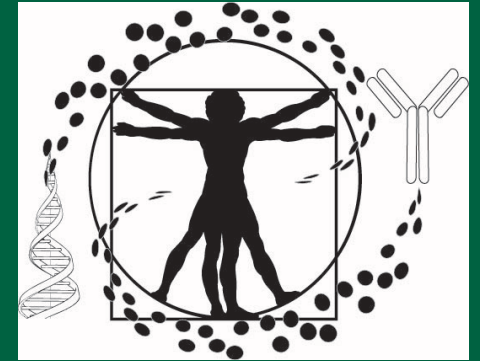


**UAB** THE UNIVERSITY OF  
ALABAMA AT BIRMINGHAM.

**UAB** IMMUNOLOGY  
INSTITUTE

The University of Alabama at Birmingham



# UAB HSOM Immunology Institute Annual Review – Nov 2024

<https://www.uab.edu/medicine/immunologyinstitute/>

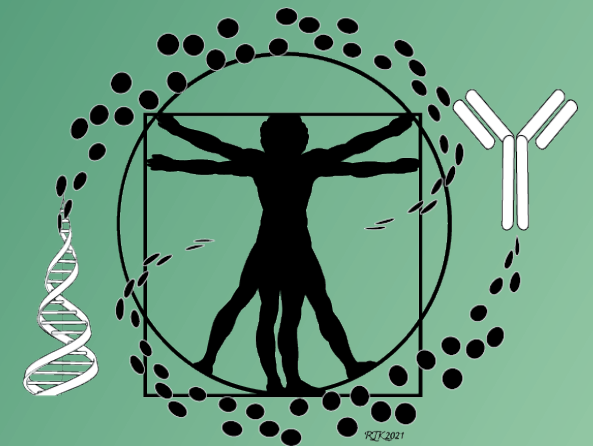
An interdisciplinary research hub for faculty, researchers, trainees, clinicians, health policy experts, and educators who seek to advance the study of the immune system and its role in health and disease

## Today's Presentation

- Achievements 2024
  - I. Membership and Funding
  - II. Education, Outreach and Training
  - III. External and internal engagement
  - IV. Build Research Capabilities (Infrastructure)\*\*
  - V. Goals 2025
  - VI. Finances

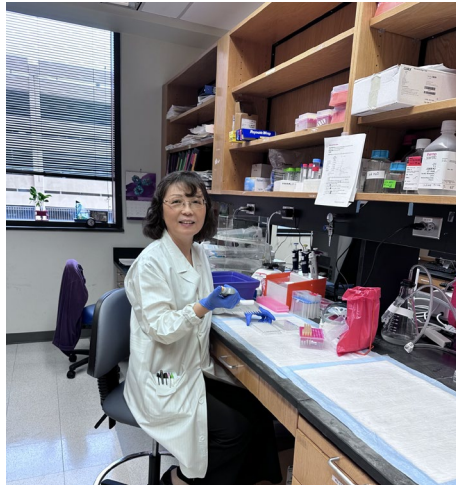
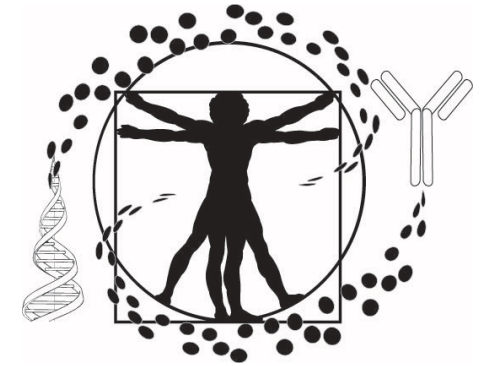
# FY24 Achievements

## I. Membership and Funding



# Growing the Institute - Staffing

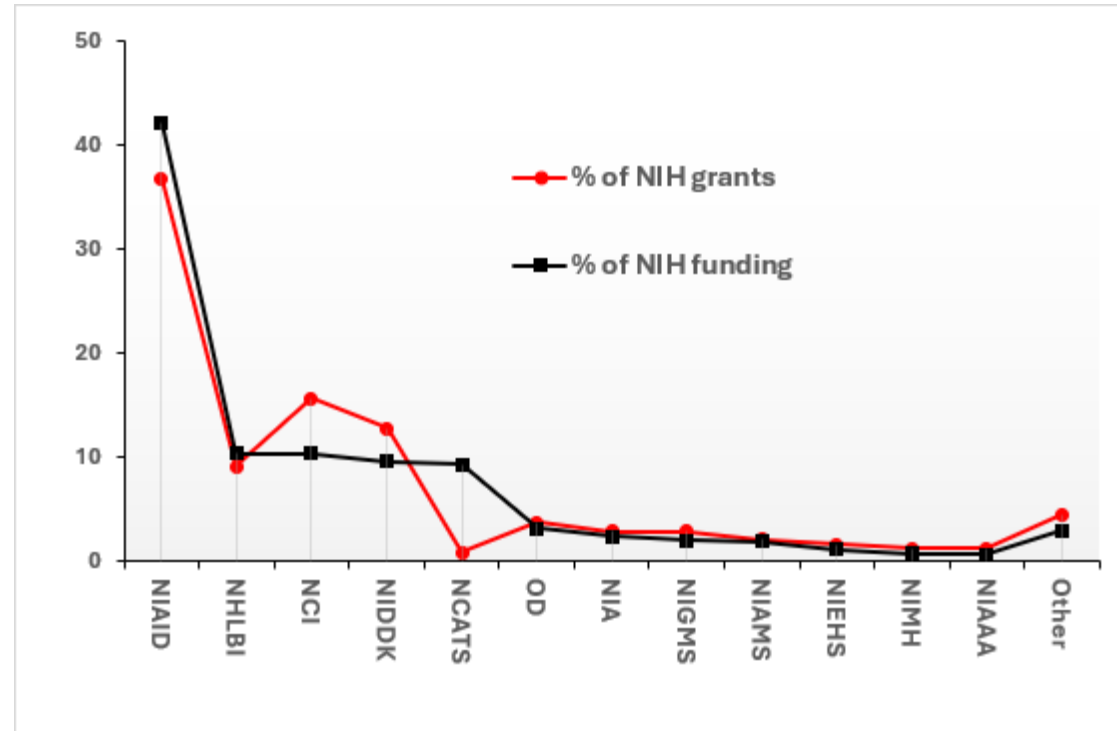
New staff (Kianna Arrington) and  
Antibody Characterization and Serology Recharge Facility





# Immunology Institute Membership and Funding

- Membership increased **20%**; **355** total (166 faculty+ 53 full time-staff + 136 trainees)
- The faculty membership includes **9** Instructors, **34** Assistant Professors, **39** Associate Professors and **84** Professors who are aligned with **6 University Schools** (HSOM 91.6%, SOD, SOHP, SOPH, SOO, CAS) and **50 Departments and Divisions**



# Impact of the studies conducted by II members

## ICITE Report

*/Cite:* Influence provides **Relative Citation Ratio (RCR)** values, which measure the scientific influence of each paper by field- and time-adjusting the citations it has received, and benchmarking to the median for NIH publications, the value of which is set at 1.0. Fields are defined for each article by using its co-citation network. This benchmarking process ensures that a paper with an RCR of 1.0 has received the same number of cites/years as the median NIH paper in its field, while a paper with an RCR of 2.0 has received twice as many cites/year as the median NIH-funded paper in its field. The displayed values are maximum, the mean, the SEM and the median of the papers in the group. **Weighted RCR** - is the sum of the RCRs for the articles in the group. This weights the article count by their influence relative to NIH-funded papers. A highly influential set of articles will have higher **Weighted RCR** than **Total Pubs**, while a set of articles with below average influence will have a lower **Weighted RCR** than **Total Pubs**

2018-2022 (98 faculty); 335 pubs; 170 pubs RCR/yr  $\geq 1$ ; mean RCR =2; weighted RCR = 713

2019-2023 (150 faculty), 386 pubs; 163 pubs RCR/yr  $\geq 1$ ; mean RCR =2; weighted RCR = 882

2020-2024 (153 faculty), 399 pubs; 157 pubs RCR/yr  $\geq 1$ ; mean RCR =2; weighted RCR = 801

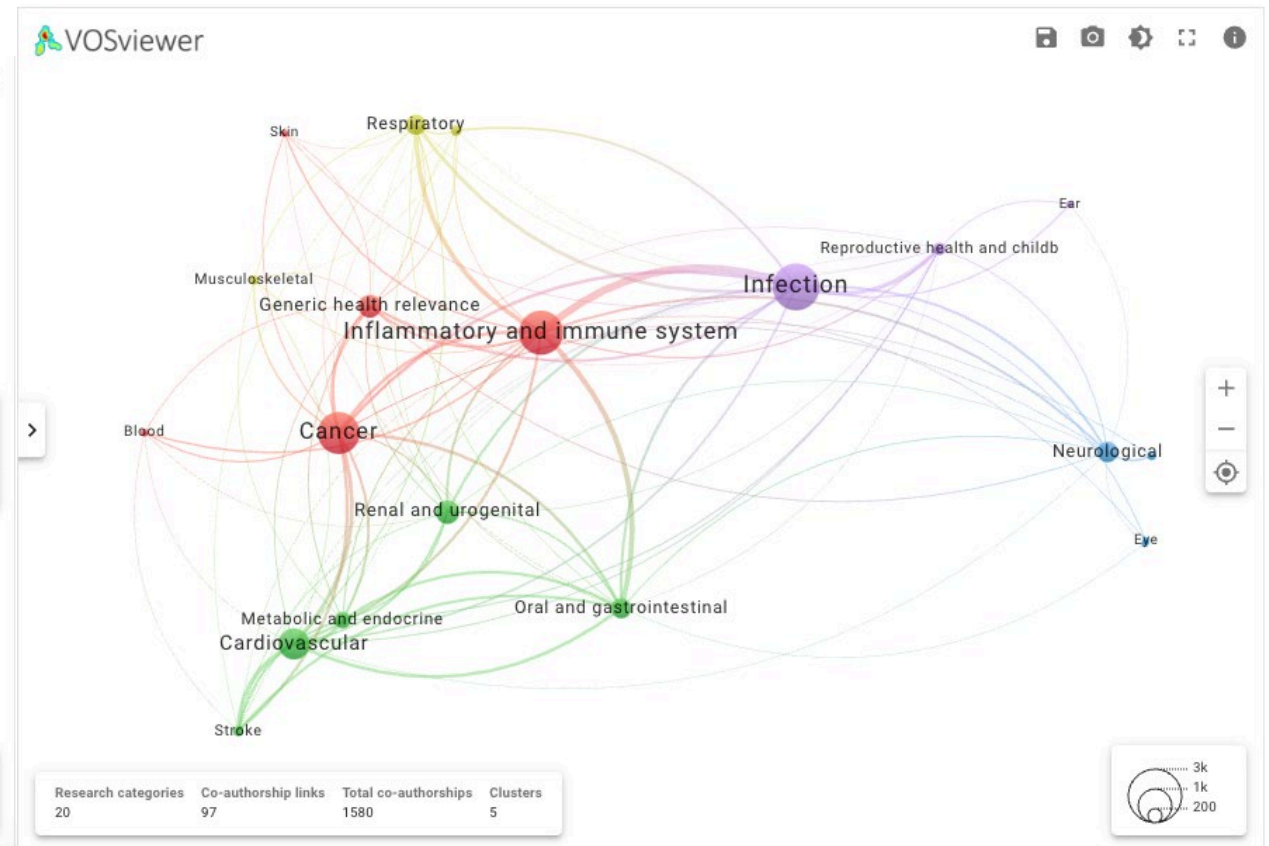
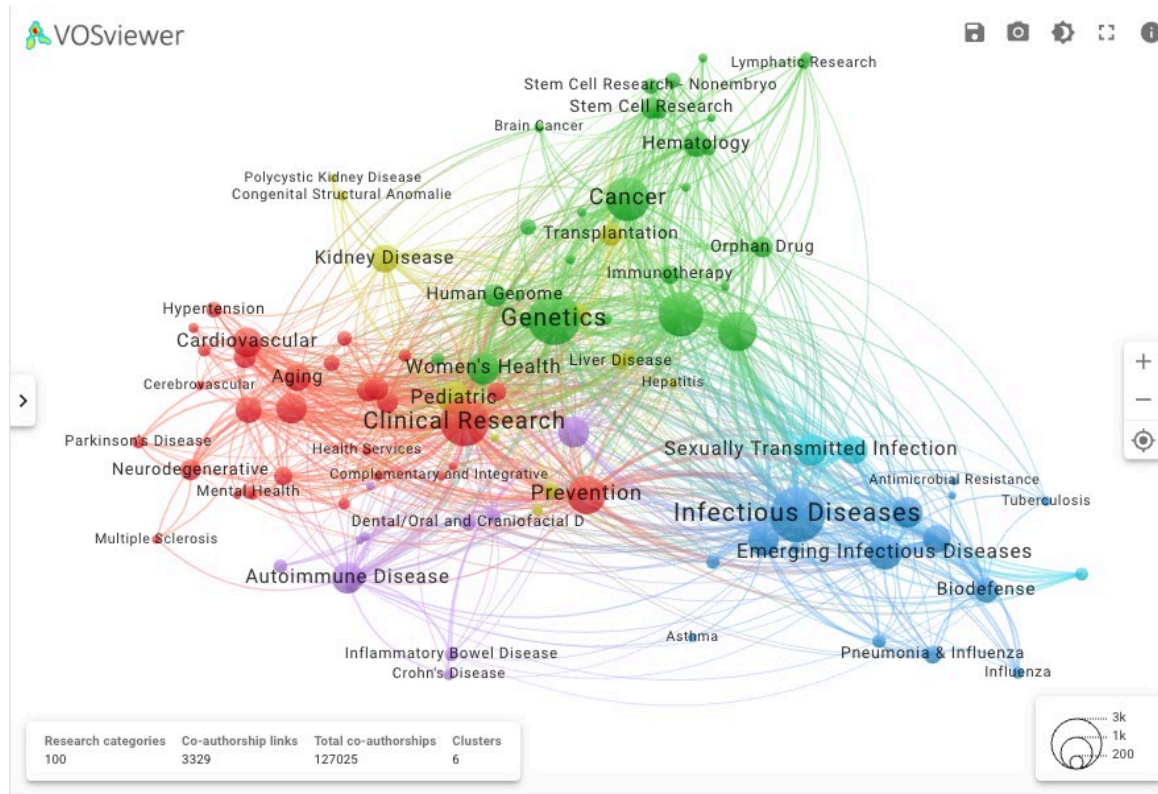
**Based on these metrics, members of the II are continuing to publish influential papers**

