UCLA ELI and EDYTHE BROAD
Center Of Regenerative Medicine
and Stem Cell Research

**PRESS RELEASE**
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# Four UCLA Scientists Receive Prestigious Innovator Award for Pioneering Research Using Stem Cells

- Four prominent UCLA researchers received the elite NIH Director's New Innovator Awards, the most of any institution represented
- Each recognized for groundbreaking research that will forward revolutionary stem cell and neuro-science in medicine
- The $2.3 million award (per recipient) supports unusually creative investigators with the most innovative new research ideas
- Success of these projects will potentially spur the creation of potential new cellular therapies with a wide variety of applications

Four scientists from the Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research at UCLA have received a National Institutes of Health (NIH) Director's New Innovator Award that will forward revolutionary stem cell and neuro-science in medicine. The four UCLA researchers were among only 50 scientists nationwide to receive the New Innovator Award, the most of any institution represented.

Each recipient received a $2.3M award for their respective projects. These included Dr. Reza Ardehali, assistant professor of cardiology, for his research investigating novel ways to use stem cells to regenerate heart tissue; Dr. Elissa Hallem, assistant professor of microbiology, immunology and molecular genetics, for her work studying interactions between animal parasites and their hosts to foster the further understanding of human parasitic diseases; Dr. Sririam Kosuri, assistant professor of chemistry and biochemistry, for his project developing new biological system technologies to solve outstanding problems in gene regulation; and Dr. Lili Yang, assistant professor of microbiology, immunology and molecular genetics, for her work developing a new method to track special immune cells for use in new cellular therapies.

"These New Innovator Award grants are an important acknowledgement of our cutting-edge research and will help our faculty drive the revolutionary advances we are seeing in stem cell and neuro-science," said Dr. Owen Witte, professor and director of the Broad Stem Cell Research Center. "Every cellular therapy that reaches patients must begin in the laboratory with novel ideas and experiments that will lead us in new directions in medicine and ultimately improve human life. That makes these awards invaluable to our research effort."

The NIH Director's New Innovator Award is designed specifically to support unusually creative investigators with highly innovative research ideas at an early stage of their career. The award seeks to support exceptionally creative new scientists whose research complements ongoing efforts by NIH.

**Dr. Reza Ardehali: Unlocking the Secrets to Regenerating Heart Tissue**

Dr. Ardehali's cutting-edge work focuses on both human embryonic stem cells and induced pluripotent stem cells, known as human pluripotent stem cells (hPSC), to provide insights into the mechanisms involved in the differentiation and specification of heart cells. hPSC have the unique ability to become any cell type in the body. His lab recently identified several novel surface markers that can highly enrich early cardiovascular progenitor cells. When delivered into functioning human hearts that are transplanted in laboratory conditions, the progenitor cells integrate structurally and functionally into the host myocardium. These studies established the basis for future hPSC-based cardiac therapy.

Dr. Ardehali and his colleagues were also the first to directly measure limited division in the cells that make up heart muscle (cardiomyocytes), proving that cardiomyocytes divide and that such cell division is rare. This discovery resolves an important controversy over whether the heart muscle has the power to regenerate and is critical for future research that may lead to regenerating heart tissue to repair damage caused by disease or heart attack.

His 2013, California Institute for Regenerative Medicine (CIRM), the state's stem cell research agency, New Faculty Physician Scientist Translational Research Award allowed Dr. Ardehali to initiate the preclinical studies on stem cell based therapies for heart disease that were pivotal for his success in the 2014 New Innovator Award competition. The NIH grant affirms the critical success of the project-to-date, and emphasizes the creativity of Dr. Ardehali's research and its potential to have a significant impact on the creation of novel regenerative approaches to treat heart disease.

"The support and resources of UCLA and the Broad Stem Cell Research Center have been instrumental in my research, and it is a tremendously exciting time to be involved in stem cell science," said Dr. Ardehali. "I am hoping that with this funding from the NIH, we can further our understanding of the origin of cells that contribute to scar tissue formation and come up with revolutionary new ideas that will change the way we see and treat heart disease."

Dr. Ardehali's research was additionally supported by the CIRM, American Heart Association, and the American College of Cardiology.

**Dr. Elissa Hallem: Exploring Interactions Between Animal Parasites and Human Hosts**

Dr. Elissa Hallem's research is exploring novel ways to understand the neural mechanisms by which animal parasites interact with their hosts, in the hope of providing a critical framework for the further understanding of human parasitic diseases.

Dr. Hallem and her team focus on parasitic nematodes, commonly known as roundworms, and another tiny worm known as *Caenorhabditis elegans*. They study the neurobiology of host–seeking behavior, including the neural circuits and signaling pathways that underlie parasitic nematodes' ability to detect and respond to olfactory cues from a host. They explore the responses of *C. elegans* to these same host olfactory cues to better understand how the nervous system of a parasite differs from that of a free-living animal.

