

Casey Michelle Theriot, PhD.
Assistant Professor in Infectious Disease
College of Veterinary Medicine, Department of Population Health and Pathobiology
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Education and Training

06/2015-Present	Assistant Professor in Infectious. College of Veterinary Medicine Department of Population Health and Pathobiology North Carolina State University, Raleigh, NC
09/2013-06/2015	Research Investigator, Department of Internal Medicine, Division of Infectious Disease The University of Michigan, Ann Arbor, MI
08/2010- 08/2013	Postdoctoral Fellowship, Department of Internal Medicine, Division of Infectious Disease The University of Michigan, Ann Arbor, MI
07/2005- 08/2010	Ph.D., Department of Microbiology North Carolina State University, Raleigh, NC
09/2002- 04/2004	Microbiologist Centers for Disease Control and Prevention, Atlanta, GA
12/2001- 09/2002	Industrial Hygiene Specialist/Analyst Materials Analytical Services, Suwanee, GA
05/2000- 08/2001	Research Tech II, Department of Microbiology The University of Georgia, Athens, GA
08/1997- 05/2001	Bachelor of Environmental Health Science The University of Georgia, Athens, GA

Research Interests

- Identifying the role of the gastrointestinal tract microbiome and metabolome in shaping colonization resistance against *Clostridium difficile*
- *Clostridium difficile* physiology and pathogenesis
- Metabolism of bile acids by the indigenous gastrointestinal microbiota

Grants

Present and Active

Sponsor: CMI/GCIBD Microbiome Pilot Project Initiative
Title: Shifts in the Gastrointestinal Microbiome During *Clostridium difficile* Infection
PI: Theriot
Dates: 01/01/16-6/30/16
Role: Principal Investigator

Amount: \$10,000
Sponsor: 1K01GM109236-01/Mentored Research Scientist Development Award in Metabolomics (K01)
Title: Shifts in the Gastrointestinal Metabolome During *Clostridium difficile* Infection
PI: Theriot
Dates: 9/01/13-8/30/17
Role: Principal Investigator
Amount: \$507,800

Previous Grants

Sponsor: Michigan Metabolomic and Obesity Center/Michigan Nutrition and Obesity Research Center
Title: Small Pilot Grant in Metabolomics
PI: Charles Burant (Director)
Role: Postdoctoral fellow
Amount: \$5,000

Sponsor: NHLBI T32 HL007749
Title: University of Michigan Multidisciplinary Training Program In Lung Disease
PI: Ted Standiford (Director)
Dates: 12/01/11-08/31/13
Role: Postdoctoral fellow
Amount: Salary

Sponsor: Pfizer/ASPIRE 673305
Title: Effects of Tigecycline on the Murine Intestinal Microbiome and Experimental *Clostridium difficile* Infection
PI: Young, Bassis and Theriot
Dates: 12/01/11-11/30/12
Role: Postdoctoral fellow
Amount: \$99,840

Sponsor: AI07528
Title: University of Michigan Molecular Mechanisms in Microbial Pathogenesis Training Program
PI: Vic DiRita (Director)
Dates: 09/01/10-08/30/11
Role: Postdoctoral fellow
Amount: Salary

Honors and Awards

2014 NIDDK Host-Microbiota Interactions Travel Award
2011 & 2013 The University of Michigan Department of Microbiology and Immunology Travel Award
2001 Georgia Environmental Health Association, Irving Bell Scholarship Recipient
2000 American Society for Safety Engineers, Georgia Chapter Scholarship Recipient
1999 Delta Epsilon Iota Honor Society, Iota Scholarship Award for Community Service

1997-2001 Georgia Hope (Helping Outstanding Pupils Educationally) Scholarship Recipient

Memberships in Professional Societies

2015-2016 Member of the Organizing Committee, 13th Biennial Congress --Anaerobe 2016
The Anaerobe Societies of the Americas