# Research Networking between HSOM II Members

## Dimensions analysis 2024

6 broad research category clusters with 3329 co-authorship links

Opportunity to increase connectivity across research categories



We now have examples of new crossdisciplinary studies/grant applications

# II member/trainee accomplishments - highlights



- ❖ Fran Lund, Ph.D., named an AAI Distinguished Fellow
- ❖ \$18.5 million U19 grant will study B and T memory cells in transplanted lungs, uteruses and kidneys



- ❖ ISAC recognizes UAB Flow Cytometry and Single Cell Core facility



- ❖ Potential therapeutic target found to combat tuberculosis, a disrupted NAD(H) homeostasis
- ❖ NIH grant establishes UAB's Global Research Resource for Human Tuberculosis –Adrie Steyn



- ❖ Justement elected fellow of the American Association for the Advancement of Science



- ❖ Brittney Knott, UAB Immunology trainee, was selected as one of only 20 Trainee Member speakers for Major Symposium at the AAI IMMUNOLOGY2024™



# Influential papers published by I-4ward members



Casey Weaver and Carlene Zindl



Sunil Sudarshan



Troy Randall, Rebecca Arend, Selene Meza-Perez

Key role found for gut epithelial cells and their expression of MHCII in the defense against deadly diarrheal infections

L-2-hydroxyglutarate remodeling of the epigenome and epitranscriptome creates a metabolic vulnerability in kidney cancer models

Increasing arginine levels can be combined with immunotherapy to enhance immune responses and improve outcomes of cancer patients

Spatiotemporal immune atlas of a clinical -grade gene-edited pig -to-human kidney xenotransplant

Enhanced brain delivery of antibodies heightens the potential to treat brain diseases



Paige Porrett

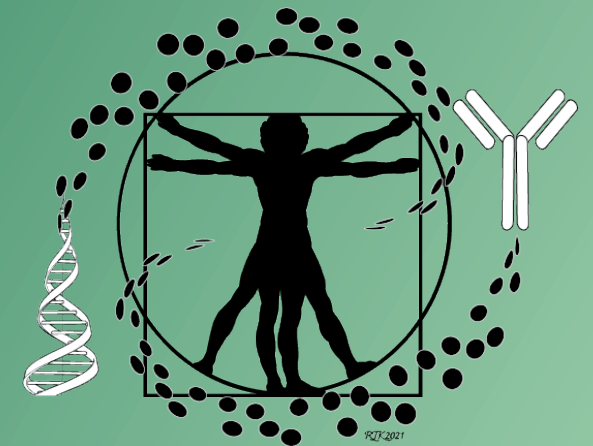


Masa Kamata



# FY24 Achievements

## II. Support Education, Outreach, Training



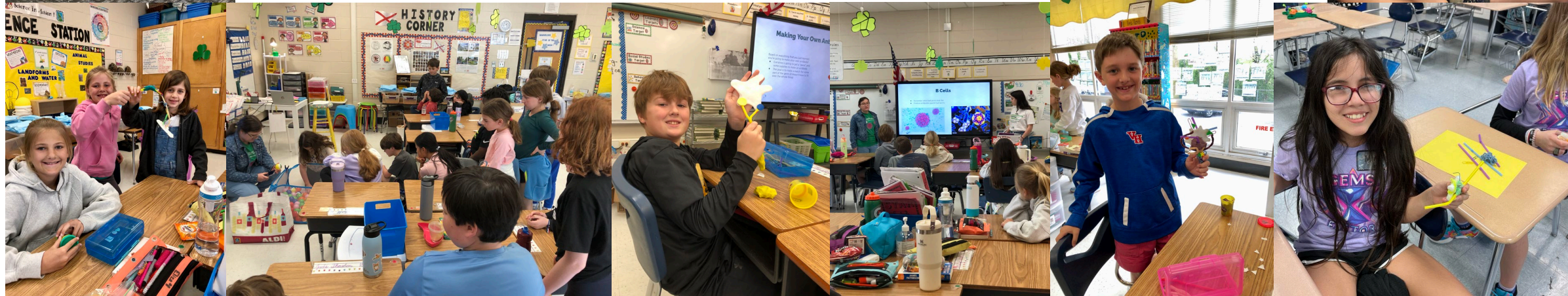


# Community engagement and education



In 2024, II supported the Undergraduate Immunology Society (UIS) in engaging approximately 350 participants in learning about immunology at McWane Science.

UIS/II also hosted a series of immunology workshops at GEMS event at Berry Middle School in Hoover in February and Vestavia Hills Elementary East and Vestavia Hills Elementary Liberty Park in March 2024.





# (Under) Graduate Education and training

189 trainees and staff are II members

Activities for Trainees managed by II

- Trainee Research in Progress
- HSOM AMC21 Awardee Program
- Program in Immunology Seminar Series
- Annual Immunology Symposium and Vaccine Lecture
- Southeastern Immunology Symposium





UAB IMMUNOLOGY INSTITUTE

RESEARCH IN PROGRESS

JUNE 27, 2024  
3:30 - 5:00 PM  
BBRB 170

GARRETT WILSON  
A novel subset of colonocytes targeted by *Citrobacter rodentium* elicits epithelial MHCII-restricted help from CD4 T cells



GARRETT WILSON  
MD-PHD STUDENT  
DEPARTMENT OF PATHOLOGY

MATTHEW CHEUNG  
MD-PHD STUDENT  
NIH MEDICAL SCIENTIST  
(MD-PHD) TRAINING PROGRAM

JOIN US!

MATTHEW CHEUNG  
Assessment of the immune response, microchimerism, and viral transmission during pig-to-human kidney xenotransplantation

<https://www.uab.edu/medicine/immunologyinstitute/news-events/research-in-progress>

UAB IMMUNOLOGY INSTITUTE

RESEARCH IN PROGRESS

APRIL 18, 2024  
3:30 - 5:00 PM  
BBRB 170

NESTOR PRIETO-DOMINGUEZ  
Inhibition of Innate Immune Response by MIPs During Cancer Immunotherapy



NESTOR PRIETO-DOMINGUEZ  
POSTDOCTORAL FELLOW  
DEPARTMENT OF MICROBIOLOGY

ERIN YEPESEN EARNHARDT  
PHD CANDIDATE  
DEPARTMENT OF MEDICINE

ERIN YEPESEN EARNHARDT  
Influenza A virus alters host defense in the airway epithelium via induced cystic fibrosis transmembrane conductance regulator dysfunction

JOIN US!

[b.edu/medicine/immunologyinstitute/news-events/research-in-progress](https://www.uab.edu/medicine/immunologyinstitute/news-events/research-in-progress)

UAB IMMUNOLOGY INSTITUTE

RESEARCH IN PROGRESS

SEPT 12, 2024  
3:30 - 4:30 PM  
BBRB 170

JESSICA LANE  
Natural-Acquired Antibody Against *Streptococcus*



JESSICA LANE  
PH.D. CANDIDATE  
DEPARTMENT OF MICROBIOLOGY

CHARLES KUHLMANN  
PH.D. CANDIDATE  
BBB-IMMUNOLOGY

CHARLES KUHLMANN  
JNK signaling impacts CAR-T cell response

[ologyinstitute/news-events/research-in-progress](https://www.uab.edu/medicine/immunologyinstitute/news-events/research-in-progress)



# Program in Immunology Seminar Series

Program in Immunology Seminar Series

## TREM2 in Neurodegeneration and Cancer

Thursday  
March 7, 2024  
3:30 PM  
BBRB 170

**Marco Colonna, M.D.**  
Robert Rock Belliveau Endowed Professor of Pathology & Immunology  
Professor of Medicine  
Washington University School of Medicine

Sponsored by UAB  
Immunology Institute/Comprehensive Transplant Institute/Comprehensive Diabetes Center/O'Neal  
Comprehensive Cancer Center/Comprehensive Arthritis, Musculoskeletal, Bone and Autoimmunity  
Center/Center for AIDS Research/Clinical Immunology and Rheumatology/Microbiology/Medicine

- 2023/2024 PII seminar series - **19 external/8 internal speakers**, co-sponsored World AIDS Day, Research in Progress, John Volanakis (Marion Pepper, PhD) & Robert Stroud (Eddie-Williams Owiredu and Melissa Jennings) Immunology lectures
- Earlier start time & II hosts post-seminar reception to encourage networking
- Average attendance increased from **39 (FY23) to 60 (FY24)**; highest of 101 with Dr. Marco Colonna





# The Eleventh Annual Southeastern Immunology Symposium in BIRMINGHAM

UAB trainees attended free with II vouchers!



Faculty/Staff/Vendors	177
Trainees	223
Total registrants	400
Faculty/Staff/Vendors	177
Institutions represented	21
States represented	16- AL, CA, FL, GA, IL, KY, LA, MA, MN, MO, NC, OH, SC, TN, TX, VA
Abstracts submitted	208
Vendors sponsored	16

Regional Institution	Number of Attendees
Augusta University	25
Duke University	9
Emory University	39
Georgia Tech	2
LSU	2
MUSC	8
NIH	2
St. Jude Children's	3
UAB	158
UF Scripps	3
UFL	1
UNC	9
University of Alabama	1
University of South Alabama	5
University of Louisville	2
University of South Florida	2
University of Tennessee -Knoxville	5
UVA	29
Vanderbilt University	58
Virginia Tech	8
Wake Forest University	2
Total	373





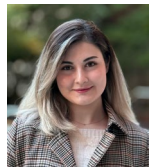
# HSOM Graduate Trainee Awards Program

- **30** Total AMC21 awards since 2017
- **7** trainees graduated [Andrews/2022: Osis/2022; Mabry/2023; Phillips/2023; Fisher/2023; Bollar/2024; Hunter/2024]
- **4** new awardees in 2024 (FY25)

**Jessica Scoffield, PhD**  
 – new faculty Director <sup>15</sup>



## Welcome UAB AMC21 Awardees!



Kimia Rayat Sanati

2024	2023	2022
 Erica Acox Microbiology	 James 'Nick' Brazell Immunology	 Craig Peters GGB
 Caroline Ennis CMDB	 Stephanie Suinn Microbiology	 Abigail Brooks P3
 Ashley Denslow Immunology	 John Bailey Echols GGB	 Meet Patel Cancer Biology
 Kyle Sahlberg Immunology	 Md Hasanul Banna Siam Microbiology	
2021	2020	2019
 Ashley Adamson Neuroscience	 Eddie-Williams Owiredu P3	 Gabrielle Childers Immunology
 Courtney Barkley Microbiology	 Tanya Pierre CMDB	 Julia Ziebro Immunology
 Abbigael Eil Cancer Biology	 Derian Pugh Neuroscience	
 Natalie Remiszewski Neuroscience		
 Patrick Song Cancer Biology		
 Ryan Strickland Neuroscience		

**Davide Botta, PhD**  
 - new facilitating Director



# HSOM Graduate Trainee Awards Program accomplishments

**13 grants obtained by awardees: NIH T32 (7) , F31 (3), TL1 (1), and AHA predoctoral fellows (2)**

**81 publications** including JAMA Psychiatry, Lancet Psychiatry, Clinical Cancer Research, Theranostics, Neuro-Oncology and Nature Communications

**Honors and Awards** Endo Society Research Experiences for Graduate & Medical Students; Trainee Professional Development Award (TPDA), Society for Neuroscience, Sigma Xi Scientific Research Honor Society; Phi Kappa Phi Honor Society, Graduate Student Travel Support Award, Society of Toxicology, Graduate Student Travel Award, American Journal of Hypertension, Golden Key International Honour Society



# NEW! Trainee Travel Awards



**Trainee Travel Awards** – for graduate students accepted to candidacy and postdoctoral fellows; The **Summer 2024 recipients** included:

**Lance Benson** in Jennifer Pollock’s laboratory attending the American Physiology Society Summit 2024 – “Sex Differences in T Cell Migration from the Spleen to the Kidney in Mice at Baseline and in Response to Angiotensin II Infusion”

**Susana Cheetham** in Troy Randall’s laboratory attending the American Association of Immunologists – “Influenza-specific lung-resident memory B cells assist CD4 and CD8 T cell recall responses during challenge infections”

**Krishna Chinta** in Adrie Steyn’s laboratory attending the Gordon Research Conference: Immunometabolism in Health and Disease – “Mycobacterium tuberculosis infection elicits glucose-dependent changes in neutrophil immunometabolism and effector functions”

