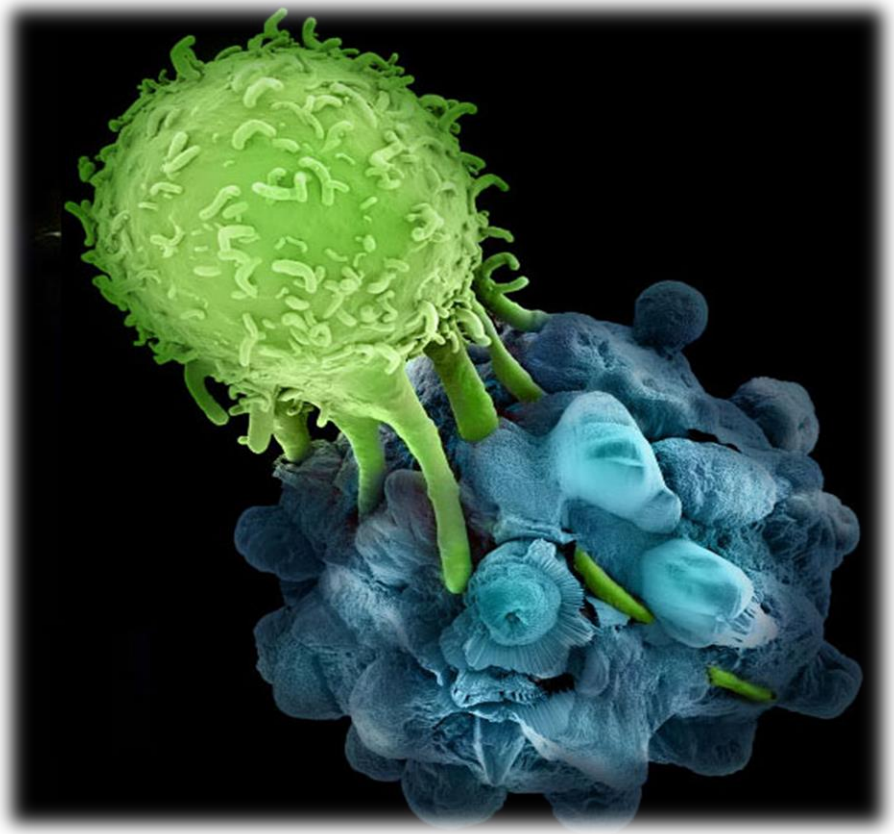
Immuno-Oncology Biomarkers: State of the Art

CITN Data Management and Specimen Sharing

(May 17, 2018)



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CITN Goal and Mandate

- Advance the field of immunotherapy and *accelerate* development of immunotherapy for cancer patients

- *Quickly pair* cutting edge clinical trials with informative correlative biomarker studies

Inform the next steps!

- *Rapid progress and success* required comprehensive, *centralized operations* for:
  - *Coordination of protocol biomarker sections with PIs and PMs*
  - *Quality Specimen collection, processing, biobanking, management (to match protocols and amendments)*
  - *Real-time immune monitoring assays*
  - *Close collaborations with expert laboratories for biomarker studies*
  - *Integrated Data Management*

Goals of Talk - CITN Data Management and Specimen Sharing

- **Emphasis: *Without quality specimens…there is no quality science/data!***
- **Complexity of Specimen Accession process** (*esp for Multicenter trials*)
  - *What does it REALLY take to for this piece of the flow puzzle?*
- **What 'systems' has the CITN Lab put in place to accomplish this?**
- **What are the results?**
- **What can be learned and applied?**

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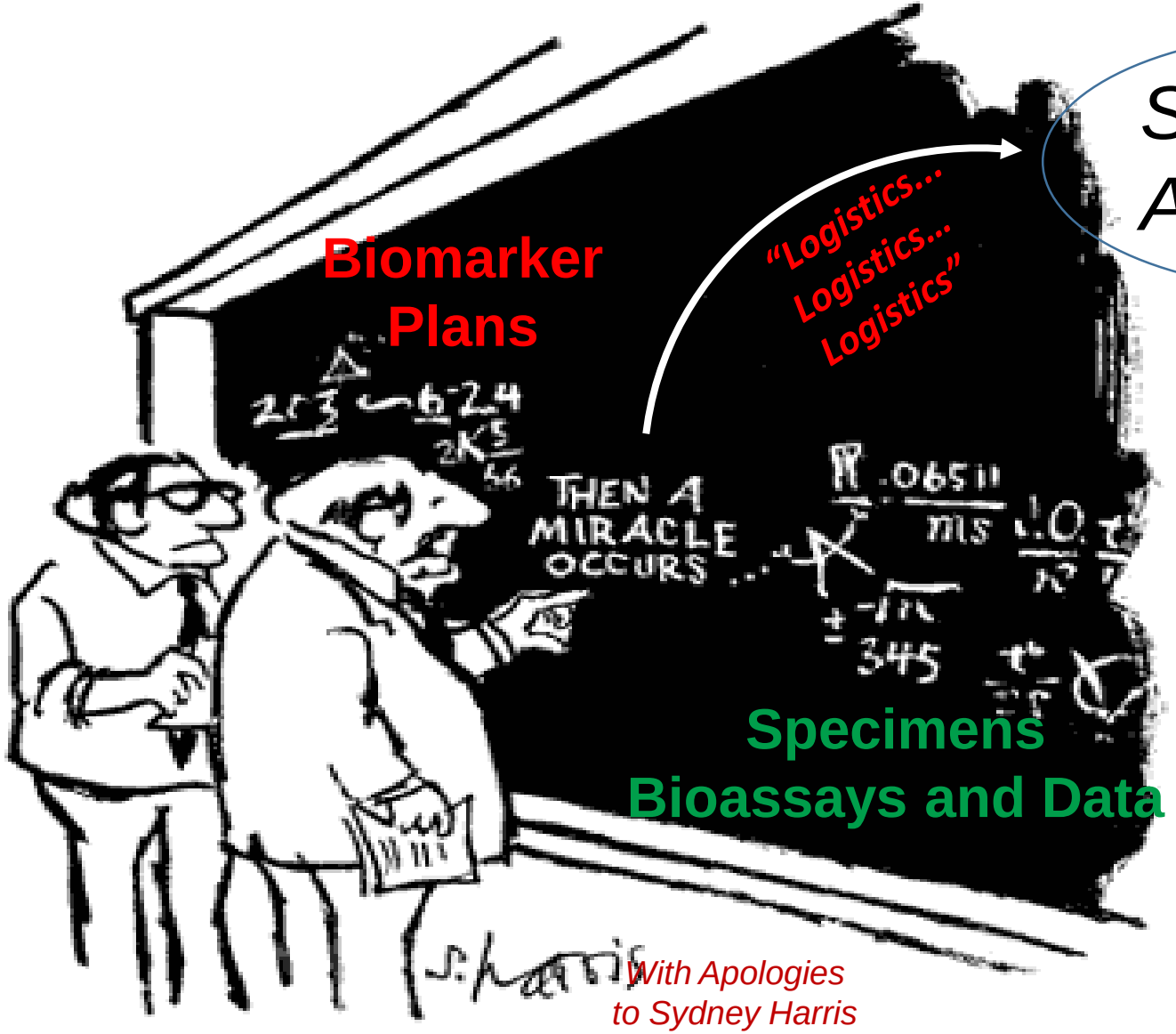
"Logistics…Logistics…Logistics" *Ignacio Wistuba*

- **What 'systems' has the CITN Lab put in place to accomplish this?**

- **What are the results?**

- **What can be learned and applied?** **"Nimbleness"** *Lisa Butterfield*



With Apologies to Sydney Harris

"I think you should be more explicit here in step two."

