Leslie B. Vosshall, Ph.D.

VICE PRESIDENT AND CHIEF SCIENTIFIC OFFICER, HOWARD HUGHES MEDICAL INSTITUTE • ROBIN CHEMERS NEUSTEIN PROFESSOR, LABORATORY OF NEUROGENETICS AND BEHAVIOR

The Vosshall lab studies how complex behaviors are controlled by cues from the environment and modulated by the internal physiological state. Working with the dengue and Zika vector mosquito, *Aedes aegypti*, Vosshall's research has yielded new knowledge about how sensory stimuli are perceived and processed.

Vosshall's lab takes a multidisciplinary approach spanning neurobiology, behavior, genetics, and genomics. The early focus of the lab was to study how the brain interprets olfactory signals associated with food, danger, or potential mating partners using three model organisms: flies, mosquitoes, and humans. The lab identified the genes that mediate odor and carbon dioxide perception in insects, including *Orco*, a member of the odorant receptor gene family, which is uniquely expressed in a majority of olfactory sensory neurons and highly conserved across insect evolution. The researchers pinpointed *Orco* as a potential target for chemical inhibitors, which could potentially be used to fight mosquito-transmitted infectious diseases.

Beginning in 2008, the group established a mosquito genetics research program to understand host-seeking and blood-feeding behaviors in the mosquito. They focus on *Ae. aegypti*, the mosquito associated with yellow fever, dengue, and Zika viruses. These mosquitoes have evolved an intense attraction to human body odor, body heat, and carbon dioxide—the gas exhaled in human breath—and serve as deadly vectors of infectious disease. Olfactory cues guide mosquitoes toward humans, from which female mosquitoes derive the blood they need to complete egg development. Although a genome for this mosquito has been available since 2007, it is highly fragmented. In 2018, Vosshall and colleagues led an international effort to produce a complete genome assembly that is catalyzing investigations throughout the world.

The Vosshall lab has also developed genome-editing techniques for targeted mutagenesis in *Ae. aegypti* using the CRISPR-Cas9 system to enable the tracing of neural pathways and functional imaging of circuits activated by sensory cues. The establishment of loss-of-function genetics in mosquitoes has opened up new paths of investigation in vector biology, including the neurobiology of host-seeking and egg-laying, and the mechanisms of insect repellents. A particular focus is to understand why some humans are more attractive to *Ae. aegypti* than others, and the role of the skin microbiome in this differential attraction, and how insect repellents work to prevent biting behavior. Mosquitoes transmit deadly infectious diseases to humans both in the United States and around the world, and understanding the rules by which these animals target human hosts will enable the development of tools to reduce their capacity to spread disease.

EDUCATION

A.B. in biochemistry, 1987
Columbia University

Ph.D., 1993
The Rockefeller University

POSTDOC

Columbia University, 1993–1997

POSITIONS

Associate Research Scientist, 1997–2000
Columbia University

Assistant Professor, 2000–2006
Associate Professor, 2006–2010
Professor, 2010–
Associate Director, Kavli Neural Systems Institute, 2015–2016
Director, Kavli Neural Systems Institute, 2016–2022
The Rockefeller University

Investigator, 2008–2022
Vice President and Chief Scientific Officer, 2022–
Howard Hughes Medical Institute

AWARDS

Arnold and Mabel Beckman Foundation Young Investigator, 2001

NSF Career Award, 2001

McKnight Scholar, 2001

John Merck Fund Scholar, 2002

Presidential Early Career Award for Scientists and Engineers, 2002

New York City Mayor's Award for Excellence in Science and Technology, 2005

Irma T. Hirschl/Monique Weill-Caulier Trust Research Award, 2005

The Rockefeller University Distinguished Teaching Award, 2005

Blavatnik Award, 2007

Lawrence C. Katz Prize, Duke University, 2009

Dart/NYU Biotechnology Alumnae Achievement Award, 2010

Gill Young Investigator Award, 2011

Pradel Research Award, National Academy of Sciences, 2020

W. Alden Spencer Award, 2022

Perl-UNC Neuroscience Prize, 2023

Dickson Prize in Medicine, 2024

HONORARY SOCIETIES

National Academy of Sciences

National Academy of Medicine

Fellow, American Association for the Advancement of Science

American Philosophical Society

SELECTED PUBLICATIONS

Venkataraman, K. et al. Two novel, tightly linked, and rapidly evolving genes underlie *Aedes aegypti* mosquito reproductive resilience during drought. *ELife* 12, e80489 (2023).

De Obaldia, M.E. et al. Differential mosquito attraction to humans is associated with skin-derived carboxylic acid levels. *Cell* 185, 4099–4116 (2022).

Herre, M. and Goldman, O.V. et al. Non-canonical odor coding in the mosquito. *Cell* 185, 3104–3123 (2022).

Duvall, L.B. et al. Small-molecule agonists of *Ae. aegypti* neuropeptide Y receptor block mosquito biting. *Cell* 176, 687–701 (2019).

Matthews, B.J. et al. Improved reference genome of *Aedes aegypti* informs arbovirus vector control. *Nature* 563, 501–507 (2018)

BIOCHEMISTRY, BIOPHYSICS, CHEMICAL BIOLOGY, AND STRUCTURAL BIOLOGY   CANCER BIOLOGY   CELL BIOLOGY   **GENETICS AND GENOMICS**   IMMUNOLOGY, VIROLOGY, AND MICROBIOLOGY   MECHANISMS OF HUMAN DISEASE   **NEUROSCIENCES AND BEHAVIOR**   ORGANISMAL BIOLOGY AND EVOLUTION   PHYSICAL, MATHEMATICAL, AND COMPUTATIONAL BIOLOGY   STEM CELLS, DEVELOPMENT, REGENERATION, AND AGING