

BIOGRAPHICAL SKETCH

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NAME: Skinner, Michael K.

eRA COMMONS USER NAME (credential, e.g., agency login): skinner

POSITION TITLE: Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Warner Pacific College, Portland, OR	A.S.	06/77	General Science
Reed College, Portland, OR	B.A.	06/79	Chemistry
Washington State University, Pullman, WA	Ph.D.	06/82	Biochemistry
University of Toronto, Toronto, Ont., Canada	Post-doc	1984	Biochem/Physiol.
Rosetta Inpharmatics/Merck, Seattle WA	Sabbatical	2008	Bioinformatics

A. Personal Statement. The Skinner laboratory has operated for over 30 years with over 30 years of research in gonadal development and systems biology and 20 years in environmental epigenetics research. The ability of environmental factors to promote an epigenetic transgenerational inheritance of adult onset disease phenotypes was first described by the Skinner laboratory. More recently many of the current state of the art epigenetic technologies have been in part developed and utilized by the Skinner laboratory to elucidate the molecular mechanisms involved in the epigenetic transgenerational inheritance phenomenon. Therefore, Dr. Skinner and his laboratory are well qualified to perform the proposed research. Dr. Michael Skinner has trained over 116 students and fellows and published over 300 publications.

Jirtle RL and MK Skinner (2007) Environmental Epigenomics and Disease Susceptibility. *Nature Genetics Rev.* 8:253-262. PMID: 16973726

Skinner MK (2014) A new kind of inheritance. *Scientific American* 311(2)44-41. PMID: 25095468

Hanson MA, Skinner MK. (2016) Developmental origins of epigenetic transgenerational inheritance. *Environ Epigenet.* 2016;2(1). PMID: 27390622

Nilsson E, Sadler-Riggelman I, Skinner MK (2018) Environmentally Induced Epigenetic Transgenerational Inheritance of Disease. *Environmental Epigenetics.* 4(2):1-13, dvy016. PMID: 30038800

B. Positions and Honors.**Positions:**

2010-Present Eastlick Distinguished Professor, School of Biological Sciences, Washington State University, Pullman, Washington.

2002-2008 Founder and Director, Center for Integrated Biotechnology, Washington State University, Pullman, Washington.

1996-2008 Founder and Director, Center for Reproductive Biology, Washington State University, Pullman, Washington.

1996-2010 Professor, School of Molecular Biosciences, Washington State University, Pullman, Washington.

1991-1996 Member, the Reproductive Endocrinology Center and the Developmental Biology Program in Biological Sciences, University of California, San Francisco.

1991-1996 Associate Professor, Department of Obstetrics, Gynecology and Reproductive Sciences and Department of Physiology, University of California, San Francisco, CA.

1985-1991 Assistant Professor, Department of Pharmacology, Vanderbilt University, School of Medicine, Nashville, Tennessee.

Honors: (Selected Past 5 Years)

- 2016 Invited by Elsevier Press to develop and act as the Editor-in-Chief of the Encyclopedia of Reproduction, Second Edition, involving 6 volumes and over 600 chapters which was published in July 2018.
- 2016 Washington State University Distinguished Faculty Address and Outstanding Career Achievement Award
- 2015 Invited by Oxford University Press to establish the journal Environmental Epigenetics and act as the Founding Editor-in-Chief.
- 2014 Invited TEDxRainier Talk, Seattle, WA, (One of the largest worldwide)
<https://www.youtube.com/watch?v=f1Pf5S8Nbfk>
- 2014 Awarded Eastlick Distinguished Professorship
- 2014 Invited Featured article in Scientific American, "A New Kind of Inheritance".
- 2013 Awarded Smithsonian 2013 "American Ingenuity Award", in the area of the Natural Sciences, Washington, D.C. With feature article in Smithsonian Magazine and documentary on the Smithsonian Channel.
- 2013 Fifth Annual Gregor Stoddard Visiting Professorship and Lecturer, Department of Pediatrics, University of Colorado, School of Medicine, Aurora, CO.
- 2012 Elected Fellow of the American Association for the Advancement of Science (AAAS).
- 2012 Brasel Basic Science Lectureship, Los Angeles, Biomedical Research Institute at Harbor-UCLA, Los Angeles, CA.
- 2012 The DH Ruttenberg Visiting Professorship in Endocrine Disruption and Child Health, Mt. Sinai School of Medicine. New York, NY.

C. Contributions to Science.

Selected peer-reviewed publications relevant to application (Selected from over 300 publications):

<http://www.ncbi.nlm.nih.gov/sites/myncbi/1PiX8IHGveyAh/bibliography/41624451/public/?sort=date&direction=ascending>.

