BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Rawls, John Franklin	Associate Professor of Cell & Molecular Physiology, and Microbiology & Immunology
eRA COMMONS USER NAME jfrawls	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Emory University, Atlanta, GA	B.S.	1996	Biology
Washington University, St. Louis, MO	Ph.D.	2001	Developmental Biology
Washington University, St. Louis, MO	Postdoctoral Training	2001-2006	Gastroenterology and Microbiology

A. PERSONAL STATEMENT

Research in my laboratory seeks to understand the genetic and environmental factors regulating intestinal physiology and energy balance. First, my laboratory uses molecular, genetic, and *in vivo* imaging approaches to study how commensal microorganisms (microbiota) interact with vertebrate hosts to regulate innate immunity and nutrient metabolism, as well as the mechanisms underlying assembly of the intestinal microbiota. We utilize the zebrafish as a host model in which host and microbial cells can be viewed and manipulated a transparent living vertebrate. We have pioneered the use of germ-free or gnotobiotic zebrafish to investigate the roles of commensal microorganisms in vertebrate development and nutrition. We are currently using these methods to investigate the bacterial signals and responsive host signal transduction pathways that regulate innate immunity and digestive physiology. Second, my laboratory is also utilizing the advantages of the zebrafish system to investigate mechanisms underlying the formation and function of white adipose tissues (WAT). We have pioneered methods for *in vivo* imaging of zebrafish WAT, and we are currently using these techniques to explore the developmental and physiologic processes regulating WAT morphogenesis and energy storage.

B. POSITIONS AND HONORS

Positions and Employment:

1996-2001 Graduate Student, Program in Developmental Biology, Department of Genetics, Washington University, St. Louis, MO (Mentor: Stephen L. Johnson, Ph.D.).
2001-2006 Postdoctoral Research Fellow, Center for Genome Sciences, Department of Molecular Biology & Pharmacology, Washington University, St. Louis, MO (Mentor: Jeffrey I. Gordon, M.D.).
2006-2012 Assistant Professor, Department of Cell & Molecular Physiology, University of North Carolina, Chapel Hill, NC.
2009-2012 Assistant Professor, Department of Microbiology & Immunology, University of North Carolina, Chapel Hill, NC.
2012-present Associate Professor, Department of Cell & Molecular Physiology, University of North Carolina, Chapel Hill, NC.
2012-present Associate Professor, Department of Microbiology & Immunology, University of North Carolina, Chapel Hill, NC.

Honors and Awards:

1995 Summer Undergraduate Research Fellow, Emory University, Atlanta, GA.
2001 Spencer T. and Ann W. Olin Medical Scientist Fellow, Washington University, St. Louis, MO.
2001 Victor Hamburger Prize in Developmental Biology, Washington University, St. Louis, MO.
2002-2005 NIH Ruth L. Kirschstein Individual National Research Service Award.
2006-2010 NIH Mentored Research Scientist Development Award.

2008-2012 Pew Scholar in the Biomedical Sciences, Pew Charitable Trusts.
2009, 2010 Kavli Fellow, National Academy of Science's Kavli Frontiers of Science Program.

Other Experience and Professional Memberships:

2003, 2008 Ad hoc reviewer, National Science Foundation.
2006-present Member, Center for Gastrointestinal Biology & Disease, UNC-CH (Member of Executive Committee since 2010).
2006-present Member, Curriculum in Genetics & Molecular Biology, UNC-CH.
2006-present Director, Zebrafish Aquaculture Core Facility, UNC-CH.
2007-present Executive Committee Member, Microbiome Core Facility, UNC-CH.
2007-present Member, Nutrition Obesity Research Center, UNC-CH.
2008-present Associate Editor, *Gut Microbes*.
2009 Reviewer, NIH Challenge Grants in Health and Science Research (RC1), Special Emphasis Panel/Scientific Review Group 2009/10 ZRG1 DKUS-A (58).
2010 Ad hoc reviewer, Integrated Mechanisms of Inflammation Committee, French National Research Agency (ANR).
2010 Ad hoc reviewer, Animal Systems, Health and Wellbeing Committee, UK Biotechnology and Biological Sciences Research Council (BBSRC).
2010-present Member, Lineberger Comprehensive Cancer Center, UNC-CH.
2011 Member, NIGMS Dynamics of Host-Associated Microbial Communities, Special Emphasis Panel/Scientific Review Group 2011/10 ZGM1 GDB-2 (MC).
2011-present Member, McAllister Heart Institute, UNC-CH.