Specimen Accession

UWIML
Nora Disis
Chihiro Morishima

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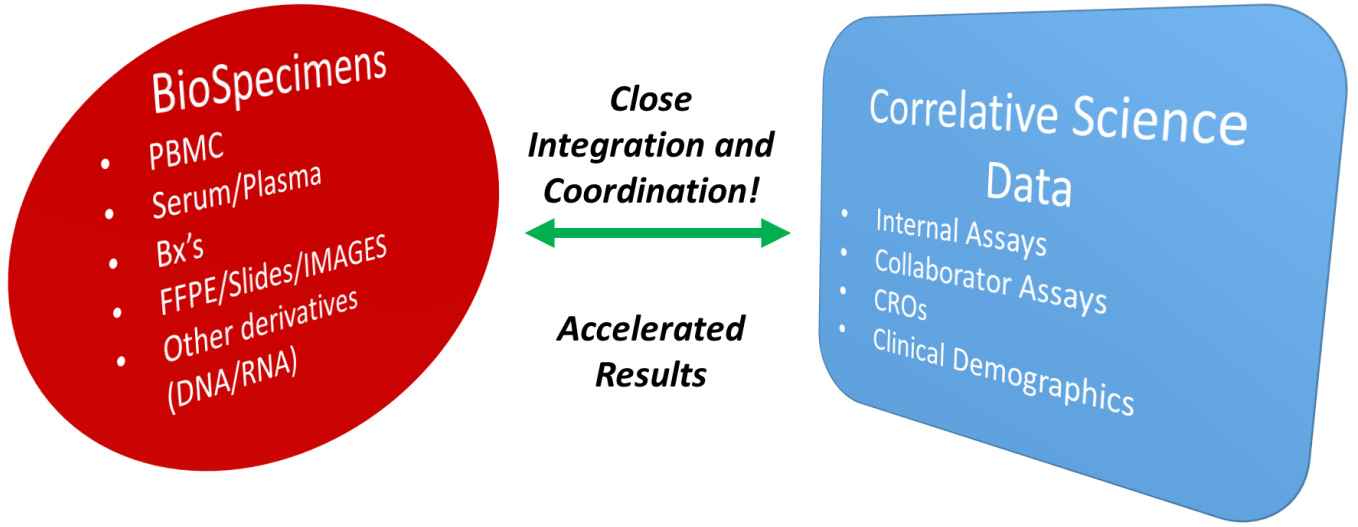
Logistics are complex for multicenter trials…

What does it take?

Essential Components:



- **Integrated Systems**
- **Dedicated Staff <u>vested</u> in:**
  - Understanding the systems
  - The Samples! from acquisition, thru processing and data generation
- ***<u>Consistent</u>*, validated SOPs and Assays**:
  - To obtain, ship, process, handle and store *<u>multiple specimen types</u>* under optimal conditions that allow for *<u>real time</u>* and *<u>future</u>* assays

Logistics are complex for multicenter trials… What does it take?

Study Set up

- Identify appropriate assays, timing, and amt of specimen
- Accurately detail entire workflow and all procedures
  - *ie trial specific lab m*
- Distribute d
- Train Site
- Assemble/ p study-specific specimen collection kits
- MTAs and Contracts
- *Rapidly* adjust to Amendments

Sample Handling

- Define/Write SOPs
- Track/mo ll shipments
  a n of custody
  imens
- duct real time assays (ie Whole blood) or distribute fresh specimens for assays
- Contact sites for any delayed shipping and/or QA deviations
- Process and Store specimens under retrieval conditions
- Assess specimens for quality
- Rapidly adjust to Amendments

Biomarker Studies

- Consult with trial PI, disease experts and assay experts
- Perform specified in house assays (ie Flow)
- **MTAs, Contracts, Consents**
- Retrieve and Ship specimens
- Manage/QA/QC Repository
- Monitor Samples *Out* vs Data *Back in*
- Monitor RETURNED Samples
- QA/Assemble/Organize Data
- Handle Ancillary Study Requests

~70% of CIML effort/Cost goes toward this aspect!

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Logistics are complex for multicenter trials… What does it take?

Study Set up

- Identify appropriate assays, timing, and amt of specimen
- Accurately detail entire workflow and all procedures
  - *ie trial specific lab manuals*
- Distribute docs to all sites
- Train Site staff and PI's
- Assemble/Ship study-specific specimen collection kits
- MTAs and Contracts
- *Rapidly* adjust to Amendments

Sample Handling

- Define/Write SOPs
- Track/monitor all shipments and record chain of custody
- Process specimens
- Conduct real time assays (ie Whole blood) or distribute fresh specimens for assays
- Contact sites for any delayed shipping and/or QA deviations
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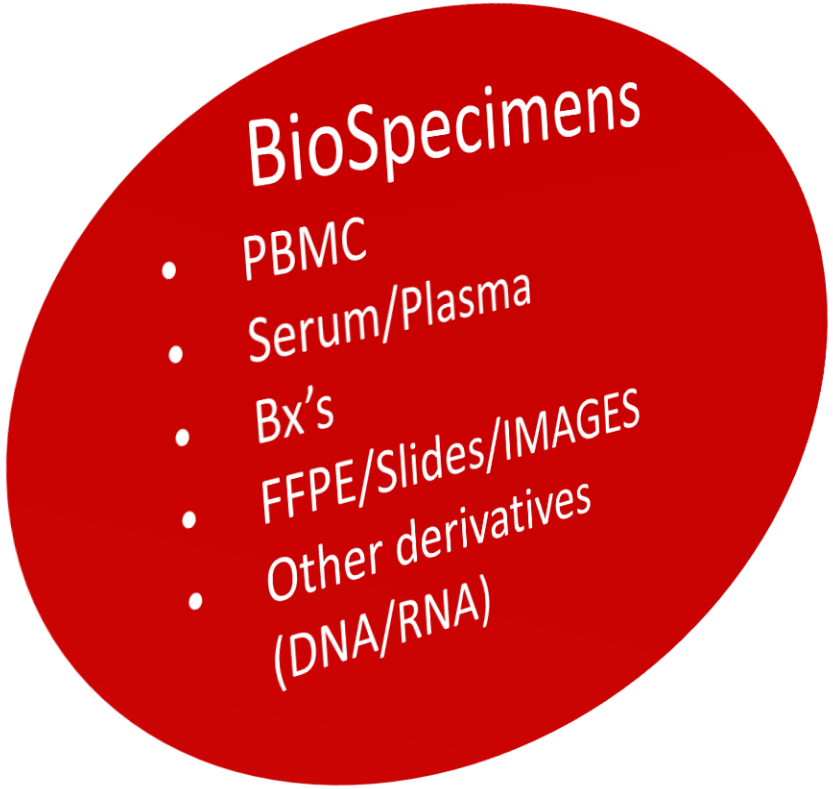
CITN Data Management and Specimen Sharing

Two Integrated Repositories:

