Human Immunology & Immunotherapy Initiative (HI³)

After decades of investigation establishing principles in animal models, it has recently become possible to treat and cure some diseases in humans by interventions that target immunological functions. Immunotherapy, described by Science magazine as the Breakthrough of the Year in 2013, has led to major changes in the standard of care for some diseases and is particularly useful in infectious disease, autoimmunity, allergy/asthma, and especially cancer.

The mission of the Human Immunology and Immunotherapy Initiative (HI³) is to develop the infrastructure to create an all-inclusive facility that provides experimental models for the preclinical testing of new candidate therapeutics, reliable immunotherapeutic production, consistent clinical trials research support, and organized immune monitoring capabilities. In addition, the HI³ will train future scientific leaders within the realm of immunotherapy and recruit exemplary faculty to the CU Anschutz medical campus that will complement and enhance existing strengths.

The ultimate goal of the HI³ is to establish preeminence in human immune system-targeted therapies on the CU Anschutz medical campus.
ACTIVITIES

• Faculty Recruitment
• Human Immune Monitoring Shared Resource (HIMSR)
• Translational Research Networking & Preclinical Models (TRNPM)
• GMP Immunotherapeutic Production
• Training Program
• Clinical Research Program
HI3 Faculty Recruitment UPDATE

• Amy Davis (endowed) Chair in Basic Human Immunology
  ✓ Eduardo Davila, PhD campus visits April, June & upcoming in July
  ✓ in collaboration with Medical Oncology, Cancer Center, Dept. Surgery, Dept. Medicine, Dean Reilly, Patten Davis Foundation

• Currently funded from the NCI (R01, “Augmenting T cell activity to weak tumor antigens and reversing myeloid cell-mediated T cell inhibition” 2017-2022) and the VA (Merit Award, “IL-1 Receptor-Associated Kinase as a Cancer Therapeutic Target” 2018-2021)
• Patented “Universal Anti-tag Chimeric Antigen Receptors for Treating Cancer”
• Co-founded Living Pharmaceuticals, Inc., which was acquired by Miltenyi Biotec in 2017
• Awarded the BioMaryland LIFE (Leading Innovative Faculty Entrepreneur) in 2014
• Member of the Transplantation, Tolerance and Tumor Immunology (TTT) Study Section for the National Cancer Institute.
• R25 focused on increasing the number of URM pursuing a biomedical research degree and extensive track record of mentorship
• 2016 received the “UMB Dean’s Faculty Award for Diversity and Inclusion”
HI3 Faculty Recruitment UPDATE

- Autoimmunity
  - HI3 Autoimmunity Program Director search on hold

- Additional HI3 Supported Hires
  - Mike Verneris, MD, University of Minnesota, Peds Hem/Onc, 9/16
  - Doug Shepherd, PhD, University of Colorado, CU Pharm, 10/17
  - Ron Schuyler, PhD, University of Colorado, HIMSR, 11/17
  - Terry Fry, MD, National Cancer Institute, Peds Hem/Onc, 1/18
  - Paul Norman, PhD, Stanford University, BIPM, 3/18
  - Erin Schenk, MD, Mayo Clinic, CU Med Onc, 5/18
ACTIVITIES

• Faculty Recruitment
• **Human Immune Monitoring Shared Resource**
• Translational Research Networking & Preclinical Models (TRNPM)
• GMP Immunotherapeutic Production
• Training Program
• Clinical Research Program
Hired within the last year

- **Ron Schuyler**, PhD - Bioinformatics, Assistant Research Professor, Immunology
  - Center for Genomic Regulation (Barcelona, Spain) and UC Denver

- **Doug Shepherd**, PhD - MIBI, Assistant Research Professor, Pharmacology
  - UC Denver (Downtown) and Los Alamos

- **Anjelica Miranda**, BS – Part-time PRA
  - UC Denver (Downtown student)
HI3 HIMSR – Personnel UPDATE