C. SELECTED PEER-REVIEWED PUBLICATIONS

1. Bear, J.E., **Rawls, J.F.**, and Saxe, C.L. III. (1998) SCAR, a WASP-related protein, isolated as a suppressor of receptor defects in late *Dictyostelium* development. ***J. Cell Biol.*** 142(5): 1325-1335. [PMCID: PMC2149354]

2. Parichy, D.M., **Rawls, J.F.**, Pratt, S.J., Whitfield, T.T., and Johnson, S.L. (1999) Zebrafish *sparse* corresponds to an orthologue of c-*kit* and is required for the morphogenesis of a subpopulation of melanocytes, but is not essential for hematopoeisis or primordial germ cell development. ***Development*** 126(15): 3425-3436. Cover article.

3. **Rawls, J.F.**, and Johnson, S.L. (2000) Zebrafish *kit* mutation reveals primary and secondary regulation of melanocyte development during fin stripe regeneration. ***Development*** 127(17): 3715-3724.

4. Parichy, D.M., Mellgren, E.M., **Rawls, J.F.**, Lopes, S., Kelsh, R.N., and Johnson, S.L. (2000) Mutational analysis of *endothelin receptor b1* (*rose*) during neural crest and pigment pattern development in the zebrafish, *Danio rerio*. ***Dev. Biol.*** 227(2): 294-306.

5. **Rawls, J.F.**, Mellgren, E.M., and Johnson, S.L. (2001) How the zebrafish gets its stripes. ***Dev. Biol.*** 240(2): 301-314.

6. **Rawls, J.F.**, and Johnson, S.L. (2001) Requirements for the *kit* receptor tyrosine kinase during regeneration of zebrafish fin melanocytes. ***Development*** 128(11): 1943-1949.

7. **Rawls, J.F.**, and Johnson, S.L. (2003) Temporal and molecular separation of the *kit* receptor tyrosine kinase's roles in melanocyte migration and survival. ***Dev. Biol.*** 262(1): 152-161. Highlighted in *STKE*.

8. **Rawls, J.F.**, Frieda, M.R., McAdow, A.R., Gross, J.P., Clayton, C.M., Heyen, C.K., and Johnson, S.L. (2003) Coupled mutagenesis screens and genetic mapping in zebrafish. ***Genetics*** 163(3): 997-1009. [PMCID: PMC1462478]

9. **Rawls, J.F.**, Samuel, B.S., and Gordon, J.I. (2004) Gnotobiotic zebrafish reveal evolutionarily conserved responses to the gut microbiota. ***Proc. Natl. Acad. Sci. U.S.A.*** 101(13): 4596-4601. [PMCID: PMC384792] Cover article; highlighted in *Microbe*, *ScienceNow*, and *PNASOnline*.

10. **Rawls, J.F.**, Mahowald, M.A., Ley, R.E., and Gordon, J.I. (2006) Reciprocal gut microbiota transplants from zebrafish and mice to germ-free recipients reveal host habitat selection. ***Cell*** 127(2): 423-433. Cover article; highlighted in *Cell*.