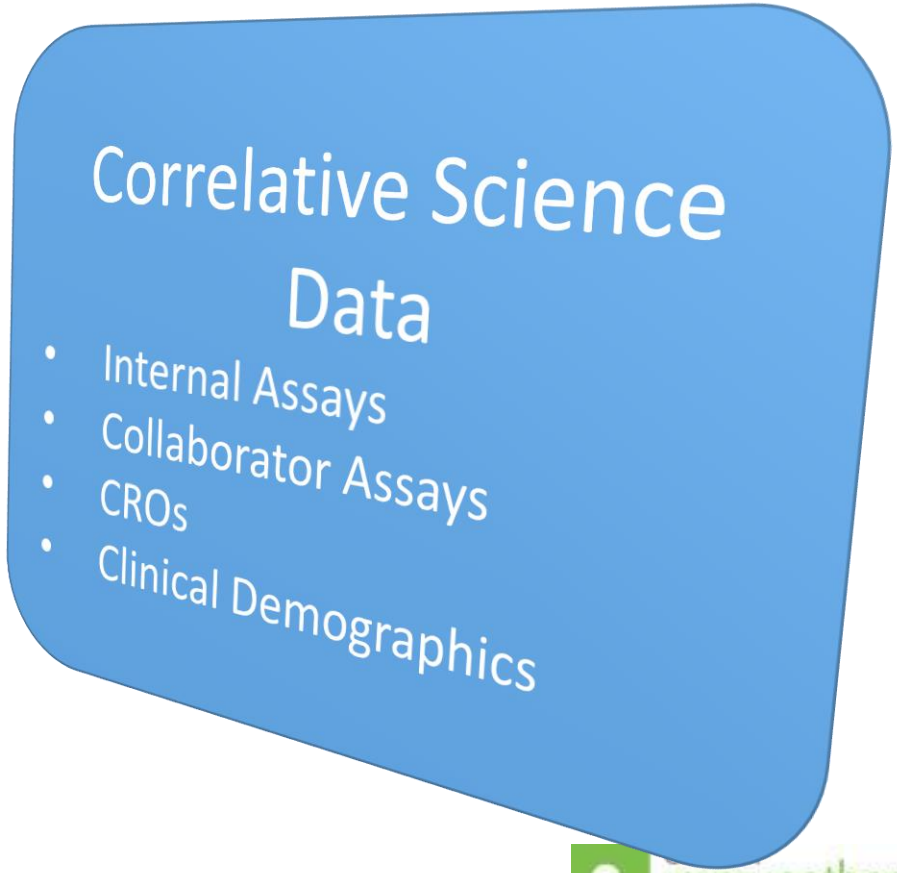
Specimens - BSI-II



Close Integration and Coordination!

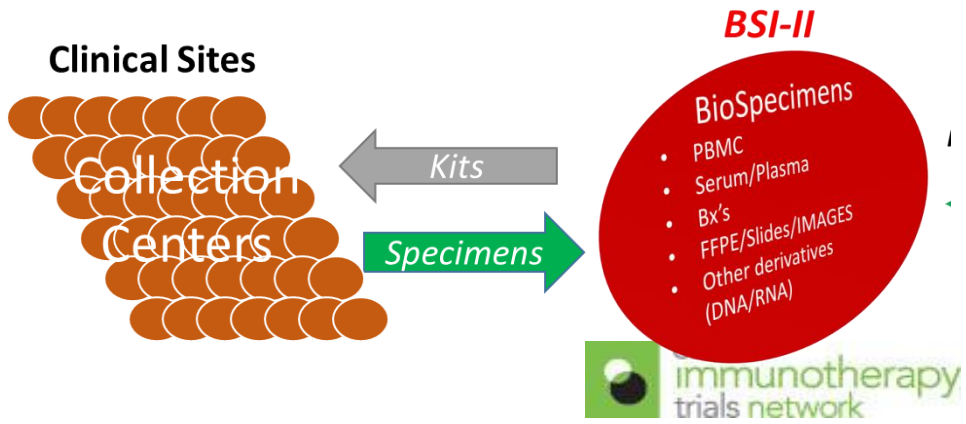
Accelerated Results

Data - LabKey



BSI- Interface between Sites and the CITN Lab

- **Accurate Chain of Custody (real time)**
  - Web-based shipping - Not platform dependent
  - Manage large number of remote users (42 member sites / >10 trials)
  - Accurate Specimen and shipment tracking
  - Reconcile logged shipments with physical specimens → Annotate
- **Study Related Document Posting and Notifications to Sites**
- **Data QC and Auditing**
  - Reconcile logged shipments with physical specimens → Annotate
  - Reporting (standard, routine, robust)
- **Robust security (study level / user level)**
- **Regulatory Compliance**



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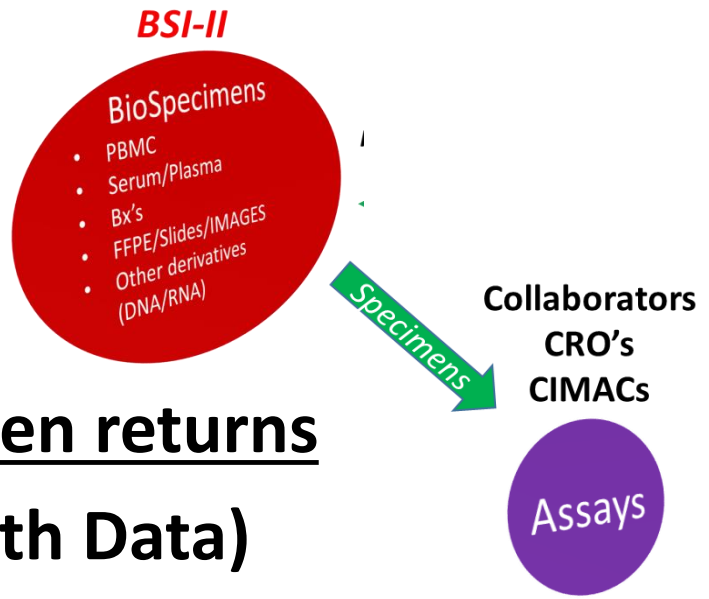
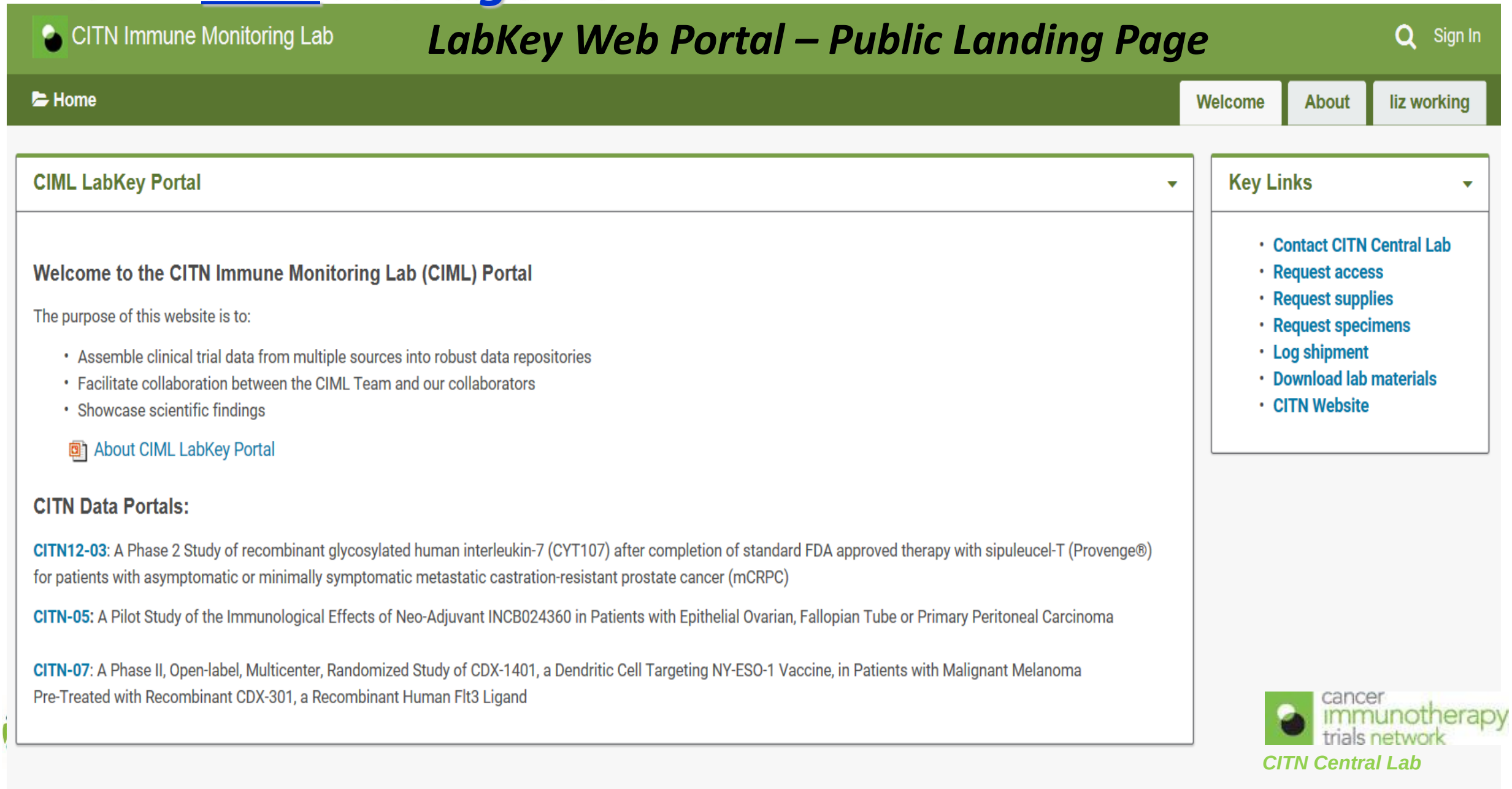
BSI – Specimen Management

