

# Jacques Ravel

## Professor

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## Education

- 1990 **B.Sc.** Biology and Chemistry. University of Nancy I  
1992 **M.Sc.** Biology – Microbiology, Enzymology and Molecular Biology  
“Magistere”, Microbiology, Enzymology and Molecular Biology University of Nancy I  
1999 **Ph.D.** Marine Estuarine Environmental Sciences, University of Maryland College Park

## Professional Experience

- 1999-2002 NIH-National Research Scientific Award Postdoctoral Fellow The Johns Hopkins Univ.  
*Dr. Craig A. Townsend* – Chemistry Department  
1991-1993 **Visiting Scientist - Graduate Research Assistant**  
University of Maryland Biotechnology Institute (UMBI), Center of Marine Biotechnology (COMB)  
*Laboratory of Dr. Rita R. Colwell*  
1993-1999 **Graduate Research Assistant**  
(UMBI) Center of Marine Biotechnology - MEES Program  
*Laboratory of Dr. Frank T. Robb and Dr. Russell T. Hill* - Molecular Microbial Ecology  
2002-2011 **Adjunct Assistant Professor**  
University of Maryland Biotechnology Institute, Center of Marine Biotechnology  
2004-present **Assistant Investigator**  
Microbial Genomics/Functional Genomics, The Institute for Genomic Research (TIGR)  
2007-2012 **Associate Professor**  
Department of Microbiology & Immunology, The Institute for Genome Sciences  
University of Maryland School of Medicine  
2012-present **Adjunct Professor**  
Wayne State University School of Medicine, Department of Obstetrics and Gynecology  
2012-present **Professor and Associate Director for Genomics**  
Department of Microbiology & Immunology, The Institute for Genome Sciences  
University of Maryland School of Medicine

## Honors and Awards

- 1996 **Award of Excellence**, UMBI – In recognition of exemplary service and dedication  
1996-1999 **Graduate Fellowship**, Schering-Plough Research Institute  
2000-2002 **Postdoctoral Fellowship**, NIH - National Scientific Research Award  
2002 **Young Investigator Award**, Society for Industrial Microbiology  
2012 **Fellowship of the American Academy of Microbiology**

## Journal Editor-in-Chief:

- 2011-present Microbiome – BMC Journal (<http://www.microbiomejournal.com>).

## Journal Editorial Board:

- 2008-present PLoS ONE  
2010-present Open Microbiology (Wiley)  
2010-present Frontiers in Evolutionary and Genomics Microbiology

## National/International Services (selected)

- 2002-2008 **Lead Investigator** for TIGR genomics Efforts in supports of the Amerithrax FBI investigation of the anthrax mail attacks.  
2003-2010 **Member** of the Federal Bureau of Investigation’s sponsored Scientific Workgroup on Microbial Genetic and Forensics (SWGMPF), which aimed at establishing the baseline procedures for the emerging field of Microbial Forensics.  
2006 **Chair and Organizer** of a session on “Microbial Forensics”. ASM Biodefense Conference, Washington DC.  
2006 **Member** to an American Academy of Microbiology sponsored colloquium on “Genomes and Global Pathogens”. The concept of bacterial species was discussed genomics advancements

- were discussed. September 27-28, 2006. Washington D.C. A report on the committee recommendations was published in 2007 by the American Academy of Microbiology.
- 2007 NIH – Human Microbiome Project Workshop – Contribute to the development of the framework for the NIH RoadMap Human Microbiome project (12/09-10).
- 2009 **Co-chair of the Metagenomics/Microbiome working group** at the “Seeking New Dimensions and Strategies for Women's Health Research” conference at Washington University in St. Louis on March 4-6, 2009. Organize by the Office of Research on Women's Health (ORWH) at NIH to formulate its priorities for the next 10-20 years and produce ORWH Strategic Agenda.
- 2010-2011 **Organizer.** Keystone symposium on “Microbial Communities as Drivers of Ecosystem Complexity” held in Breckenridge, CO – March 25-30, 2011. This conference will bring US and international scientists from the fields of environmental sciences and the human microbiome to promote their interactions.
- 2011-2013 **Member** of the Defense Threat Reduction Agency (DTRA) Pathogen Characterization and Biomarker Discovery Scientific Advisory Board. The Scientific Advisory Board is comprised of experts across several critical fields and is charged with advising DTRA Diagnostics and Disease Surveillance Division regarding scientific directions and objectives relevant to the agency's mission.
- 2012-present **Member** of Juvenile Diabetes Research Foundation (JDRF) Microbiome Consortium External Advisory Board. JDRF is bringing together individuals from a variety of backgrounds and fields of expertise for the purpose of addressing the role of microbiome in type 1 diabetes.
- 2012-present **Member** of the Wellcome Trust Peer Review College.  
Provide expert opinion on grants/scholarships applications considered by the Wellcome Trust Foundation.
- 2013-present **Member** of the External Advisory Committee, NIAID Respiratory Pathogens Research Center at the University of Rochester.  
Provide advise and expert opinion on the running and progress of this NIAID contract with the University of Rochester.
- 2013-present **Member** of the External Advisory Committee, Host Microbiome Initiative University of Michigan Medical School.  
Provide advise on project development and investment to the University of Michigan regarding an university-wide microbiome initiative.