2014 Member of the Faculty Search Committee for Host-Microbiome Fast Forward
Candidates UM Medical School

2011-present Member, The University of Michigan Association of Women in Science

2011-present Member, The University of Michigan Postdoctoral Society

2010-present Member, The Anaerobe Societies of the Americas

2003-present Member, The American Society for Microbiology

2007-2010 Representative, NCSU Department of Microbiology Graduate Curriculum
Committee

2006-2007 Treasurer, NCSU Microbiology Graduate Student Association

2005-2010 Member, North Carolina Branch, The American Society for Microbiology

Mentoring and Teaching

Mentorship in the lab of Vincent Young Summer 2010-present

Jhansi Leslie, Graduate student	Fall 2011-present
Nathan Porter, Rotating graduate student	Fall 2011-Winter 2012
Charles Koumpouras, Undergraduate	Fall 2011-Summer 2012
Gabrielle Hatton, Undergraduate	Winter 2012-Fall 2012
Cassie Schumacher, Master's student	Fall 2012-Winter 2014
Gabrielle Hatton, Medical student	Summer 2013
Alison Bowman, Undergraduate	Summer 2013-present

Mentorship and Teaching in Graduate School Summer 2005-Summer 2010

Fall 2006 and 2009 North Carolina State University
Graduate Teaching Assistant for Department of Microbiology
Taught MB 352 General Microbiology Laboratory Session. This lab consisted of a lecture and lab section where basic microbiology techniques were taught to undergraduates.

Spring 2006-Fall 2008 North Carolina State University Department of Microbiology
Graduate Student Mentor in the Lab of Dr. Amy Grunden
Direct oversight of laboratory research activities for five undergraduates and two graduate researchers in the lab working on projects related to my research focus. Students were taught proper lab techniques and were required to do a poster.

Extramural Invited Presentations

- National ASM, New Orleans, LA May 2011.
- Microbiology Research Symposium, University of Bern, Switzerland, Europe October 2012.
- National ASM, Denver, CO May 2013.
- Mini-Research Symposium, University of Würzburg, Germany, Europe June 2013.
- Michigan ASM, Grand Rapids, MI March 2014.

- Department of Microbiology and Immunology Retreat, University of Michigan, Ann Arbor, MI October 2014.
- NIH Common Fund Annual Meeting, Research Triangle International, Raleigh, NC October 2014.
- Raising *C. difficile* Awareness Conference, University of Illinois Chicago, IL November 2014.
- Practical Applications of Metabolomics Workshop, The Ohio State University, Columbus, OH November 2014.
- Practical Applications of Metabolomics Workshop, Boston, MA February 2015.
- *C. diff* Spores and More Radio show: *C. difficile* and the Microbiome, March 2015.
- Michigan Regional Comprehensive Metabolomics Resource Core (MRC)² 2015 Metabolomics Workshop, Ann Arbor, MI June 2015.
- Center for Gastrointestinal Biology & Disease Seminar Series, University of North Carolina, Chapel Hill, NC August 2015.
- 9th International Conference on the Molecular Biology and Pathogenesis of Clostridia, Freiberg, Germany September 2015.
- NIH Common Fund Annual Meeting, University of Kentucky, Lexington, KY September 2015.
- North Carolina American Society of Microbiology, NCSU, Raleigh, NC October 2015.
- Michigan Regional Comprehensive Metabolomics Resource Core (MRC)² 2016 Metabolomics Workshop, Ann Arbor, MI May 2016.
- Anaerobe Society of the Americas Conference, Nashville, TN July 2016.