Full Team

- Jill Slansky, PhD - Director
- Kim Jordan, PhD - Assistant Director
- Elena Hsieh, MD - Experimental Design Support
- Jen McWilliams, PhD – Part-time Research Associate
- Angela Minic, MS - Sr. PRA
- Anjelica Miranda, BS - Part-time PRA
- Erin Kitten, BS - HIMSR/Flow Lab Manager
- Ron Schuyler, PhD - Bioinformatics
- Doug Shepherd, PhD - MIBI
HI3 HIMSR – User List UPDATE

Immunology & Microbiology
John Cambier
Ross Kedl
Roberta Pelanda/Julie Lang
Dohun Pyeon
Rosemary Rochford
Jill Slansky
Raul Torres
Jing Wang

Pathology
Dan Merrick
Jennifer Richer
Philip Owens (VA)
Xiao-jing Wang

Obstetrics and Gynecology
Kian Behbakht
Ben Bitler
Andy Bradford
Joshua Johnson

Endocrinology
Bryan Bergman
Jena French
Katja Kiseljak-Vassiliades
Rebecca Schweppe

Surgery
Martin McCarter
Richard Schulick

Radiation Oncology
Karen Goodman
Sana Karam
Christine Fisher/Tyler Robin

Hematology
Enkhee Purev

Cardiology
Kika Sucharow

Medical Oncology
Anthony Elias
Jen Diamond
Antonio Jimeno
Chris Lieu
Traci Lyons
Todd Pitts
William Robinson
Fred Hirsch
Peter Kabos
Erin Schenk

Pediatrics
Elena Hsieh- Allergy and Immunology
Kenneth Jones- Informatics
Joanne Masterson- Gastroenterology
Katja Gist- Cardiology
Stephanie Nakano- Cardiology
Carina Venter- Allergy and Immunology

Gastroenterology
Beth Tamburini

Renal Medicine
Josh Thurman
Katharina Hopp

Anesthesiology
Eoin McNamee

Barbara Davis Center
Janet Snell-Bergeon
Viral Shah

Infectious Disease
James Colbert
Adriana Weinberg
Cara Wilson

Linda Crnic Institute
Huntington Potter/Tim Boyd

Pulmonary
Howard Li
David Schwartz

CSU Environmental & Radiologic Health Sciences
Joshua Schaeffer

University of Nebraska Medical Center
Ted Mikuls

Commercial
Terumo
ElisaTech
Fluidigm

… ~60 Labs/PIs
HI3 HIMSR – Pending grant applications and letters of support

Medical Oncology
Ross Camidge- ARIAD trial
Aik Choon Tan- CLC
William Robinson- Melanoma Research Alliance
Kasey Couts- Melanoma Research Alliance
Chris Lieu- RO1 & CLC
Todd Pitts- R21
Traci Lyons- RO1

Radiation Oncology
Sana Karam- Astrazeneca trial
Tyler Robin- training grant

Endocrinology
Katja Kiseljak-Vassiliades- CLC & DOD
Rebecca Schwegpe- RO1

Allergy and Clinical Immunology
Stephen Dreskin- RO1

CU Cancer Center
Eric Clambey- SIRC application

Obstetrics and Gynecology
Ben Bitler

Environmental and Occupational Health
Alison Bauer- RO1

Infectious Disease
Cara Wilson and Mario Santiago
Adriana Weinberg- RO1 & UO1
Ed Janoff- RO1

Immunology
Jill Slansky- RO1

Pediatrics
Katja Gist- K23 & Webb-Waring Biomed Research Award
Nicholas Foreman- RO1
Stephanie Nakano- training grant

Dermatology
Dennis Roop- RO1

Renal Medicine
Katharina Hopp- KO1

Gastroenterology
Beth Tamburini

Barbara Davis Center
Richard Benninger- P30 (DRC)
HI3 HIMSR – Services UPDATE

Human Immune Monitoring Shared Resource (HIMSR) Services

- Experimental Design
- Sample Processing
- Cells Sorting
- Cytometry
- Data Analysis
- Imaging
- Immunoassays
- Immune Function
HI3 HIMSR – Services UPDATE

Number of investigators/projects utilizing different services

- **Blue**: Vectra (IHC/IF)
- **Red**: MSD (protein array)
- **Green**: Cellular assays
- **Purple**: Flow Cytometry
- **Orange**: Mass Cytometry
- **Black**: Sample Processing