### **Education Services**

2008-present Supervised a total of 18 graduate students and 7 postdoctoral fellows. Currently mentor 4 junior faculty.

### **Television and Media Appearances**

2008-present Media appearances include the New York Time (front page), CNN, NOVA and National Geographic for the Amerithrax investigation. Appearances on National Public Radio, printed and web press for issues on Women's health issues.

### **Current Grants and Contracts (relevant to the research proposal and selected from 13 funded projects)**

**EPSTI: Eco-Pathogenomics of Sexually Transmitted Infections** (PI Bavoil/Ravel) 09/01/09-08/31/19, NIH U19 AI084044 (\$22 millions)

NIH Collaborative Research Center: The focus of this project is on the discovery of biomarkers with applications in diagnosis, prevention and treatment of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* mono- and co-infections. It comprises three projects that will evaluate the human genetics component of the infections, the host response (immune and miRNA) as well as the genital microbiome.

**Modeling diversity and stability of vaginal microbial communities** (PI Ponciano/Ravel) 01/01/13-12/31/16, NIH R01GM103604 (\$1.6 millions)

The vaginal microbiota of women who sampled daily for 10 weeks will be characterized and the dynamics of the vaginal microbiota will be modeled using novel statistical approach.

### **Open Source Software Development**

PhyloTrac™ [phylotrac.sourceforge.net](http://phylotrac.sourceforge.net) – Interactive™ analysis of PhyloChip dataset.

inVUE™ [invue.srouceforge.net](http://invue.srouceforge.net) - Graphical display of large dataset

speciateIT™ [speciateIT.sourceforge.net](http://speciateIT.sourceforge.net) – Species level taxonomy of short 16S rRNA gene sequences.

genomeMTV™ [genomeMTV.sourceforge.net](http://genomeMTV.sourceforge.net) – Genome tiling microarray data analysis.

MCClassifier™ [github.com/pgajer/MCClassifier](https://github.com/pgajer/MCClassifier) - Markov Chain based rapid and accurate taxonomic classifier