Bibliography

Peer-Reviewed Journals and Publications

1. **Theriot, C.M.**, S.R. Tove, A.M. Grunden. (2010) Characterization of Two Proline Dipeptidases (Prolidases) from the Hyperthermophilic Archaeon *Pyrococcus horikoshii*. *Applied Microbiology and Biotechnology*. 86(1):177-88. doi: 10.1007/s00253-009-2235-x.
2. **Theriot, C.M.**, X. Du, S.R. Tove, A.M. Grunden. (2010) Improving the Catalytic Activity of Hyperthermophilic *Pyrococcus* Prolidases for Detoxification of OP Nerve Agents over a Broad Range of Temperatures. *Applied Microbiology and Biotechnology*. 87(5):1715-26. doi: 10.1007/s00253-010-2614-3.
3. **Theriot, C.M.**, A.M. Grunden. (2011) Hydrolysis of Organophosphorus Compounds by Microbial Enzymes. *Applied Microbiology and Biotechnology*. 89(1):35-43. doi: 10.1007/s00253-010-2807-9.
4. Reeves, A.E., **C.M. Theriot**, I.L. Bergin, G.B. Huffnagle, P.D. Schloss, V.B. Young. (2011) The Interplay Between Microbiome Dynamics and Pathogen Dynamics in a Murine Model of *Clostridium difficile* Infection. *Gut Microbes*. 2(3):145-58.
5. **Theriot, C.M.**, B. Semcer, S. Shah, A.M. Grunden. (2011) Improving the Catalytic Activity of Hyperthermophilic *Pyrococcus horikoshii* Prolidase for Detoxification of Organophosphorus Nerve Agents over a Broad Range of Temperatures. *Archaea*. 2011:Article ID 565127:1-9. doi: 10.1155/2011/565127.
6. **Theriot, C.M.**, C.K. Koumpouras, P.E. Carlson, I.L. Bergin, D.M. Aronoff, V.B. Young. (2011) Cefoperazone-treated Mice as an Experimental Platform to Assess Differential Virulence of *Clostridium difficile* Strains. *Gut Microbes*. 2(6):326-334. doi: 10.4161/gmic.19142.

7. **Theriot C.M.**, Young V.: Antibiotic-associated Diarrhea. In: Nelson K. (Ed.) Encyclopedia of Metagenomics: Springer Reference (www.springerreference.com). Springer-Verlag Berlin Heidelberg, 0. DOI: 10.1007/SpringerReference_303379 2013-01-02 03:33:57 UTC.

8. Sadigh Akha, A.A., **C.M. Theriot**, J.R. Erb-Downward, A.J. McDermott, N.R. Falkowski, H.M. Tyra, R.A. McDonald, D.T. Rutkowski, V.B. Young, G.B. Huffnagle. Acute Infection of Mice with *Clostridium difficile* Leads to an Innate Immune Response, eIF2 α Phosphorylation and Pro-survival Signaling. *Immunology*. 2013 Sep; 140(1):111-122. doi: 10.1111/imm.12122.

9. Taveirne, M.E., **C.M. Theriot**, J. Livney, V.J. DiRita. The Complete *Campylobacter jejuni* Transcriptome During Colonization of a Natural Host Determined by RNAseq. *PLoS One*. 2013 Aug 21;8(8):e73586. doi: 10.1371/journal.pone.0073586. eCollection 2013.

10. **Theriot, C.M.**[#], V.B. Young. Microbial and Metabolic Interactions Between the Gastrointestinal Tract and *Clostridium difficile* Infection. *Gut Microbes*. 2014 Jan 1;5(1):86-95.

[#]Corresponding author.

*Featured cover photo in *Gut Microbes* January/February 2014

11. **Theriot, C.M.**, M.J. Koenigskecht, P.E. Carlson, G.E. Hatton, A.M. Nelson, B. Li, G. Huffnagle, J. Li, V.B. Young. (2014) Antibiotic-induced Shifts in the Mouse Gut Microbiome and Metabolome Increase Susceptibility to *Clostridium difficile* Infection. *Nat. Commun.* 5:3114 doi: 10.1038/ncomms4114.

*Highlighted in *Nature* 505, 456–457 (23 January 2014) doi:10.1038/505456d. How antibiotics boost infection.

*Highlighted in *Nature Reviews Gastroenterology & Hepatology* 2014 Feb 18. doi: 10.1038/nrgastro.2014.23. Microbiota: Antibiotics shift mouse gut microbiome and metabolome.

