005 St. Jude National Graduate Student Symposium travel award
- 2004 Protein Society Finn Wold Travel Award
- 2002 Syracuse University General Honors
- 2002 Syracuse University Department of Biology Award for Research and Scholarship
- 2002 George Stanton Award for Scholarship
- 2001-2002 University 100 Student Ambassador
- 2000 DIPA Scholarship to study at the University of New South Wales, Sydney, Australia
- 1998-2002 National Dean's List
- 1998-2002 Syracuse University Dean's List
- 1998-1999 Jafra Edge Scholarship
- 1998 Montville Rotary Club Scholarship

PROFESSIONAL ACTIVITIES

- 2023-present Associate Editorial Board Member, npj *Microgravity*
- 2022 Biological Sciences Superpanel for the National Academies of Sciences, Engineering, and Medicine decadal survey committee on Biological and Physical Sciences Research in Space (2023-2032)
- 2022 Invited Session Chair, "Crew Health During Spaceflight", COSPAR: 44th Scientific Assembly. Athens, Greece (2022)
- 2021 BioTrac training course, "*Flow Cytometry: Principles and Methods*"
- 2021 NASA Ames Life Science Data Archive Analysis (ALSDA) Working Group
- 2021 Editorial Board member, npj *Microgravity*
- 2021 Sigma Xi, Full member (invited)
- 2020 Co-Investigator for the NASA-funded spaceflight payload, BAC (launched December 6, 2020)
- 2019 Invited Session Chair, Nature-NASA Conference, *The Microbiology of Human Spaceflight*
- 2019 NASA Research Opportunities in Space Biology (ROSBio) grant review panel
- 2018 Biodesign Student Travel Grant, reviewer
- 2017-2019 Editorial Board Member for *Scientific Reports* (Nature)
- 2017 Freie Universität Berlin - Dahlem Postdoc Fellowships, External reviewer
- 2015-2021 Associate Editorial Board Member, npj *Microgravity*
- 2015-2018 Governing Board (Elected Member), American Society for Gravitational and Space Research (ASGSR)
- 2015-2018 Managing Editor for npj *Microgravity*
- 2015-present Member, American Society for Microbiology (ASM)
- 2015 Co-Investigator for the NASA-funded spaceflight payload, Micro-5/PHOENIX (SpaceX Dragon, CRS-5, launched January 10, 2015)
- 2015 National Institute of Food and Agriculture's (NIFA) Exploratory Research program of the Agriculture and Food Research Initiative, External reviewer, 2015
- 2014-2015 Editorial Board Member for npj *Microgravity*
- 2011 Senior member of the research team for the spaceflight payload, RASV, flown aboard STS-135 (Space Shuttle Atlantis, launched July 8, 2011)
- 2010 Co-Investigator and senior member of the research team for the NASA-funded spaceflight payload, STL-IMMUNE, flown aboard STS-131 (Space Shuttle Discovery, launched April 5, 2010)
- 2009-present Member, American Society for Gravitational and Space Research (ASGSR)
- 2004-2007 Member, Protein Society
- 2003-2007 Member, Biophysical Society
- 2001 Golden Key National Honor Society
- 2001 Phi Kappa Phi National Honor Society
- 1999 Phi Eta Sigma National Honor Society
- 1999 National Society of Collegiate Scholars

Ad hoc reviewer for PLoS ONE, Tissue Engineering, BMC Microbiology

COMPLETED RESEARCH SUPPORT

RNA Binding Proteins as Evolutionarily Conserved Cellular Spaceflight Response Mechanisms
NASA Solicitation: Fundamental Space Biology - Microbial, Plant, Cell Biology: NNH08ZTT003N

PI: Cheryl Nickerson; **Role:** Co-Investigator

Period: 08/01/09 – 07/30/13

\$450,000

Evaluating the Spaceflight Infectious Disease Risk Potential of Pathogenic and Commensal microorganisms using *Caenorhabditis elegans* as a Human Surrogate Model for Infection

NASA Solicitation NNJ12ZSA002N: Research and Technology Development to Support Crew Health and Performance in Space Exploration Missions

Role: Principal Investigator

Dates: 09/09/13 – 09/08/14

\$100,000

A New Dimension in Modeling Irritable Bowel Syndrome (IBS) to Elucidate Novel Diagnostic Biomarkers and Microbiome Signatures

Mayo Clinic Partnership for Collaborative Research Seed Grant Program 2014

PI: Cheryl Nickerson; **Role:** Co-Investigator

Dates: 01/01/15 – 08/15/16

\$40,000

Combined Effects of Microgravity Analogue Culture and Incremental Oxygen Levels on Bacterial Pathogen Adaptive Responses

NNJ13ZSA002N-OMNIBUS: NASA Human Research Program Omnibus Opportunity

PI: Cheryl Nickerson; **Role:** Co-Investigator

Dates: 02/1/15 - 08/31/16

\$100,000

RNA Deep Sequencing and Metabolomic Profiling of Microgravity-Induced Regulation of the Host-Pathogen Interaction: An Integrated Systems Approach

NASA Solicitation NNH12ZTT001N: Research Opportunities in Space Biology

PI: Cheryl Nickerson; **Role:** Co-Principal Investigator

Dates: 07/01/13 – 09/30/17

\$750,000

Investigation of host-pathogen interactions conserved cellular responses and countermeasure efficacy during spaceflight using the human surrogate model *Caenorhabditis elegans*