Total=63
HI3 HIMSR – Flow Cytometry Panels

In Development:
- Non-lymphoid phospho panel
- Non-lymphoid cytokine panel
- B cells

**Lymphocyte Cytokine**
- CD4
- IFNγ
- IL-4
- IL-17
- IL-2
- CD11b
- TNF-α

**Lymphocyte Phospho-panel**
- CD4
- pAKT
- pIκBα
- pH3
- pERK
- p38

**T cell Phenotyping**
- CD3
- CD4
- CD8
- CD45RA
- CD45RO
- CD127
- ICOS
- CXCR5
- CXCR3
- CCR4
- CCR6
- CCR7
- CCR9

**T cell Activation**
- CD3
- CD4
- CD8
- CD25
- CTLA-4
- Tbet
- EOMES
- LAG-3
- CD66
- PD-1
- Tim-3
- FOXP3

**Basic Phenotyping**
- CD3
- CD4
- CD11b
- CD16
- CD14
- CD56
- CD19
- CD11c
- CD15
- CD123
- CD1c
- CD141

**Monocyte/DC**
- CD33
- Dump
- CD14
- PDL1
- CD11b
- CD16
- HLADR
- CD14
- Arg1
- CD123
- CD1c
- CD15
Phenotyping panel complete!

CD4, CD8, helper T cell subsets, memory/naïve T cells, regulatory T cells, effector T cells, NK cells, B cells, memory/naïve B cells, monocytes, activated monocytes, pDCs, CD1c+ DCs, CD141+ DCs, MDSCs (monocytic and granulocytic), PD-1/PDL-1 expression

Currently working on phospho- and cytokine panels
1. Investigator decides which primary antibodies they are interested in. 

<table>
<thead>
<tr>
<th>Lineage/Phenotypes</th>
<th>Activation/Effectors</th>
<th>Inhibitory</th>
<th>Tissue Markers</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD3</td>
<td>CD45RO ✪IL-1β</td>
<td>CTLA4</td>
<td>CD11</td>
</tr>
<tr>
<td>CD4</td>
<td>CD127 Ki67</td>
<td>IDO</td>
<td>Lyve-1/D240</td>
</tr>
<tr>
<td>CD8</td>
<td>CTLA4 Perforin</td>
<td>IL-10</td>
<td>α-actin</td>
</tr>
<tr>
<td>CD11b</td>
<td>EOMES RORγt</td>
<td>PD1</td>
<td>SMA SOX10</td>
</tr>
<tr>
<td>CD11c</td>
<td>CD68 Granzyme B Tbet</td>
<td>Lag3</td>
<td>Cytokeratin</td>
</tr>
<tr>
<td>CD14</td>
<td>CSFR1/CD115 HLADR/DP/DQ GATA3</td>
<td>IL-10 Tim3</td>
<td>EpCam Vimentin</td>
</tr>
<tr>
<td>CD15</td>
<td>C-kit/CD117 pSTAT3</td>
<td>PD1</td>
<td>Inhibin-α CDCP1</td>
</tr>
<tr>
<td>CD16</td>
<td>CD127</td>
<td></td>
<td>CD146</td>
</tr>
<tr>
<td>CD19</td>
<td>CD163</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD20</td>
<td>CCR2/CD192</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD33</td>
<td>Elastase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>huCD45</td>
<td>FOXP3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. HIMSR staff design a preliminary panel:
- Separate co-expressing markers
- Abundant markers on dimmer opals
- Closest we can get to an existing panel

3. Pre-test in human tonsil:
- Opal balancing/unmixing
- Staining morphology
- Autostainer programming

4. Pre-test in tissue of interest:
- Opal balancing/unmixing
- Staining morphology

5. Large slide batch in experimental tissue:
- Always run control tonsil
- Test scan several slides in a batch

Currently working on ISH/IHC combining RNA/protein
HIMSR Mouse Imaging User Group

**Objective:** Share protocols and avoid re-inventing the wheel!
- Email list of interested investigators
- Online spreadsheet of antibodies and protocols
- Reagent bank available for some primary and secondary antibodies