### List of publications for the last 5 years – Jacques Ravel

67. Price LB, Liu CM, Johnson KE, Aziz M, Lau MA, Bowers J, **Ravel J**, Keim PS, Serwadda D, Wawer MJ and Gray RH<sup>#</sup>. 2010. The effects of circumcision on the penis microbiome. *PLoS ONE*. 5(1): e8422.
68. Foster JT, Allan GA, Chan AP, Rabinowicz PD, **Ravel J**, Jackson PJ, and Keim P<sup>#</sup>. 2010. Single Nucleotide Polymorphisms for Assessing Genetic Diversity in Castor Bean (*Ricinus communis*). *BMC Plant Biology*. 10:13.
69. Eppinger M, Worsham PL, Nikolich MP, Riley DR, Sebastian Y, Mou S, Achtman M, Lindler LE and **Ravel J**<sup>#</sup>. 2010. Genome sequence of the deep-rooted *Yersinia pestis* strain Angola reveals new insights into the evolution and pangenome of the plague bacterium. *Journal of Bacteriology*. 192(6):1685-1699.
70. Forney LJ, Gajer P, Williams CJ, Schneider GM, McCulle SL, Karlebach S, Brotman RM, Davis CC, Ault KA and **Ravel J**<sup>#</sup>. 2010. Comparison of self-collected and physician-collected vaginal swabs for microbiome analysis. *Journal of Clinical Microbiology*. 48:1741-1748.
71. Brotman RM<sup>#</sup>, **Ravel J**, Cone RA, and Zenilman RM. 2010. Rapid fluctuation of the vaginal microbiota in asymptomatic women measured by Gram Stain Nugent score analysis. *Sexually Transmitted Infections*. 86: 297-302.
72. Wagner DM, Runberg J, Vogler AJ, Lee J, Driebe E, Price LB, Englethaler DM, Fricke WF, **Ravel J**, and Keim P<sup>#</sup>. 2010. No resistance plasmid in *Yersinia pestis*, North America. *Emerging and Infectious Diseases*. 16(5):885-887.
73. **Ravel J**<sup>#</sup>, Gajer P, Abdo Z, Schneider GM, McCulle SL, Karlebach S, Gorle R, Russell J, Tacket CO, Brotman RM, Davis CC, Ault KA, Peralta L and Forney LJ. 2011. The vaginal microbiome of reproductive age women. *Proceedings of the National Academy of Sciences USA*. 108 Suppl 1:4680-7. Epub 2010 Jun 3
74. Schatz MC, Phillippy AM, Gajer P, DeSantis TZ, Andersen GL and **Ravel J**<sup>#</sup>. 2010. Integrated microbial survey analysis of prokaryotic communities for the PhyloChip microarray. *Applied and Environmental Microbiology*. 76(16):5636-5638.
75. Chan AP, Crabtree J, Zhao Q, Lorenzi H, Orvis J, Puiu D, Melake-Berhan A, Jones KM, Redman J, Chen G, Cahoon EB, Gedil M, Stanke M, Haas BJ, Wortman JR, Fraser-Liggett CM, **Ravel J** and Rabinowicz PD<sup>#</sup>. 2010. Draft genome sequence of the oilseed species *Ricinus communis*. *Nature Biotechnology*. 28(9):951-6.
76. Price LB, Liu CM, Frankel YM, Melendez JH, Aziz M, Buchhagen J, Contente-Cuomo T, Engelthaler DM, Keim PS, **Ravel J**, Lazarus GS, Zenilman JM. 2010. Macroscale spatial variation in chronic wound microbiota: A cross-sectional study. *Wound Repair Regen*. Oct 13. Epub ahead of print.
77. Morelli G, Song Y, Mazzone CJ, Eppinger M, Roumagnac P, Wagner DM, Feldkamp M, Kusecek B, Vogler AJ, Li Y, Cui Y, Thomson NR, Jombart T, Leblois R, Lichtner P, Rahalison L, Petersen JM, Balloux F, Keim P, Wirth T, **Ravel J**, Yang R, Carniel E, Achtman M. 2010. *Yersinia pestis* genome sequencing identifies patterns of global phylogenetic diversity. *Nature Genetics* 12:1140-3.
78. Zhou X, Brotman RM, Gajer P, Abdo Z, Schüette U, Ma S, **Ravel J** and Forney LJ. 2010. Recent Advances in Understanding the Microbiology of the Female Reproductive Tract and the Causes of Premature Birth. *Infectious Diseases in Obstetrics and Gynecology*. Volume 2010, Article ID 737425. Epub 2010 Dec 9.
79. Rasko DA, Worsham P, Abshire TG, Stanley ST, Bannan JD, Wilson MR, Langham R, Decker RS, Jiang L, Read TD, Phillippy AM, Salzberg SL, Pop M, Van Ert MN, Kenefic LJ, Keim PS, Fraser-Liggett CM and **Ravel J**<sup>#</sup>. 2011. *Bacillus anthracis* comparative genome analysis in support of the