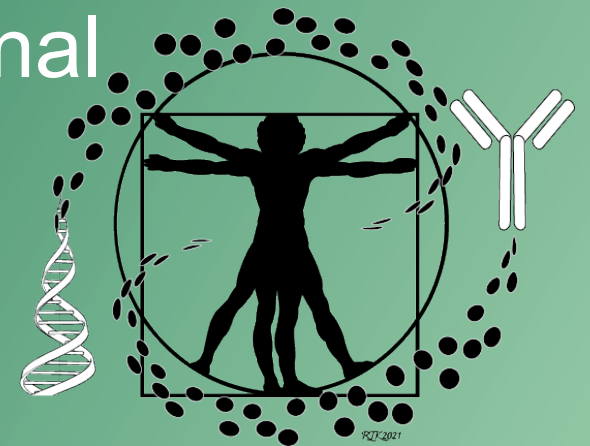
# Research in Progress – 4<sup>th</sup> year & above graduate students and postdoctoral fellows

10/5/23	Nicole Arroyo-Diaz	Andre Ballesteros-Tato's lab	IFN- $\gamma$ production by Tfh cells is required for CXCR3 <sup>+</sup> pre-memory B cell differentiation and subsequent lung-resident memory B cell responses
10/5/23	Millie Perez	Olaf Kutsch's lab	CD151 <sup>+</sup> T Cell Frequencies as an Immunological Clock that Identifies Premature Immunological Aging in People With HIV
4/18/24	Erin Yepsen Earnhardt	Kevin Harrod's lab	Influenza A virus alters host defense in the airway epithelium via induced cystic fibrosis transmembrane conductance regulator dysfunction
6/27/24	Garrett Wilson	Casey Weaver's lab	A novel subset of colonocytes targeted by Citrobacter rodentium elicits epithelial MHCII-restricted help from CD4 T cells
6/27/24	Matthew D. Cheung	Anupam Agarwal's and James George's lab	Assessment of the immune response, microchimerism, and viral transmission during pig-to-human kidney xenotransplantation
9/12/24	Charles Kuhlmann	Masakazu Kamata's Lab	JNK signaling impacts CAR-T cell response
9/12/24	Jessica Lane	Carlos Orihuela's lab	Natural-acquired antibody against Streptococcus pneumoniae among healthy adults is primarily to biofilm-exclusive antigens



# FY24 Achievement

## III. Engagement with other External and Internal Research Units





# Establishment of an External Advisory Board

First EAB meeting: February 12, 2025



Shannon Turley, Ph.D.  
Genetech  
Stromal cell function in inflammation and cancer



E. John Wherry, Ph.D.  
Univ. Pennsylvania  
T Cell Exhaustion and Cancer Immunotherapy



PJ Utz, M.D.  
Stanford Univ.  
Development of efficacious immune-therapies and treatments.



Nadine Roupael, M.D.  
Emory Univ.  
Vaccine Clinical Trial



David Masopust, Ph.D.  
Univ. Minnesota  
T cell migration, differentiation, and memory development



Gwendalyn Randolph, Ph.D.  
Washington Univ.  
Immune cell trafficking and tissue-specific transcriptional profiling



Miriam Merad, M.D. Ph.D.  
Mount Sinai School of Medicine  
Dendritic cell and macrophage biology

# Support *Multi-FUNDED!!* Disciplinary Grants

Human Immunology U19 Evolution and Durability of Human T and B Cell Responses (Lund, PD/PI) – Lund, Randall, Porrett, Green, King, Rosenberg – awarded 04/24 - **\$18,324,905 total**

NIAID R24 Global Research Resource for Human Tuberculosis (Steyn,PD/PI) – Steyn, Benson, Glasgow and AHRI -awarded 08/24 – **\$5,850,378 total**

NIH Cooperative Centers on Human Immunology  
INFRASTRUCTURE AND OPPORTUNITY FUND

HOME ABOUT FUNDING MEMBERS NEWS CONTACT

Advancing our understanding of the mechanisms regulating human immune response

The *NIH Cooperative Centers on Human Immunology (CCHI)* were awarded in response to RFA-AI-22-069 to support research on human immune system regulation and function for the discovery and characterization of new principles of human immunology for the prevention and treatment of infectious and immune-mediated diseases. The CCHI U19 program supports mechanistic and hypothesis-testing studies to discover novel molecules, mechanisms, or regulatory pathways governing function of the human immune system in both healthy and vulnerable populations (i.e., across lifespan, organ/tissue transplant

Global Research Resource for Human Tuberculosis  
HEERSINK SCHOOL OF MEDICINE

Home About the GRR-HTB Human TB Tissues Analytical Services Request Services Policies

Our mission is to transform the landscape of global TB research by accelerating the study of human TB tissue.

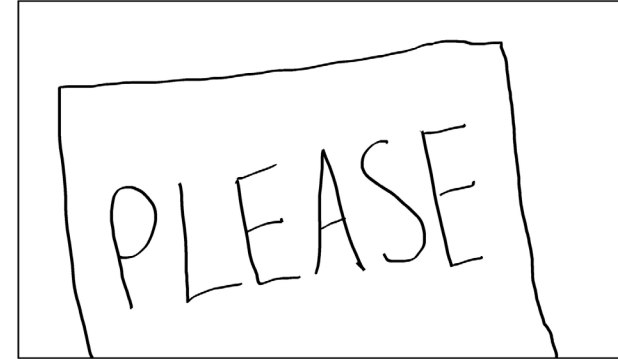
The GRR-HTB supports innovative TB research by providing confidential, personalized, investigator-requested analyses of human TB tissue specimens, enabling investigators worldwide to challenge existing paradigms of the cellular and pathological basis of human TB to improve diagnosis, prevention, and treatment of TB.

# Facilitate multi -investigator grant applications

Dr. Carol Ballinger (II Admin Manager) provided all Administrative Support for II Member multidisciplinary grants

- ❑ Human Virome U24 Coordinating Center (Lefkowitz, submit 11/23) – Lefkowitz, Thompson, Argonne Natl Labs, J. Craig Venter Institute, UVA (\$16,219,935 total, Not funded) – *but awarded as a Bacterial/Viral Bioinformatics Resource Center (BVBR) Site with Univ. Chicago* (\$1,244,970 total, 06/24)
- ❑ Immunology SEPA R25 (Bruns, Justement, resubmit 06/24) – **Pending**, \$1,350,000 total
- ❑ NHLBI Program Project P01 - cardiac dysfunction following pneumonia (Orihuela, submit 09/24) – Orihuela, Lal, Sethu, Xie, Erdmann – **Pending**, \$11,248,875 total

THE PERFECT ACADEMIC GRANT APPLICATION  
GRANTSCIENCE.COM



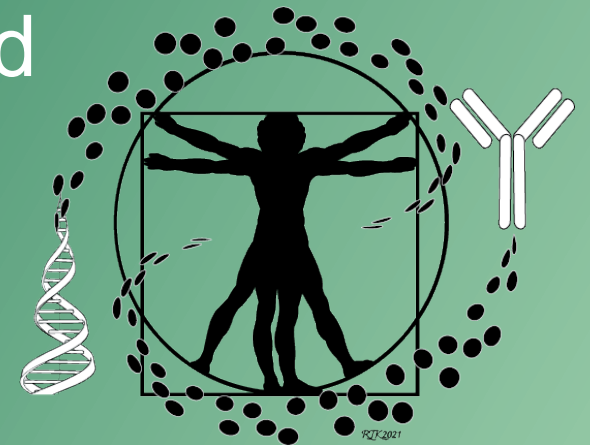
# Support Immunology Relevant Services

The screenshot shows a web browser displaying the Immunology Institute website. The browser's address bar shows the URL: [uab.edu/medicine/immunologyinstitute/research-cores/immunology-relevant-services](http://uab.edu/medicine/immunologyinstitute/research-cores/immunology-relevant-services). The website header includes the UAB logo and the text "THE UNIVERSITY OF ALABAMA AT BIRMINGHAM" on the left, and "Explore UAB" with a magnifying glass icon on the right. Below the header, the page title "Immunology Institute" is displayed, followed by "HEERSINK SCHOOL OF MEDICINE". A navigation menu contains links for "About", "Members", "Research", "Education", "News & Events", and "Give". On the left side, a vertical menu lists "Research & Cores" with sub-items: "Cores and Infrastructure", "Immunology Relevant Services" (highlighted with a left-pointing arrow), "Antibody Characterization and Serology (ACS) Core", "Multiplex Immunofluorescence COMET™ Services", "Featured Discovery", "Healthy Donor Cohort", and "Pilot Grant". The main content area features a breadcrumb trail: "Home - Research & Cores - Immunology Relevant Services". The main heading is "Immunology Relevant Services", followed by a list of service links: "Antibody Characterization and Serology (ACS) Core", "Multiplex Immunofluorescence COMET™ Services under Flow Cytometry and Single Cell (FCSC) Core", "Immunophenotyping Services under FCSC Core", and "Global Research Resource for Human Tuberculosis".



# FY24 Achievements

## IV. Build IRrelevant Research Capabilities and Portfolio





# UAB Healthy Donor Cohort – up and running

[Home](#) - [Research & Cores](#) - Healthy Donor Cohort

## Healthy Donor Cohort

You are being asked to join a group of healthy adults who are willing to serve as participants in UAB research studies for which investigators need blood samples. There are no direct benefits to you for enrolling in this cohort although your donation will assist with UAB immunology research and increase our knowledge of how the immune system works.

### HOW DOES IT WORK?

**Enrollment:** If you decide to enroll in this group (UAB HDC), we will ask you to complete a questionnaire (<https://redcap.link/uabhdcc>) to collect basic information and verify that you are a healthy (no active cancer within the past 5 years, no diagnoses of autoimmune disorders, no diagnoses of anemia or lymphopenia, not treated with immune modulating drugs, and not currently treated for chronic viral infection(s)), non-pregnant adult (18 years of age or older) weighing at least 110 lbs.



**781**  
Participants  
Enrolled



**61**  
Requests



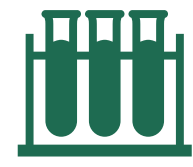
**34**  
Median Age  
(1885)



**9**  
Labs

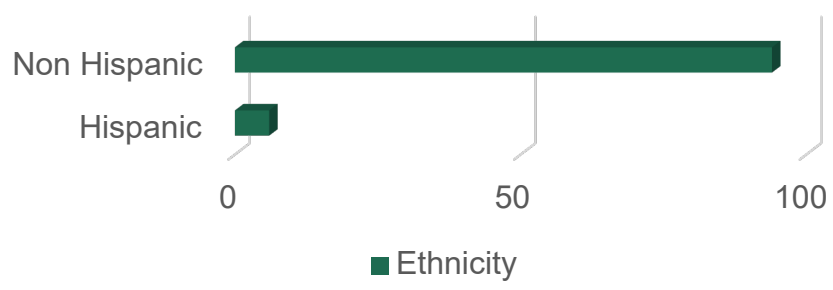


**568**  
Female  
(72.7%)

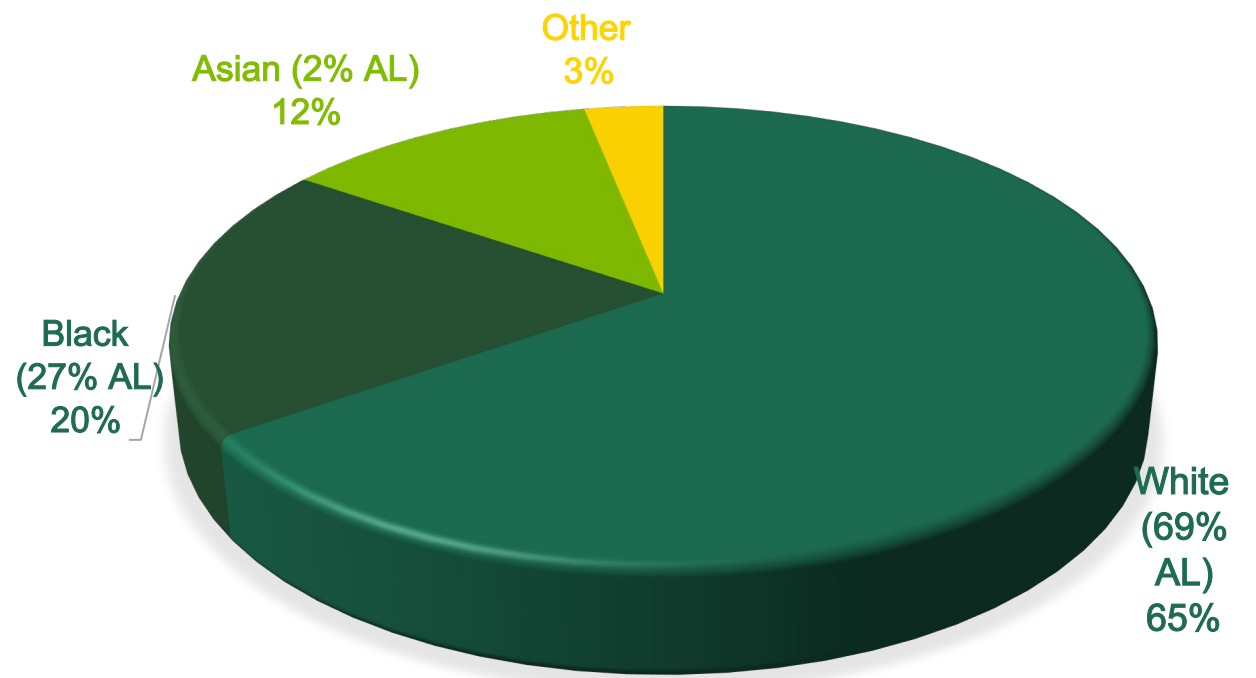


**185**  
Samples

Ethnicity



RACE



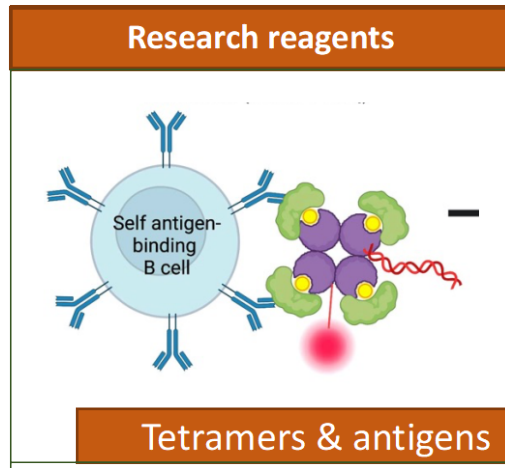
# Using the UAB HDC for other studies – Flu vaccine study across the lifespan

Goal enroll 20 individuals with specific DOB for flu vaccine– completed in 48 hrs!!

