

CURRICULUM VITAE

1. PERSONAL INFORMATION

Ian Michael Carroll
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2. EDUCATION

DEGREE	AWARDING INSTITUTION	DATE	SPECIALTY
Post-Doc.	University of North Carolina, Chapel Hill	2004-2009	GI Microbiome
Ph.D.	Trinity College Dublin	1999-2004	Molecular Microbiology
B.Sc.	Dublin City University	1996-1999	Biotechnology

3. EMPLOYMENT HISTORY

- Assistant Professor, Department of Medicine, University of North Carolina CH 2009-present
 - Postdoctoral Fellow, Department of Medicine University of North Carolina CH 2007-2009
 - Postdoctoral Fellow, Department of Genetics, University of North Carolina CH 2004-2007
 - Teaching Assistant, Trinity College Dublin, Ireland 2003-2004

4. HONORS

- **NIDDK Mentored Research Scientist Development Award** (K01) 2011
- **Pilot feasibility competition finalist** - Center for Gastrointestinal Biology and Disease (CGIBD) 2011
- **Young Investigator Grant for Probiotics Research Award** from the Global Probiotics Council
Sponsored by Danone and YAKULT 2010
- **Small Grant Program Award** from the University Research Council, UNC-Chapel Hill 2010
- **Young Investigator Seed Grant Award**
Center for Functional Gastrointestinal and Motility disorders, UNC-CH 2008
- **Travel Award** Collaborate with researchers in Hyderabad, India 2002
- **Travel Award** 11th international workshop on *Campylobacter*, *Helicobacter* and Related Organisms
European Helicobacter pylori Study Group 2001

5. BIBLIOGRAPHY AND PRODUCTS OF SCHOLARSHIP

* designates a student mentored by Dr. Ian Carroll.

Books and Chapters

1. Ellermann ME, Carr JS, Fodor AA, Arthur JC, **Carroll IM**. 2016. Characterizing and Functionally Defining the Gut Microbiota: Methodology and Implications. p 15-25, ***The Microbiota in Gastrointestinal Physiology: Implications for Human Health, Prebiotics, Probiotics, and dysbiosis.***
2. **Carroll IM**, Ringel-Kulka T, Ringel Y. 2010. Quantification and Identification of Probiotic Organisms in Humans. p 55-59, ***Probiotics: A Clinical Guide.***

Refereed Papers

Original research

1. Kang DJ, Kakiyama G, Betrapally NS, Herzog J, Nittono H, Hylemon PB, Zhou H, **Carroll IM**, Yang J, Gillevet PM, Jiao C, Takei H, Pandak WM, Iida T, Heuman DM, Fan S, Fiehn O, Kurosawa T,