NASA Solicitation: Fundamental Space Biology - NNH09ZTT002N

PI: Cheryl Nickerson; **Role:** Co-Investigator

Dates: 07/13/10 - 09/30/17

\$1,354,000

Contributions of the microbiome in astronaut health: a new dimension in modeling crew infectious disease risks

NASA NNH16ZTT001N-MS

PI: Cheryl A. Nickerson; **Role:** Co-Principal Investigator

Dates: 10/1/18 – 9/30/23

\$499,942 – this amount includes a \$200,000 PECASE award that I received in 2019

ACTIVE RESEARCH SUPPORT

High dimensional biology to understand the functional response of Salmonella to long-term multi-generational growth in the chronic stress of microgravity

NASA NNH14ZTT002N: Research Opportunities for Flight Experiments in Space Biology (ILSRA)

PI: Cheryl Nickerson; **Role:** Co-Investigator

Dates: 6/1/15 – 4/30/20

\$2,656,000

Polymicrobial biofilm growth and control during spaceflight

NASA NNH15ZTT002N: Research Opportunities in Materials Science - MaterialsLab Open Science Campaigns for Experiments on the International Space Station

PI: Robert McLean; **Role:** Co-Investigator

Dates: 12/05/16 – 12/04/20

\$537,646

Spaceflight-Induced Changes in Microbial Virulence and the Impact to the Host Immune Response

NASA Human Research Program

PI: C. Mark Ott; **Role:** Co-Investigator
10/1/19 – 9/30/24
\$1,117,098

RNA-Seq profiling to identify molecular biosignatures associated with spaceflight analogue-induced phenotypic changes in microbial pathogens

NASA HRP Grant Augmentation Competition for Students and Postdocs
PI: Cheryl A. Nickerson; Ph.D. Student: Karla Franco; **Role:** Co-Investigator
\$30,000

Effects of Low Dose Radiation and Radiation Countermeasures on Infection by Spaceflight Analogue Cultured Salmonella using 3-D Biomimetic Human Tissue Models

NASA Human Research Program Omnibus Opportunity
PI: Cheryl A. Nickerson; **Role:** Co-I

Biofilm Inhibition with Germicidal Light Side-Emitted from Nano-enabled Flexible Optical Fibers in Water Systems
NSF-CASIS

PI: Paul Westerhoff; **Role:** Co-PI
\$380,000

PUBLICATIONS

1. Sullivan DT, MacIntyre R, Fuda N, Fiori J, **Barrila J***, Ramizel L. Analysis of glycolytic enzyme co-localization in *Drosophila* flight muscle. (2003) *The Journal of Experimental Biology*. 206: 2031-2038. * Misspelled as "Barrilla" in print
2. Bacha U*, **Barrila J***, Velazquez-Campoy A, Leavitt SA, Freire E. (2004) Identification of Novel Inhibitors of the SARS Associated Coronavirus Main Protease 3CL^{pro}. *Biochemistry*. 43:4906-4912. * Co-first author
3. Nadella M, Bianchet MA, Gabelli SB, **Barrila J**, Amzel LM. (2005) Structure and Activity of the axon guidance protein MICAL. *Proceedings of the National Academy of Sciences*. 102(46): 16830-16835.
4. Sydnes MO, Hayashi Y, Sharma VK, Hamada T., Bacha U., **Barrila J**, Freire E, Kiso Y. (2006) Synthesis of Glutamic Acid and Glutamine Peptides Possessing a Trifluoromethyl Ketone Group as SARS-CoV 3CL Protease Inhibitors. *Tetrahedron*. 62: 8601 – 8609.
5. **Barrila J**, Bacha U, Freire E. (2006) Long-Range Cooperative Interactions Modulate Dimerization in SARS 3CL^{pro}. *Biochemistry*. 45(50): 14908 – 14916.
6. Bacha U, **Barrila J**, Gabelli SB, Kiso Y, Amzel LM, Freire E. (2008) Development of Broad-Spectrum Halomethyl Ketone Inhibitors Against Coronavirus Main Protease 3CL^{pro}. *Chemical Biology and Drug Design*. 72: 34-49.
7. Wilson JW, Ott CM, Quick L, Davis R, Höner zu Bentrup K, Crabbé A, Richter E, Sarker S, **Barrila J**, Porwollik S, Cheng P, McClelland M, Tsapraillis G, Radabaugh T, Hunt A, Shah M, Nelman-Gonzalez M, Hing S, Parra M, Dumars P, Norwood K, Bober R, Devich J, Ruggles A, CdeBaca A, Narayan S, Benjamin J, Goulart C, Rupert M, Catella L, Schurr MJ, Buchanan K, Morici L, McCracken J, Porter MD, Pierson DL, Smith SM, Mergeay M, Leys N, Stefanyshyn-Piper HM, Gorie D, and Nickerson CA. (2008) Media ion composition controls regulatory and virulence response of *Salmonella* in spaceflight. *PLoS ONE*. 3(12):e3923. Epub 2008 Dec 12.
8. **Barrila J**, Gabelli SB, Bacha U, Amzel LM, Freire E. (2010) Mutation of Asn28 disrupts the dimerization and enzymatic activity of SARS 3CL^{pro}. *Biochemistry*. 49(20): 4308-17
9. Sarker S, Ott CM, **Barrila J**, and Nickerson CA. (2010) Discovery of Spaceflight-related virulence mechanisms in *Salmonella* and other microbial pathogens: Novel approaches to commercial vaccine development. *Gravitational and Space Biology* 23(2): 75-78.
10. **Barrila J***, Radtke AL*, Crabbé A, Sarker SF, Herbst-Kravovetz MM, Ott, CM, Nickerson CA. (2010) Organotypic 3D cell culture models: using the rotating wall vessel to study host-pathogen interactions. *Nature Reviews Microbiology*. 8: 791-801. * Co-first author; Received the cover image of *Nature Reviews Microbiology*
11. Nickerson, CA, Ott, CM, Castro, SL, Garcia, VM, Molina, TC, Briggler, JT, Pitt, AL, Tavano, JJ, Byram, JK; **Barrila, J**, Nickerson, MA. (2011) Evaluation of Microorganisms Cultured from Injured and Repressed Tissue Regeneration Sites in Endangered Giant Aquatic Ozark Hellbender Salamanders. *PLoS ONE*. 6(12): e28906.