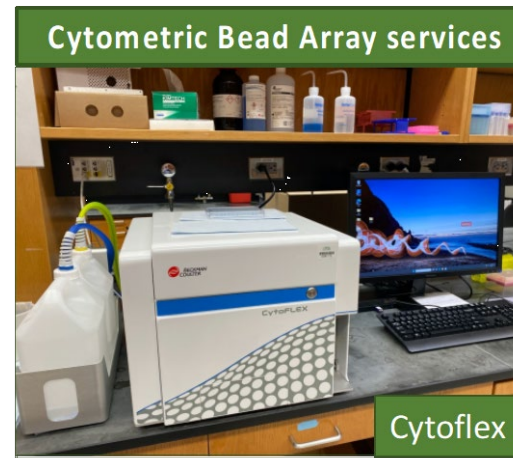
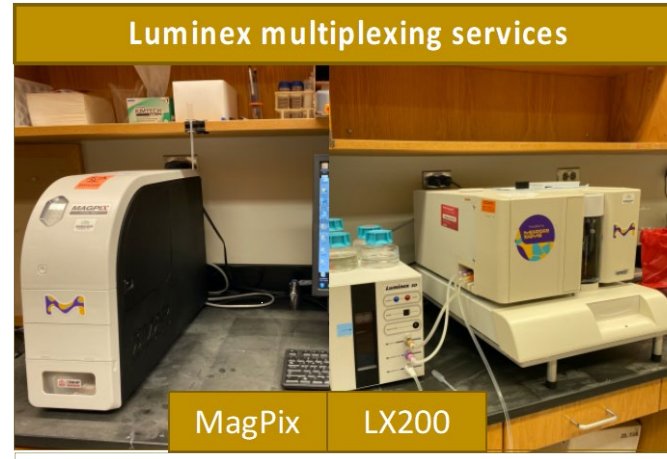
DOB Groups	Visit 1 Complete	Study Complete	DOB of Participants	M	F	Black	White
1947-1957 (N=5)	5	5	1948, 1950 (2), 1955, 1956	2	3	0	5
1957-1968 (N=7)	7	7	1959 (2), 1960, 1961, 1963, 1966, 1967	2	5	2	5
1968-1977 (N=8)	8	8	1969 (3), 1970, 1972, 1973 (2), 1974	4	4	4	4
<b>Total</b>	<b>20</b>	<b>20</b>	<b>NA</b>	<b>8</b>	<b>12</b>	<b>6</b>	<b>14</b>

# Antibody Characterization and Serology (ACS) Service Center

Multiplexed immunoassays and HTS technologies to quantitate soluble biomarkers in biologic samples



Reagents to follow B and T cell responses *in situ*



Quantitate antibody responses and antibody affinities in biologic samples

# ACS users already span many HSOM departments and divisions



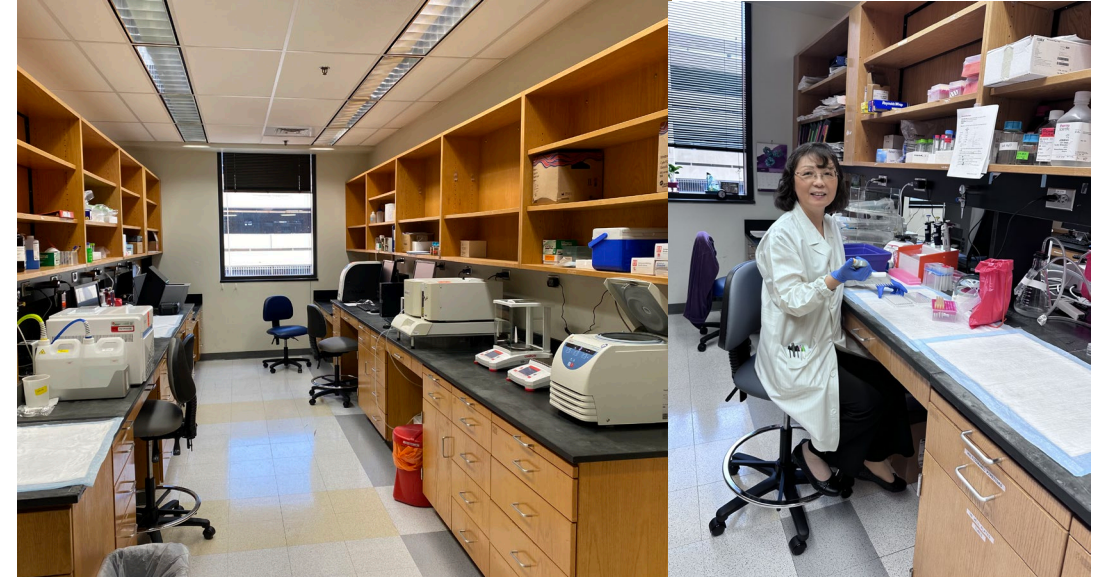
10  
Depts/Divisions



22  
Grants supported



15  
Labs supported



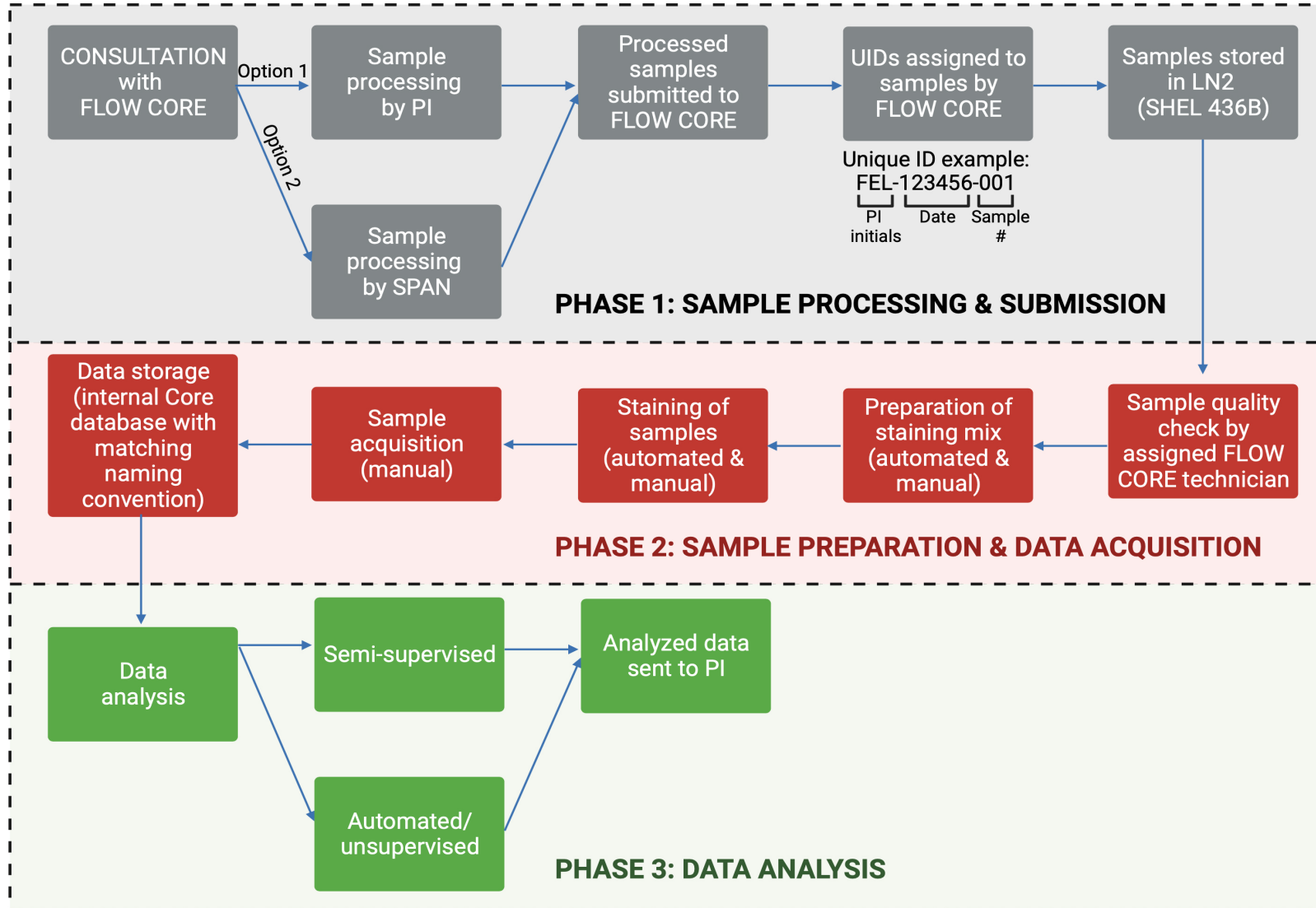
[Home](#) - [Research & Cores](#) - [Immunology Relevant Services](#) - [Antibody Characterization and Serology \(ACS\) Core](#)

## Antibody Characterization and Serology (ACS) Core

ACS most often used for custom 80plex soluble protein measurements



# Immunophenotyping core service has launched



Immunophenotyping is a powerful approach to identify easily monitored biomarkers and cellular signatures that may be useful as diagnostic and prognostic indicators of disease. Immunophenotyping is particularly helpful when monitoring patients who are exposed to immunotherapies, such as checkpoint inhibitors and targeted immune modulators that are increasingly used in chronic disease settings.

# Flow panels for human immunophenotyping

**PBMC panel (30 parameter – 44 subsets):  
VALIDATED AND READY  
(Tissues and blood)**

**B cell panel (24 parameter and 23 subsets):  
VALIDATED AND READY  
(Tissues and blood)**

**T cell panel (33 markers):  
Final optimization**

**Myeloid lineage panel (34 markers): optimizing in  
bone marrow samples**

<b>NKT Cells</b>	NKT cell	CD19-/CD14-/CD3+/CD56+
<b>NK Cells</b>	CD56bright CD16- NK Cell CD56+/dim CD16+ NK Cell CD56- CD16+ NK Cell	CD19-/CD14-/CD3-/CD56bright/CD16- CD19-/CD14-/CD3-/CD56+/dim/CD16+ CD19-/CD14-/CD3-/CD56-/CD16+
<b>CD3+ Cells</b>	CD3+ T Cell	CD19-/CD14-/CD56-/CD3+
<b>CD4+ Cells</b>	CD4+ T Cell CD4 Naive T cell (Nav) CD4 Central Memory T Cell (CM) CD4 Effector Memory T Cell (EM) CD4 Effector Memory RA+ T Cell (EMRA) CD4 Anergic CD4 Senescent CD4 No-Expression CD4 Exhausted	CD19-/CD14-/CD56-/CD16-/CD3+/CD4+ CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/CCR7+/CD45RA+ CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/CCR7-/CD45RA+ CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/CCR7-/CD45RA- CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/CCR7+/CD45RA- CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/PD1+/CD57+ CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/PD1-/CD57+ CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/PD1-/CD57- CD19-/CD14-/CD56-/CD16-/CD3+/CD4+/PD1+/CD57-
<b>CD8+ Cells</b>	CD8+ T Cell CD8 Naive T Cell (Nav) CD8 Central Memory T Cell (CM) CD8 Effector Memory T Cell (EM) CD8 Effector Memory RA+ T Cell (EMRA) CD8 Anergic CD8 Senescent CD8 No-Expression CD8 Exhausted	CD19-/CD14-/CD56-/CD16-/CD3+/CD8+ CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/CCR7+/CD45RA+ CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/CCR7-/CD45RA+ CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/CCR7-/CD45RA- CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/CCR7+/CD45RA- CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/PD1+/CD57+ CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/PD1-/CD57+ CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/PD1-/CD57- CD19-/CD14-/CD56-/CD16-/CD3+/CD8+/PD1+/CD57-
<b>B Cells</b>	B Cell Transitional B Cell Naive B Cell Unswitched Memory B Cell Switched Memory B Cell IgG+ Switched Memory B Cells True IgM+ Memory B Cells Double Negative IgG+ Double Negative IgM+ Double Negative DoubleNegative 2 Plasmablast Plasma Cell	CD3-/CD14-/CD56-/CD19+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27-/CD24+/CD38+/IgM+ CD3-/CD14-/CD56-/CD19+/IgD+/CD27-/IgM+ CD3-/CD14-/CD56-/CD19+/IgD+/CD27+/IgM+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27+/IgG+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27+/IgM+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27- CD3-/CD14-/CD56-/CD19+/IgD-/CD27-/IgG+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27-/IgM+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27-/CD11c+ CD3-/CD14-/CD56-/CD19+/IgD-/CD27+/CD38+/CD24-/CD138- CD3-/CD14-/CD56-/CD19+/IgD-/CD27+/CD38+/CD24-/CD138+
<b>Monocytes</b>	Classical Monocyte Intermediate Monocyte Non-Classical Monocyte	CD3-/CD19-/CD56-/CD8-/HLA-DR+/CD14+/CD16- CD3-/CD19-/CD56-/CD8-/HLA-DR+/CD14+/CD16+ CD3-/CD19-/CD56-/CD8-/HLA-DR+/CD14-/CD16+
<b>DCs</b>	DC CD1c+ Conventional DC CD141+ Conventional DC Plasmacytoid DC	CD3-/CD14-/CD16-/CD19-/CD56-/HLA-DR+ CD3-/CD14-/CD16-/CD19-/CD56-/CD11b-/HLA-DR+/CD11c+/CD141-/CD1c+ CD3-/CD14-/CD16-/CD19-/CD56-/CD11b-/HLA-DR+/CD11c+/CD1c-/CD141+ CD3-/CD14-/CD16-/CD19-/CD56-/CD11b-/HLA-DR+/CD11c-/CD123+/CD303+