- Sikaroodi M, Sartor RB, Bajaj JS. 2016. Rifaximin Exerts Beneficial Effects Independent of its Ability to Alter Microbiota Composition. *Clin Transl Gastroenterol* 25:e187.
2. Cheng J, Ringel-Kulka T, Heikamp-de Jong I, Ringel Y, **Carroll IM**, de Vos WM, Salojärvi J, Satokari R. 2016. Discordant temporal development of bacterial phyla and the emergence of core in the fecal microbiota of young children. *ISME J.* 10:1002-1014.
 3. Ringel-Kulka T, Benson AK, **Carroll IM**, Kim J, Legge RM, Ringel Y. 2015. Molecular Characterization of the Intestinal Microbiota in Patients With and Without Abdominal Bloating. *Am J Physiol Gastrointest Liver Physiol* 23: epub.
 4. Cheng J, Ringel-Kulka T, Jong IH, Ringel Y, **Carroll IM**, de Vos W, Salojärvi J, Satokari R. 2015. Discordant temporal development of bacterial phyla and the emergence of core in the fecal microbiota of young children. *ISME* 177:1-13.
 5. Kleiman SK*, Watson HJ, Bulik-Sullivan EC*, Huh EY, Tarantino LM, Bulik CM, **Carroll IM**. 2015. Composition and Diversity of the Intestinal Microbiota in Acute Anorexia Nervosa. *Psychosomat Med* 77:969-981.
 6. Becker-Dreps S, Allali I, Monteagudo A, Vilchez S, Hudgens MG, Rogawski ET, **Carroll IM**, Zambrana LE, Espinoza F, Azcarate-Peril MA. 2015. Gut Microbiome Composition in Young Nicaraguan Children During Diarrhea Episodes and Recovery. *Am J Trop Med Hyg* pii: 15-0322.
 7. Maharshak N, Ryu HS, Fan TJ, Onyiah JC, Schulz S, Otterbein SL, Wong R, Hansen JJ, Otterbein LE, **Carroll IM**, Plevy SE. 2015. *Escherichia coli* heme oxygenase modulates host innate immune responses. *Microbiol Immunol* 59:452-465.
 8. Ellermann M, Huh EY, Liu B, **Carroll IM**, Tamayo R, Sartor RB. 2015. Adherent-invasive *Escherichia coli* production of cellulose influences iron-induced bacterial aggregation, phagocytosis and induction of colitis. *Infect Immun* 27:4068-4080.
 9. Maharshak N, Young E, Paiboonrungruang C*, Shanahan M, Thurlow L, Herzog J, Djukic Z, Orlando R, Pawlinski R, Ellermann M, Borst L, Patel S*, Dotan I, Sartor RB, **Carroll IM** 2015. *Enterococcus faecalis* gelatinase mediates intestinal permeability via Protease Activated Receptor 2. *Infect Immun* 83:2762-2770.
 10. Ringel Y, Maharshak N, Ringel-Kulka T, Wolber EA, Sartor RB, **Carroll IM**. 2015. High throughput sequencing reveals distinct microbial populations within the mucosal and luminal niches in healthy individuals. *Gut Microbes* 4:173-181.
 11. Ocvirk S, Sava IG, Lengfelder I, Lagkouvardos I, Steck N, Roh JH, Tchaptchet S, Bao Y, Hansen JJ, Huebner J, **Carroll IM**, Murray BE, Haller D. 2015. Surface-Associated Lipoproteins Link *Enterococcus faecalis* Virulence to Colitogenic Activity in IL-10-Deficient Mice Independent of Their Expression Levels. *PLoS Pathog* 11:e1004911.
 12. Zhao N, Chen J, **Carroll IM**, Ringel-Kulka T, Epstein MP, Zhou H, Zhou JJ, Ringel Y, Li H, Wu MC. 2015. Testing in Microbiome Profiling Studies with the Microbiome Regression based Kernel Association Test (MiRKAT). *Amer J Human Gen* 96:797-807.
 13. Peat CM, Kleiman SC*, Bulik CM, **Carroll IM**. 2015. The Intestinal Microbiome in Bariatric Surgery Patients. *Euro Eat Dis Rev* 23:496-503.
 14. Kleiman SC*, **Carroll IM**, Tarantino LM, Bulik CM. 2015. Gut feelings: A role for the intestinal microbiota in anorexia nervosa? *Int J Eat Disord* 48:449-451.
 15. Morgan AP, Crowley JJ, Nonneman RJ, Quackenbush CR, Miller CN, Ryan AK, Bogue MA, Paredes SH, Yourstone S, **Carroll IM**, Kawula TH, Bower MA, Sartor RB, Sullivan PF. 2014. The antipsychotic olanzapine interacts with the gut microbiome to cause weight gain in mouse. *PLoS One* 9:e115225.

