Acute Kidney Injury Retreat

The NIH-sponsored Pittsburgh Center for Kidney Research provides the renal research community with unique, multidisciplinary resources to study renal physiology, cell biology, and pathophysiology.
AKI Retreat

• Sponsored by:
  – Pittsburgh Center for Kidney Research
    • an O’Brien Kidney Research Center
  – Department of Critical Care Medicine
  – Renal-Electrolyte Division
Objectives of the AKI Retreat

• Foster a cross-campus dialogue focused on AKI
  – Identify common areas of interest
  – Develop collaborations
  – Incorporate new techniques
    • Kidney center cores
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Objectives of the Center

• Facilitate multidisciplinary research, training and information transfer
  – Kidney physiology
  – Kidney cell biology
  – Kidney pathophysiology
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Objectives of the Center

• Facilitate the exploration of new directions of investigation
  – Physiological tools
  – Cell biological tools
  – Genetic and molecular biological tools
  – Model organisms
Pittsburgh Center for Kidney Research

- Core Facilities
  - Cellular Physiology
  - Single Nephron and Organ Physiology
  - Urinary Tract Epithelial Imaging
  - Model Organisms
- Educational Programs
- Pilot grants
Pittsburgh Center for Kidney Research
Steering Committee

– Thomas Kleyman, Center Director
– Ora Weisz, Center Associate Director
– John Johnson, Director, Core A
– Lisa Satlin, Co-Director, Core B
– Edwin Jackson, Co-Director, Core B
– Gerard Apodaca, Director, Core C
– Jeffrey Brodsky, Co-Director, Core D
– Neil Hukriede, Co-Director, Core D
Core A: Cellular Physiology
Core Director: John Johnson, MD

• Provide model systems for studying the function, regulation, trafficking and biogenesis of transporters and other plasma membrane proteins.

• Expression of channels/transporters and potential regulatory/interacting proteins in isolated systems, including *Xenopus* oocytes and naive cell expression systems such as HEK cells.

• Techniques include standard voltage clamp for assessment of short-circuit current and transepithelial resistance and well as direct measures of tissue capacitance, impedance and single channel properties.

• Generate recombinant viruses to facilitate expression of wild type or mutated channels, transporters and other proteins of interest.
Core B: Single Nephron and Organ Physiology
Core co-Directors: Edwin Jackson, PhD and Lisa Satlin, MD

- Studies of the expression, localization and functional characteristics of transport and other relevant proteins in single nephron tubules.
- Functional studies
  - *in vitro* microperfusion of isolated segments
  - Measurement of transepithelial ion/solute fluxes
  - Fluorescence functional imaging of single tubular cells
  - Single cell electrophysiologic analyses
- Biochemical studies
  - Microassays of enzyme/transporter activity
- Molecular studies
  - Real time PCR (whole kidney, single tubule, and single cell)
  - Immunoblotting (whole kidney and single tubules)
- Metabolomics services
  - Measure levels of small molecules involved in regulating nephron function
Core C: Urinary Tract Epithelial Imaging
Core Director: Gerard Apodaca, PhD

- Provides qualitative and quantitative image analyses of the urinary tract, including the specialized epithelial cells that line the nephron of the kidney and the mucosal surface of the bladder.
- Light microscopic analyses
  - Histology
  - Immunohistochemistry
  - Scanning laser confocal
  - Spinning disk confocal
  - Live-cell video microscopy
- Electron microscopic analyses
  - Fine structure analysis
  - Immuno-electron microscopy
  - Scanning electron microscopy
- Computerized image processing and stereology
Core D: Model Organisms to Elucidate Novel Aspects of Kidney Function
Core co-Directors Jeffrey Brodsky, PhD and Neil Hukriede, PhD

- Employs two genetically-tractable systems, the yeast *Saccharomyces cerevisiae* and the zebrafish *Danio rerio*, to study fundamental aspects of kidney development and protein structure and function.

- **Yeast sub-Core**
  - Establish expression systems for wild type and disease-causing proteins that transit the secretory pathway in kidney cells.
  - Genomic and proteomic approaches to identify factors that impact protein biogenesis. Heterologous expression systems are then used to delineate the mechanism of action of these factors.

- **Zebrafish sub-Core**
  - Creating and analyzing new zebrafish transgenic reporter lines
  - Establishing two-component transgenic kidney lines for targeted gene expression studies
  - Small molecule screens for changes to nephric structure
Pilot and feasibility projects

- Currently support 5 projects
- Up to 2 years in duration
- New proposals will be solicited in March
- Three general categories of investigators are considered for Pilot and Feasibility funding
  - newly independent investigators without current or previous R01 or VA Merit Review support
  - established investigators with limited previous kidney-related research
  - established renal investigators proposing innovative ideas that represent a clear departure from ongoing research directions
Education and training opportunities

- Visiting professor series
- Weekly research seminars
- AKI retreat
- Annual protein trafficking (Local Traffic) meeting
- Pittsburgh ubiquitin-proteasome meeting
- Annual Telluride meeting on epithelial cell biology and physiology
- Training in specific techniques
- 1 to 2 week mini-sabbaticals
- 3 to 6 month sabbaticals for scientists interested in acquiring the skills needed for successful microperfusion
Information regarding core facilities, educational opportunities, and pilot and feasibility funding

- contact Drs. Kleyman or Weisz
  - kleyman@pitt.edu or weisz@pitt.edu
- website: http://www.kidneycenter.pitt.edu
- yearly newsletter – sent to all center participants
- emails (Pilot grant program)
  - all faculty in the health sciences at the University of Pittsburgh