Requests for information



9

Labs from 9  
Depts/Divisions

# Immunology Institute\* supporting development and distribution of immunology -relevant clinical data bundles

- Rapidly obtain bundled clinical data sets that are semitailored for our research interests
- Can be used to determine whether potential cohort exists or to collect clinical information on an existing cohort
- Initial bundles are focused on diseases that are often treated with immunomodulating therapies

## Immunology -relevant bundles

- ❖ Respiratory infection/disease
  - ❖ Acute and Long COVID
  - ❖ Viral and bacterial
- ❖ Autoimmune Disease
  - ❖ Lupus
  - ❖ RA etc
- ❖ Cancer Immunology
  - ❖ MM, Breast, Ovarian etc
- ❖ Transplantation
  - ❖ Kidney, lung etc

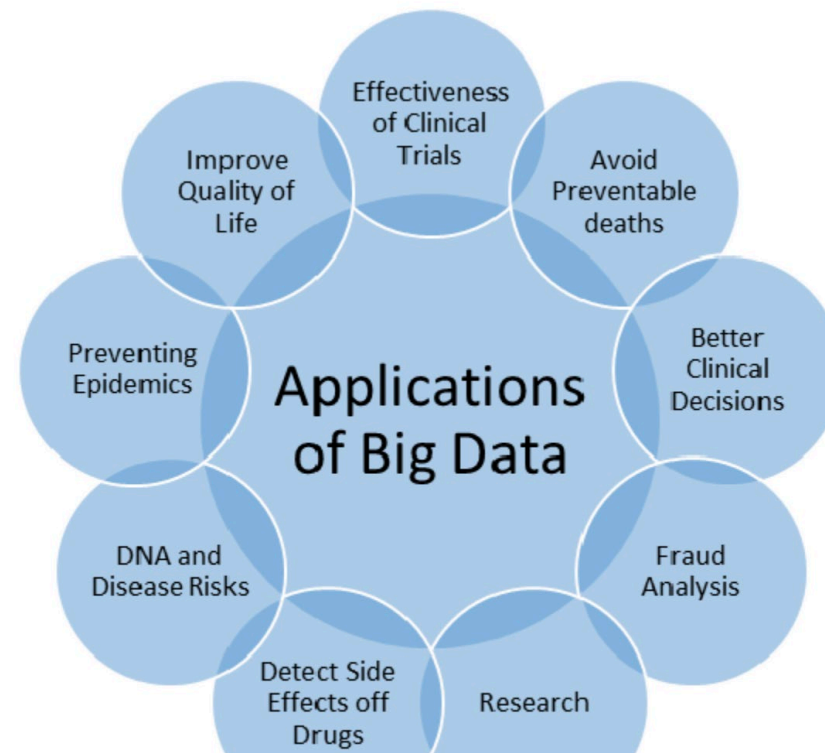


Figure 1 Applications of Big Data

Published in IEEE International Advance Computing Conference 2017

**Big Data Security in Healthcare: Survey on Frameworks and Algorithms**

Sudipta Chandra Soumya Ray R. T. Goswami



**Greer Burkholder MD, MSPH**  
Assoc Professor,  
Infectious Diseases,  
RISC Director of Data  
Services



**Dale Johnson, MS**  
Informatics Dept,  
Informatics Architect



**Urva Tul Vusqa, MBBS**  
RISC Clinical Data  
Specialist

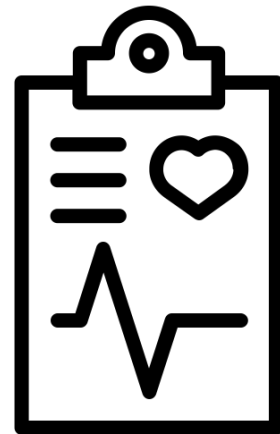
\*partners include RISC, DBIDS, CCTS, COERE

# Example of a search for a group of patients

Find me all the patients seen at UAB in the last decade who had at least one clinical lab that was "hi" for anti-Smith or anti-RNP or anti-SSA

Data returned includes:

- ❖ Diagnoses 28,992 medical/concept codes (ie. 992 are autoimmune and 2187 are CKD)
- ❖ Vital Signs 148 medical/concept codes (ie BMI and Diastolic BP)
- ❖ Lab results 43 medical/concept codes (autoimmune specific)
- ❖ Medications 3650 medical/concept codes (ie. 1100 autoimmune meds with 12 for abatacept (different delivery routes)
- ❖ 1091 Columns of data for individuals (on 26 sheets)
  - ❖ Demographics (34 data points)
  - ❖ Emergency encounter no Admittance (26 data points)
  - ❖ In-patient encounter (29 data points)
  - ❖ In-patient maxO2 (7 data points)
  - ❖ Out-patient encounters (26 data points)
  - ❖ Labs (30 data points - autoimmune specific)
  - ❖ Meds order (30 data points – autoimmune specific)
  - ❖ Vital signs (26 data points)
  - ❖ Many others and then filtered by TAGS (focused on autoimmunity in this bundle, most recent, Y/N etc)





# Find me patients at UAB in last decade with high labs for Smith, or RNP or SSA antibodies

Data returned on 3727 individuals. I found 3407 are still alive and 2073 were seen at least one time at UAB in 2024.

- ❖ ~90% are women and more than 50% are Black women - expected for these Autoantibodies (Lupus specific)
- ❖ ~10% are men (n=282)
- ❖ DRILL DOWN ON THE RARE MALE PATIENTS

Drug treatment	last 10 yrs	In 2024
Anti-CD20	17	15
Baracitinib	1	0
Belimumab	17	8
chloroquine	1	0
corticosteroid	199	96
Etanercept	1	0
IL-1 inhibitor	3	0
IL12/23 inhibitor	4	1
IL17 inhibitor	0	0
IL23 inhibitor	0	0
IL6 inhibitor	2	2
JAKi	2	1
TNFi	11	3



4.5 hr to run  
20 min to sort

AutoAbs	# Patients
Anti-Smith (10 yrs)	127
Anti-Smith 2024	34
Smith+RNP+SSA scored (10 yrs)	98
Smith scored 2024	4
RNP scored 2024	7
SSA scored 2024	18



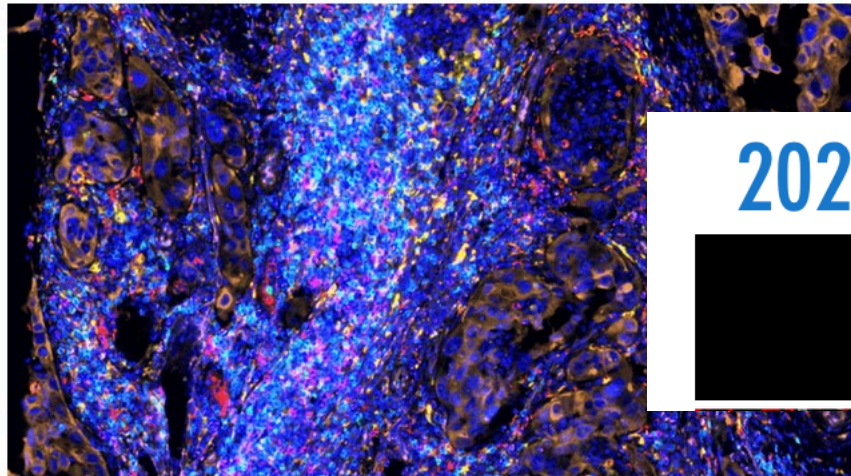
Patients	Next Appointment
483038	UAB PHYSICAL MED & REHAB MED WEST   Carter, Johnny M   03/05/2025 02:40:00 PM
597365	TKC - ULTRASOUND   RADIOLOGY ULTRASOUND   10/31/2024 02:00:00 PM
1837395	GAR MRI   RADIOLOGY MRI GARDENDALE   11/25/2024 09:30:00 AM
1997889	TKC Infusion 5th Flr   INFUSION POD C   11/08/2024 01:30:00 PM
2558268	WHITAKER RHEUMATOLOGY   Taylor, Adam Douglas MD   11/22/2024 11:20:00 AM
2569513	TKC Cardiology   McElderry, Hugh T MD   06/25/2025 09:00:00 AM
2774795	TKC Infusion 5th Flr   INFUSION POD B   11/06/2024 09:15:00 AM
2820739	EMG   EMG UH LABORATORY   11/06/2024 01:40:00 PM
2850934	TKC-OTOLARYNGOLOGY   Stone, Caitlin MCD CCC-SLP   11/07/2024 08:30:00 AM
2969593	Acton Rd Infsn Thrpy   ACTON ITU 1   10/31/2024 10:30:00 AM
2982233	TKC Radiology Diagnostic   RADIOLOGY GI TKC   11/25/2024 10:00:00 AM
3869860	TKC Neurology   Kazame1, Mohamed MD   10/30/2024 02:40:00 PM
3902593	Wallace Tumor - Pet   PET SCAN   11/14/2024 07:30:00 AM
4064315	WHITAKER DERMATOLOGY   Elewski, Boni E MD   11/22/2024 10:45:00 AM
4081484	Cardio-Pulmonary Reh   RADIOLOGY PULMONARY REHAB   10/29/2024 01:00:00 PM
4141093	not scheduled
4150000	not scheduled
4244678	not scheduled
4703421	not scheduled
4777588	not scheduled

# Spatial Biology – the Google Maps View of our Cells\*

\*Scientific American Dec 2014

Spatial Biology – The 2024 SciLifeLab Science Summit

Allison Institute scientific symposium features spatial biology breakthroughs, \$5 million gift to support further efforts



## 2024 Spatial Biology Summit

3RD ANNUAL  
SPATIAL BIOLOGY SUMMIT  
SEPTEMBER 10-12, 2024  
STANFORD, CA

Home > Spatial Symposium 2024

## BioChain's 2nd Annual Spatial Symposium

Three Decades of Pioneering Precision Medicine, Enriching Science, Shaping Futures



3rd Annual  
**Spatial Biology for  
Immuno-Oncology Summit**  
28-30 January, 2025 | San Diego, CA

FREE PASS

RS-SINAI

## Spatial Biology Symposium '24

March 7

Hosted by the Cedars-Sinai Spatial Molecular Profiling, Proteomics, and Applied Genomics Shared Resources, Cancer Shared Resources, and Academic Affairs

WATCH THE REPLAY ON YOUTUBE

# Launching Spatial Biology platforms at UAB

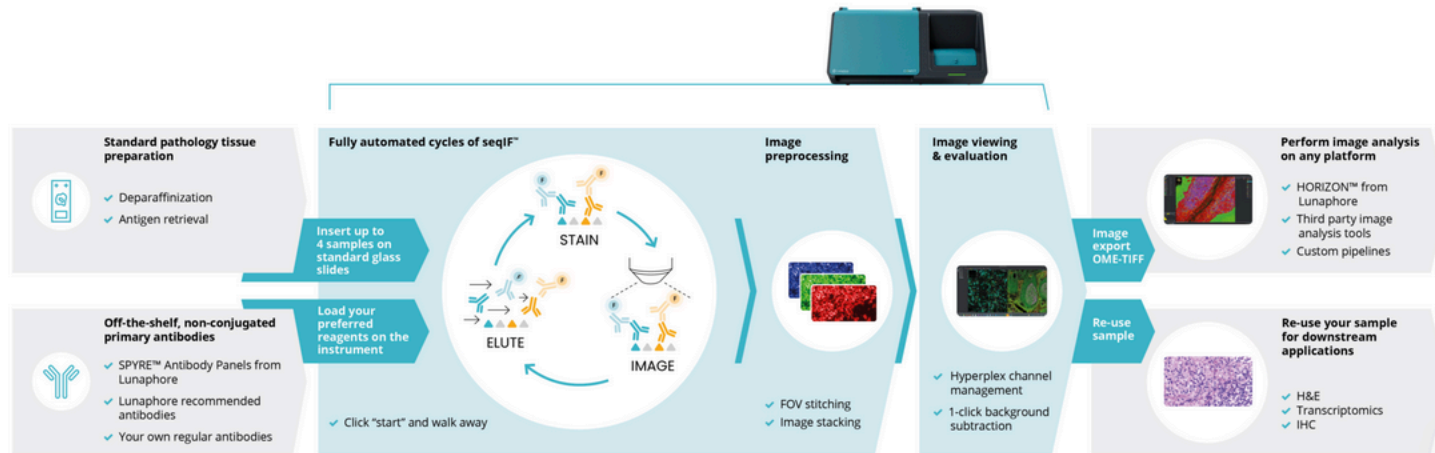
Single cell spatial proteomics

AI-driven spatial analytic platform



## Hyperplex workflow without user intervention

A fully integrated system across staining, image acquisition and image pre-processing.