- Amerithrax investigation. *Proceedings of the National Academy of Sciences USA*. 108(12):5027-32. Epub 2011 Mar 7.
80. Donia MS, Fricke WF, **Ravel J**, Schmidt EW. 2011. Variation in tropical reef symbiont metagenomes defined by secondary metabolism. *PLoS One*. 6(3):e17897.
  81. Eppinger M, Mammel MK, Leclerc JE, **Ravel J#**, Cebula TA. 2011. Genome Signatures of *Escherichia coli* O157:H7 isolates from the Bovine Host Reservoir. *Applied Environmental Microbiology*. 77(9):2916-25. Epub 2011 Mar 18.
  82. Fricke WF, Mammel MK, McDermott PF, Tartera C, White DG, Leclerc JE, **Ravel J#**, Cebula TA. 2011. Comparative genomics of 28 *Salmonella enterica* isolates: Evidence for CRISPR-mediated adaptive sublineage evolution. 2011. *Journal of Bacteriology*. 193(14):3556-68. Epub 2011 May 20.
  83. Yilmaz P, Kottmann R, Field D, ` R, Cole JR, Amaral-Zettler L, Gilbert JA, Karsch-Mizrachi I, Johnston A, Cochrane G *et al.* **Ravel J...** Glockner, FO. 2011. Minimum information about a marker gene sequence (MIMARKS) and minimum information about any (x) sequence (MIxS) specifications. *Nature Biotechnology*, 29(5):415-420.
  84. Caporaso JG, Lauber CL, Costello EK, Berg-Lyons D, Gonzalez A, Stombaugh J, Knights D, Gajer P, **Ravel J**, Fierer N Gordon, JI and Knight, R: Moving pictures of the human microbiome. *Genome Biology* 2011, 12(5):R50.
  85. Rivarola M, Foster JT, Chan AP, Williams AL, Rice AW, Liu A, Melake-Berhan A, Huot-Creasy H, Puiu D, Rosovitz MJ, Khouri HM, Beckstrom-Sternberg SM, Allan GJ, Keim P, **Ravel J#**, and Rabinowicz PD. 2011. Castor Bean Organelle Genome Sequencing and Worldwide Genetic Diversity Analysis. *PLoS ONE*. 6(7):e21743. Epub 2011 Jul 7.
  86. Eppinger M, Bunk B, Johns MA, Edirisinghe JN, Kutumbaka KK, Koenig SSK, Huot-Creasy H, Rosovitz MJ, Riley DR, Daugherty A, Martin M, Elbourne LDH, Paulsen I, Biedendieck R, Braun C, Garyburn S, Dhingra S, Lukyanchik V, Ball B, ul-Qamar R, Seibel J, Bremer E, Jahn D, **Ravel J#** and Vary PS. 2011. Genome sequences of the biotechnologically important *B. megaterium* strains QM B1551 and DSM319. *Journal of Bacteriology* 193(16):4199-213. Epub 2011 Jun 24.
  87. Zan J, Fricke WF, Fuqua C, **Ravel J**, and Hill R. 2011. Genome sequence of *Ruegeria* sp. KLH11, a *N*-acylhomoserine lactone-producing bacterium isolated from the marine sponge *Mycale laxissima*. *Journal of Bacteriology*. 193(18):5011-5012.
  88. Vogler AJ, Chan F, Wagner DM, Roumagnac P, Lee J, Nera R, Eppinger M, **Ravel J**, Rahalison J, Rasoamanana BW, Beckstrom-Sternberg SM, Achtman M, Chanteau S and Keim P. 2011. Phylogeography and Molecular Epidemiology of *Yersinia pestis* in Madagascar. *PLoS Pathogens*. 5(9): e1319.
  89. Du Y, Derewacz DK, Deguire SM, Teske J, **Ravel J**, Sulikowski GA, Bachmann BO. 2011. Biosynthesis of the Apoptolidins in *Nocardiosis* sp. FU 40. *Tetrahedron*. 67(35):6568-6575.
  90. Marine R, Polson SW, **Ravel J**, Hatfull G, Russell D, Sullivan M, Syed F, Dumas MD, K.E. Wommack. 2011. Evaluation of a transposase protocol for rapid generation of shotgun high-throughput sequencing libraries from nanogram quantities of DNA. *Applied and Environmental Microbiology*. 77(22):8071-8079.
  91. Dumas, MD, Polson SW, Ritter DD, **Ravel J**, Gelb JD, Morgan RD, Wommack KE. 2011. Impacts of Poultry House Environment on Poultry Litter Bacterial Community Composition. *PLoS ONE*. 6(9): e24785.
  92. Eppinger M, Mammel MK, Leclerc JE, **Ravel J#**, Cebula TA. 2011. Genomic Anatomy of *Escherichia coli* O157:H7 outbreaks. *Proceedings of the American Academy of Sciences*. 108(50):20142-7 [Epub 2011 Nov 30]