HIMSR Mouse IHC/IF Workshop

**Objective:** To titrate 5 primary antibodies for the development of a 7-color immune cell panel for mouse tissue
- Labs can titrate antibodies in their own labs & develop 7-color panels
- HIMSR scans slides on the Vectra
- Once developed, 7-color panels can be run on the HIMSR autostainer (human panels have priority, but ~once per week for mouse panels is reasonable)

**Current mouse panel:** CD3, FOXP3, CD4, CD8, F480, B220
HIMSR Vectra User Group

- Meets on the first Thursday of every month at 2:00pm in RC1N, Room 8108
  - discuss problems
  - present data
  - ask questions
  - obtain feedback
  - training seminars for inForm and Phenochart analysis software

- Next Meeting is August 2nd, 2018 at 2:00pm
  - TOPIC: inForm Software training

Training videos will be available the HI3 channel on Office 365
The MIBI!

- MIBI ‘training session’ held at IonPath March 12-16
- Expected date of arrival: Aug 2018

What to expect upon arrival:
- HIMSR will validate antibody panels and instrument
- Not a high throughput machine
- Investigators need to create tissue microarray slides (TMAs)
- Will not be ready for use until we’re happy with the data
HI3 HIMSR – Equipment UPDATE

MesoScale Discovery SQ120

• Assay plate reader is now available- sign up in iLabs!
• HIMSR can perform the assays for you as well

Equipment Wish list

XCELLigence 96-well plate Real Time Cell Analyzer
• Proliferation and cytotoxicity assays

Nanostring nCounter Analysis System
• Gene expression measurements using targeted panels

Terumo Automated Buffy Coat isolation (TACSI)
• automated isolation of peripheral blood mononuclear cells

New flow cytometer… TBD
Website update- coming soon

- Antibody panels
- New services descriptions
- Instructions to access training video links on Office 365
- HI3 Acknowledgement and grant description language (Office 365)

iLabs Billing- May 2018

- Services will be entered by HIMSR staff
- Billing will be performed monthly through iLabs
- Update your speedtypes!

Biorepository and Sample processing

- Establishing a streamlined/standard workflow
- Biorepository manages sample kits & interfaces with clinical team
- Biorepository will track clinical samples in Encore
- HIMSR performs the same-day processing required for immunology-related assays (de-identified)
- Extra samples will be stored at the Biorepository
Bioinformatics and Data Analysis Tools (Ron Schuyler)

CyTOF Data-
- Data normalization across multiple sets of samples
- Unsupervised hierarchical clustering of cellular sub-populations

Vectra/Imaging Data-
- “Zero Correction” for quantification
- Conversion of the data to .fcs files for analysis
- Automated data analysis for quantification
- Nearest neighbor analysis (spatial relationships)

Genomics Data-
- RNAseq
- Deep sequencing of peptide libraries

COPD collaboration
- Katerina Kechris
- Statistical analysis and multi-omics integration

Please fill out the Bioinformatics Project Request form on the HIMSR website if you are interested in working with Ron!
ACTIVITIES

• Faculty Recruitment
• Human Immune Monitoring Shared Resource (HIMSR)
• **Translational Research Networking & Preclinical Models (TRNPM)**
• GMP Immunotherapeutic Production
• Training Program
• Clinical Research Program
“Human Immune Tissue Network Biobank” COMIRB protocol approved

- Umbrella protocol will allow any HI3 investigator to obtain and study fresh human tissue of immunological relevance (adult and pediatric) without the need of obtaining their own COMIRB protocol
- To obtain tissue, investigators simply fill out a form provided by the HI3
- Names of clinicians from which to obtain human tissue and the consent form, when needed, will be provided by HI3
- If interested in obtaining human tissue through this protocol, please contact Roberta Pelanda

Human Immune System Mice

- Moving mice to breeding barrier in R2 in order to be able to send mice out directly to other investigators rooms without the need for quarantine
• Faculty Recruitment
• Human Immune Monitoring Shared Resource (HIMSR)
• Translational Research Networking & Preclinical Models (TRNPM)
• **GMP Immunotherapeutic Production**
• Training Program
• Clinical Research Program
Collaborate with CU AMC GMP facilities toward the production of clinical grade biological reagents and cell-based immunotherapeutic products