(1) Investigation of environmentally induced epigenetic transgenerational inheritance of disease and phenotypic variation.

Anway M, Cupp AS, Uzumcu M and MK Skinner (2005) Epigenetic transgenerational actions of endocrine disruptors and male fertility. *Science* 308:1466-1469. PMID: 15933200

Senior author that designed and oversaw the research. This is the first example of an environmentally induced epigenetic transgenerational inheritance of disease. The first model of non-genetic inheritance with an epigenetic mechanism documented. The most highly cited research manuscript in the reproductive sciences. The extensive press can be seen at <http://skinner.wsu.edu/pressinfo.html>

Skinner MK, Guerrero-Bosagna C, Haque MM. (2015) Environmentally induced epigenetic transgenerational inheritance of sperm epimutations promote genetic mutations. *Epigenetics*. 10(8):762-71. PMID: 26237076

McBirney M, King SE, Pappalardo M, Houser E, Unkefer M, Nilsson E, Sadler-Riggelman I, Beck D, Winchester P, Skinner MK. (2017) Atrazine induced epigenetic transgenerational inheritance of disease, lean phenotype and sperm epimutation pathology biomarkers. *PLoS One*. 12(9):1-37, e0184306. PMID: 28931070

Nilsson E, Sadler-Riggelman I, Skinner MK (2018) Environmentally Induced Epigenetic Transgenerational Inheritance of Disease. *Environmental Epigenetics*. 4(2):1-13, dvy016. PMID: 30038800

(2) Role of epigenetic transgenerational inheritance in the etiology of disease.

Mohan Manikkam, Carlos Guerrero-Bosagna, Rebecca Tracey, Md. M. Haque and Michael K. Skinner (2012) Transgenerational Actions of Environmental Compounds on Reproductive Disease and Identification of Epigenetic Biomarkers of Ancestral Exposures. *PLoS ONE* 7(2):1-12, e31901. PMID: 22389676

Senior author and designed the experiments. This is the first report of exposure specific epimutations in the germline suggesting epigenetics can provide diagnostic markers for exposures and later life disease. The first genome-wide analysis of transgenerational germline epimutations. One of the most highly accessed papers in the field. The extensive press can be seen at <http://skinner.wsu.edu/toxnews/projectnews.html>

McBirney M, King SE, Pappalardo M, Houser E, Unkefer M, Nilsson E, Sadler-Riggelman I, Beck D, Winchester P, Skinner MK. (2017) Atrazine induced epigenetic transgenerational inheritance of disease, lean phenotype and sperm epimutation pathology biomarkers. *PLoS One*. 12(9):1-37, e0184306. PMID: 28931070

Skinner MK, Manikkam M, Haque Md., Zhang B, Savenkova M (2012) Epigenetic Transgenerational Inheritance of Somatic Transcriptomes and Epigenetic Control Regions. *Genome Biology* 3;13(10):R91. PMID: 23034163

Nilsson E, King SE, McBirney M, Kubsad D, Pappalardo M, Beck D, (2018) Vinclozolin induced epigenetic transgenerational inheritance of pathologies and sperm epimutation biomarkers for specific diseases. *Plos One* 13(8):1-29, e0202662. PMID: 30157260

(3) Investigate the genomic features of transgenerational epimutations.

Skinner MK, Manikkam M, Tracey R, Nilsson E, Haque Md. M, and Guerrero-Bosagna C (2013) Ancestral DDT Exposure Promotes Epigenetic Transgenerational Inheritance of Obesity. *BMC Medicine* 11:228. PMID: 24228800

This was one of the first reports of environmental toxicant promoting transgenerational obesity. The germline epimutations were also identified in this paper. One of the highly accessed papers of *BMC Medicine*. Press on the paper can be seen at <http://skinner.wsu.edu/toxnews/projectnews.html>

Skinner MK and Guerrero-Bosagna C (2014) Role of CpG Deserts in the Epigenetic Transgenerational Inheritance of Differential DNA Methylation Regions. *BMC Genomics* 15:692. PMID: 25142051

Haque M, Holder, LB, Skinner MK (2015) Genome-Wide Locations of Potential Epimutations Associated with Environmentally Induced Epigenetic Transgenerational Inheritance of Disease Using a Novel Machine Learning Prediction Approach. *Plos One* 10(11):1-25, e0142274. PMID: 26571271

Haque MM, Nilsson EE, Holder LB, Skinner MK (2016) Genomic Clustering of differential DNA methylated regions (epimutations) associated with the epigenetic transgenerational inheritance of disease and phenotypic variation. *BMC Genomics* 17:418. PMID: 27245821

(4) Role of environmentally induced epigenetic transgenerational inheritance in evolutionary biology.