93. Donia MS, Fricke WF, Partensky F, Cox J, Elshahawi SI, White JR, Phillippy AM, Schatz MC, Piel J, Haygood MG, **Ravel J** and Schmidt EW. 2011. Complex microbiome underlying secondary and primary metabolism in the tunicate-*Prochloron* symbiosis. *Proceedings of the National Academy of Sciences*. 108(51):E1423-32. [Epub 2011 Nov 28].
94. Flores R, Shi J, Gail MH, Gajer P, **Ravel J** and Goedert JJ. 2012. Assessment of the human fecal microbiota: I. Reproducibility and association of 16S rRNA pyrosequences. *European Journal of Clinical Investigation*. 42(8):848-854. DOI: 10.1111/j.1365-2362.2012.02660.x
95. Flores R, Shi J, Gail MH, Gajer P, **Ravel J** and Goedert JJ. 2012. Assessment of the human fecal microbiota: II. Measurement and reproducibility of selected enzymatic activities. *European Journal of Clinical Investigation*. 42(8):855-63. DOI: 10.1111/j.1365-2362.2012.02659.x
96. Schmidt EW, Donia MS, McIntosh JA, Fricke WF, **Ravel J**. 2012. Origin and variation of tunicate secondary metabolites. *Journal of Natural Products*. 75:294-304. [Epub ahead of print Jan 10, 2012].
97. Eppinger M, Radnedge L, Andersen G, Vietri N, Severson G, Mou S, **Ravel J#** and Worsham PL. 2012. Novel plasmids and resistance phenotypes in *Yersinia pestis*: unique plasmid inventory of strain Java 9 mediates high levels of arsenic resistance. *PLoS ONE*. 7(3):e32911.
98. Earl AM, Eppinger M, Fricke WF, Rosovitz MJ, Rasko DA, Daugherty S, Losick R, Kolter R, **Ravel J#**. 2012. Whole genome sequences of *Bacillus subtilis* and close relatives. *Journal of Bacteriology*. 194(9):2378-2379.
99. Sellitto M, Bai G, Serena G, Fricke WF, Sturgeon C, Gajer P, White JR, Koenig SSK, Sakamoto J, Boothe D, Gicquelais R, Kryszak D, Puppa E, Catassi C, **Ravel J#**, Fasano A. 2012. Proof of concept of microbiome-metabolome analysis and delayed gluten exposure on celiac disease autoimmunity in genetically at-risk infants. *PLoS ONE*. 7(3):e33387.
100. Hickey RJ, Zhou X, Pierson JD, **Ravel J**, Forney LJ. 2012. Understanding vaginal microbiome complexity from an ecological perspective. *Translational Research*. 160(4):267-82.
101. Yuan S, Cohen DB, **Ravel J**, Abdo Z, Forney LJ. 2012. Evaluation of methods for the extraction and purification of DNA from the human microbiome. *PLoS ONE*. 7(3):e33865.
102. Ma B, Forney LJ and **Ravel J#**. 2012. The vaginal microbiota: Rethinking health and diseases. *Annual Review of Microbiology*. 66:371-89.
103. Gajer P, Brotman RM, Bai G, Sakamoto J, Shutte UME, Zhong X, Koenig SSK, Fu L, Ma Z, Zhou X, Abdo Z, Forney LJ and **Ravel J#**. 2012. The temporal dynamics of the vaginal microbiota. *Science Translational Medicine*. 4, 132ra52.
104. Bai G, Gajer P, Nandy M, Ma B, Yang H, Sakamoto J, Blanchard MH, **Ravel J#**, Brotman RM. 2012. Comparison of storage conditions for human vaginal microbiome studies. *PLoS ONE*. 7(5): e36934.
105. Macklaim JM, Cohen C, Donders G, Gloor GB, Hill J, Parham G, **Ravel J**, Spear G, van de Wijgert J, and Reid G. 2012. Exploring a Road Map to Counter Misconceptions About the Cervicovaginal Microbiome and Disease. *Reproductive Science*. 19(11):1154-62. Published online 21 May 2012.
106. Flores R, Shi J, Gail MH, Gajer P, **Ravel J** and Goedert JJ. 2012. Association of Fecal Microbial Diversity and Taxonomy with Selected Enzymatic Functions. *PLoS ONE*. 7(6):e39745.
107. Brotman RM, Jones LL, Conrad M, Gajer P, Ault KA, Peralta L, Forney LJ, Carlton JM, Abdo Z, and **Ravel J**. 2012. Association between *Trichomonas vaginalis* and vaginal bacterial community composition among reproductive-age women. *Sexually Transmitted Diseases*. 39(10):807-812.
108. Huttenhower C, Gevers D, Knight R, Abubaker S, Badger JH, Chinwalla AT, et al., **Ravel J.**, et al. White O (HMP Consortium). 2012. Structure, function and diversity of the healthy human microbiome. *Nature*. 486:207-214.