11. **Rawls, J.F.**, Mahowald, M.A., Goodman, A.L., Trent, C.M., and Gordon, J.I. (2007) *In vivo* imaging and genetic analysis link bacterial motility and symbiosis in the zebrafish gut. ***Proc. Natl. Acad. Sci. U.S.A.*** 104(18): 7622-7627. [PMCID: PMC1855277]

12. **Rawls, J.F.** (2007) Enteric infection and inflammation alter gut microbial ecology. ***Cell Host & Microbe*** 2(2): 73-74.

13. Pham, L.N., Kanther, M., Semova, I., and **Rawls, J.F.** (2008) Methods for generating and colonizing gnotobiotic zebrafish. ***Nature Protocols*** 3(12): 1862-1875. [PMCID: PMC2596932]

14. Camp, J.G., Kanther, M., Semova, I., and **Rawls, J.F.** (2009) Patterns and scales in gastrointestinal microbial ecology. ***Gastroenterology*** 136(6): 1989-2002.

15. Flynn, E.J., Trent, C.M., and **Rawls, J.F.** (2009) Ontogeny and nutritional control of adipogenesis in zebrafish (*Danio rerio*). ***J. Lipid Res.*** 50(8): 1641-1652. [PMCID: PMC2724053] Cover article.

16. Volkman, H.E., Pozos, T.C., Zheng, J., Davis, J.M., **Rawls, J.F.**, and Ramakrishnan, L. (2010) Tuberculous granuloma induction via interaction of a bacterial secreted protein with host epithelium. ***Science*** 327(5964): 466-469. Highlighted in *Science* and *Cell Host & Microbe*.

17. Kanther, M., and **Rawls, J.F.** (2010) Host-microbe interactions in the developing zebrafish. ***Curr. Opin Immunol.*** 22: 10-19. [PMCID: PMC3030977]

18. Shen, X.J., **Rawls, J.F.**, Randall, T., Burcal, L., Mpande, C.N., Jenkins, N., Jovov, B., Abdo, Z., Sandler, R.S., and Keku, T.O. (2010) Molecular characterization of mucosal adherent bacteria and associations with colorectal adenomas. ***Gut Microbes*** 1(3):1-10. [PMCID: PMC2927011] Cover article.

19. Kanther, K., Sun. S., Mühlbauer, M., Mackey, L.C., Flynn, E.J., Bagnat, M., Jobin, C., and **Rawls, J.F.** (2011) Microbial colonization induces dynamic temporal and spatial NF-κB responses in gnotobiotic zebrafish. ***Gastroenterology*** 141(1):197-207.

20. Roeselers, G., Mittge, E.K., Stephens, W.Z., Parichy, D.M., Cavanaugh, C.M., Guillemin, K., and **Rawls, J.F.** (2011) Evidence for a core gut microbiota in the zebrafish. ***ISME Journal*** doi:10.1038/ismej.2011.38. Cover article.

21. Milligan-Myhre, K., Charette, J., Phennicie, R., Stephens, W.Z., **Rawls, J.F.**, Guillemin, K., and Kim, C.H. (2011) Study of host-microbe interactions in zebrafish. ***Method. Cell Biol.*** 105: 87-116.

22. Minchin, J.E.N., and **Rawls, J.F.** (2011) In vivo analysis of white adipose tissue in zebrafish. ***Method. Cell Biol.*** 105: 63-86.

23. Camp, J.G., Jazwa, A.L., Trent, C.M, and **Rawls, J.F.** (2012) Intronic cis-regulatory modules mediate tissue-specific and microbial control of *angptl4/fiaf* transcription. ***PLoS Genetics*** 8(3): e1002585.

24. Wong, S., and **Rawls, J.F.** (2012) News & Views: Intestinal microbiota composition in fishes is influenced by host ecology and environment. ***Molec. Ecol.*** (in press).

25. Sanapareddy, N., Legge, R., Jovov, B., McCoy, A., Burcal, L., Araujo-Perez, F., Randall, T.A., Galanko, J., Benson, A., Sandler, R.S., **Rawls, J.F.**, Abdo, Z., Fodor, A.A., and Keku, T.O. (2012) Increased rectal microbial richness is associated with the presence of colorectal adenomas in humans. ***ISME Journal*** (in press).