12. Crabbé A, Nielsen-Preiss SM, Woolley CM, **Barrila J**, Buchanan K, McCracken J, Searles, SC, Ott CM, Gonzalez MN, Wilson JW, Pierson D, Stefanyshyn-Piper HM, Hyman L, Nickerson CA. (2013) Spaceflight enhances cell aggregation and random budding in *Candida albicans*. *PLoS ONE*. 8(12): e80677.
13. Crabbé A, Liu Y, Sarker SF, Bonenfant NR, **Barrila J**, Borg ZD, Lee JJ, Weiss DJ, Nickerson CA. (2015) Recellularization of Decellularized Lung Scaffolds Is Enhanced by Dynamic Suspension Culture. *PLoS ONE*. 10(5): e0126846.
14. Yang J*, **Barrila J***, Roland KL, Kilbourne J, Ott CM, Forsyth R, Nickerson CA. (2015) Characterization of the Invasive, Multidrug Resistant Non-typhoidal *Salmonella* strain D23580 in a Murine Model of Infection. *PLoS Neglected Tropical Diseases*. 9(6): e0003839. *Co-first author
15. Yang J*, **Barrila J***, Roland KL, Ott CM, and Nickerson CA. (2016) Physiological Fluid Shear Alters the Virulence Potential of Invasive Non-typhoidal *Salmonella* Typhimurium D23580. *npj Microgravity*. 2: 16021. DOI: 10.1038/npjmgrav.2016.21; * Co-first author
16. **Barrila J***, Ott CM*, LeBlanc C, Mehta SK, Crabbé A, Stafford P, Pierson DL, Nickerson CA. (2016) Spaceflight modulates gene expression in the whole blood of astronauts. *npj Microgravity*. 2, 16039. *Co-first author
17. **Barrila J***, Yang J*, Crabbé A, Sarker SF, Liu Y, Ott CM, Nelman-Gonzalez MA, Clemett SJ, Nydam S, Forsyth RJ, Davis RR, Crucian BE, Quiarte H, Brenneman K, Sams C, Loscher C, Nickerson CA. (2017) Three-dimensional organotypic model of intestinal epithelial cells and macrophages reveals oxygen-dependent *Salmonella enterica* colonization patterns. *npj Microgravity*. 3:10. *Co-first author
18. **Barrila J**, Crabbé A, Yang J, Franco K, Nydam S, Forsyth RJ, Davis R, Ott CM, Gangaraju S, Coyne CB, Bissell MJ, and Nickerson CA. (2018) Modeling Host-Pathogen Interactions in the Context of the Microenvironment: 3-D Cell Culture Comes of Age. *Infect Immun*. 86(11): e00282-18. (Invited Review)
19. **Barrila J**, Sarker SF, Hansmeier N, Yang S, Buss K, Briones N, Park J, Davis RR, Forsyth RJ, Ott CM, Sato K, Kosnik C, Yang A, Shimoda C, Rayl N, Ly D, Landenberger A, Wilson SD, Yamazaki N, Steel J, Montano C, Halden RU, Cannon T, Castro-Wallace SL and Nickerson CA. (2021) Evaluating the effect of spaceflight on the host-pathogen interaction between human intestinal epithelial cells and *Salmonella* Typhimurium. *npj Microgravity* 7:9.
20. Yang J, **Barrila J**, Ott CM, King O, Bruce R, McLean RJ, Nickerson CA. (2021) Longitudinal Characterization of Social Interactions of Multispecies Microbial Populations Recovered from Spaceflight Potable Water. *npj Biofilms and Microbiomes*. 7, 70.
21. Nickerson CA, Colorado AA, **Barrila J**, Poste G, Ott CM. (2021) A Vision for the Next Generation of Spaceflight Microbiology: Human Health and Habitat Sustainability. *Nature Microbiology*. <https://doi.org/10.1038/s41564-021-01015-6>
22. **Barrila J***, Yang J, Franco K, Yang S, Buss K, Davis TJ, Aronow BJ, Bean HD, Davis RR, Forsyth RJ, Ott CM, Gangaraju S, Kang B, Hanratty B, Nydam SD, Nauman EA, Kong W, Steel J, and Nickerson CA*. (2022) Spaceflight analogue culture enhances the host-pathogen interaction between *Salmonella* and a 3-D biomimetic intestinal co-culture model. *Co-corresponding author. *Frontiers in Cellular and Infection Microbiology*. 12: 705647. <https://doi.org/10.3389/fcimb.2022.705647>
23. Franco K, Crenshaw K, **Barrila J**, Yang J, Gangaraju S, Davis RR, Forsyth RJ, Ott CM, Roland K, Curtiss III R, and Nickerson CA. (2022) Role of RpoS in regulating stationary phase *Salmonella* Typhimurium phenotypic responses under physiological low fluid shear conditions. *mSphere*. <https://doi.org/10.1128/msphere.00210-22>