- Provided $250,000 to Drs. E. Purev & C. Jordan for CAR-T cell process development in collaboration with Clinimmune and the Gates Center
- Successful scale-up production of ~2 billion CD19 CAR T cells (>60% CAR expression) took place in the Gates Manufacturing Facility process development suite in preparation for a GMP run
- HI3 HIMSR was able to analyze the cells to validate CAR-T protocols
HI3 GMP Immunotherapeutic UPDATE

Facilitate the use of campus CLIA labs for monitoring patient responses and clinical decision-making (full list and links on HI3 website)

- Exsera BioLabs - complement and autoimmune diagnostics
- Colorado Molecular Correlates Laboratory (CMOCO) - anatomic path.
- Clinimmune - flow cytometry, cell sorting, histocompatibility, stem cells
- UC Cord Blood Bank (UCCBB) at Clinimmune
- The Barbara Davis Center Autoantibody/HLA Service Center
- Colorado Genetics Laboratory – pre- and postnatal testing, cancer testing
- Hirsch Biomarker Analysis Laboratory – IHC, SISH/CISH, mRNA-ISH
- Clinical Laboratories at Children’s Hospital
- Clinical Laboratories at University of Colorado Hospital
- Diagnostic Immunology Lab – LPA, IFNγ ELISPOT, HIA
- iC42 Bioanalytic Service Center – quantitative mass spec, metabonomic and protein profiling
- Advanced Diagnostics Lab at NJH – immune response testing
• Faculty Recruitment
• Human Immune Monitoring Shared Resource (HIMSR)
• Translational Research Networking & Preclinical Models (TRNPM)
• GMP Immunotherapeutic Production
• Training Program
• Clinical Research Program
HI3 Guest Speakers

CU Department of Immunology & Microbiology and Human Immunology and Immunotherapy Initiative (HI3)

GUEST SEMINAR

Jae Jung, PhD
Distinguished Professor and Chair, Mol Micro & Immunol Department
Fletcher Jones Foundation Professor
Director of USC Institute of Emerging Pathogens & Immune Diseases
Keck School of Medicine
University of Southern California

“Immunopathogenesis of two emerging viruses: Zika virus and SFTS virus”

2:00-3:00pm
Monday, February 12, 2018
Hensel Phelps West
HI3 Training UPDATE

• Monetarily support trainees across the continuum at the pre-doctoral, post-doctoral, and junior faculty level
  ✔ Establish fellowships to support training and research for future leaders in immunotherapy starting in year 3 of initiative – 2 PhD candidates, 1 post-doctoral fellow, 1 junior faculty

• Provide educational resources for trainees
  ✔ Develop and implement a 2-day introductory overview course on human immunology for Terumo BCT – June 2018
  ✔ Develop and implement a 2.5-day introductory overview for HI3 trainees and scientists who would like to expand or update their understanding of the field and address its role in health and disease and learn more about HIMSR services – October 2018
  ✔ Continue to coordinate a ‘Human Translational Immunology’ case study seminar series to highlight the investigation and treatment of diseases of the immune system currently underway on the Anschutz campus and connect clinicians with basic scientists
# HI3 'Human Translational Immunology' case study seminar series

Highlight the investigation and treatment of diseases of the immune system currently underway on the Anschutz campus and connect clinicians with basic scientists.