With this research, Dr. Hallem seeks to further elucidate a current line of inquiry in stem cell research of how neural circuits specify behavior, specifically the way different sensory neural circuits work and develop in different species. Future discoveries can provide a blueprint for the basic principles of circuit design, and be broadly applicable to different organisms including human sensory systems.

"I'm very grateful to NIH and NIDCD for their investment in our work," said Hallem. "Our research would not be possible without the incredible support we have received from everyone at UCLA."

Dr. Hallem's research was additionally supported by the John D. and Catherine T. MacArthur Foundation.

**Dr. Sri Kosuri: In Pursuit of Faster and Simpler Biological Systems**

The Kosuri lab develops innovative new technologies to better understand and engineer biological systems, specifically to tackle outstanding problems in gene regulation and synthetic biology.

Using a cutting-edge combination of DNA synthesis, DNA sequencing and genome engineering technologies, Dr. Kosuri and his team are pioneering new methods to build large libraries of synthetic DNA sequences using low-cost DNA microarrays, facilitating thousands to millions of designed constructs for modest cost. These measurement technologies can allow for testing the functionality of synthetic DNA libraries, and engineering new technologies to perform large-scale synthesis and sequencing experiments in a wide variety of cell types and organisms.

Recent explorations in gene regulation included synthesizing large libraries of tens of thousands of reporter constructs, then measuring the RNA and protein levels of these reporters simultaneously in a single experiment. They are now exploring more complex regulatory elements (including super enhancers, intron/exons, proteins) and devoloping new reporters that investigate other phenotypes (mRNA splicing, microRNA regulation, protein-protein interactions and epigenetic marks), while expanding the range of organisms available for these type of experiments .

"I am very humbled and thankful that our team has been recognized by the NIH for this prestigious award," said Dr. Korsuri. "We will use these funds to accelerate our efforts to develop and bring these new technologies to the study of human biology and disease."

Dr. Kosuri's research is additionally supported by the UCLA Broad Stem Cell Research Center Innovation Award and the National Science Foundation.

**Dr. Lili Yang: Using a New Method to Track Special Immune Cells**

All the different cells that make up our blood come from blood stem cells (called hematopoietic stem cells, or HSCs). These include special white blood cells called T cells, which serve as the "foot soldiers of the immune system," attacking bacteria, viruses and other invaders that cause diseases. Among these T cells is a smaller group of cells called invariant natural killer T cells (iNKT), which have a remarkable capacity to mount immediate and powerful responses to disease when activated, like a small special forces unit among the foot soldiers.

iNKT cells are believed to be important to immune system regulation of infections, allergies, cancer and autoimmune diseases such as Type I diabetes and multiple sclerosis. iNKT cells develop in small numbers in the blood, usually less than one percent of all the blood cells, and can differ greatly in numbers between individuals. Very little is known, however, about how the blood stem cells produce iNKT cells.

Dr. Lili Yang's project is developing a novel model system to genetically program human blood stem cells to become iNKT cells. With this knowledge, Dr. Yang and colleagues hope to provide a roadmap for future therapies designed to increase the number of iNKT cells in the blood, creating more "special forces" cells and increasing the body's ability to fight off the diseases these cells affect.

"The potential for iNKT T cell receptor-based gene therapy is very exciting because it may overcome the limitations of conventional T cell receptor-based gene therapy, which only targets specific types of tumor and a sub-group of patients," said Dr. Yang. "The iNKT T cell receptor gene therapy we are investigating holds tremendous promise for the future as it could have universal application, treating many types of cancer and a large group of patients regardless of the types of tumor they have.."

Dr. Yang's research was additionally supported by the National Cancer Institute of the NIH, the CIRM, the Concern Foundation, and various UCLA entities including the Broad Stem Cell Research Center, the Translational Consortium in Engineered Immunity, the Department of MIMG, the David Geffen School of Medicine, the UCLA Clinical and Translational Science Institute, and the Jonsson Comprehensive Cancer Center.

**About Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research**

The stem cell center was launched in 2005 with a UCLA commitment of $20 million over five years. A $20 million gift from the Eli and Edythe Broad Foundation in 2007 resulted in the renaming of the center. With more than 200 members, the Eli and Edythe Broad Center of Regenerative Medicine and Stem Cell Research is committed to a multi-disciplinary, integrated collaboration of scientific, academic and medical disciplines for the purpose of understanding adult and human embryonic stem cells. The center supports innovation, excellence and the highest ethical standards focused on stem cell research with the intent of facilitating basic scientific inquiry directed towards future clinical applications to treat disease. The center is a collaboration of the David Geffen School of Medicine, UCLA's Jonsson Comprehensive Cancer Center, the Henry Samueli School of Engineering and Applied Science and the UCLA College of Letters and Science.

To learn more about the center, visit our website at http://www.stemcell.ucla.edu