- **Repository administration**
  - Barcodes and Standard Label Printing
  - Scalability
  - Centrally managed
  - Storage Management
- **QC: Specimen Processing, Issues; Specimen Characteristics**
- **Querying inventory**
- **Modules (Connect to samples)**
  - Subject Module (High Level demographics list)
  - Consent Module
- **Ship outs to collaborators, contractors … and <u>Specimen returns</u>**
- **INTEGRATE with Labkey (Cross-reference Samples with Data)**



CITN Data Management

LabKey Web Portal – Public Landing Page



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LabKey Data Portal Example – CITN-07 Study

Log in Required for Access

CITN-07 Data Portal

Steve Fling

CITN-07 | Lab Team Links | Overview | Datasets and Views | Library | Subject List | files

Study Overview

CITN-07: A Phase II, Open-label, Multicenter, Randomized Study of CDX-1401, a Dendritic Cell Targeting NY-ESO-1 Vaccine, in Patients with Malignant Melanoma Pre-Treated with Recombinant CDX-301, a Recombinant Human Flt3 Ligand

Study Status: Cohorts 1 & 2 fully enrolled. Cohorts 3 & 4 enrolling effective with Amendment 3.

Primary Objectives:

1. To determine whether the immune response to NY-ESO-1 elicited by vaccination with CDX-1401 (anti-DEC205-NY-ESO-1 fusion protein vaccine) plus polyinosinic-polycytidylic acid stabilized with poly-L-lysine and carboxymethylcellulose (poly-ICLC) is substantially increased by prior expansion in the number of circulating dendritic cells (DC) by therapy with CDX-301 (fms-related tyrosine kinase 3 ligand [Flt3L]).
2. To determine whether the proportion of responders to NY-ESO-1 is >50% when T cell responses are elicited by vaccination with CDX-1401 plus poly-ICLC in combination with CDX-301 (Flt3L) 75 mcg/kg/day administered prior to vaccination: i) for 5 days in both of the first two vaccine cycles; and ii) for 5 days in the first vaccine cycle only.

Secondary Objectives:

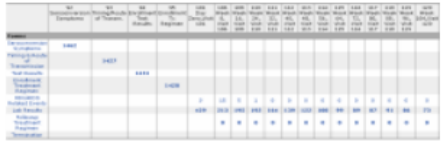
1. To assess the effect of the vaccine regimen on immune responses to other ongoing and nascent antitumor response antigens associated with melanoma (e.g., PRAME, MAGE-A3, p53, and gp100) as well as memory viral responses (influenza A) and chronic viral responses (Cytomegalovirus [CMV], Epstein-Barr virus [EBV])
2. To assess the effect of the vaccine regimen on the frequency and phenotypic character of peripheral blood mononuclear cell (PBMC) subsets including DCs, monocyte populations, T cells, and natural killer (NK) cells
3. To assess the safety, tolerability, and clinical efficacy of the vaccine regimens

Protocol Documents:

Attached Files

CITN-07-Flt3L_A3_v4_16FEB17.pdf
CITN-07 Lab Manual v5 20171108.pdf

Data Overview



Study Navigator

Participant List

Key Links

- Contact CITN Central Lab
- Request access
- Request supplies
- Request specimens
- Log shipment
- Download lab materials
- CITN Website