<table>
<thead>
<tr>
<th>2017/2018</th>
<th>2018/2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wednesday, October 25, 2017</strong>&lt;br&gt;A Day in the Life of a Clinical Immunologist: An Interesting Case of Type I Diabetes&lt;br&gt;Elena Hsieh, MD&lt;br&gt;HENSEL PHELPS WEST&lt;br&gt;Assistant Professor</td>
<td><strong>Wednesday, September 19, 2018</strong>&lt;br&gt;CART-T Targets CD19 and CD22&lt;br&gt;Terry Fry, MD&lt;br&gt;Professor</td>
</tr>
<tr>
<td><strong>Wednesday, November 15, 2017</strong>&lt;br&gt;They’ll See You Before They See Me:&lt;br&gt;Multidisciplinary Collaborations Identifying Monogenic Forms of Immune Dysregulation&lt;br&gt;Cullen Dutmer, MD&lt;br&gt;Assistant Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, December 20, 2017</strong>&lt;br&gt;WINTER HOLIDAY BREAK</td>
<td></td>
</tr>
<tr>
<td><strong>Wednesday, January 31, 2018</strong>&lt;br&gt;Molecular Drivers of “Asymptomatic Autoimmunity”&lt;br&gt;Mike Holers, MD&lt;br&gt;Professor</td>
<td>University of Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, February 21, 2018</strong>&lt;br&gt;The Many Faces of Inflammatory Bowel Disease&lt;br&gt;Ed deZoeten, MD, PhD&lt;br&gt;Associate Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, March 21, 2018</strong>&lt;br&gt;Inflammatory Dysregulation with Disseminated Intravascular Coagulation&lt;br&gt;Brian Bronchard, MD&lt;br&gt;Assistant Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, April 18, 2018</strong>&lt;br&gt;Complications and Management of Immunotherapeutic Strategies in Pediatric Leukemia&lt;br&gt;Lia Gore, MD&lt;br&gt;Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, May 9, 2018</strong>&lt;br&gt;Pathophysiology of Eosinophilic Esophagitis&lt;br&gt;Glenn Furuta, MD&lt;br&gt;Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, October 17, 2018</strong>&lt;br&gt;Multiple Sclerosis&lt;br&gt;Timothy L. Vollmer, MD&lt;br&gt;FAAN Professor</td>
<td>University of Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, November 28, 2018</strong>&lt;br&gt;the Eradication of Polio&lt;br&gt;Edwin J. Asturias, MD&lt;br&gt;Associate Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, December 19, 2018</strong>&lt;br&gt;WINTER HOLIDAY BREAK</td>
<td></td>
</tr>
<tr>
<td><strong>Wednesday, January 16, 2019</strong>&lt;br&gt;Spondyloarthritis and Inflammatory Bowel Disease (IBD)&lt;br&gt;Kristi Kuhn, MD, PhD&lt;br&gt;Assistant Professor</td>
<td>University of Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, February 20, 2019</strong>&lt;br&gt;Type 1 Diabetes TrialNET&lt;br&gt;Kimber Simmons, MD&lt;br&gt;Assistant Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, March 20, 2019</strong>&lt;br&gt;Development of bi- and tri-specific immune killer engagers (BiKes and TriKes)&lt;br&gt;Michael Vernieri, MD&lt;br&gt;Professor</td>
<td>Children’s Hospital Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, April 17, 2019</strong>&lt;br&gt;Diabetes Resistant MHC class II Molecules&lt;br&gt;Aaron Michels, MD&lt;br&gt;Associate Professor</td>
<td>University of Colorado</td>
</tr>
<tr>
<td><strong>Wednesday, May 15, 2019</strong>&lt;br&gt;Development and Use of clinical grade CAR-T Cells&lt;br&gt;Enkhtsetseg ‘Enkhee’ Purev, MD, PhD&lt;br&gt;Assistant Professor</td>
<td>University of Colorado</td>
</tr>
</tbody>
</table>
ACTIVITIES

• Faculty Recruitment
• Human Immune Monitoring Shared Resource (HIMSR)
• Translational Research Networking & Preclinical Models (TRNPM)
• GMP Immunotherapeutic Production
• Training Program
• Clinical Research Program
HI3 member participation in newly created CU Cell Therapy and Immunotherapy Task Force

Goals and Scope

• Review process for all protocols using ACT or new immunotherapy agents
• Review initial cell therapy proposals
• Develop process map(s) for the exact steps investigators need to take to get cell therapies into the pipeline
Possible Directions – could be separate or overlapping

1. Clinical Immunology Core
   • Provide ready access to high quality clinical data and biospecimens from subjects who have an immune-system related disease, are at high-risk for disease and healthy controls

2. HI3 Clinical Research Program
   • Provide expertise and coordination with campus clinical research services to HI3 research teams to effectively operationalize clinical research
The screen that you will see when you click on the button