Google Scholar: https://scholar.google.com/citations?hl=en&user=1OTTAdAAAAAJ&view_op=list_works&authuser=1

BOOK CHAPTERS

1. Ott CM, Crabbé A, Wilson JW, **Barrila J**, Castro S, and Nickerson CA. (2012) Microbial Stress: Spaceflight-induced alterations in microbial virulence and infectious disease risks for the crew, in *Stress Challenges and Immunity in Space*, Ed. Alexander Chouker. Springer, 2012. 482 pp.

2. **Barrila J**, Wilson JW, Soni A, Yang J, Ott CM, Nickerson CA. (2016) Using spaceflight and spaceflight analogue culture for novel mechanistic insight into *Salmonella* pathogenesis, in *Effect of Spaceflight and Analogue Culture on Human and Microbial Cells: Novel Insights into Disease Mechanisms*. Eds. Nickerson, Ott, Pellis. Springer.
3. Crabbé A, **Barrila J**, Ott CM, Nickerson CA. (2016) *Outpacing Infectious Disease: Mimicking the Host-Pathogen Microenvironment*, in *Effect of Spaceflight and Analogue Culture on Human and Microbial Cells: Novel Insights into Disease Mechanisms*. Eds. Nickerson, Ott, Pellis. Springer.
4. Castro SL, Niesel DW, **Barrila J**, and Ott CM. (2016) Spaceflight and spaceflight analogue induced responses in Gram positive bacteria, in *Effect of Spaceflight and Analogue Culture on Human and Microbial Cells: Novel Insights into Disease Mechanisms*. Ed. C. A. Nickerson, C. M. Ott, N. Pellis. Springer.
5. Yang J, Thornhill SG, **Barrila J**, Nickerson CA, Ott CM, and McLean JC. (2018) Microbiology of the Built Environment in Spacecraft Used for Human Flight, in *Microbiology of Atypical Environments*. Ed. Gurtler and Trevors. Elsevier.
6. Ott CM, Crabbé A, Wilson JW, **Barrila J**, Castro S, and Nickerson CA. (2020) Microbial Stress: Spaceflight-induced alterations in microbial virulence and infectious disease risks for the crew, in *Stress Challenges and Immunity in Space*, 2nd edition. Ed. Alexander Chouker. Springer.

ABSTRACTS/PRESENTATIONS

Bacha U*, **Barrila J***, Sinha N, Velazquez-Campoy A, and Ernesto Freire. *Development of Inhibitors against the SARS Associated Coronavirus Protease 3CL^{pro}*. Poster presentation (*Co-presenter). 48th Biophysical Society Meeting, Baltimore, MD. (2004)

Barrila J, Armstrong A, Bacha UM, Kang L, Amzel M, and Freire E. *Structural Stability and Enzymatic Activity of the SARS Coronavirus Main Protease 3CL^{pro}*. Poster presentation. 18th Protein Society Meeting, San Diego, CA. (2004)

Barrila J, Bacha U and Freire E. *Structural Stability and Enzymatic Activity of the SARS Coronavirus Main Protease 3CL^{pro}*. Poster presentation. St. Jude National Graduate Student Symposium, Memphis, TN. (2005)

Barrila J, Bacha U and Freire E. *Dissecting the Structure and Stability of SARS 3CL^{pro}*. Invited oral presentation. St. Jude National Graduate Student Symposium (Memphis, TN) (2005)

Barrila J, Bacha U, and Freire E. *Long-Term Cooperative Interactions Modulate Dimerization in SARS 3CL^{pro}*. Poster presentation. 51st Biophysical Society Meeting, Baltimore, MD. (2007)

Barrila J, Bacha U, and Freire E. *A New Strategy for Inhibiting SARS 3CL protease*. Poster presentation. 21st Protein Society Meeting (Boston, MA) (2007)

Barrila J, Forsyth RJ, Davis R, Wilson JW, Sarker SF, Crabbé A, Ott CM, Roland KL, Gonzales A, Kilbourne J, Brenneman K, Curtiss III R, Hansmeier N, Halden RU, Zaborin A, Zaborina O, Alverdy JC, and Nickerson CA. *Using Spaceflight and Spaceflight Analogue Culture to Advance Human Health*. Poster presentation. 2012 Center for Infectious Diseases and Vaccinology Open House, The Biodesign Institute (Tempe, AZ)