CITN Central Lab

CITN-07 Study Data

CITN-07 | Lab Team Links | Overview

Overview: CITN-07 CITN-07

VIEWS | SPECIMENS | SHOW ALL DATASETS

Correlative Studies vs Individual Data Points

Subject's current cohort: All | Subject Count | Row Count

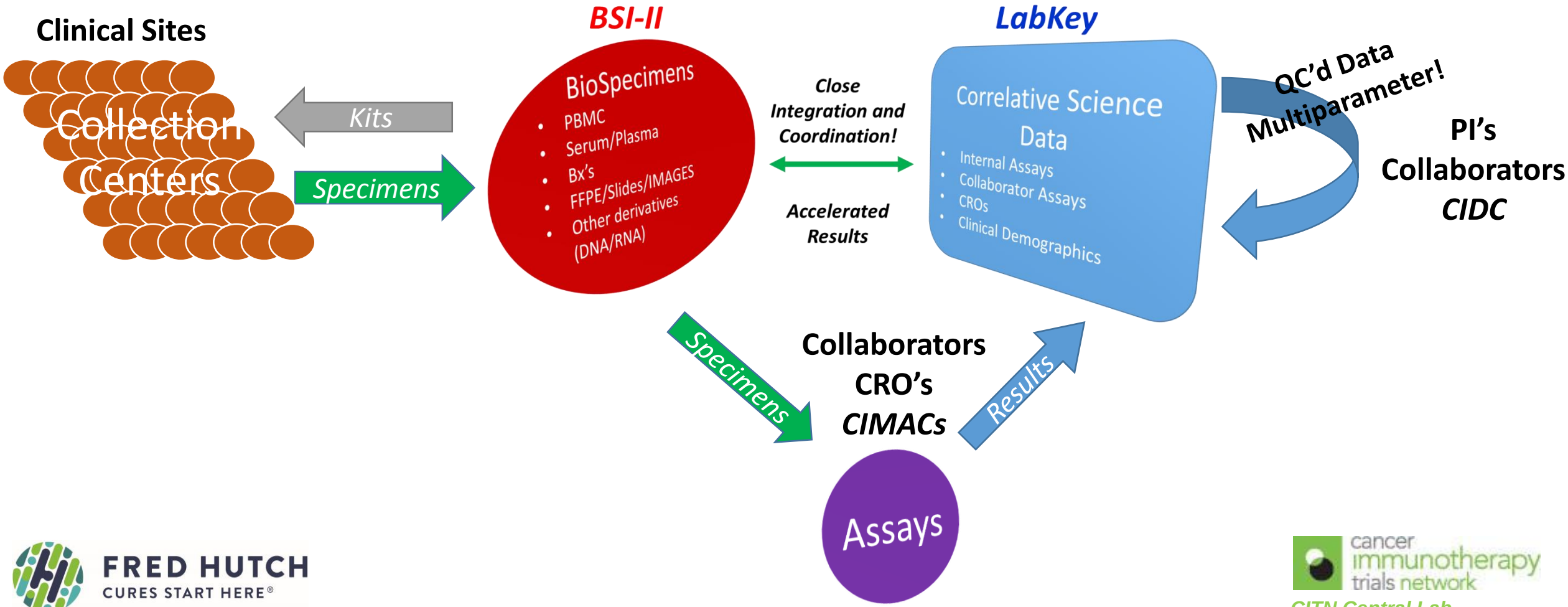
	All Visits	Pre	C1D-7	C1D01	C1D02	C1D08	C1D15	C1D22	C2D01	C2D08	C2D15	C3D01	C3D08	C3D15	C4D01	C4D08	C4D15	FUW04	FUW12	Recurrence Assessment
Assay Will Not Be Run																				
Anti-CDX1401 Immunogenicity HAHA data (Celldex)	0																			
Circulating Tumor Cells (CTC)																				
CTC Primary Data (UW Hematology)	109		29	28															52	
CTC Results	109		29	28															52	
Complete Blood Counts (CBC)																				
CBC Primary Data (Axio)	958		27	60	56	59	60	60	60	58	59	59	56	58	58	58	57	58	55	
CBC Results - Calculated WBC and Differential Counts Dataset	958		27	60	56	59	60	60	60	58	59	59	56	58	58	58	57	58	55	
CBC Results - Neutrophil to Lymphocyte Ratio	958		27	60	56	59	60	60	60	58	59	59	56	58	58	58	57	58	55	
Data In Process																				
Intra-cellular cytokine staining (Bhardwaj)	0																			
DC Subsets (Bhardwaj)	0																			
Nanostring Data	0																			
ELISA and PK Results- CellDex																				
ELISA Anti-NYESO1 Primary Data (CellDex)	347		30	30				60				58			59			56	54	
ELISA Anti-NYESO1 Results - Titer Dilution by Cohort - Dataset	347		30	30				60				58			59			56	54	
anti-CDX-301 Immunogenicity and Specificity Assay (CellDex)	144		29					30				28			29				28	
PK assay for CDX301 (CellDex)	140		29	28		27			29	27										
ELISpot T-cell Immune Responses																				
Elispot Primary Data (CIML)	346		30	30				60				59			58			55	54	
ELISpot Results - Corrected Spots Per Well (cSPW)	346		30	30				60				59			58			55	54	
ELISpot Results - Visit to Baseline Ratio	346		30	30				60				59			58			55	54	
Flow Cytometry																				
Whole Blood Flow-HLADR in NK and DC-Absolute Cells - Dataset	358		16	32		31	30	32	32	31	31	31			31			31	30	
Whole Blood Flow-MDSC Freq of CD45 - Dataset	265		12	24		22	22	24	23	24	22	23			23			23	23	
Whole Blood Flow-PBMC Subset-Absolute Cells-Dataset	359		16	32		31	30	32	32	31	31	31			31			32	30	
Whole Blood Flow-T cell Panel-Absolute Cells-Dataset	265		12	24		23	22	24	22	24	22	23			23			23	23	
Flow Primary Data (CIML)	359		16	32		31	30	32	32	31	31	31			31			32	30	
IHC																				
H&E Results (Mosaic)	51	51																		
NYESO Expression Results (Mosaic)	43	43																		
Subject Demographics																				
Subject List	60		30	30																
First Recurrence 10Jan18	21	21																		

Easy Links to individual data points

Powered by LabKey

Ultimate Goal:

Integrated, Logistical Support for Correlative Studies to Accelerate Next Steps



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Labkey Database Attributes - Integration

- **Cross-Integration with the BSI-II Biorepository Database**
  - Quickly associate biomarker data with Specimen QC and characteristics
- **QC'd Data, organized by Study for ALL correlative Studies**
  - All users reference the same QC'd data
  - Easy access for Multi-parametric analyses
- **Collaborative Platform for data sharing**
  - Access to 'Port Data Out' - TO Users/Collaborators/CIDC
  - Tacking for Samples OUT versus expected Data IN
  - Port Data In – FROM Collaborator/CROs/CIMACs
  - User Tracking
- **Integrate with Other Lab Tools**
  - RedCap; HaloLink; Document Control

CITN CIML Success

Quantity of Specimens

In 5+ years– to the end of 2017:

- **>60,000** bio-specimens Collected, Processed, stored: (blood, tumor, tissue)
- **~2200** shipments Received, Managed

In 2016 and 2017 alone the CIML:

- Coordinated biomarker studies and **~190 shipments** of samples to Collaborators/CROs.

Bio-Specimen Type*	Received 2017	Used 2017	Out 2017	Stored To Date	Used To Date	Destroyed To Date	Lost To Date	Out To Date	Currently Stored
PBMC	2,851	356	935	26,894	1522	54	3	1,856	23,459
Plasma	4,146	28	1884	16,302	1	78	0	2,020	14,203
Serum	1,137	13	229	11,705	46	23	0	1,478	10,158
Tumor **	309	7	471	4,512	383	43	8	1,735	2,343
Grand Total	8,443	404	3519	59,413	1952	198	11	7,089	50,163

***Does not include DNA and RNA and Derivatives*

***Various Tumor Biopsies: FFPE; OCT; Fresh Frozen; RNA Later; Ascites*

Quantity of Correlative Studies

In house, Collaborators, CROs

In 5 Years:

- **47** Correlative Biomarker Studies **completed** across 9 clinical Trials
- **23** Correlative Biomarker Studies **In Progress** across 6 clinical Trials
- **~20 Planned** Biomarker Studies **In Progress** across 3 clinical Trials
- **~6** Ancillary Studies in progress or in review
- **2** CIMAC Correlative Studies **in review**

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Correlative Biomarker Studies and Collaborations Coordinated by CITN Central Lab; Completed, In Progress or Planned – 'Nimble'