*UofMHealthBlogs.org highlight: <http://uofmhealthblogs.org/general/changes-gut-bacteria-boost-growth-common-hospital-acquired-infection/10722/>

*NIH Common fund highlight: Common Fund Metabolomics web page: <http://commonfund.nih.gov/metabolomics/index>.

*Selected NIAID Research Advance of 2014

12. **Theriot, C.M.**^{*#}, C.M. Bassis^{*}, V.B. Young. Alteration of the Murine Gastrointestinal Microbiota by Tigecycline Leads to Increased Susceptibility to *Clostridium difficile* Infection. *Antimicrobial Agents and Chemotherapy*. 2014 May;58(5):2767-74. doi: 10.1128/AAC.02262-13.

*Co-first authors. [#]Corresponding author.

13. Trindade. B.C., **C.M. Theriot**, J.L. Leslie, P.E. Carlson, I.L. Bergin, M. Peters-Golden, V.B. Young, D.M. Aronoff. *C. difficile*-Induced Colitis in Mice is Independent of Leukotrienes. *Anaerobe*. 2014 Dec; 30:90-8. doi: 10.1016/j.anaerobe.2014.09.006.

14. Sadighi Akha, A.A., A.J. McDermott, **C.M. Theriot**, P.E. Carlson Jr., R.A. McDonald, N.R. Falkowski, I.L. Bergin, V.B. Young, G.B. Huffnagle. IL22 and CD160 Play Additive Roles in the Mucosal Host Response to *Clostridium difficile* Infection in Mice. *Immunology*. 2015 Apr; 144(4):587-97. doi: 10.1111/imm.12414.

15. **Theriot, C.M.**[#], C.M. Bassis, C.A. Schumacher, A.M. Seekatz, V.B. Young. The Effects of Tigecycline and Vancomycin Administration on Established *Clostridium difficile* Infection. *Antimicrobial Agents and Chemotherapy*. 2015 Mar; 59(3):1596-604. doi: 10.1128/AAC.04296-

[#]Corresponding author.

16. Koenigsnecht, M.J., **C.M. Theriot**, I.L. Bergin, C.A. Schumacher, P.D. Schloss and V.B. Young. Dynamics and Establishment of *Clostridium difficile* Infection in the Murine Gastrointestinal Tract. *Infection and Immunity*. 2015 Mar; 83(3):934-41. doi: 10.1128/IAI.02768-14.

17. Seekatz, A.M., **C.M. Theriot**, C. Molloy, K. Wozniak, I. Bergin, V. Young. (2015) Fecal microbiota transplant eliminates *Clostridium difficile* in a murine model of relapsing disease. *Infect Immun*. 2015 Oct;83(10):3838-46. doi: 10.1128/IAI.00459-15. Epub 2015 Jul 13.

18. **Theriot, C.M.** and V.B. Young. Interactions between the Gastrointestinal Microbiome and *Clostridium difficile*. *Annu Rev Microbiol*. 2015 Oct 15;69:445-61. doi: 10.1146/annurev-micro-091014-104115.

19. **Theriot, C.M.**[#], A.A. Bowman, V.B. Young. 2016. Antibiotic induced alterations of the gut microbiota alter secondary bile acids and allow for *C. difficile* spore germination and outgrowth. *mSphere* 1(1):e00045-15. doi: 10.1128/mSphere.00045-15.

[#]Corresponding author.

20. Noecker, C., A. Eng, S. Srinivasan, **C.M. Theriot**, V.B. Young, J.K. Jansson, D.N. Fredricks, E. Borenstein. 2016. Metabolic model-based integration of microbiome taxonomic and metabolomic profiles elucidates mechanistic links between ecological and metabolic variation. *mSystems* 1(1):e00013-15. doi:10.1128/mSystems.00013-15.