Yang J, **Barrila J**, Ott CM, Roland KL, Curtiss III, R, and Nickerson CA. *Characterization of Invasive Multidrug Resistant *Salmonella enterica* serovar Typhimurium ST313 D23580 in Response to Physiological Fluid Shear*. Poster. Center for Infectious Diseases and Vaccinology Open House, The Biodesign Institute, Tempe, AZ (2012)

Rideout A, **Barrila J**, Bradley P, Spadafino J, Forsyth RJ, Davis R, Ott CM, and Nickerson CA. *Response of *Salmonella bongori* to Physiological Low Fluid Shear Culture*. 2013 ASU School of Life Sciences Undergraduate Research Symposium (Tempe, AZ) (2013)

Crabbé A, Sarker SF, Bonenfant NR, Liu Y, **Barrila J**, Pattengill J, Lee JJ, Weiss DJ, and Nickerson CA. *Improved recellularization efficiency and cell health in decellularized lung scaffolds using a low fluid shear bioreactor system*. Stem Cells and Cell Therapies in Lung Biology and Lung Diseases conference, Burlington, VT. (2013)

Castro SL, Nickerson CA, Ott CM, Forsyth RJ, Rideout A, Alverdy JB, and **Barrila J**. *Evaluating the Spaceflight Infectious Disease Risk Potential of Pathogenic and Commensal microorganisms using *Caenorhabditis elegans* as a Human*

Surrogate Model for Infection. Poster presentation. 2014 Human Research Program Investigators' Workshop, Galveston, TX (2014)

Nickerson CA, Wotring VE, **Barrila J**, Crabbé A, Castro SL, Davis R, Rideout A, McCarthy B, and Ott CM. *Efficacy of Antimicrobials on Bacteria Cultured in a Spaceflight Analogue*. Poster. 2014 Human Research Program Investigators' Workshop, Galveston, TX. (2014)

McCarthy B, **Barrila J**, Rideout A, Forsyth RJ, Davis R, Castro SL, Ott CM, and Nickerson CA. *LSMMG-conditioned Medium Modulates the Response of Salmonella enterica serovar Typhimurium to Physiological Fluid Shear*. Poster. 2014 ASU School of Life Sciences Undergraduate Research Symposium, Tempe, AZ. (2014)

Barrila J^{*}, Crabbé^{*} A, Yang J^{*}, Sarker SF, Ott CM, Liu Y, Crucian B, Nelman-Gonzales M, Quiarte H, Brenneman K, Sams C, and Nickerson CA. *Three-Dimensional Co-Culture Model of Intestinal Epithelium and Macrophages Reveals Altered Colonization Profiles of Salmonella Pathovars*. Poster presentation. 2014 Center for Infectious Diseases and Vaccinology After Hours, The Biodesign Institute, Tempe, AZ. (2014) *Co-first author

Yang J, **Barrila J**, Ott CM, Roland KL, Kilbourne J, Forsyth RJ, Park J, Steel J, LaBaer J, Curtiss III R, and Nickerson CA. *Salmonella Typhimurium ST313 D23580: Characterizing the Impact of Traditional and Low Fluid Shear Culture Conditions on Virulence and Pathogenesis-Related Responses*. Poster. 2014 Center for Infectious Diseases and Vaccinology After Hours, The Biodesign Institute, Tempe, AZ. (2014).

Barrila J, Ott CM, Forsyth RJ, Davis R, Wilson JW, and Nickerson CA. *Experimental Considerations for the Proper Assessment of Spaceflight-induced alterations in Microbial Virulence*. 2014 Annual Meeting of the American Society for Gravitational and Space Research (ASGSR), Pasadena, CA. (2014)

McCarthy B, **Barrila J**, Rideout A, Forsyth RJ, Davis R, Castro SL, Ott CM, and Nickerson CA. *Correlation between Physiological Fluid Shear-Induced Alterations in the Salmonella Stress Response and LSMMG-conditioned Medium*. Poster. 2015 ASU School of Life Sciences Undergraduate Research Symposium, Tempe, AZ. (2015)

Barrila J, Sarker SF, Hansmeier N, Briones N, Park J, Ott CM, Sato K, Rayl N, Steel J, Kosnik C, Yang A, Ly D, Shimoda C, Cannon T, Davis R, Forsyth RJ, Castro SL, Landenberger A, Montano C, Magee M, Halden RU, LaBaer J, and Nickerson CA. *Microgravity Uniquely Alters the Host-Pathogen Interaction Between Human Intestinal Epithelial Cells and Salmonella enterica serovar Typhimurium*. Poster presentation. 115th General Meeting of the American Society for Microbiology, New Orleans, LA (2015)

Yang J^{*}, **Barrila J**^{*}, Roland KL, Kilbourne J, Ott CM, Forsyth RJ, and Nickerson CA. *Characterization of the Invasive, Multidrug Resistant Non-typhoidal Salmonella Strain D23580 in a Murine Model of Infection*. Poster (*Co-first author). 115th General Meeting of the American Society for Microbiology, New Orleans, LA (2015)

Yang J, Crabbé A, Sarker SF, **Barrila J**, Crucian BE, Nelman-Gonzales MA, Quiarte H, Brenneman K, Sams C, Ott CM, and Nickerson CA. *Three-dimensional Co-Culture Model of Intestinal Epithelial Cells and Macrophages Reveals Altered Colonization Profiles of Salmonella Pathovars*. Poster. 115th General Meeting of the American Society for Microbiology, New Orleans, LA (2015)

Fergione S, **Barrila J**, Nickerson CA, Stahl S, and Ott CM. *The Effect of Simulated Microgravity on the Physiology of Ralstonia pickettii Isolates from the International Space Station*. ASBMB. (2016)

Barrila J. *Using Spaceflight and Ground-based Modeled Microgravity Platforms for Novel Insight into Host-Pathogen Interactions*. Oral Presentation. CIVV seminar. Tempe, AZ (2017).