Stay ahead

Realize the potential of AI-driven precision pathology

Get a demo

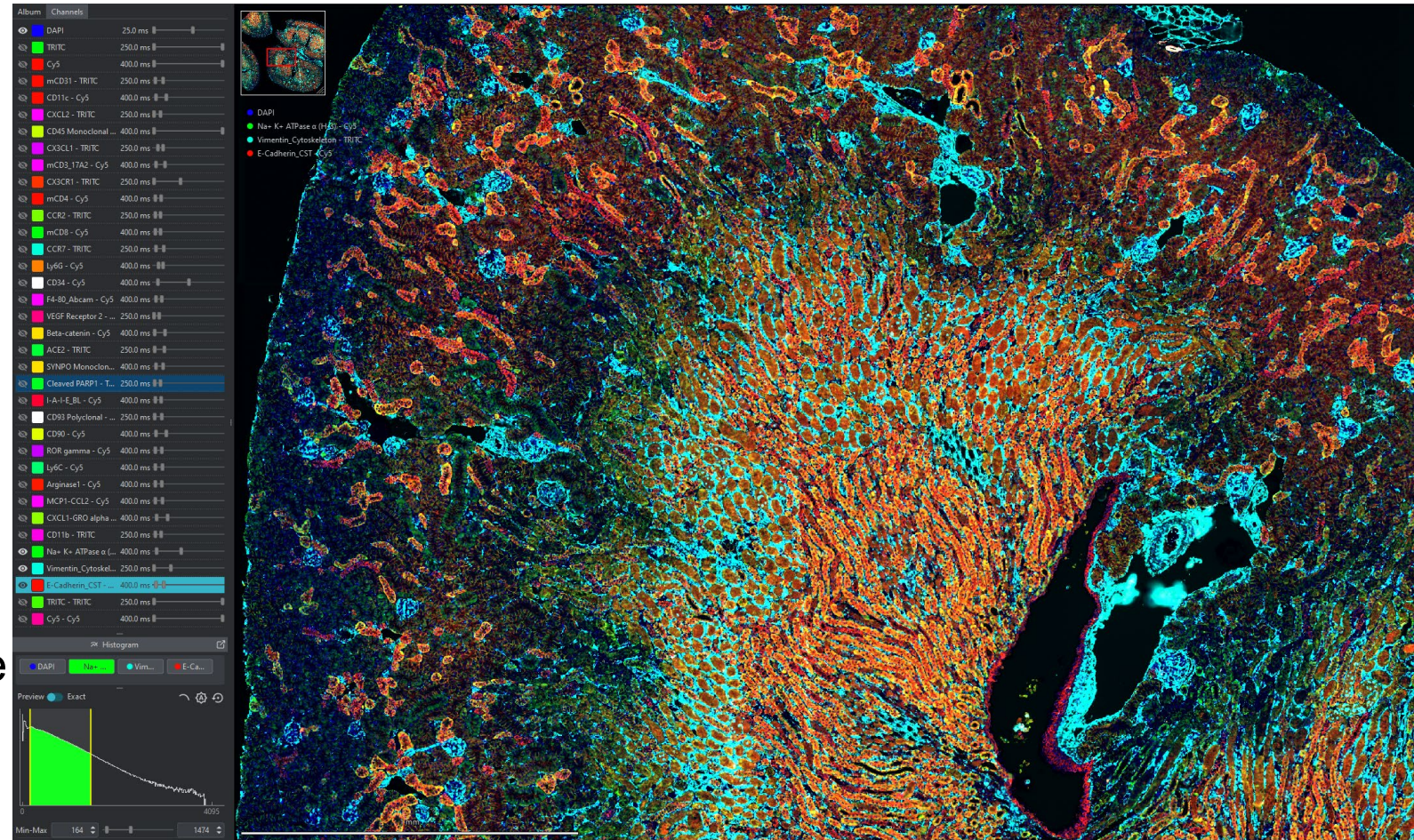
Check out our Resources



# Spatial Biology – understanding how cells interact in tissues

Definition from AI Google

The future of spatial biology lies in significantly enhancing our understanding of how cells interact within a tissue by providing detailed spatial information about gene expression and protein localization, enabling researchers to better study disease progression, therapeutic response, and develop more targeted treatments, particularly for complex diseases like cancer and neurodegenerative disorders, all while achieving higher resolution and multi-omics capabilities through advanced technologies and computational analysis.



Mouse kidney – Jim George Lab and Harish Pal



# Lunaphore Comet and Visiopharm Analytic Software Suite

37

- ❖ Human antibodies validated (n=60)
- ❖ Mouse antibodies validated (n=60)\*\*\*
- ❖ Preset staining panels
  - ❖ 7 human tissue
  - ❖ 7 mouse tissue
- ❖ Visiopharm AI-driven software
  - ❖ Deep learning-based algorithms
  - ❖ Kaltura channel training videos
  - ❖ Analytic seats available
  - ❖ Azure virtual computing systems
- ❖ Data management
  - ❖ Transfer data
  - ❖ Long-term storage
  - ❖ Short-term analysis



Julie Carstens



Harish Pal



Chris Risley



COMET 1.0 and now 2.0

# COMET and Visiopharm are actively being used at UAB



22

Investigators



13

Departments/  
Divisions



7 + 7

Mouse and  
human tissues  
interrogated

# UAB Spatial Day- October 8, 2024

89 Registrants

## Spatial Day

Featuring:

Lunaphore COMET Hyperplex System  
and  
Visiopharm Analysis Software

Join us for a workshop to

Learn how to get started using these  
incredible spatial tools.

Presentations by  
Core, Visiopharm and invited UAB speakers

Open round tables and Q&A with  
on Scientists and your FCSC support team

**October 8, 2024**  
**8a- 4p**  
**WTI 101**

Lunch Provided to  
Registered  
Attendees



Limited Seating:  
Closes Oct 1

### SPATIAL DAY SCHEDULE

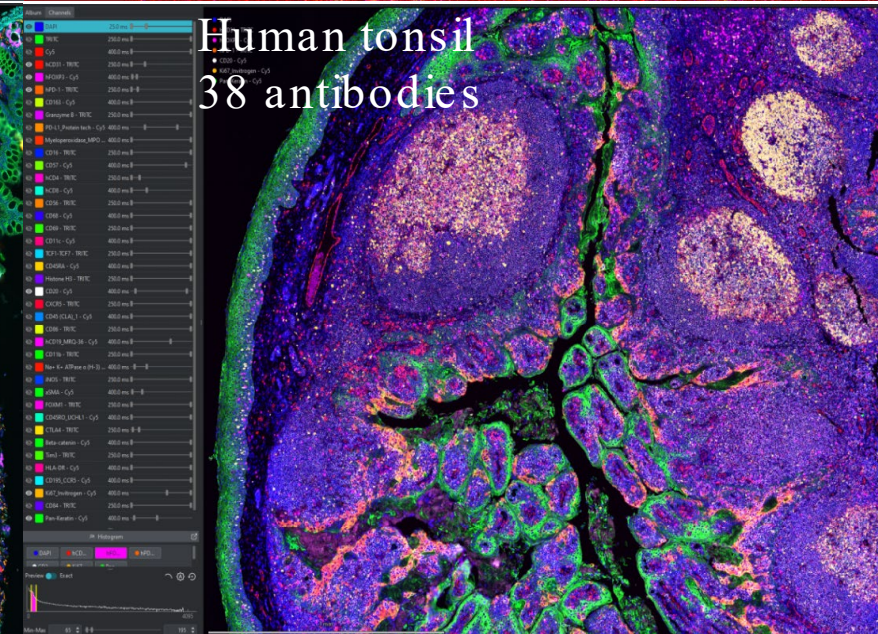
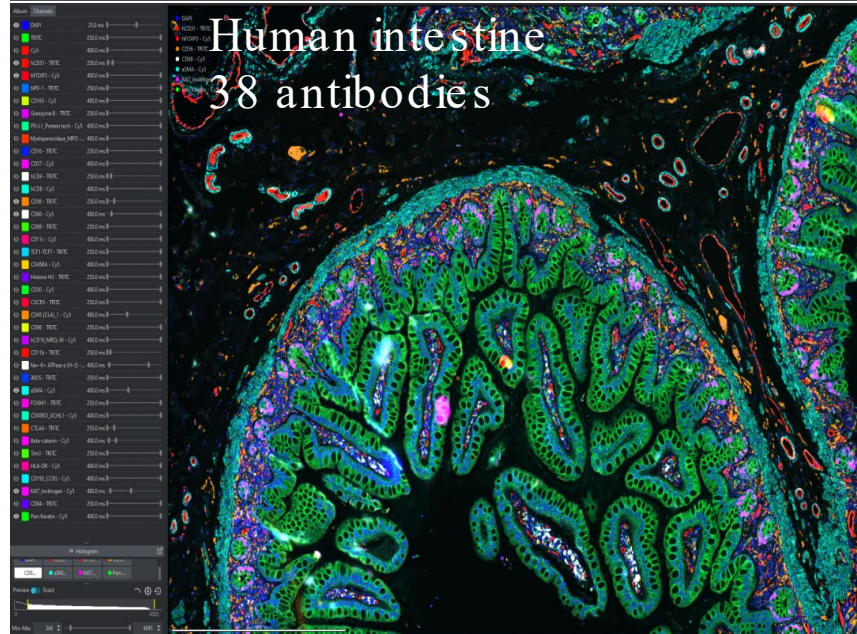
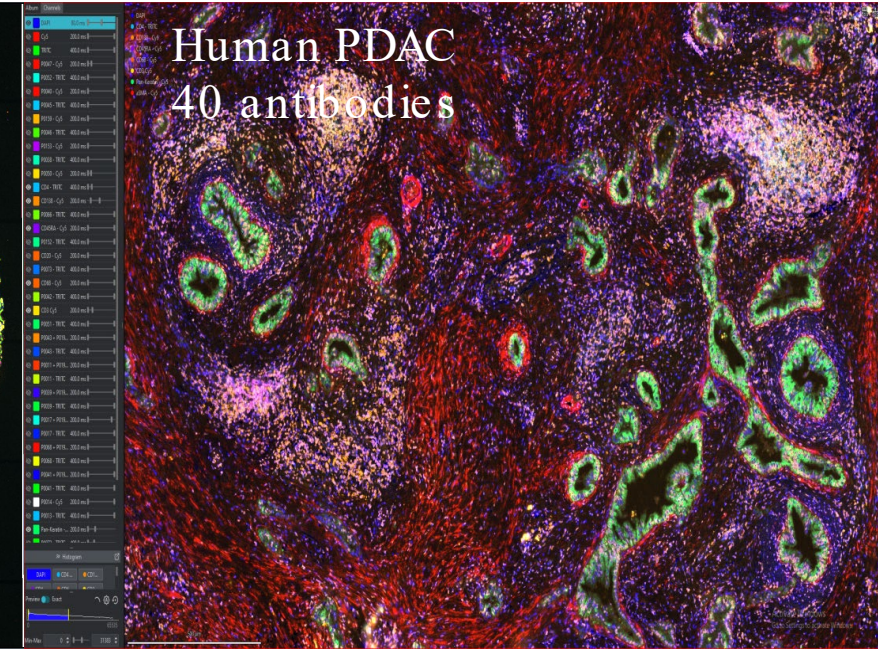
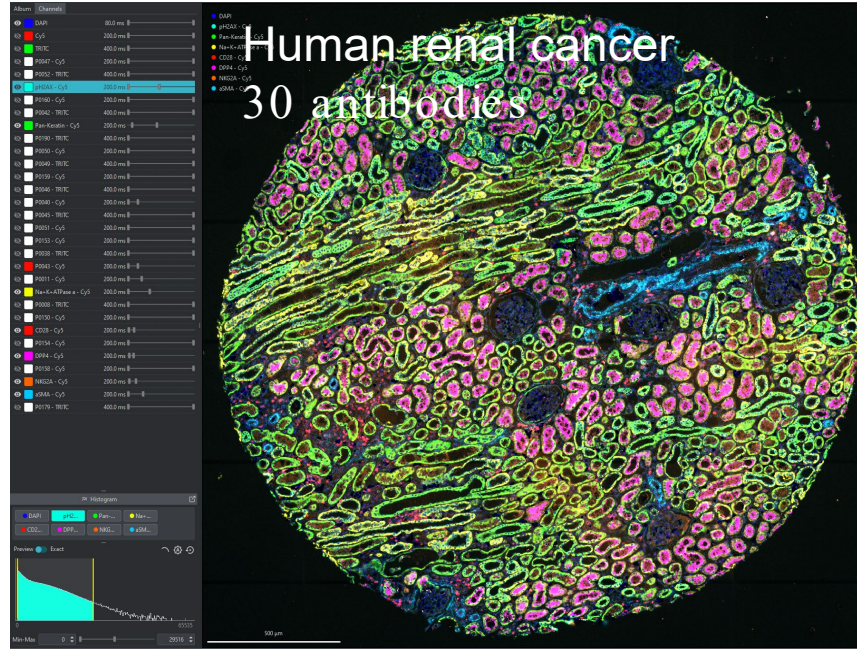
Time	Topic	Speaker
8:00 - 8:25	The Way I Use It: COMET	Gelare Ghajar-Rahimi, Ph.D. - MSTP
8:25 - 9:20	Introduction to COMET	Emily Martersteck and Tawnie Cordes
9:20 - 9:40	Break	
9:40 - 10:35	COMET Applications	Emily Martersteck and Tawnie Cordes
10:35 - 10:55	How to Access COMET and Visiopharm at UAB	Harish Pal
10:55 - 11:15	Large Data Storage, Transfer, Computing at UAB	William Warriner, PhD.
11:15 - 11:30	RFA Announcement	Troy Randall, Ph.D.
11:30 - 12:10	Break and Lunch Box	
12:10-12:35	The Way I Use It	Julienne L Carstens, Ph.D.
12:35-13:30	Introduction to Image Analysis and quantification: Visiopharm	Brit Boehmer, Ph.D. and Kyle Kisel
13:30-13:50	Break	
13:50-14:45	Visiopharm Applications Demos	Brit Boehmer, Ph.D. and Kyle Kisel
14:45-15:00	Break - move to WTI 231 for Round Tables and Q&A	
15:00-16:00	WTI 231 Q&A and Round Tables	



Image Credit: Sajid Nadeem



# Examples of hyperplexed assays in different tissues



Slides provided by Harish Pal



# COMET Voucher RFA Released due Nov 15th

8 research projects funded (4 from II and 4 from I-4ward). Eligible applicants must hold a full-time UAB faculty appointment at any rank. Priority will be given to applications that have preliminary histologic data and demonstrate readiness to move to next level, 40-color analysis. Applications should share strong thematic overlap with either of the research missions of II (must be an II [member](#)) or I-4ward (focused on infectious or inflammatory diseases)

[Home](#) - [Research & Cores](#) - [Pilot Grant](#) - COMET™ Voucher RFA

## COMET™ Voucher RFA

LUNAPHORE COMET™ IS AT UAB AND READY FOR YOUR EXPERIMENTS!!!!



