

## **PARTICIPATION IN RESEARCH**

Scholarly activity by the staff and residents is considered an essential part of the general surgery residency. The residents are required to pursue a research project during the course of their training program. The residents incorporate their projects into their day-to-day activities.

Although a dedicated research year is not mandatory, 3 residents are encouraged to take time off for research each year. Generally one PGY-2 and two PGY-3's are expected to go out each year. Residents who are taking time out for a research year must have a research mentor selected at least 6 months prior to the start of the research year. Dr Nathan Alderson (our Research Administrator) will assist residents in finding research mentors. Any resident interested in research should contact Dr. Alderson at [Nathan.Alderson@cshs.org](mailto:Nathan.Alderson@cshs.org) and arrange to meet with him to determine a research plan.

The Department of Surgery will fully fund the research year, however, resident are encouraged to seek their own funding through research grants. For more information regarding funding, contact Kristin Martinez at [Kristin.Martinez@cshs.org](mailto:Kristin.Martinez@cshs.org).

Any resident interested in spending time away for research should notify the Program Director.

A number of our independent surgical laboratories are described below:

### **Minimally Invasive Surgical Technology Institute (Daniel L. Farkas, PhD--Director)**

The Minimally Invasive Surgical Technology Institute (MISTI) is directed by Dr. Daniel L. Farkas, Vice-chairman for Research, Cedars-Sinai Medical Center (CSMC) Department of Surgery. The Institute consists of a scientific research team, a pre-clinical facility and a clinical assessment team, working together on the development and testing of noninvasive technologies and their introduction into everyday surgical practice. The Institute is the focal point for transfer of existing tools and knowledge among specialties, and for collaborative research applying new technologies. Its thematic thrust areas are pursued in five closely linked laboratories (1) Advanced Optics and Robotics; (2) Biophotonics; (3) Wound Healing; (4) Surgical Spectroscopy and (5) Preclinical imaging.

### **The Cardiothoracic Surgery Laboratory (Kevin Burton, PhD--Director)**

The basic research program of the Division of Cardiothoracic Surgery is focused on research into cardiomyopathies and related disorders of the heart and their treatment modalities, including heart transplants, bioprosthetic valves and stem-cell therapies. These problems are approached using modern cell biological and physiological methods such as optical imaging and bioengineering assays of cellular changes related to disease and treatment, including differentiation of cardiac stem and progenitor cells.

### **The Pediatric Surgery Laboratory (Philip Frykman, MD, PhD-- Director)**

The initial focus of the Pediatric Surgery Laboratory is on Hirschsprung's Disease (HD), a genetic disorder causing severe constipation in newborns, affecting one in 5000 live births. Current therapy employs minimally invasive surgery to remove the affected bowel (usually colon) in infancy, re-establishing normal stooling in most children. The most common complication of HD is Hirschsprung-associated enterocolitis (HAEC), a severe infection of the large and small intestine affecting up to 30% of patients with HD, even after corrective surgery to remove the abnormal bowel. The cause of HAEC is unknown; it results in frequent hospital admissions and, in advanced cases, even death. The goal of the lab is to develop an animal model of HAEC after surgical resection to more accurately recapitulate the human disease, study the causative factors of HAEC, and serve as a preclinical model to test novel therapies.

### **The Ophthalmology Research Laboratories (Alexander V. Ljubimov, PhD--Director)**

The Cedars-Sinai Medical Center Ophthalmology Research Laboratories (ORL) consists of two units, the Diabetic Eye Disease Laboratory and the Center for Viral Immunology and Vaccine Development. Directed by Dr. Alexander V. Ljubimov, the Diabetic Eye Disease Laboratory is studying corneal and retinal abnormalities in diabetes mellitus. Ocular diabetes research is focused on elucidating molecular mechanisms of diabetic alterations using the comprehensive approach to ocular changes in diabetes to study both the retina and the cornea. Gene therapy and gene silencing approaches, as well as modulation of vascular stem cells, are used. The Center for Viral Immunology and Vaccine Development, directed by Dr. Homayon Ghiasi, Ph.D., is focused on ocular and systemic immune responses to Herpes virus. The Center's main research goals are to unravel the effects of Herpes virus infection on the body's immune response using methods of immunology and molecular biology; and, determine its role in the development of ocular herpetic disease and nerve demyelination.

### **The Transplant Immunobiology Research Laboratory (Gordon Wu, PhD--Director)**

The Transplant Immunobiology Laboratory (TIL) is the research arm of the Comprehensive Transplant Center at Cedars-Sinai Medical Center, whose mission is to:

- Conduct innovative research in the field of transplant biology and immunology
- Provide transplant professionals with state-of-the-art research facilities, technologies and assistance
- Bring together scientists and clinicians to exchange information and insights to new directions in future transplant research
- Promote multidisciplinary collaborations in our research community

Current studies being conducted include increasing understanding of the pathogenesis of allograft fibrosis, examining the role of Kupffer Cells in the recruitment of extra hepatic progenitors of fibroblasts during the development of hepatic cirrhosis, and exploring cellular and molecular mechanisms governing B cell production of alloantibodies (which can affect acute humoral rejection).

**The Islet Cell Transplantation Laboratory (Donald Dafoe, MD and Dodanim Talavera, MD, PhD – Co-Directors)**

We are interested in coaxing human embryonic stem cells (HESC) to differentiate into insulin-secreting cells for transplantation and reversal of Type 1 diabetes mellitus. HESC differentiate *in vitro* into pancreatic cell progenitors (dHESC) that express markers such as Pdx1, Foxa2 and Isl1 but no insulin synthesis has been detected. Our molecular biology based research is predicated on the hypothesis – and our encouraging preliminary data - that human endothelial cells (HEC) as well as human pancreatic ductal cells (HPDC) will induce dHESC to become insulin-secreting cells and transplantation of these cells into diabetic severe combined immunodeficient (NOD-SCID) mice will reverse insulin-dependent diabetes.

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In addition to our surgical laboratories, our researchers also have access to the Core Support Facilities of CSMC. These include:

- Animal Care and Research Core
- Biostatistics Core
- Confocal Microscopy Core
- DNA Sequencing Core
- Flow Cytometry and Cell Sorter Core
- Microarray Core
- Winnick Family Clinical Research Center (GCRC)