16. Ringel-Kulka T, Goldsmith JR, **Carroll IM**, Barros SP, Palsson O, Jobin C, Ringel Y. 2014. *Lactobacillus acidophilus* NCFM affects colonic mucosal opioid receptor expression in patients with functional abdominal pain - a randomised clinical study. **Aliment Pharmacol Ther** 40:200-207.
17. Eun CS, Mishima Y, Wohlgemuth S, Liu B, Bower M, **Carroll IM**, Sartor RB. 2014. Induction of bacterial antigen-specific colitis by a simplified human microbiota consortium in gnotobiotic interleukin-10^{-/-} mice. **Infect Immun** 82:2239-2246.
18. Shanahan MT, **Carroll IM**, Grossniklaus E, White A, von Furstenberg RJ, Barner R, Fodor AA, Henning SJ, Sartor RB, Gulati AS. 2014. Mouse Paneth cell antimicrobial function is independent of Nod2. **Gut** 63:903-910.
19. Shanahan MT, **Carroll IM**, Gulati AS. 2014. Critical design aspects involved in the study of Paneth cells and the intestinal microbiota. **Gut Microbes** 5:208-214.
20. **Carroll IM**, Ringel-Kulka T, Ferrier L, Wu MC, Siddle JP*, Bueno L, Ringel Y. 2013. Fecal protease activity is associated with compositional alterations in the intestinal microbiota. **PLoS One** 8:e78017.
21. Ringel-Kulka T, Cheng J, Ringel Y, Salojarvi J, **Carroll IM**, Palva A, de Vos WM, Satokari R. 2013. Intestinal microbiota in healthy U.S. young children and adults--a high throughput microarray analysis. **PLoS One** 8:e64315.
22. Packey CD, Shanahan MT, Manick S*, Bower MA, Ellermann M, Tonkonogy SL, **Carroll IM**, Sartor RB. 2013. Molecular detection of bacterial contamination in gnotobiotic rodent units. **Gut Microbes** 4:361-370.
23. Maharshak N, Packey CD, Ellermann M, Manick S*, Siddle JP*, Huh EY, Plevy S, Sartor RB, **Carroll IM**. 2013. Altered enteric microbiota ecology in interleukin 10-deficient mice during development and progression of intestinal inflammation. **Gut Microbes** 4:316-324.
24. **Carroll IM**, Maharshak N. 2013. Enteric bacterial proteases in inflammatory bowel disease--pathophysiology and clinical implications. **World J Gastroenterol** 19:7531-7543.
25. **Carroll IM**, Ringel-Kulka T, Siddle JP*, Klaenhammer TR, Ringel Y. 2012. Characterization of the fecal microbiota using high-throughput sequencing reveals a stable microbial community during storage. **PLoS One** 7:e46953.
26. **Carroll IM**, Ringel-Kulka T, Siddle JP*, Ringel Y. 2012. Alterations in composition and diversity of the intestinal microbiota in patients with diarrhea-predominant irritable bowel syndrome. **Neurogastroenterol Motil** 24:521-530, e248.
27. Araujo-Perez F, McCoy AN, Okechukwu C, **Carroll IM**, Smith KM, Jeremiah K, Sandler RS, Asher GN, Keku TO. 2012. Differences in microbial signatures between rectal mucosal biopsies and rectal swabs. **Gut Microbes** 3:530-535.
28. Uronis JM, Arthur JC, Keku T, Fodor A, **Carroll IM**, Cruz ML, Appleyard CB, Jobin C. 2011. Gut microbial diversity is reduced by the probiotic VSL#3 and correlates with decreased TNBS-induced colitis. **Inflamm Bowel Dis** 17:289-297.
29. Ringel-Kulka T, Palsson OS, Maier D, **Carroll IM**, Galanko JA, Leyer G, Ringel Y. 2011. Probiotic bacteria *Lactobacillus acidophilus* NCFM and *Bifidobacterium lactis* Bi-07 versus placebo for the symptoms of bloating in patients with functional bowel disorders: a double-blind study. **J Clin Gastroenterol** 45:518-525.
30. **Carroll IM**, Ringel-Kulka T, Keku TO, Chang YH, Packey CD, Sartor RB, Ringel Y. 2011. Molecular analysis of the luminal- and mucosal-associated intestinal microbiota in diarrhea-predominant irritable bowel syndrome. **Am J Physiol Gastrointest Liver Physiol** 301:G799-807.
31. **Carroll IM**, Chang YH, Park J, Sartor RB, Ringel Y. 2010. Luminal and mucosal-associated intestinal microbiota in patients with diarrhea-predominant irritable bowel syndrome. **Gut Pathog** 2:19.