Study and P.I.	Biomarker Study	Specimens Handled by Central Lab	Monitoring Team/ Collaborator	Status
CITN-07: Flt3L + Poly ICLC + Anti-DEC205-NY-ESO-1 Vaccine Nina Bhardwaj	T-cell response: IFNγ Elispot	PBMC	CITN Central Lab	*Completed*
	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood	CITN Central Lab	*Completed*
	CD4/CD8 Intracellular Cytokine Staining (ICS)	PBMC	N. Bhardwaj/ Mt Sinai	*Completed*
	ELISA- Anti-NYESO1 Antibody; Anti-CDX-1401 antibodies	Serum	Celldex Therapeutics	*Completed*
	ELISA - Autoantibody Correlates	Serum	SIDRA	*Completed*
	Multicolor IHC for NY-ESO-1 Expression	Tumor Biopsy/FFPE	Mosaic Labs	*Completed*
	Transcriptional profiling, nCounter Gene Expression	PBMC	Central Lab/Nanostring/SIDRA	**In Progress**
	Multi-parameter Biostatistical Correlates	Data	R. Gottardo/ FHCRC	**In Progress**
	Multi-spectral Flow: DC Subsets	PBMC	N. Bhardwaj/ Mt Sinai	**BioMarker Suppl't - In Progrss**
	IHC - Myeloid markers	FFPE	M. Houghton; R. Pierce/ FHCRC	**Ancillary Study Proposal**
CITN-09; anti-PD1 in MCC Paul Nghiem	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood	CITN Central Lab	*Completed*
	T-cell response: ICS	PBMC	J. McAlrath/ FHCRC	*Completed*
	Tetramer Staining/Phenotyping	PBMC	P. Nghiem/UW	*Completed*
	TCR Sequencing/Clonality/ SC Phenotyping	FFPE and PBMC	P. Nghiem/UW/ Adaptive	*Completed*
	Multiplex IHC: Immune Markers	Tumor Biopsy/FFPE	J. Taube/ Hopkins	*Completed*
	Multicolor IHC: PD-1 and PD-L1 Expression	Tumor Biopsy/FFPE	J. Yearley/ Merck	*Completed*
	IHC- MCPyV Expression/ HLA Expression	Tumor Biopsy/FFPE	FHCRC Core Histo Lab	*Completed*
	AMERK- MCPyV Ab levels-	Serum	UW Lab Med	*Completed*
	HLA Typing	PBMC Pellet	D. Geharty/FHCRC	*Completed*
	DNA (WES - Whole Exome) Sequencing for T cell NeoAg	Tumor Biopsy/FFPE	C. Wu/ Broad	**BioMarker Suppl't - In Progrss**
	Kyn/Trp ratio	Plasma	Incyte Corp	**In Progress**
	T cell Epitope Discovery	PBMC	S. Hadrup/U. Denmark	**In Progress**
	gamma/delta T cells	PBMC	P. Ohashi/U. Toronto	**Ancillary Study - In Progress**
	IHC - Myeloid markers	FFPE	M. Houghton; R. Pierce/ FHCRC	**Ancillary Study Proposal**
CITN-10; anti-PD1 in MF/SS Youn Kim	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood and PBMC	CITN Central Lab	*Completed*
	Luminex Cytokine/Chemokine Analysis	Serum	M. Khodadoust/ Stanford	*Completed*
	CyTOF for PD-L1 and Sezary Cell phenotyping	PBMC	M. Khodadoust/ Stanford	*Completed*
	Transcriptional profiling, nCounter Gene Expression	Tumor Biopsy/FFPE	J. Yearley/ Merck	*Completed*
	Multicolor IHC and multiplexed immunofluorescence (IF)	Tumor Biopsy/FFPE	J. Yearley/ Merck	*Completed*
	MIBI for Tumor Micro Environment	Tumor	D. Phillips/ Stanford	**BioMarker Suppl't - In Progrss**
	DNA Sequencing (FACS sorted Sezary Cells)	PBMC	M. Khodadoust/ Stanford/ Frederick	**In Progress**
	DNA (WES - Whole Exome) Sequencing for T cell NeoAg	Tumor Biopsy/FFPE	M. Khodadoust/ Stanford/ Central La	**In Progress**
	Kyn/Trp Ratio	Plasma	Incyte Corp	**In Progress**

CITN-12; Anti-PD1 in Advanced Malig with HIV Cancer Tom Uldrick	**Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets**	Whole Blood	CITN Central Lab	**In Progress**
	ELISPOT - HIV Specific T-cell immunity	PBMC	NIAID/ M.Connors	**In Progress**
	Transcriptional profiling, HIV Transcriptome	Cell Lysate	R.Sekaly/ Case Western	**In Progress**
	RNA Sequencing- HIV SC plasma RNA and phylogetics	Plasma	J.Lifson; F. Malderaldi/NCI	**In Progress**
	Luminex - Plasma Cytokines	Plasma	T. Uldrick/ FHCRC	**In Progress**
	PMBC HIV DNA and US-RNA	PBMC	S.Lewin/Melborne, Australia	**In Progress**
	CyTOF for T cell immunophenotyping	PBMC	R. Rutishauser/ UCSF	**In Progress**
	PMBC TILDA	PBMC	N. Chomont/ DARE	**Completed**
	KS T-cell Immunity	PBMC	D. Whitby/ NCI	**In Progress**
	Multicolor IHC and multiplexed immunofluorescence (IF)	Tumor Biopsy/FFPE	R. Pierce/FHCRC	**Planned**
	Transcriptional profiling, nCounter Gene Expression	Tumor Biopsy/FFPE	CITN Central Lab/NanoString	**Planned**
CITN12-03; IL-7 + Provenge Larry Fong	**Multispectral flow Immunophenotyping**	Whole Blood and PBMC	CITN Central Lab	*Completed*
	WBC for Neutrophil/Lymphoctye Ratios	Whole Blood	Local Lab and Central Lab	*Completed*
	T-cell response: IFNγ Elispot	PBMC	CITN Central Lab	*Completed*
	T cell Response: Proliferation	PBMC	Dendreon Corp	*Completed*
	ELISA anti-PAP Abs	Serum	Dendreon Corp	*Completed*
	CYT107 (IL7) Immunogenicity	Serum	Eurofins/RevImmune Corp	*Completed*
	CyTOF for T cell immunophenotyping	PBMC	S. Bendall; H. Maeker/CIMAC	**Submitted for approval by CTEP**
	TCR Sequencing	PBMC	H. Maeker/ CIMAC	**Submitted for approval by CTEP**
CITN-13; anti-PD1 and IFNg in MF/SS Michael Khodadoust	**Peripheral Immunophenotyping (CyTOF)**	PBMC	M. Khodadoust/ Stanford	**Specimen Acquisition**
	Luminex Cytokine/Chemokine Analysis	Serum	M. Khodadoust/ Stanford	**Specimen Acquisition**
	Transcriptional profiling, nCounter Gene Expression	Tumor Biopsy/FFPE	CITN Central Lab/NanoString	**Specimen Acquisition**
	Multicolor IHC and multiplexed immunofluorescence (IF)	Tumor Biopsy/FFPE	R. Pierce/FHCRC	**Specimen Acquisition**
	DNA (WES - Whole Exome) Sequencing for T cell NeoAg	Tumor Biopsy/FFPE	M. Khodadoust/ Stanford/ Central	**Specimen Acquisition**
	TCR sequencing and Clonality	PBMC	CITN Central Lab/Adaptive	**Specimen Acquisition**
	Microbiome	Fecal Swab	D. Fredricks/FHCRC	**Specimen Acquisition**
	Kyn/Trp Ratio	Plasma	Incyte Corp	**Specimen Acquisition**
CITN-05; IDO1 inhibitor, Neoadjuvant Ovarian Ca Kunle Odunsi	**Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets**	Whole Blood	CITN Central Lab	*Completed*
	T-cell response: IFNγ Elispot	PBMC	K. Odunsi/ RPCI	*Completed*
	Transcriptional profiling, nCounter Gene Expression	PBMC and Ascites	Central Lab/Nanostring	*Completed*
	Transcriptional profiling	Tumor Biopsy/FFPE	Central Lab/Nanostring	*Completed*
	IHC (CD8, CD3)	Tumor Biopsy/FFPE	Phenopath Laboratories	*Completed*
	Mutlticolor IHC for IDO1 and other markers	Tumor Biopsy/FFPE	K. Odunsi/ RPCI	*Completed*
	RNA Seq	Tumor Biopsy/FFPE	K. Odunsi/ RPCI	*Completed*
	ELISA for Tumor Ag expression	Serum	K. Odunsi/ RPCI	*Completed*
	Kyn/Trp Ratio	Plasma/ Ascites	Incyte Corp	*Completed*
	rum Levels	Serum	Incyte Corp	