Winston J.A., **C.M. Theriot**. Impact of microbial derived secondary bile acids on colonization resistance against *Clostridium difficile* in the gastrointestinal tract. In review at *Anaerobe* March 2016.

Winston J.A., R. Thanissery, S.A. Montgomery, **C.M. Theriot**. Cefoperazone treated mouse model of *Clostridium difficile* strain R20291: a clinically relevant platform for testing therapeutics. In review at *JOVE* April 2016.

Book Chapters

1. **Theriot, C.M.**, S.R. Tove, A.M. Grunden. (2009) Biotechnological Applications of Recombinant Microbial Prolidases. In *Advances in Applied Microbiology* (Laskin, A., Gadd, G. and Sariaslani, S., eds), p. 99-132. Academic Press, New York.

Abstracts

1. **Theriot, C.M.**, J. Whichard, T. Barrett. bla_{CMY}-mediated Third Generation Cephalosporin Resistance Among *Salmonella enterica* serotype Newport strains: Preliminary Results of FoodNet Case Control Study, National ASM, New Orleans, LA 2004.

2. **Theriot, C.M.**, T. Quintero-Varca, P. Joshi, S. Tove, A.M. Grunden. Expression and Biochemical Characterization of *P. horikoshii* Prolidase Homolog 1 and 2 and *P. furiosus* Prolidase Homolog 2 and their Potential for the Detoxification of Organophosphorus Nerve Agents, National ASM, Toronto, Canada 2007.
3. **Theriot, C.M.**, S. Tove, A.M. Grunden. Construction of Hyperthermophilic *Pyrococcus furiosus* Prolidase Mutants with Higher Catalytic Activity at Lower Temperatures, National ASM, Boston, MA 2008.
4. **Theriot, C.M.**, S. Tove, A.M. Grunden. Generation of Recombinant *Pyrococcus* Prolidases with Enhanced Activity over a Broader Temperature Range for Detoxification of Organophosphorus Nerve Agents, National ASM, Philadelphia, PA 2009.
5. **Theriot, C.M.**, P.E. Carlson, I.L. Bergin, D.M. Aronoff, V.B. Young. Comparative Pathogenicity of *C. difficile* Strains in Cefoperazone-treated Mice, 18th Annual Midwest Microbial Pathogenesis Conference, Ann Arbor, MI 2011.
6. Sadigh Akha, A.A., **C.M. Theriot**, A.J. McDermott, A.E. Reeves, V.B. Young, G.B. Huffnagle. The Local and Systemic Immune Response in a Mouse Model of Acute *Clostridium difficile* Infection, 7th International Conference on the Molecular Biology and Pathogenesis of the Clostridia- ClosPath, Ames, IA 2011.
7. **Theriot, C.M.**, P.E. Carlson, I.L. Bergin, D.M. Aronoff, V.B. Young. Different *Clostridium difficile* Strains Cause Varied Disease Severity in Cefoperazone-treated Mice, 7th International Conference on the Molecular Biology and Pathogenesis of the Clostridia- ClosPath, Ames, IA 2011.
8. **Theriot, C.M.**, G.E. Hatton, J. Li, V.B. Young. Functional Roles of the Gut Microbiota in Colonization Resistance against *Clostridium difficile*, Anaerobe Society of the Americas, San Francisco, CA 2012.
9. **Theriot, C.M.**, G.E. Hatton, J. Li, V.B. Young. Functional Roles of the Gut Microbiota in Colonization Resistance against *Clostridium difficile*, Metabolomics and Obesity Symposium, Ann Arbor, MI 2012.
10. Bassis, C.M., **C.M. Theriot**, V.B. Young. Changes in the Gut Microbiota and *Clostridium difficile* Susceptibility with Tigecycline Treatment, National ASM, Denver, CO 2013.
11. Zhang, L., **C.M. Theriot**, T. Rajendiran, S. Brown, V.B. Young. Detection and Quantification of Carbohydrates in the Murine Gastrointestinal Tract Following Antibiotic Treatment and During *Clostridium difficile* Infection. National American Society for Mass Spectrometry, Minneapolis, MN 2013.
12. Trindade, B.C., **C.M. Theriot**, V.B. Young, D.M. Aronoff. Effect of Antibiotics on the Gastrointestinal Tissue Lipidome in a Murine Model of *Clostridium difficile* Infection. ICAAC, Denver, CO 2013.
13. Trindade, B.C., **C. M. Theriot**, Paul E. Carlson Jr, Gary B. Huffnagle, Marc Peters-Golden, Vincent B. Young, David M. Aronoff. Lack of Evidence for Involvement of Leukotrienes as Mediators of Disease Severity in a Murine Model of *Clostridium difficile* Infection. ICAAC, Denver, CO 2013.