109. Methé B, Nelson K, Pop M, Creasy HH, Giglio MG, Huttenhower C, Gevers D, Petrosino JF et al., **Ravel J**, et al., White O (HMP Consortium). 2012. A framework for human microbiome research. *Nature*. 486:215-221.
110. Nur HA, Choi SY, Eppinger M, Clark PW, Chen A, Alam M, Haley BJ, Taviani E, Hine E, Su Q, Tallon LJ, Prosper JB, Furth K, Hoq MM, Li H, Fraser-Liggett CM, Cravioto A, Huq A, **Ravel J**, Cebula TA, Colwell RR. 2012. Genomic Diversity of 2010 Haitian cholera outbreak strains. *Proceedings of the National Academy of Sciences*. 109(29):E2010-7. Published online June 18 2012.
111. **Ravel J**<sup>#</sup>, Gajer P, Fu L, Mauck CK, Koenig SSK, Sakamoto J, Motsinger-Reif AA, Doncel GF, Zeichner SL. 2012. Twice-Daily Applications of HIV Microbicides Alter the Vaginal Microbiota, *mBio* 3(6):e00370-12
112. Flores R, Shi J, Fuhrman B, Xu X, Veenstra TD, Gail MH, Gajer P, **Ravel J**, Goedert JJ. 2012. Fecal microbial determinants of fecal and systemic estrogens and estrogen metabolites: a cross-sectional study. *Journal of Translational Medicine*, 10(1):253
113. Planet PJ, Rampersaud R, Hymes SR, Whittier S, Della-Latta PA, Narechania A, Daugherty SC, Santana-Cruz I, Desalle R, **Ravel J**, Ratner AJ. 2013. Genome Sequence of the Human Abscess Isolate *Streptococcus intermedius* BA1. *Genome Announc*. 1(1). Epub 2013 Jan 31.
114. Bradford LL, **Ravel J**, Bruno V. 2013. Understanding vulvovaginal Candidiasis through a community genomics approach. *Current Fungal Infection Reports*. 7(2):126-131 Epub 2013 Apr 4
115. DiRuggiero J, Wierchos J, Robinson CK, Souterre T, **Ravel J**, Artieda O, Souza-Egipsy V and Ascaso C. 2013. Microbial colonisation of chasmoendolithic habitats in the hyper-arid zone of the Atacama Desert. *Biogeosciences*, 10(4):2439–2450. Epub 2013 Apr 12.
116. Wommack, KE and **Ravel J**. 2013. Microbiome, demystifying the role of microbial communities in the biosphere. *Microbiome*, 1(1): 1.
117. Eppinger M, Daugherty S, Agrawal S, Galens K, Sengamalay N, Sadzewicz L, Tallon L, Cebula TA, Mammel MK, Feng P, Soderlund R, Tarr PI, DebRoy C, Dudley EG, Fraser CM, **Ravel J**. 2013. Whole-genome draft sequences of 26 enterohemorrhagic *Escherichia coli* O157:H7 strains. *Genome Announcement*. Mar-Apr; 1(2): e00134-12.
118. Liu CM, Hungate BA, Tobian AA, Serwadda D, **Ravel J**, Lester R, Kigozi G, Aziz M, Galiwango RM, Nalugoda F, Contente-Cuomo TL, Wawer MJ, Keim P, Gray RH, Price LB. 2013. Male circumcision significantly reduces prevalence and load of Genital anaerobic bacteria. *mBio*. 2013 Apr 16:4(2).
119. Hoffmann DE, Fortenberry JD, **Ravel J**. 2013. Are changes to the common rule necessary to address evolving areas of research? A case study focusing on the human microbiome project. *The Journal of law, medicine & ethics : a journal of the American Society of Law, Medicine & Ethics*. 41(2):454–469.
120. Hoffmann DE, Fraser CM, Palumbo FB, **Ravel J**, Rothenberg K, Rowthorn V, Schwartz J. 2013. Probiotics: Finding the right regulatory balance. *Science*. 342(6156):314-315.
121. Hovis KM, Mojica S, McDermott JE, Pedersen L, Simhi C, Rank RG, Myers GSA, **Ravel J**, Hsia R-C, Bavoil PM. 2013.. Genus-optimized strategy for the identification of chlamydial type III secretion substrates. *Pathogens and Diseases*. Epub 2013 Jul. 19.
122. Brotman RM, Shardell MD, Gajer P, Fadrosch D, Chang K, Silver MI, Viscidi RP, Burk AE, **Ravel J**, Gravitt PE. 2014. Association between the vaginal microbiota, menopause status, and signs of vulvovaginal atrophy. *Menopause*. 21(5):450-458.
123. Yu G, Fadrosch D, Ma B, **Ravel J**, and Goedert, J. J. 2014. Anal microbiota profiles in HIV-positive and HIV-negative MSM. *AIDS*. 28(5):753–760.