CITN-04; IDO1 inhibitor + Melitac in Melanoma Craig Slingluff	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood	CITN Central Lab	*Completed*
	T-cell response: IFNγ Elispot	PBMC	C. Slingluff/ UVA	*Completed*
	IHC (CD8, CD3)	Tumor Biopsy/FFPE	Phenopath Laboratories	*Completed*
	Mutlticolor IHC for other T cell and immune markers	Tumor Biopsy/FFPE	C. Slingluff/ UVA	*Completed*
	TIL Expansion and characterization	Tumor Biopsy TIL	C. Slingluff/ UVA	**In Progress**
	Transcriptional profiling	Tumor Biopsy/FFPE	CITN Central Lab/ Nanostring	**In Progress**
	Kyn/Trp Ratios in Tumor by MS	Tumor Biopsy Flash Froze	Incyte Corp	**In Progress**
	INC204360 Serum Levels	Serum	Incyte Corp	**In Progress**
	IHC - Myeloid markers	FFPE	M. Houghton; R. Pierce/ FHCRC	**Ancillary Study Proposal**
CITN11-02; NCI IL-15 Jeff Miller	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood	CITN Central Lab	*Completed*
	ELISA and IL-15 neutalization Assays	Serum	T. Waldmann/ NCI	*Completed*
	NK Function	PBMC	J. Miller/ UM and Altor Biosci	*Completed*
CITN-06; IL15:IL15Ra-Fc Kim Margolin	Multispectral flow Immunophenotyping	Whole Blood	CITN Central Lab	*Completed*
	ELISA and IL-15 neutalization Assays	Serum	T. Waldmann/ NCI	*Completed*
	Plasma Cytokines	Plasma	NCI and Altor BioSci	*Completed*
	Alt-803 PK and Immunogenicity	Serum	Altor BioSci	*Completed*
	NK Function	PBMC	C. Chihiro UW	*Completed*
CITN-14; anti-PDL1 and IL7 in urothelial carcinoma Evan Yu	Real time Multispectral flow Immunophenotyping for PBMC and T cell subsets	Whole Blood/PBMC	CITN Central Lab	**Specimen Acquisition Prep**
	T cell (CD4+ and CD8+) counts	Whole Blood	Clinical Labs	**Specimen Acquisition Prep**
	TCR sequencing and Clonality	PBMC	Adaptive	**Specimen Acquisition Prep**
	T-cell response: IFNγ Elispot	PBMC	CITN Central Lab	**Specimen Acquisition Prep**
	Luminex Cytokine/Chemokine Analysis	Serum	FHCRC Core	**Specimen Acquisition Prep**
	Kyn/Trp and Arginine- Metabolites	Plasma	TBD	**Specimen Acquisition Prep**
	Microbiome	Fecal Swab	D. Fredricks/FHCRC	**Specimen Acquisition Prep**
	WES and Neoantigen	Tumor Biopsy/FFPE	FHCRC and TBD	**Specimen Acquisition Prep**
	Transcriptional profiling, nCounter Gene Expression	Tumor Biopsy/FFPE	Nanostring and FHCRC	**Specimen Acquisition Prep**
	Multicolor IHC and multiplexed immunofluorescence (IF)	Tumor Biopsy/FFPE	Genentech and FHCRC	**Specimen Acquisition Prep**

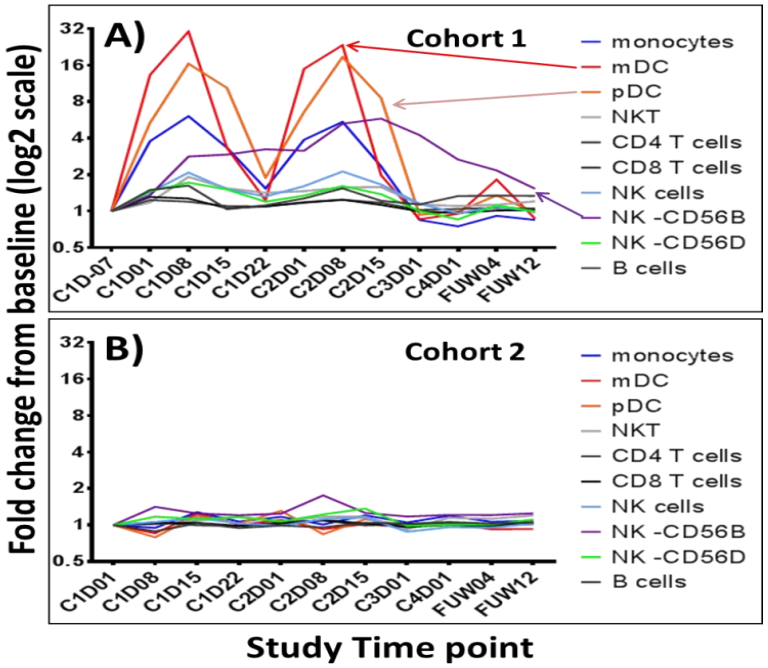
Centralized, Whole Blood Flow

Real time PharmacoDynamics for Immune Monitoring

(Making the Most out of Limited Samples)