The UAB Heersink School of Medicine **Immunology Institute (II)** and **I-4ward** (Inflammation, Infection, Immunity and Immunotherapy) strategic theme are requesting applications for a new voucher program designed to support experiments using the new [Lunaphore COMET™](#) single cell resolution proteomic platform which is now available here at [UAB](#). Investigators interested in using cutting-edge spatial biology tools to characterize migratory and resident inflammatory cells and tissue-specific cell populations within tissue samples isolated from patients and pre-clinical models (mouse) of acute and chronic disease are invited to apply.

The Lunaphore COMET™ fast fluidic exchange technology allows for staining of tissue sections (fixed and fresh frozen) with standard, off-the-shelf primary (non-conjugated) antibodies (Abs). The incubation time with each Ab is reduced from several hours to only a few minutes – which allows for hyper-multiplexing of 20+ different Abs\* in just one day. The COMET™ microfluidic chip allows for controlled flow rate, flow pressure and chamber temperature, resulting in precise and consistent staining of tissue samples and high reproducibility across different tissue samples and experiments.

# Single cell resolution spatial transcriptomics (Xenium) on the same tissue sample that is used for spatial proteomics

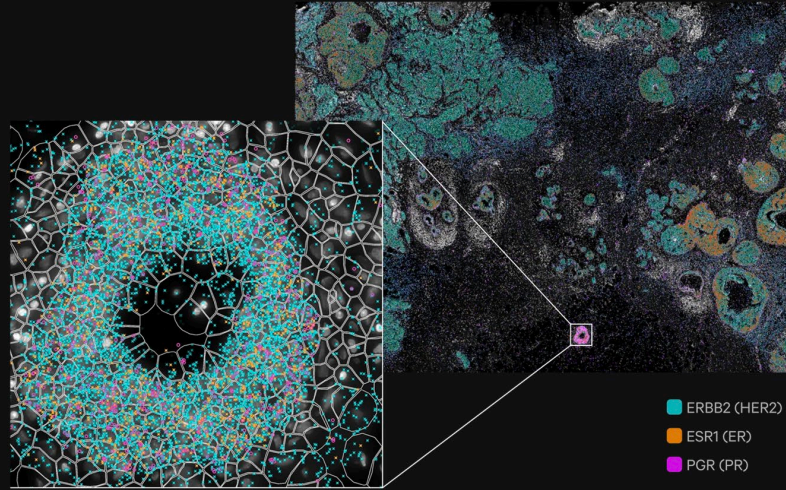
Single cell Resolution spatial transcriptomics in fresh frozen and FFPE tissue

Xenium In Situ

High-performance  
**in situ** from the  
single cell leader

[Request pricing](#)

[See performance](#)



In this breast cancer sample (Stage II-B, ER+/PR-/HER2+), Xenium identifies a previously unknown triple-positive region.

- ❖ HSF-GEF Awarded \$180,000 to Immunology Institute (Lund), I-4ward and Brain Health (Jeremy Day and Fran Lund), Flow Cytometry and Single Cell Core (Troy Randall), Biologic Data Sciences Core (Liz Worthey)
- ❖ Matching Support: \$629,500
  - ❖ HSOM, SOE
  - ❖ UAB Centers and Institutes (n=14)
  - ❖ HSOM Departments and Divisions (n=11)
  - ❖ HSOM Strategic Research Groups
- ❖ full time bioinformatics support for pipeline development and tools

Xenium was delivered in late Dec. 2023, installed July 2024

Hi Fran and all,

The xenium process took longer than I calculated initially. We have completed the off-instrument process, which took four days. The machine is running now and will finish on Sunday morning So far, everything has gone through well.

shanrun

FIRST  
SAMPLES  
THIS  
WEEK

# UAB Spatial Biology working group

## Team COMET

Julie Carstens (HemeOnc)

Aaron Silva-Sanchez (Rheumatology)

Harish Pal (FCSC core)

## Team Data management/infrastructure

William Warner (Research Computing)

Chris Risley (Micro)

Anna Sorace (Radiology)

## Team Xenium

Shanrun Liu (FCSC core)

Basu Madhubanti (FCSC Core)

## Team Informatics

Lara Ianov (BDS core)

Nilesh Kumar (BDS core)

Yanfeng Zhang (Genetics)

Y-Hua (Dean) Fang (Radiology)

Satwick Acharyya (Public Health)

## Team Cheerleaders

Frances Lund (Micro) Troy Randall (Rheumatology)

Ralph Zottola (Research Computing)

Liz Worthey (Genetics)





# Example of working together to develop analytic tools

To perform single cell spatial transcriptomics, we need to be able to define edge of each cell

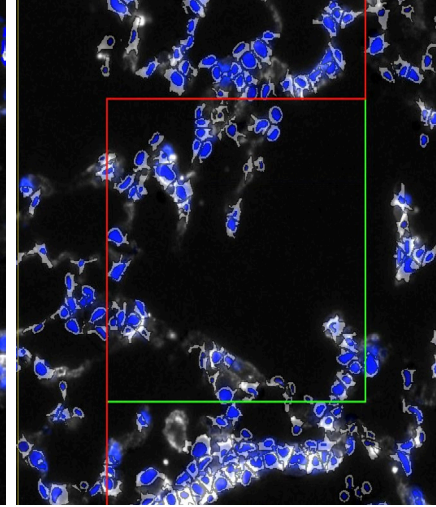
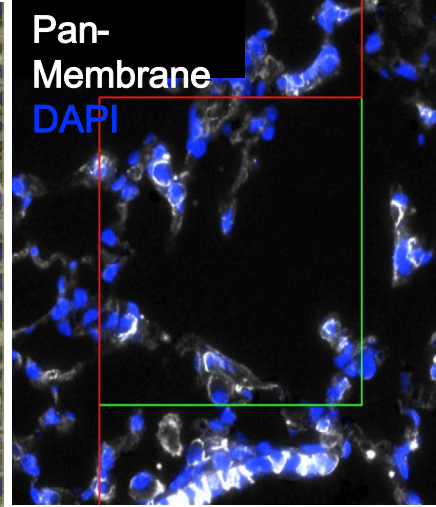
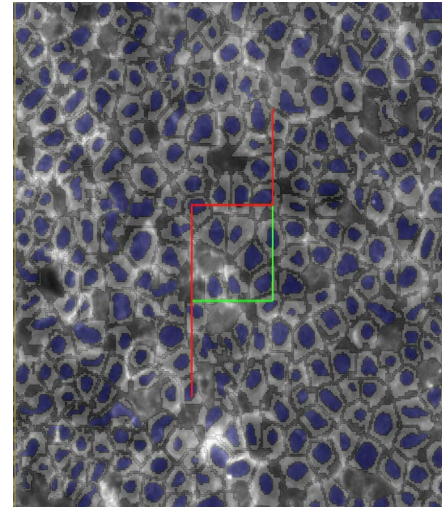
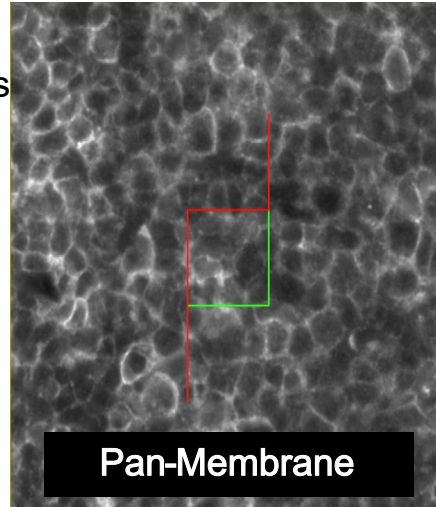


Julie Carstens



Lara Ivanov

Using the COMET to define the cells



Solid tissue LN

Challenging tissue - Lung



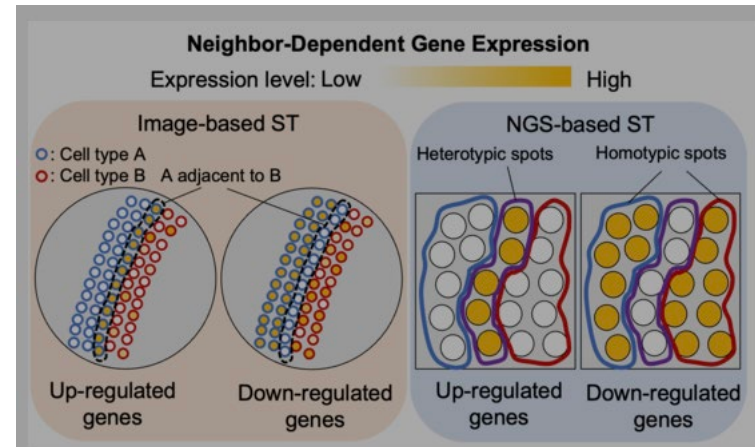
Nilesh Kumar



Dean Fang



Chris Risley



Using mathematical modeling and informatics to define neighbor interactions and how those interactions impact transcriptional programming of the cells



# Example of working together to develop analytic tools

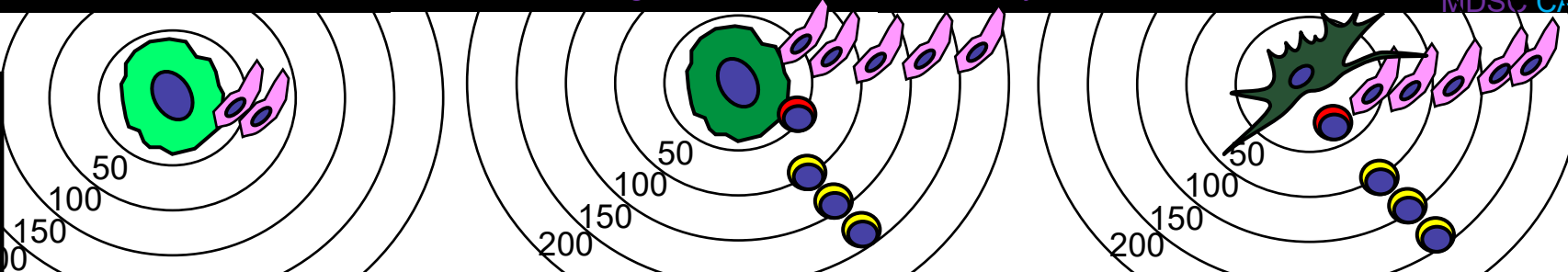
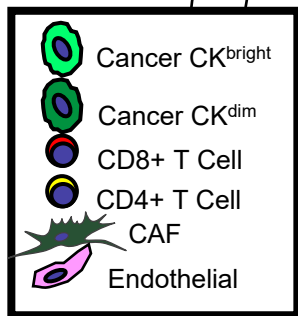
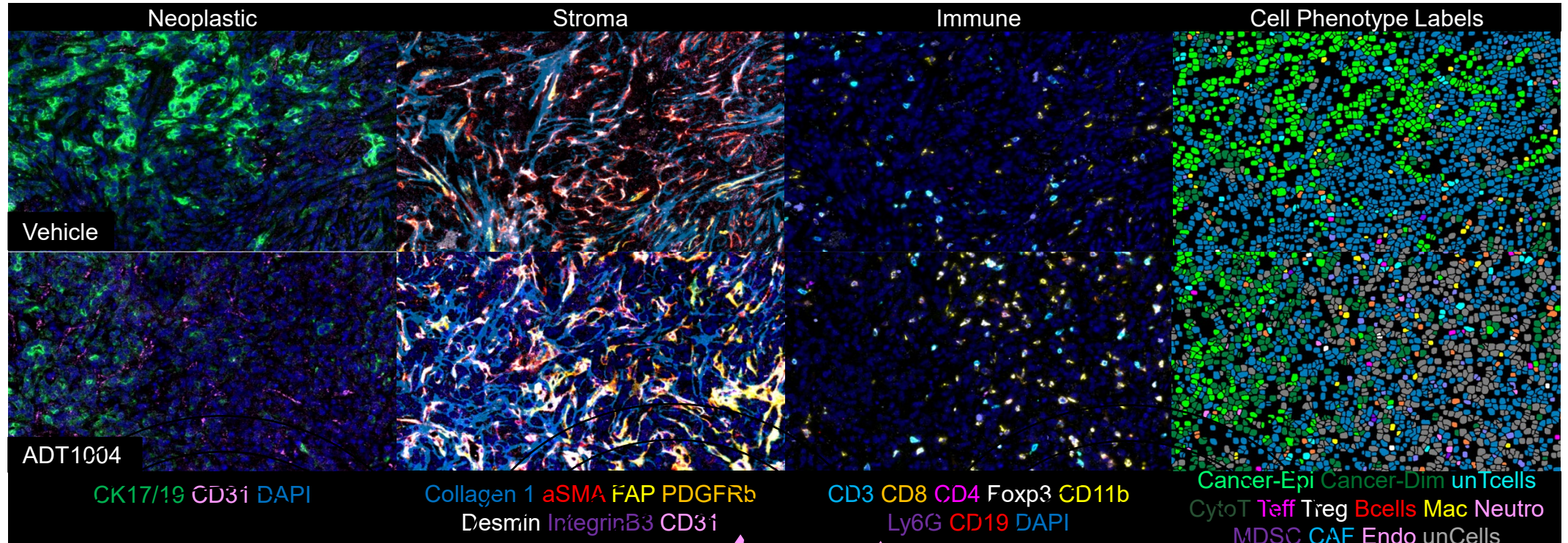
To identify the nearest neighbors and those cells that are more adjacent