Skinner MK, Guerrero-Bosagna C, Haque M, Knutie S, Koop J, and Clayton D (2014) Epigenetics and the Speciation and Evolution of Darwin's Finches. *Genome Biology & Evolution* 24;6(8):1972-89. PMID: 25062919

First author and designed experiments and wrote the manuscript. Provides the first phenotypic associations between related species to suggest a potential role of epigenetics in evolutionary biology. One of the most highly accessed papers for this journal. Press can be seen at <http://skinner.wsu.edu/toxnews/projectnews.html>

Skinner MK (2015) Environmental Epigenetics and a Unified Theory of the Molecular Aspects of Evolution: A Neo-Lamarckian Concept that Facilitates Neo-Darwinian Evolution. *Genome Biol Evol* 7(5): 1296-1302. PMID: 25917417

McNew SM, Beck D, Sadler-Riggelman I, Knutie SA, Koop JAH, Clayton DH, Skinner MK. (2017) Epigenetic variation between urban and rural populations of Darwin's finches. *BMC Evol Biol*. 17(1):183. PMID: 28835203

Thorson JLM, Smithson M, Beck D, Sadler-Riggelman I, Nilsson E, Dybdahl M, Skinner MK (2017) Epigenetics and adaptive phenotypic variation between habitats in an asexual snail. *Scientific Reports*. 7(1):14139. PMID: 29074962

(5) Elucidation of the molecular mechanisms of transgenerational epigenetic inheritance.

Skinner MK, Ben Maamar M, Sadler-Riggelman I, Beck D, Nilsson E, McBirney M, Klukovich R, Xie Y, Tang C, Wei Yan (2018) Alterations in sperm DNA methylation, non-coding RNA and histone retention associate with DDT-induced epigenetic transgenerational inheritance of disease. *BMC Epigenetics and Chromatin* 11:8, 1-24. PMID: 29482626

First author and designed the research and wrote the paper. The first system biology analyses of combined DNA methylation, ncRNA and histone retention associated with the epigenetic transgenerational inheritance of disease. One of the first epigenetic systems biology approaches links to epigenetic transgenerational phenomenon. Highly accessed paper in field.

Ben Maamar M, Sadler-Riggelman I, Beck D, Skinner MK (2018) Epigenetic Transgenerational Inheritance of Altered Sperm Histone Retention Sites. *Scientific Reports* 28;8(1):5308. PMID: 29593303

Schuster A, Skinner MK, Yan W. (2016) Ancestral vinclozolin exposure alters the epigenetic transgenerational inheritance of sperm small noncoding RNAs. *Environ Epigenet*. 2(1) 1-10, pii: dvw001. PMID: 27390623

Ben Maamar M, Sadler-Riggelman I, Beck D, McBirney M, Nilsson E, Klukovich R, Xie Y, Tang C, Yan W, Skinner MK (2018) Alterations in sperm DNA Methylation, Non-Coding RNA expression, and histone retention mediate Vinclozolin induced epigenetic transgenerational inheritance of disease. *Environmental Epigenetics* 4(2):1-19, dvv101. PMID: 29732173

D. Research Support.

Active

NIH R01 ES012974-11, 4/1/2014-3/31/2019, "Epigenetic Transgenerational Endocrine Disruptor Actions" This project deals with the examination of the epigenetic actions of the endocrine disruptor vinclozolin on testis development and male fertility. This grant investigates the DNA methylation mechanisms involved in the transgenerational phenomena. Principal Investigator: Dr. Michael K. Skinner.

NIH 5R01CA175216 4/1/2018-3/31/2023 "Testicular effects of modern chemotherapy regimens in osteosarcoma survivors" Assess the impacts of pubertal boys exposure on the sperm epigenetics of adult human males. Co-Investigator: Dr. Michael K. Skinner.

Pending

NIH R01ES029473, 07/01/2018-06/30/2023, "Preconception Exposures and Epigenetic Inheritance" Impacts of pubertal male chemotherapy exposure on generational sperm epigenetics and transgenerational disease. Principal Investigator: Michael K. Skinner, \$1,912,500

2019-2024 NIH11R01HD099092-01 "Chemotherapy and Epigenetic Inheritance" Principal Investigator: Michael K. Skinner, \$2,612,189.00

2019-2024 NIH Grant# 364206 "Great Lakes Superfund Research Center: PCBs and Methylmercury-- Environmental and Epigenetic Transgenerational Impacts"

"Project 1" Principal Investigator: Michael K. Skinner, \$2,508,126.

"Genomics and Bioinformatics Core" Principal Investigator: Michael K. Skinner, \$600,525

No overlap with any of the Active or Pending grants with the current grant application, as none are involved in obesity etiology.