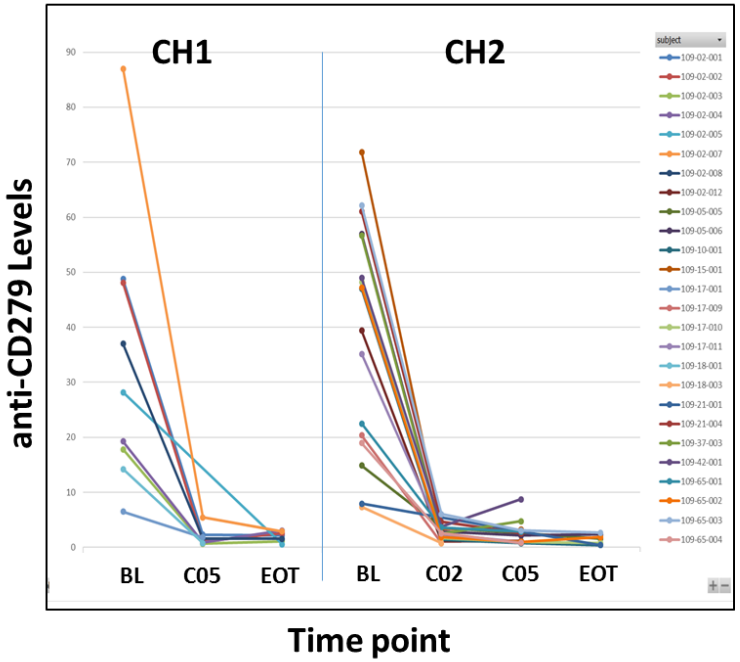
Flt3L

Expansion of innate Immune Cells by Flt3L in CITN07

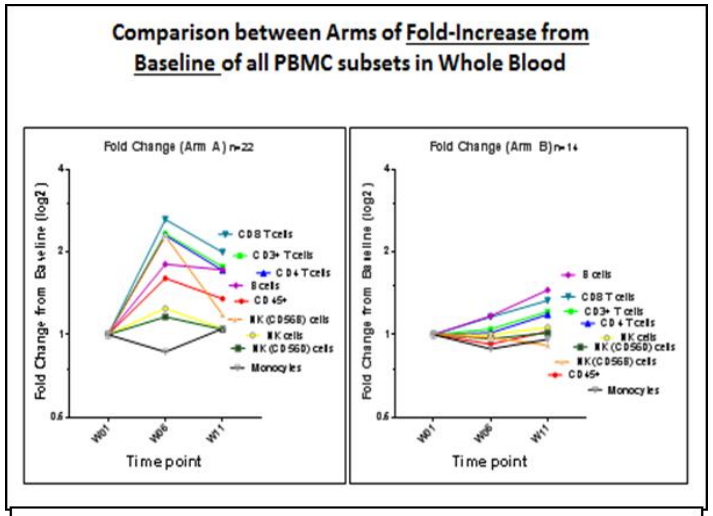


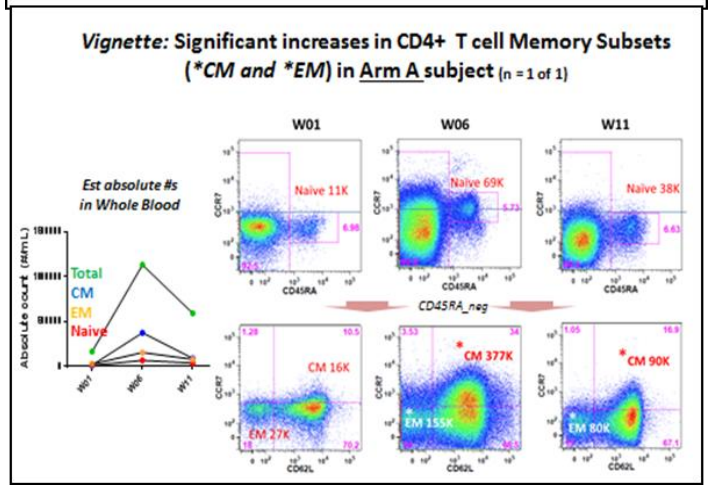
Anti-PD1

PD1 Staining on CD8+ T cells in CITN-09
Pre and Post Pembro treatment

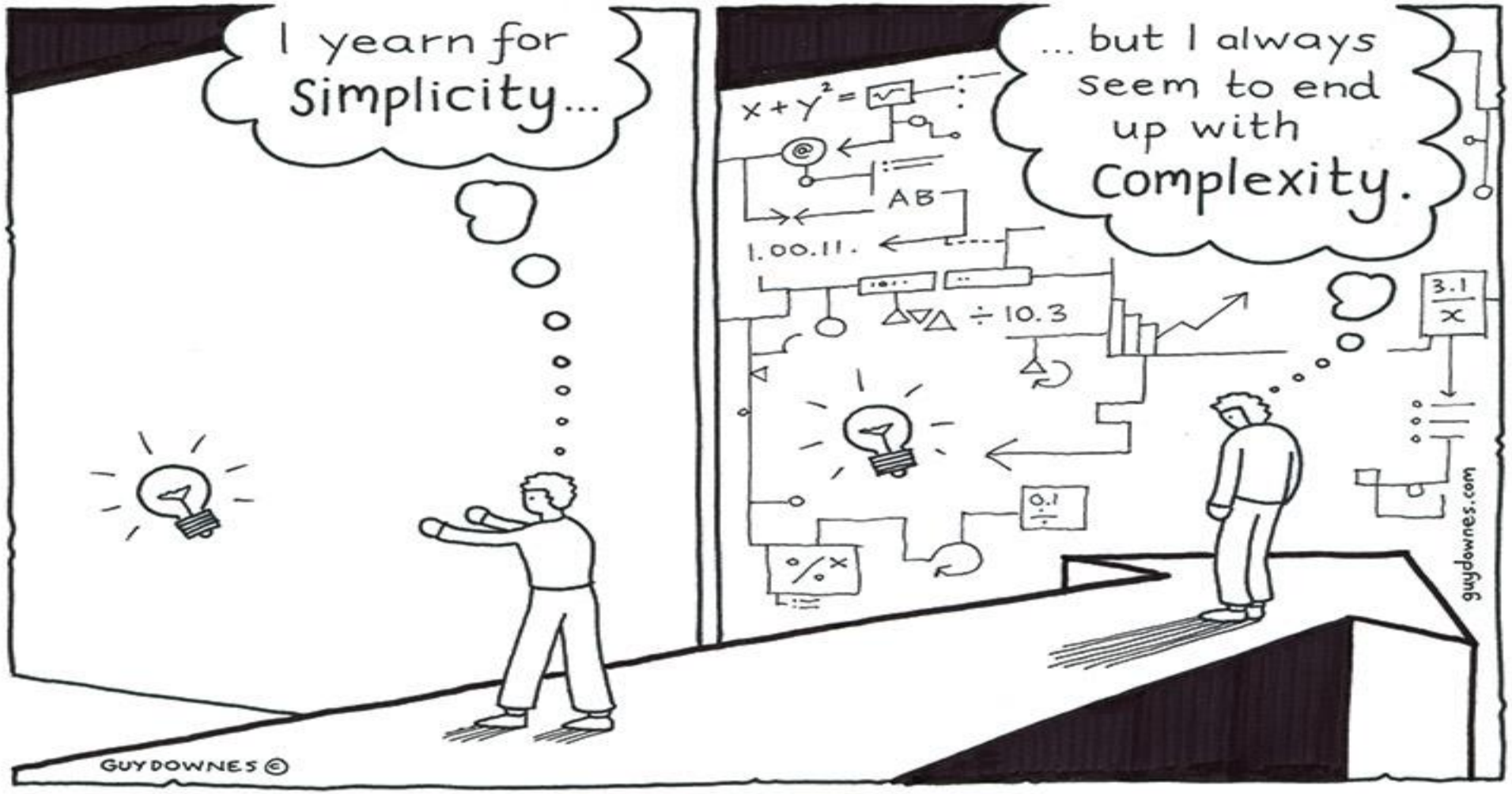


IL-7





"Logistics...Logistics...Logistics"



Summary - What can be learned and applied?

"Nimbleness"

- Integrated, Centralized Staff and Systems with a vested interest in *"Samples to Data"*
- Connected to the Trials Network and Protocol Managers
- Connected to Clinical Sites and Staff
- Connected to Contracts, and MTAs
- Connected to Trial PIs
- Connected to Assays and Collaborators

Final Thoughts

Quality Specimens…for Quality science/Data!

Quality of Specimens

=

Variability

=

Reliability in Correlative Biomarker Data

=

# of Samples/Subjects required

=

Accelerated Progress to 'Inform Next Steps'

FRED HUTCH
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cancer immunotherapy trials network
CIML

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