PRESIDENT'S LECTURE SERIES

Daniel Siegwart, Ph.D.

Innovation in Nanotechnology: From Vaccines to Novel Genetic Disease Treatment

Thursday, Feb. 13, 2025
4 p.m. Lecture, Reception to Follow
Tom and Lula Gooch Auditorium
utsouthwestern.edu/pls

UTSouthwestern
Medical Center

ABOUT THE PRESIDENT'S LECTURE SERIES

The President's Lecture Series was established to recognize the importance of UT Southwestern staff in enabling the Medical Center to achieve its mission and goals. The faculty excels in education, research, and patient care only with the contributions of staff, whose work, directly and indirectly, supports faculty endeavors.

The lectures selected for this series provide an opportunity for the employees of UT Southwestern to learn more about the research discoveries, clinical advances, and other contributions of the Medical Center's most accomplished scientists, physicians, and senior leaders. Three times each academic year, leading experts present a President's Lecture, discussing in nontechnical terms the basics of their research and clinical programs and their implications for good health and medical care.

The President's Lecture Series is offered in appreciation and respect for the work and dedication of UT Southwestern staff.

Daniel K. Podolsky, M.D.
President
UT Southwestern Medical Center

ABOUT THE LECTURE

Genetic medicines in which molecules of DNA or RNA are the therapeutic agents hold enormous promise for treating diseases ranging from genetic or inflammatory disorders to cancer. Although several of these therapies are currently being investigated or used to treat dozens of maladies, getting them precisely to where treatment is needed in the body has been challenging.

Over the last decade, Daniel Siegwart, Ph.D., has made numerous strides toward delivery of nanoparticles carrying genetic medicines. His research has led to more than 300 publications and patents.

In 2020, Dr. Siegwart and his colleagues reported in *Nature Nanotechnology* the first system for targeted delivery named Selective Organ Targeting (SORT). By adding an extra component to the usual recipe for lipid nanoparticles, the researchers could adjust the physical properties of these drug carriers at will. The small but significant changes directed delivery of nanoparticles to specific locations in the body – including the lungs, spleen, liver, bone marrow, lymph nodes, and cancerous tumors – where they released their genetic cargo inside cells. As described in *Science,* this approach corrected mutations that cause cystic fibrosis.

Other groundbreaking research from Dr. Siegwart's team has included developing nanoparticles that go deep into tumors to transport drugs and activate an immune response, effectively stopping the growth and spread of liver and ovarian tumors in mice. Another study led by Dr. Siegwart, published in *Proceedings of the National Academy of Sciences,* demonstrated how genetic material tagged with a "cellular ZIP code" could successfully treat psoriasis and various forms of cancer in mice models. Using the body as a biofactory and pharmacy could someday allow patients to receive such treatments at home instead of in a hospital.

"Simply put, I love ideas," Dr. Siegwart said. "It's just really fun and exciting to dream up new ideas, work on them with my colleagues, and use our creativity to pursue solutions that can address medical problems."

ABOUT THE SPEAKER

Daniel Siegwart, Ph.D., Professor of Biomedical Engineering, Biochemistry, and in the Harold C. Simmons Comprehensive Cancer Center, is recognized for developing lipid nanoparticles that serve as carriers for genetic medicines. He and his colleagues have shown in animal models that this approach can deliver genetic instructions that prompt cells to produce therapeutic proteins, turning them into living drug factories. This method can also be used to deliver therapies that fix the genomes of cells, correcting the root cause of genetic diseases.

Dr. Siegwart's breakthrough work has been recognized recently with his election to the National Academy of Inventors. His patents and pending patent applications worldwide cover several fields, including chemical compound compositions, drug and gene delivery systems, methods of targeting nanoparticles to organs and cells, and engineered nucleic acid sequences. He has co-founded multiple biotechnology companies. In addition, he was recently selected as a National Academy of Medicine (NAM) Emerging Leader in Health and Medicine Scholar – one of only 10 scientists and physicians from across the United States appointed to three-year terms who will be addressing topics shaping the future of health and medicine for the NAM.

Dr. Siegwart, who joined the UT Southwestern faculty in 2012, holds the W. Ray Wallace Distinguished Chair in Molecular Oncology Research and serves as the Director of the Program in Genetic Drug Engineering, Director of the Drug Delivery Program in Biomedical Engineering, and is co-Leader of the Chemistry and Cancer Program in the Simmons Cancer Center.

He majored in biochemistry at Lehigh University and studied as a research fellow at the University of Tokyo. After earning his Ph.D. in chemistry from Carnegie Mellon University, he completed a postdoctoral fellowship at the Massachusetts Institute of Technology in the laboratory of renowned engineer Robert Langer, Sc.D.

ABOUT THE NEXT SPEAKER

Thursday,
April 24, 2025

Ondine Cleaver, Ph.D., Professor of Molecular Biology, is known for her work studying the fundamental processes by which cells become specialized to form organs and tissues. Understanding these basic developmental principles is crucial to current efforts to generate bioengineered tissues. Disruptions in these processes can also lead to a wide range of diseases, from congenital malformations to cancer.

Over the last 20 years, Dr. Cleaver's research has significantly advanced our understanding of the molecular and cellular mechanisms driving blood vessel development and organogenesis. Her lab has revealed key insights into how progenitor cells assemble into functional tissues, focusing on blood vessels and organs like the pancreas, kidney, and lung.

More recently, her team has been using organoids – tiny, lab-grown versions of organs – to study how organs develop and to explore ways to recreate these processes using bioengineering approaches. Her work aims to improve human health by advancing our understanding of blood vessel development, stem cell environments, and diseases like diabetes, with the ultimate goal of discovering new ways to improve tissue repair and regeneration.

Dr. Cleaver, who joined the UT Southwestern faculty in 2004, holds the Lee Fikes Chair in Biomedical Sciences and is the Director of the Genetics, Development and Disease (GDD) Graduate program. She plays major roles in the Society for Developmental Biology, including serving as Editor-in-Chief for the society journal *Developmental Biology.* Additionally, she is a former President of the North American Vascular Biology Organization.

She received her B.S. in molecular biology and B.A. in history at the University of Texas at Austin. After earning her Ph.D. in zoology from UT Austin, she completed a postdoctoral fellowship at Harvard in the laboratory of Douglas Melton, Ph.D.