32. Ringel Y, **Carroll IM**. 2009. Alterations in the intestinal microbiota and functional bowel symptoms. **Gastrointest Endosc Clin N Am** 19:141-150, vii.
33. **Carroll IM**, Threadgill DW, Threadgill DS. 2009. The gastrointestinal microbiome: a malleable, third genome of mammals. **Mamm Genome** 20:395-403.
34. **Carroll IM**, Andrus JM, Bruno-Barcena JM, Klaenhammer TR, Hassan HM, Threadgill DS. 2007. Anti-inflammatory properties of *Lactobacillus gasseri* expressing manganese superoxide dismutase using the interleukin 10-deficient mouse model of colitis. **Am J Physiol Gastrointest Liver Physiol** 293:G729-738.
35. Rinella ES, Eversley CD, **Carroll IM**, Andrus JM, Threadgill DW, Threadgill DS. 2006. Human epithelial-specific response to pathogenic *Campylobacter jejuni*. **FEMS Microbiol Lett** 262:236-243.
36. Kauser F, Khan AA, Hussain MA, **Carroll IM**, Ahmad N, Tiwari S, Shouche Y, Das B, Alam M, Ali SM, Habibullah CM, Sierra R, Megraud F, Sechi LA, Ahmed N. 2004. The cag pathogenicity island of *Helicobacter pylori* is disrupted in the majority of patient isolates from different human populations. **J Clin Microbiol** 42:5302-5308.
37. **Carroll IM**, Khan AA, Ahmed N. 2004. Revisiting the pestilence of *Helicobacter pylori*: insights into geographical genomics and pathogen evolution. **Infect Genet Evol** 4:81-90.
38. **Carroll IM**, Ahmed N, Beesley SM, Khan AA, Ghousunnissa S, Morain CA, Habibullah CM, Smyth CJ. 2004. Microevolution between paired antral and paired antrum and corpus *Helicobacter pylori* isolates recovered from individual patients. **J Med Microbiol** 53:669-677.
39. **Carroll IM**, Ahmed N, Beesley SM, Khan AA, Ghousunnissa S, Morain CA, Smyth CJ. 2003. Fine-structure molecular typing of Irish *Helicobacter pylori* isolates and their genetic relatedness to strains from four different continents. **J Clin Microbiol** 41:5755-5759.

Published abstracts

1. Maharshak N, **Carroll IM**, Ringel-Kulka T, Wolber EA, Sartor RB, Ringel Y. 2014. High Throughput Sequencing of the Intestinal Mucosa Versus Luminal Microbiota in Humans. **Gastroenterol** 146, 5, S-837.
2. Packey CD, **Carroll IM**, Sartor RB. 2011. Radiation Diminishes Abundant *Lactobacillus Reuteri* Populations in the Murine Intestinal Microbiota. **Gastroenterol** 140, 5, S-664.
3. Whitehead KJ, Schmitz JM, **Carroll IM**, Arthur JC, Jobin C, Sartor RB. 2011. Ingestion of Dietary Carbohydrates Influences the Aggressiveness of Colitis and Intestinal Microbial Composition in IL-10^{-/-} Mice. **Gastroenterol** 140, 5, S-47.
4. Matsuura M, Liu B, **Carroll IM**, Whitehead KJ, Sartor RB. 2010. Selective Alteration of Growth and Virulence for Iron-Dependent Enteric Bacterial Species; Possible Novel Mechanisms of Detrimental Effects of Dietary Iron on Intestinal Inflammation. **Gastroenterol** 138, 5, S-580.
5. Packey CD, **Carroll IM**, Azcarate-Peril MA, Sartor RB. 2010. Radiation Induces a Dysbiosis of the Murine Fecal Microbiota. **Gastroenterol** 138, 5, S-750–S-751.
6. **Carroll IM**, Chang Y, Sartor RB, Ringel Y. 2009. Profiling the Adherent Mucosal and Luminal Microbiota in Diarrhea-Predominant Irritable Bowel Patients. **Gastroenterol** 136, 5, A-222.
7. Packey CD, **Carroll IM**, Bower MA, Tonkonogy SL, Sartor RB. 2009. Molecular Detection of Bacterial Contamination in Gnotobiotic Rodent Units. **Gastroenterol** 136, 5, Suppl. 1, A-103.
8. Matsuura M, Liu B, **Carroll IM**, Sartor RB. 2009. Dietary Iron Potentiates On Intestinal Inflammation in IL-10 Deficient Mice By Selectively Altering Enteric Microbiota. **Gastroenterol** 136, 5, Suppl. 1, A-247.
9. Packey CD, **Carroll IM**, Sartor RB. 2009. Administration of Ciprofloxacin Rescues Mice from the Radiation GI Syndrome **Gastroenterol** 136, 5, Suppl. 1, A-715.