Julie Carstens



Dean Fang



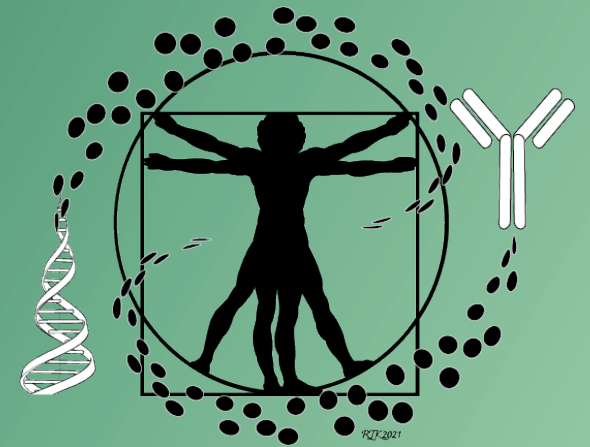
mesenchymal expressing CK<sup>dim</sup> cells in ADT1004 Treated tumors did NOT co-localize with CD8+ or CD4+ T Cells

FAP+ and IntegrinB3+ CAFs exclude CD8+ T cells  
IntegrinB3+ CAFs exclude CD4+ T cells

*Manuscript under Review  
Do NOT post*

**UAB** THE UNIVERSITY OF  
ALABAMA AT BIRMINGHAM.

# FY24 Finances



**UAB** IMMUNOLOGY  
INSTITUTE

The University of Alabama at Birmingham



# FY24 Budget Expenses

# Recruitment and Retention Investments



Paul Goepfert  
ID



Nathan Erdmann  
ID



J. Victor GarciaMartinez  
Micro



## Past Commitments

\$25K/yr, 5 yrs Erdmann retention, Medicine- ID (complete 2023) (5/5)

## Ongoing Commitments

- \$50K/yr, 5 yrs, Goepfert retention, Medicine - ID (active 2023) (1/5)
- \$25K/yr, 5 yrs, Steyn retention, Microbiology (active 2024)

## Pending Commitments

- \$100K/yr, 5 yrs for Micro Chair recruitment, Microbiology (enabled 2023)
- \$50K/yr, 5 yrs, Killian recruitment, Surgery (enabled 2024)

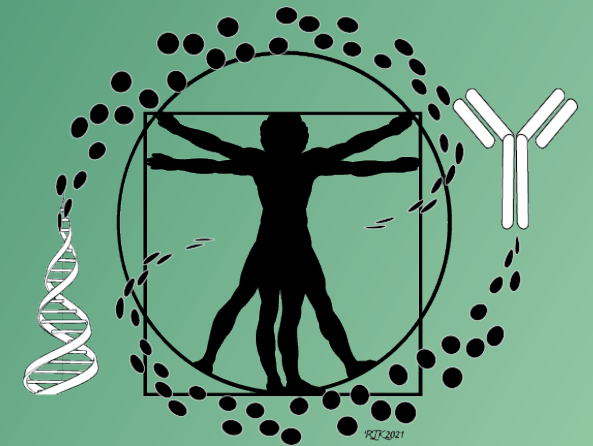
# Immunology Institute Pilot Project Funds and Education/Outreach

Awarded 3 pilots on Jan 1, 2024  
(\$50,000/yr for up to 2 years)

1. Sunil Sudarshan (Urology) and Lyse Norian (Nutrition Science): Oncometabolic Regulation of the Immune Response and Immunotherapy Efficacy in Kidney Cancer.
2. Chander Raman (Dermatology) and Lin Jin (Dermatology): Elucidating interactive network of NKT and NK cell populations and skin resident cells in Hidradenitis suppurativa (HS) pathogenesis. *Funded 1 year.*
3. Xu Feng (Pathology): RANK Signaling Mechanism in the Immune System. *Funded for up to 2 years.*



# FY25 Goals and Finances



# FY25 Budgeting Projections

# 2025 Priorities – Services

## Immunophenotyping Service

- Finish validation of 2 immunophenotyping panels (T cells/Myeloid cells)
- Start voucher RFA for Immunophenotyping core to generate preliminary data or publication data (and increase usage)
- Provide 3-5 LOS for grant submissions that will use the core
- Develop 1 standard mouse panel to capture major immune cell types

## ACS Service Center

- Increase the number of labs using the core annually to 20 or more (45% increase).
- Publicize core through presentations.
- Provide 5 or more LOS for grant submissions that will use core.
- Add and advertise additional types of serology services on Luminex and other larger format serology platforms.
- Build and validate new serology CBAs for influenza and market to internal and external users (**VTEU application**)





# 2025 Priorities – Services and future initiatives

## Healthy Donor Cohort

- Increase cohort to 1000 individuals
- Enhance enrollment outside of UAB (community engagement)
- Increase on-campus presence for recruitment
- Increase labs using HDC to 20 (50% increase)
- Increase number of collected samples to 320 (50% increase)

## Spatial Biology

- Continue working groups
- Support informatics/biostatistics tool development
- RFA for the COMET (4 vouchers from II, 4 from I-4ward)
- RFA for Xenium (4 vouchers from II, 4 from I-4ward)
- RFA for combined Xenium + COMET (2 vouchers from II)

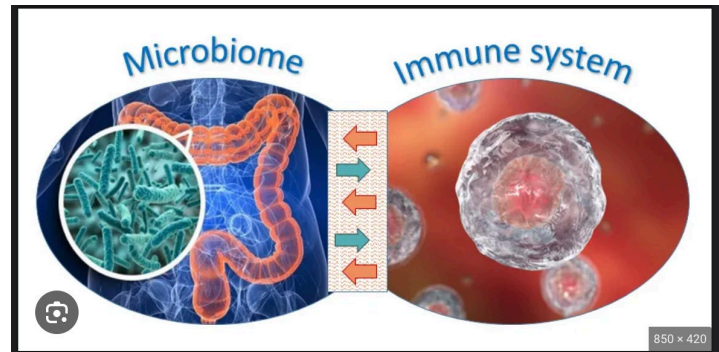
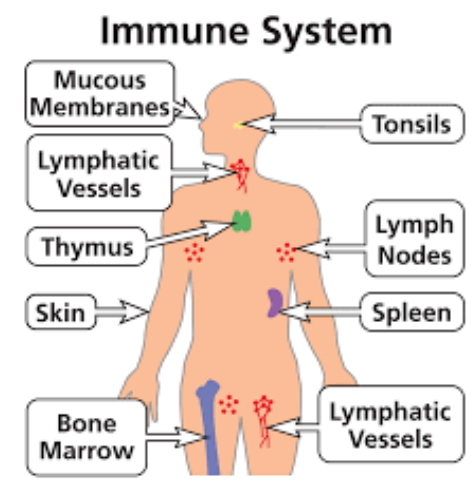
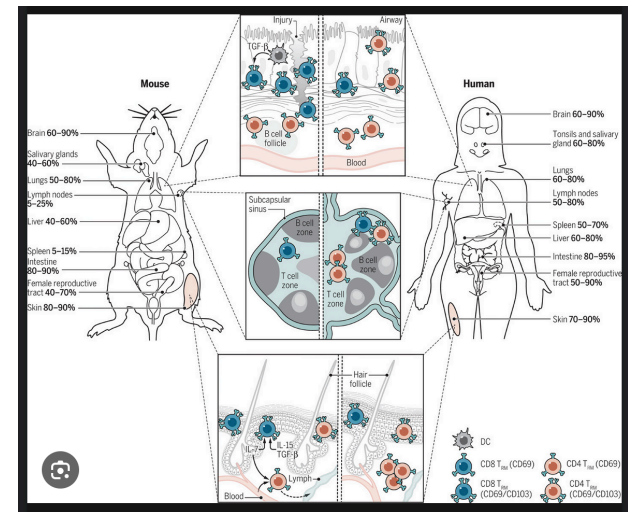
## Medical informatics

- Add ~65 more tagged labs (renal and liver function, CBC, lipid panels HgbA1C etc)
- Add 416 more tagged meds (anticoagulants, anti-hypertensive medications, diabetes medications, lipid lowering medications, HIV drugs, COVID drugs)
- Viral respiratory panels and cultures
- Solid organ transplant and cancer registry data
- Imaging information
- Biopsy results

# Future Research Priorities?

- ❖ Dirty Mouse Colony
- ❖ SEBLAB Immunologic Assay Core
- ❖ Human Lymph Node Biopsies, bone marrow aspirates, fat biopsies
- ❖ Human Tissue-derived Immune Cell Core
- ❖ Disease Cohort samples
- ❖ Vaccine and immunophenotyping for pre-clinical and clinical investigator and industry-initiated trials
- ❖ Microbiome initiatives (since loss of microbiome center)

**Can 'dirty mice' save animal research?**  
 Studies find ways to create more realistic immune systems, but critics have concerns  
20 APR 2016 • BY DAVID SHULTZ

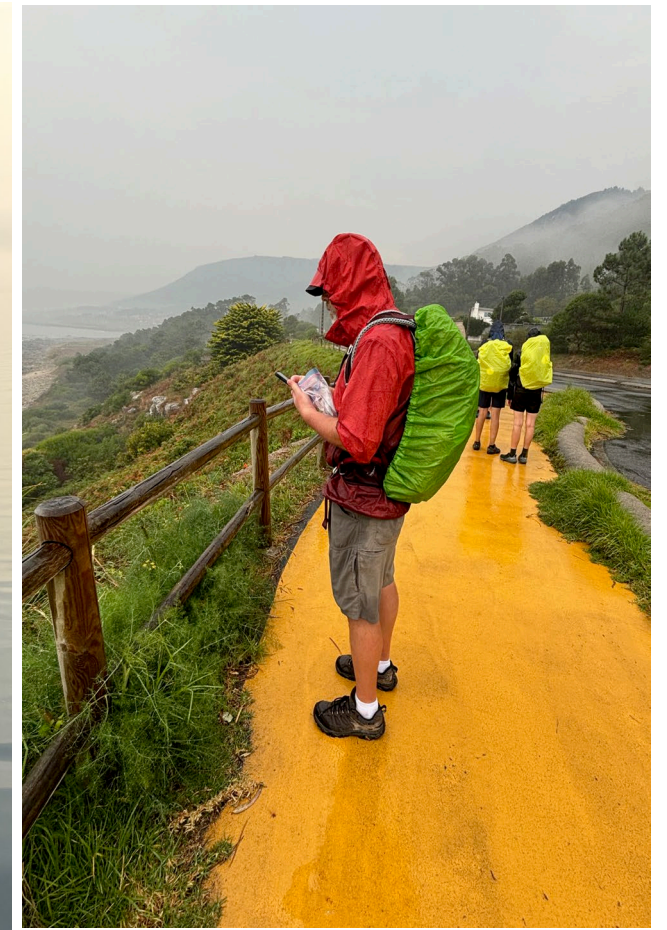


# 2025 Priorities – the BIG PICTURE

- Immunology Institute will come up for renewal
  - What is the process for HSOM Institute renewals, when is deadline?
  - Work with EAB and our constituents to define next priorities (those that need to start before renewal and those to propose in the renewal)
  - Are there priorities that HSOM has for research that we could help support?
  - We really need a succession plan for midway through next round of the institute (I have a shelflife in all my positions)
- Pitch for way to build immunology community through recruitment (next slide)
  - Most of our funds have gone to retentions (important but....)
  - How to bring in new immunology-relevant researchers (particularly since UAB has lost a lot of immunology focused researchers in the last 2 years)?



# Spatial Biology (the google map view of a frontier that we can't afford to miss)!



Fran's view of Camino de Santiago 2024

# The 30,000 foot view elevator pitch

- Recruit as part of a HSOM/university wide cluster hire for faculty with interest and expertise in Spatial Biology (not just single cell but organismal level—think ecosystems at the tissue level)
- Cross-cutting and interdisciplinary (wet lab, computational biology, informatics, biostatistics)
- I-4ward will start the Spatial Biology in Inflammation PRIME (postdoc) program this Spring— may be a way to identify individuals with expertise and then potentially even select some for faculty positions at a later time.....
- Build out spatial metabolomics platform