124. **Ravel J**, Brotman RM, Gajer P, Ma B, Nandy M, Fadrosh DW, Sakamoto J, Koenig SSK, Fu L, Zhou Z, Hickey RJ, Schwebke JR and Forney LJ. 2013. Daily temporal dynamics of vaginal microbiota before, during and after episodes of bacterial vaginosis. *Microbiome* 1:29.
125. Robinson CK, Wierchos J, Black C, Crits-Christoph A, Ma B, **Ravel J**, Ascaso C, Artieda O, Valea S, Roldán M, Gómez-Silva B, DiRuggiero J. 2014. Microbial diversity and the presence of algae in halite endolithic communities are correlated to atmospheric moisture in the hyper-arid zone of the Atacama Desert. *Environmental Microbiology*. Dec 24. [Epub ahead of print].
126. Sanjar F, Hazen TH, Shah SA, Koenig SSK, Agrawal S, Daugherty S, Sadzewicz L, Tallon LJ, Mammel MK, Feng P, Soderlund R, Tarr PI, DebRoy C, Dudley EG, Cebula TA, **Ravel J**, Fraser CM, Rasko DA, Eppinger M. 2014. Genome sequence of *Escherichia coli* O157:H7 strain 2886-75, associated with the first reported case of human infection in the United States. *Genome Announcement*. 2(1):e01120-13.
127. Marsan D, Wommack KE, **Ravel J**, Chen F. 2014. Draft genome sequence of *Synechococcus* sp. strain CB0101, isolated from the Chesapeake Bay estuary. *Genome Announcement*. 2(1):e01111-13.
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129. Fadrosh D, Ma B, Gajer P, Sengamalay N, Ott S, Brotman RM, Ravel J. 2014. An improved dual-indexing approach for multiplexed 16S rRNA gene sequencing on the Illumina MiSeq platform. *Microbiome*. 2(1):6.
130. Feigelson HS, Bischoff K, Ardini M-AE, **Ravel J**, Gail MH, Flores R, and Goedert JJ. 2014. Feasibility of self-collection of fecal specimens by randomly sampled women for health-related studies of the gut microbiome. *BMC Research Notes*, 7(1):204.
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132. Montalvo NF, Davis J, Vicente J, Pittiglio R, **Ravel J** and Hill RT. 2014. Integration of Culture-Based and Molecular Analysis of a Complex Sponge-Associated Bacterial Community. *PLoS ONE*, 9(3):e90517.
133. **Ravel J** and Wommack KE. 2014. All hail reproducibility in microbiome research. *Microbiome*, 2(1):8.
134. Broutet N, Fruth U, Deal C, Gottlieb SL, Rees H, Bavoil P, Bolan G, Brotman R, Broutet N, Brunham RC, Cameron CE, Carlton J, Chandra-Mouli V, Chen XS, Chirenje ZM, Deal C, Dodet B, Figueroa P, Fruth U, Garnett G, Ghanem K, Gottlieb S, Gravitt P, Guillen G, Hawkes S, Hofstetter A, Jaoko W, Jerse AE, Johnston C, Low N, Mabey D, MacDonald N, Mhalu F, Meheus A, Newman L, **Ravel J**, Rees H, Rompalo AM, Rosenthal KL, Rosenthal S, Russell MW, Shattock R, Stanberry L, Timms P, Vanrompay D, Vicari A, Wi T. 2014. Vaccines against sexually transmitted infections: the way forward. *Vaccine* 32(14):1630-7.
135. Romero R, Hassan SS, Gajer P, Tarca AL, Fadrosh DW, Bieda J, Chaemsaitong P, Miranda J, Chaiworapongsa T, and **Ravel J**. 2014. The vaginal microbiota of pregnant women who subsequently have spontaneous preterm labor and delivery and those with a normal delivery at term. *Microbiome*, 2:18.
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