10. **Carroll IM**, Jun Shen, X, Keku TO, Sartor RB, Ringel Y. 2008. Characterization of the Fecal Microbiota in Patients with Diarrhea Predominant Irritable Bowel Syndrome. **Gastroenterol** 134, 4, A-681.
11. Ringel Y, **Carroll IM**, Palsson OS, Sartor, RB. 2008. Substance P and Its Mucosal Receptors - Possible Mediators of Inflammation and Noxious Sensation in Irritable Bowel Syndrome. **Gastroenterol** 136, 5, A-221.
12. Ringel Y, **Carroll IM**, Sartor RB. 2008. Decreased Anti-Inflammatory and Cytoprotective Molecules in Colonic Mucosa of Patients with Diarrhea-Predominant Irritable Bowel Syndrome. **Gastroenterol** 136, 5, A-68.
13. **Carroll IM**, Beesley SM, O'Moráin CA, Smyth CJ. 2001. Genotyping of putative virulence factors and intergenic regions of a collection of Irish *Helicobacter pylori* isolates. Int. **J Med Microbiol** 291: 31.
14. **Carroll IM**, Beesley SM, O'Moráin CA, Smyth CJ. 2001. Genotyping of coding and non-coding regions of Irish *Helicobacter pylori* isolates. **Gut** 49:A16-A17.

6. TEACHING ACTIVITIES

PhD Mentor

- **Elle Glenny** – PhD graduate student, department of Nutrition, UNC-CH. 2015-present
- **Susan Kleiman** – PhD graduate student, department of Nutrition, UNC-CH. 2013-present

Laboratory and Research Teaching

PhD students

- **Elle Glenny** – PhD graduate student, department of Nutrition, UNC-CH. 2015-present
- **Susan Kleiman** – PhD graduate student, department of Nutrition, UNC-CH. 2013-present
- **Sebastian Teran Hidalgo** – PhD graduate student, department of Biostatistics, UNC-CH. 2013

MD students

- **Jacquelyn Carr** – T-32 postdoctoral fellow Department of Medicine. 2015-2016
- **Jennica Siddle** – Medical student, UNC-CH (T-35 program). 2012
- **Sayed Manick** – Medical student, UNC-CH (T-35 program). 2012
- **Siten Patel** – Medical student, UNC-CH (T-35 program). 2012

Undergraduate students

- **Emily Bulik-Sullivan** – Undergraduate student volunteer, Kenyon College. 2013-present
- **Chorlada Paiboonrungruang** – Student volunteer, Durham Technical Community College. 2014-2015
- **Zach Poliacoff** – Undergraduate student volunteer, UNC-CH. 2013
- **Sheena Neil** – Undergraduate student volunteer, UNC-CH. 2011
- **Daniel Williamson** – Undergraduate student volunteer, UNC-CH. 2011
- **Shelby Nash** – Undergraduate student volunteer, UNC-CH. 2010
- **Ademola Shofoluwe** – Undergraduate student volunteer, UNC-CH. 2009

Graduate Supervision and Committees

Thesis

- **Ian Williamson**, Department of Biomedical engineering. 2016-present
 - *Computer vision technology for analysis of organoid assays.*
- **Liang Chen**, Department of Microbiology and Immunology. 2015-present
 - *NLRP12 attenuates colon inflammation by maintaining colonic commensal symbiosis and the expansion of lachnospiraceae strains.*
- **Ting Fan**, Department of Microbiology and Immunology. 2014-present
 - *The role of Enterococcus faecalis sugar transport in experimental colitis.*
- **Sandi Wong**, Microbiology and Immunology. 2011-2014
 - *Assembly of intestinal microbiota is determined by host development, diet, and environment.*

Preliminary Thesis

- **Liang Chen** – oral, Microbiology and Immunology. 2014
 - *NLRP12 maintains gut microbiota symbiosis and prevents colitis.*
- **Perry Tsai** – oral, Microbiology and Immunology. 2012
 - *The future of HIV cure: from monkey to man to mouse.*
- **Sandi Wong** – written and oral, Microbiology and Immunology. 2011
 - *Assembly of intestinal microbiota is determined by host development, diet, and environment.*
- **Melissa Ellermann** – written and oral, Microbiology and Immunology. 2011
 - *Mast cells and intestinal bacterial interactions in irritable bowel syndrome (IBS).*

7. GRANTS

Active

R21-AI125800 Carroll (Co-PI) 07/01/2016 – 06/30/2018

Sulfadoxine-Pyrimethamine IPTp in Malawi: Effects on the gut and vaginal microbiomes

Sulfadoxine-pyrimethamine (SP) is widely used among pregnant women as protection against malaria. SP appears to still be beneficial to the fetus despite widespread SP-resistant malaria. Here we will test the hypothesis that the beneficial effects of SP are mediated by an effect on the gut or vaginal microbiome.

Role: co-PI

\$228,000 (10% effort)

R01MH105684 Carroll (PI) 06/01/2015 – 05/31/2020

Microbiome-mediated weight, anxiety, and stress dysregulation in anorexia nervosa

The goal of this study is to determine the functional impact of enteric microbiotas from Anorexia Nervosa patients on adiposity and behavior.