26. Wong, S., and **Rawls, J.F.** (2012) News & Views: Intestinal microbiota composition in fishes is influenced by host ecology and environment. ***Molec. Ecol.*** (in press).

27. Cocchiaro, J.L., and **Rawls, J.F.** (2012) Microgavage of the larval zebrafish intestine. ***J Vis Exp*** (in press)

28. McFall-Ngai, M., Hadfield, M., Bosch, T., Carey, H., Domazet-Loso, T., Douglas, A., Dubilier, N., Eberl, G., Fukami, T., Gilbert, S., Hentschel, U., King, N., Kjelleberg, S., Knoll, A., Kremer, N., Mazmanian, S., Metcalf, J., Nealson, K., Pierce, N., **Rawls, J.**, Reid, A., Ruby, N., Rumpho, M., Sanders, J., Tautz, D., and Wernegreen, J. (2012) Animals in a bacterial world: a new imperative for the life sciences. ***Science*** (in press).

D. RESEARCH SUPPORT

Ongoing Research Support:

USPHS 5 R01 DK081426-04 Rawls (PI) 07/01/2008-06/30/2013
NIH/NIDDK
Microbial regulation of host nutrient metabolism
The major goals of this project are to identify the bacterial and host factors that regulate expression of Fiaf/Angptl4 in the intestine.

The Pew Charitable Trust Rawls (PI) 07/01/2008-06/30/2012
Pew Scholars Program in the Biomedical Sciences
Genetic analysis of commensal host-bacterial interactions in the zebrafish intestine
This award supports the Principal Investigator's overall research program.

USPHS 5 R01 CA136887-03 Keku (PI) 04/01/2009-03/31/2014
NIH/NCI
Intestinal microbiota, diet and risk of colorectal adenomas
We propose to test the hypothesis that adherent bacteria (mucosa-associated) are linked with elevated risk of colorectal adenoma and that these bacteria modulate the association between diet, inflammation and colorectal adenomas.
Role: Co-Investigator

USPHS 5 R01 GM095385-02 Bohannan, Guillemin, Rawls (Multi-PI) 12/06/2010 - 11/30/2014
NIH/NIGMS
Microbial ecology of the zebrafish intestine
The major goals of this project are to (1) determine the relative importance of host selection and stochastic processes in the assembly of the gut microbiota, (2) determine the relative importance of diet and the immune system in host selection of the gut microbiota, and (3) define the requirements for microbial colonization of the zebrafish gut.
Role: Principal Investigator (Multi-PI)

11POST7360004 Minchin (PI) 07/01/2011-06/30/2013
American Heart Association, Mid-Atlantic Affiliate
In vivo cell lineage analysis and morphogenesis of white adipose tissue in zebrafish

The major goal of this postdoctoral fellowship is to support Dr. James Minchin's research into the cellular interactions and lineage contributions that contribute to white adipose depot morphogenesis in the zebrafish.
Role: Sponsor and Mentor

USPHS 1 R56 DK091356-01 Rawls (PI) 07/05/2011-06/30/2012
NIH/NIDDK
Mechanisms of adipose depot morphogenesis in zebrafish
The major goals of this project are to (1) elucidate the cellular mechanisms underlying adipose depot morphogenesis in live animals, and (2) identify the in vivo cell lineage contributions to developing adipose depots.
Role: Principal Investigator

USPHS 1 F32 DK094592-01 Cocchiaro (PI) 09/01/2011 – 08/30/2013
NIH/NIDDK
Microbial regulation of macromolecule absorption in the zebrafish intestine
The major goal of this postdoctoral fellowship application is to support Dr. Jordan Cocchiaro's research into the cellular and microbial mechanisms regulating macromolecular absorption in the intestinal epithelium.
Role: Sponsor and Mentor