14. **Theriot, C.M.**, G.E. Hatton, A. Nelson, M. Koenigsnecht, B. Li, J. Li, G. Huffnagle, V.B. Young. Shifts in the Gut Microbiome and Metabolome Lead to Susceptibility to *Clostridium difficile* Infection, Human Microbiome Science Vision for the Future, Bethesda, MD 2013.
15. Koenigsnecht, M., **C.M. Theriot**, C.A. Schumacher, V.B. Young. Kinetics of *C. difficile* Infection Throughout the Gastrointestinal Tract. Anaerobe Society of the Americas, Chicago, IL 2014.
16. Taveirne, M.E., **C.M. Theriot**, J.M. Beauchamp, W. Miller, C. Parker, S. Huynh, V.J. DiRita. The Microbiome Structure and *Campylobacter jejuni* Transcriptome in Naturally-Raised Chickens. National ASM, Boston, MA 2014.
17. **Theriot, C.M.** and V.B. Young. Shifts in the Gut Microbiome and Metabolome Lead to Susceptibility to *Clostridium difficile* Infection, NIDDK Host Microbiota Interaction Workshop, Bethesda, MD 2014.
18. **Theriot, C.M.**, A.A. Bowman, C.F. Burant, V.B. Young. The Role of Gastrointestinal Bile Acids in Colonization Resistance Against *Clostridium difficile*, NIH Common Fund Annual Meeting: Metabolomics, Research Triangle International, Raleigh, NC 2014.
19. **Theriot, C.M.**, A.A. Bowman, V.B. Young. Secondary bile acids shape colonization resistance against *Clostridium difficile* in the large intestine by inhibiting growth. Keystone Symposia: Meeting: Gut Microbiota Modulation of Host Physiology: The Search for Mechanism, Keystone, CO 2015.
- *Selected to present an electronic poster
20. **Theriot, C.M.**, A.A. Bowman, V.B. Young. Secondary bile acids shape colonization resistance against *Clostridium difficile* in the large intestine. NIH Common Fund Annual Meeting, University of Kentucky, Lexington, KY September 2015.
21. Winston, J.A, **C.M. Theriot**. Secondary bile acid deoxycholate inhibits *Clostridium difficile* growth and alters the gastrointestinal microbiota. North Carolina ASM Meeting, NCSU, Raleigh, NC October 2015.

Seminars and Workshops

Summer 2015	NIMBioS Research Collaboration Workshop for Women in Mathematical Biology
Winter 2015	WISE Software Carpentry Workshop
Fall 2014	NIDDK Host Microbiota Interaction Workshop
Summer 2014	University of Alabama 2 nd Metabolomics Workshop
Summer 2012	Mothur and R statistical package offered by Dr. Patrick Schloss
Fall 2012	Center for Statistical Consultation and Research (CSCAR) Statistical Analysis with R
Winter 2014	CSCAR Statistics: A Review

Reviewer for Peer-reviewed Journals

- *American Journal of Physiology: Gastrointestinal and Liver Physiology
 *BMC Microbiology

*Digestive Diseases and Sciences
*JoVE: Journal of Visualized Experiments
*mBio
*Microbiome
*AEM