Role: PI

\$2,264,117 (60% effort)

Completed

NC TraCS translational team science awards Sylvester & Carroll (co-PIs) 04/17/2015 – 10/16/2015
Effects of a Dysbiotic Microbiome Present in Crohn Disease on Skeletal Health and Linear Growth
The goal of this study is to determine the functional impact of the intestinal microbiota from children with Crohn's disease on bone development.
Role: co-PI
\$60,000 (0% effort)

P30 DK31987 Carroll (PI) 8/01/2012 – 07/31/2013
Effect of Enteric Bacterial Proteases and Protease Inhibitors on the Permeability of Intestinal Epithelial Cells
The goal of this study was to determine the mechanism in which *Enterococcus faecalis* permeabilizes the intestinal barrier and how *Bifidobacterium breve* can inhibit this process.
Role: PI
\$30,000 (100% effort)

K01 DK092330 Carroll (PI) 09/15/2011 – 09/14/2016
Inflammatory Effect of Enteric Bacterial-Mediated Intestinal Permeability
The goal of this study is to determine the mechanism in which enteric bacteria cause intestinal permeability and lead to inflammation.
Role: PI
\$570,318 (75% effort)

Global Probiotics Council, YIGPRO Carroll (PI) 07/01/2010 – 06/30/2011
Role of Intestinal Microbiota in Increased Levels of Fecal Serine Proteases and Intestinal Permeability using Diarrhea-Predominant Irritable Bowel Syndrome as a Model
The goal of this study was to identify specific members of the intestinal microbiota that are associated with increased fecal serine protease activity and intestinal permeability in human subjects using high-throughput sequencing of the 16S rRNA gene.
Role: PI
\$50,000 (100% effort)

University Research Council (URC) UNC-CH Carroll (PI) 05/01/2010 – 04/30/2012
The Relationship Between the Intestinal Microbiota and Fecal Serine Proteases Using Diarrhea-Predominant Irritable Bowel Syndrome as a Model
The goal of this study was to identify a relationship between the intestinal microbiota and fecal serine proteases in human subjects.
Role: PI
\$5,000 (100% effort)

NCTraCS, pilot 50K award Carroll (PI) 04/15/2010 – 07/14/2011
Validating Methods and Refining Protocols for the Molecular Investigation of the Intestinal Microbiota in Functional Gastrointestinal Disorders using Irritable Bowel Syndrome as a Model
The goal of this study was to develop collection and storage methods for human biological intestinal samples that will allow the composition of the intestinal microbiota to be characterized in an accurate manner.
Role: PI
\$50,000 (100% effort)

R24 DK067674-01 Carroll (PI) 7/11/2008-7/10/2009
The Role of Serine-Proteases in Gastrointestinal Function and Irritable Bowel Syndrome

The goal of this study was to identify the relationship between intestinal permeability and fecal serine proteases using IBS as a model.

Role: PI

\$35,000 (100% effort)

8. PROFESSIONAL SERVICE

To discipline

Consultation

- Co-director, GUT MICROBIOME conference, Huntington Beach, CA. 2015
- Vice President Gut Microbiome conference – www.gutmicrobes.org 2015-present
- Consultant for Salix Pharmaceuticals, Inc. 2013-present
- Member, American Gastroenterological Association (AGA) 2008-present
- Associate Member, Center for Gastrointestinal Biology and disease (CGIBD) 2006-present

Editorial appointments

- Ad hoc reviewer, Journal of Crohn's and Colitis 2015
- Ad hoc reviewer, Gut Microbes. 2014-present
- Ad hoc reviewer, FEMS Microbiology Letters. 2007-present
- Ad hoc reviewer, PLoS ONE. 2008-present
- Ad hoc reviewer, Gut Pathogens. 2009-present

Within UNC-Chapel Hill

- **Carolina Medical Student Research program** (STRT T35). 2014-2015
- **KL2 TraCS** - CTSA Multidisciplinary Clinical Research Career Development Program. 2014
- **NC TraCS** \$5K - \$50K Translational Research matched pilot grant program. 2009

Review panels

- **Duke Center for Genomics of Microbial Systems** (GeMS) pilot grant program. 2013
- **RTI International** - NIH eastern regional comprehensive metabolomics resource core pilot feasibility projects. 2015