Barrila J, Yang J, Forsyth RJ, Gangaraju S, Ott CM, and Nickerson CA. *Three-Dimensional Tissue Culture Models: Next Generation Predictive Preclinical Platforms for Human Health and Disease*. Poster. Arizona Wellbeing Commons. Tempe, AZ (2017)

McLean R, Thornhill S, DiPasquale Q, Ott CM, Yang J, **Barrila J**, Nickerson CA. *Polymicrobial Biofilms – A Widespread Mode of Bacterial Growth*. American Society for Gravitational and Space Research (ASGSR). Seattle, WA (2017)

Yang J, **Barrila J**, Forsyth RJ, Sal-Man N, Gangaraju S, Ott CM, and Nickerson CA. *Three-Dimensional Tissue Culture Models: Next Generation Predictive Preclinical Platforms for Human Health and Disease*. Poster. SEED conference. Scottsdale, AZ (2018).

Yang J, **Barrila J**, King O, Bruce R, Ott CM, McLean R and Nickerson CA. *Multidrug resistant microbial consortia isolated from International Space Station (ISS) potable water: Multi-species interactions, biofilm formation, metabolic characteristics, and hemolytic subpopulations*. Poster. 2018 MoBE Gordon Research Conference.

Invited speaker, "Microgravity: A Novel Research Platform to Advance Human Health", Biodesign VIP Salon, Flagstaff, AZ, July 18, 2018

Yang J, **Barrila J**, King O, Bruce R, Ott CM, McLean R and Nickerson CA. *Multidrug resistant microbial consortia isolated from International Space Station (ISS) potable water: Multi-species interactions, biofilm formation, metabolic characteristics, and hemolytic subpopulations*. Poster. 2018 ASM Biofilm Conference.

Thornhill SG, Yang J, **Barrila J**, Nickerson CA, Ott CM, and McLean RJC. *Planning a Microbiological Experiment for the International Space Station*. Texas ASM Branch Meeting, Corpus Christie, TX, Nov 8-10, 2018.

Yang J, **Barrila J**, Ott CM, King O, Bruce R, McLean R and Nickerson CA. *Multispecies interactions and hemolytic subpopulations of biofilm-forming microbiota recovered from spaceflight potable water*. Poster. ASM Microbe. San Francisco, CA (2019).

Barrila J*, Yang J, Franco K, Yang S, Davis T, Aronow BJ, Bean H, Davis RR, Forsyth RJ, Ott CM, Gangaraju S, Kang B, Hanratty B, Nydam SD, Kong W, Steel J, and Nickerson CA: *Dynamic low fluid shear suspension culture enhances the host-pathogen interaction between Salmonella and a human 3-D intestinal co-culture model*. * Invited presentation. 3D Tissue Infection Symposium. Wuerzburg, Germany. April 5-7, 2019.

Barrila J, Yang J, Forsyth RJ, Gangaraju S, Ott CM and Nickerson CA. *Three-Dimensional Tissue Culture Models: Next Generation Preclinical Platforms for Human Health and Disease*. Poster presentation. Statewide Symposium in Regenerative Medicine. Tempe, AZ (2019).

Franco K, Crenshaw K, Yang J, **Barrila J**, Ott CM and Nickerson CA. *RpoS Regulates the Mechanobiology of a Select Subset of Stationary Phase Stress Responses in Salmonella Typhimurium under Physiological Fluid Shear Conditions*. Poster. ASM Microbe. San Francisco, CA (2019).

Barrila J. *Preflight optimization of spaceflight microbiology experiments*. Invited presentation. Commercial Spaceflight Federation Workshop at Arizona State University. Tempe, AZ (2019).

Krieger S, Makedonas G, Mehta S, Rooney B, Nelman M, Castro C, Colorado A, Ott CM, **Barrila J**, Stafford P, Nickerson CA, Oubre C and Crucian B. *Microgravity Influence on Bacterial Pathogen Virulence and Immune Cell Function – Relevance for Spaceflight Infectious Disease Risk*. NASA Human Research Program Meeting. Poster by C.M. Ott. Galveston, TX (2020).

Ott CM, **Barrila J**, Oubre C, Koroli S, Kang BY, Davis RR, Medina-Colorado AA, Yang J, Gangaraju S, Stafford P, Crucian BE¹, and Nickerson CA. *Spaceflight-induced changes in microbial virulence and the impact to the host immune response*. NASA HRP Investigators' Workshop. Poster by C.M. Ott. Galveston, TX (2022)

Barrila J. *Spaceflight hardware to investigate the effect of spaceflight on microbial physiology and host-microbe interactions*. National Academies of Sciences Engineering and Medicine - Biological Science panel. Invited presentation Virtual. (2022)

Barrila J, Gangaraju S, Lorenzi HA, Bean H, Ott CM, Nickerson, CA. *Contributions of the microbiome in astronaut health: a new dimension in modeling crew infectious disease risks*. COSPAR 2022: 44th Scientific Assembly. Invited presentation. Athens, Greece (2022)

Yang J, **Barrila J**, Nauman EA, Ott CM, Nickerson CA. *Increases in physiological fluid shear enhance mechanotransductive pathogenic phenotypes and reveal molecular regulatory mechanisms in multidrug resistant Salmonella ST313*. ASGSR 2022. Poster by J. Yang. Houston, TX (2022)

Nickerson C, Franco Meléndez KP, Crenshaw K, **Barrila J**, Yang J, Gangaraju S, Davis RR, Forsyth R, Ott CM, Kader R, Curtiss R, Roland K, and Nickerson CA. *Role of RpoS in regulating stationary phase Salmonella Typhimurium pathogenesis-related stress responses under spaceflight analogue low fluid shear force conditions*. ASGSR 2022. Invited presentation for C. Nickerson. Houston, TX (2022).

Barrila J, Koroli S, Franco Meléndez KP, Yang J, Gangaraju S, Thornhill S, Almongor A, Medina-Colorado AA, Oubre C, Crucian B, Banken LL, Davis RR, Vu C, Ott CM and Nickerson CA. *Effect of spaceflight analogue culture on the growth,*

pathogenesis-related stress responses and infection profiles of *Salmonella* Enteritidis. ASGSR 2022. Poster. Houston, TX (2022).

Ott CM, **Barrila J**, Koroli S, Thornhill SG, Medina-Colorado (AA), Gangaraju S, Davis RR, Banken LL, Yang J, Kang BY, Vu C, Stafford P, Oubre C, Crucian BE, Nickerson CA. Spaceflight-induced changes in microbial virulence and the impact to the host immune response. HRP Investigators' Workshop. Poster (by C.M. Ott). Galveston, TX (2023)

Barrila J, Gangaraju S, Banken L, Yang J, Davis RR., Medina-Colorado AA, Park JS, Blakely EA, Stafford P, Ott CM, Nickerson CA. Effects of Low Dose Radiation and Radiation Countermeasures on Infection by Spaceflight Analogue Cultured *Salmonella* using 3-D Biomimetic Human Tissue Models. HRP Investigators' Workshop. Poster. Galveston, TX (2023)

Barrila J, Koroli S, Franco Meléndez KP, Yang J, Gangaraju S, Thornhill S, Almongor A, Medina-Colorado AA, Oubre C, Crucian B, Banken LL, Davis RR, Syed H, Sethi R, Vu C, Ott CM and Nickerson CA. Effect of spaceflight analogue culture on the growth, pathogenesis-related stress responses and infection profiles of *Salmonella* Enteritidis. ASM Microbe 2023. Poster. Houston, TX (2023).

Yang J, **Barrila J**, Nauman EA, Ott CM, Nickerson CA. Increases in physiological fluid shear enhance mechanotransductive pathogenic phenotypes and reveal molecular regulatory mechanisms in multidrug resistant *Salmonella* ST313. ASM Microbe 2023. Poster by J. Yang. Houston, TX (2023)

PATENTS

Freire E, Ottenbrite R, Xiao Y, Velasquez-Campoy A, Leavitt SA, Bacha U, **Barrila J**. (2004) Inhibitors of coronavirus protease and methods of use thereof. Patent no. 20050267071.

TEACHING and STEM COMMUNITY OUTREACH

Students/Training:

** Indicates co-mentored as faculty

- Jiseon Yang, Ph.D. student, postdoctoral researcher**
- Shivani Kapur, high school student
- Joseph Spadafino, undergraduate student
- Pierce Bradley, post-baccalaureate (post-bac)
- Charlie Pajares, undergraduate student
- Andrew Sherrard, high school student
- Keith Crenshaw, Masters student**
- Ami Gutierrez-Jensen, Master's student**
- Seth Nydam, Post-doctoral researcher**
- Bianca Kang, Honors undergraduate student**
- Matt Laff, undergraduate student**
- Sara Koroli, Honors undergraduate, Research tech **
- Antonio Bando, Ph.D. student**
- Haniyah Syed, undergraduate student**
- Jeremy Duncan, undergraduate student**
- Chloe Rozalsky, undergraduate student**
- April Rideout, undergraduate, Research tech**
- Sami Kaldawi, undergraduate student
- Alexander Ellingson, undergraduate student
- Breanne Mccarthy, Honors undergraduate student
- Richard Davis, Senior Research Technologist**
- Rebecca Forsyth, Senior Research Technologist**
- Christian Castro, Master's student**
- Karla Franco, Ph.D. student**
- Olivia King, Honors undergrad, Master's student**
- Jeffrey Zhao, undergraduate student**
- Sandhya Gangaraju, Principal Research Specialist**
- Laura Banken, Ph.D. student**
- Christian Vu, Honors undergrad, Master's student**
- Rashmi Sethi, undergraduate student, post-bac**
- Emme Velasco, undergraduate student**

Courses or Workshops:

Discovery Seminar: Life in Space: Know before you go! (Co-Instructor)	01/23 – 05/23
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/23 – 05/23
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/22 – 05/22
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/21 – 05/21
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/20 – 05/20
MIC 401: Research paper (Faculty Reader)	08/19 – 12/19
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/19 – 05/19
MIC 401: Research paper (Faculty Reader)	01/19 – 05/19
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/18 – 05/18
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/17 – 05/17
MIC 494/MIC 598: Novel Models for Host-Microbe Interactions (Co-Instructor)	01/16 – 05/16
MIC 494/MIC 598: Novel Models for Infectious Disease Research (Co-Instructor)	08/14 – 12/14
MIC 494/MIC 598: Novel Models for Infectious Disease Research (Co-Instructor)	08/13 – 12/13

Life Sciences Career Paths (Assisted)	10/12 – 12/12
Advanced Chemistry, Nanotechnology, Research Management and Innovations (ACNRMI)	10/10
Assisted with educating visiting scientists from the Kazan Chemical Institute (Russia) about ground-based Rotating Wall Vessel (RWV) technology and spaceflight culture.	
Life Sciences Career Paths (Assisted)	10/09 – 12/09
Biochemistry Graduate Teaching Assistant	09/07 – 12/07
Workshop on Hydrodynamic and Thermodynamic Analysis of Macromolecules in Solution with SEDFIT and SEDPHAT at the National Institutes of Health. <i>Taught sections on ITC and AUC</i>	09/07
Workshop on Hydrodynamic and Thermodynamic Analysis of Macromolecules in Solution with SEDFIT and SEDPHAT at the National Institutes of Health. <i>Taught sections on performing ITC and AUC</i>	02/07
Cell Biology Graduate Teaching Assistant	01/07 – 05/07
Dean's Teaching Fellowship Course Instructor	09/06 – 12/06
"Stem Cell Biology in Development and Disease". <i>Co-designed and co-taught this course as a graduate student</i>	
Cell Biology Graduate Teaching Assistant	01/06 – 05/06
Biochemistry Graduate Teaching Assistant	09/05 – 12/05
Graduate Biophysical Chemistry Tutor	04/05 – 05/05
Developmental Biology Lab Graduate Teaching Assistant	01/04 – 05/04
Biochemistry Lab Graduate Teaching Assistant	09/03 – 12/03

Community Outreach

Night of the Open Door **2012 - 2020**
 This annual event features ASU scientists and engages the public in the cutting-edge research. Led or co-led the organizational effort for our team to educate students on infectious disease/spaceflight/ 3-D cell culture.

Higher Orbits "Go for Launch!" (Mesquite High School, Gilbert AZ) **2017**
 Participated in presentation to promote student engagement in STEM fields.

ASGSR Student Poster Competition Judge (High School and Graduate Students) **2016**

PHOENIX/Micro-5 with Orion's Quest **2014 - 2016**
 Worked with this educational group to incorporate a nation-wide student analysis on our Micro-5 infection data.

RCSB Protein Data Bank (PDB) Accession Numbers

1. Nadella M, Bianchet MA, Gabelli SB, **Barrila J**, Amzel LM. (2005) Structure and Activity of the axon guidance protein MICAL. *Proceedings of the National Academy of Sciences*. 102(46): 16830-16835. **PDB Accession: 2BRA**
2. Bacha U, **Barrila J**, Gabelli SB, Kiso Y, Amzel LM, Freire E. (2008) Development of Broad-Spectrum Halomethyl Ketone Inhibitors Against Coronavirus Main Protease 3CL^{pro}. *Chemical Biology and Drug Design*. 72: 34-49. **PDB Accession: 3D62**
3. **Barrila J**, Gabelli SB, Bacha U, Amzel LM, Freire E. (2010) Mutation of Asn28 disrupts the dimerization and enzymatic activity of SARS 3CL^{pro}. *Biochemistry*. 49(20): 4308-17. **PDB Accession: 3FZD**

Gene Expression Omnibus (GEO) and NASA Gene Lab Accession Numbers

1. **Barrila J**, Ott CM, LeBlanc C*, Mehta SK, Crabbé A, Pierson DL, Nickerson CA. Spaceflight modulates gene expression in astronauts. **GEO accession: GSE47126. NASA Gene Lab: GLDS-53**
2. **Barrila J**, Sarker SF, Hansmeier N, Yang S, Buss K, Briones N, Park J, Davis RR, Forsyth RJ, Ott CM, Sato K, Kosnik C, Yang A, Shimoda C, Rayl N, Ly D, Landenberger A, Wilson SD, Yamazaki N, Steel J, Montano C, Halden RU, Cannon T, Castro-Wallace SL and Nickerson CA. Evaluating the effect of spaceflight on the host-pathogen interaction between human intestinal epithelial cells and *Salmonella* Typhimurium. **GEO accession: GSE156066. NASA Gene Lab: GLDS-323**
3. **Barrila J**, Yang J, Franco K, Yang S, Davis T, Aronow BJ, Bean H, Davis RR, Forsyth RJ, Ott CM, Gangaraju S, Kang B, Hanratty B, Nydam SD, Nauman EA, Kong W, Steel J, and Nickerson CA*. Spaceflight analogue culture enhances the host-pathogen interaction between *Salmonella* and a 3-D biomimetic intestinal co-culture model. **GEO accession: GSE146347. NASA Gene Lab: GLDS-277**