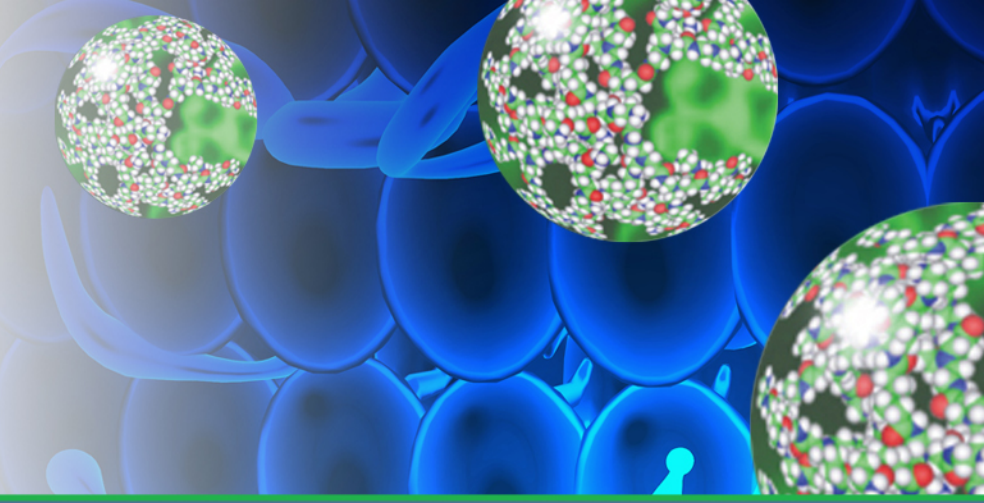
National Cancer Institute

NCI Alliance for Nanotechnology in Cancer



NCI Alliance for Nanotechnology in Cancer, and caNanoLab: A Data Repository for Cancer Nanomedicines

Luisa Russell, Ph.D.

Nanodelivery Systems and Devices Branch
Cancer Imaging Program
National Cancer Institute/NIH

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

Outline

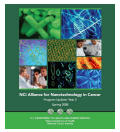
- NCI Alliance for Nanotechnology in Cancer
  - Structure
  - Achievements
  - Scientific Focus
- caNanoLab
  - Intro to Platform
  - Data Curation
  - User Statistics
  - Future Directions

NCI Alliance for Nanotechnology in Cancer Timeline

2005 CaNanoPlan Published

NCL Launches

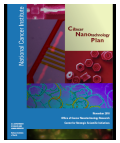
Phase I (Pilot) Awarded



Evaluation and Update (2007)

- Scientific Output
  - Over 600 pubs
- Clinical Translation
  - 50 companies
  - Over 200 patent apps
  - 8-10 clinical trials

Program Renewed



2010 CaNanoPlan Published

Phase II Kick-Off

TONIC Consortium with industry formed

Evaluation and Update (2013)

- Scientific Output
  - Over 1500 pubs
- Clinical Translation
  - Over 75 companies
  - 300 patent apps
  - 17 clinical trials

Program Renewed

Phase III Kick-Off

2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

A pilot toxicology study of single-walled carbon nanotubes in a small sample of mice

Nano Diagnostics

LETTERS

Evidence of RNAi in humans from systemically administered siRNA via targeted nanoparticles

Nano Therapy

2015 CaNanoPlan Published

NCI Alliance for Nanotechnology in Cancer Organizational Structure

Develops comprehensive solutions to significant problems in cancer biology and/or oncology and produces cancer care interventions with clinical utility

Trains next generation workforce in multi-disciplinary, multi-mentor environment

Centers for Cancer Nanotechnology Excellence (CCNE), RFA – U54

Multi-disciplinary Training T32 Awards (Center for Cancer Tr.)

Innovative Research in Cancer Nanotechnology (IRCN), PAR - U01/R01

Nanotechnology Characterization Laboratory

Develops fundamental understanding of the processes associated with the use of nanotechnology in cancer

Performs pre-clinical characterization of nanomaterials used in nano-therapeutics in support of their clinical translation

Coordination and Governance Committee

External Steering Committee

Grant Awards: Phase I, II, and III

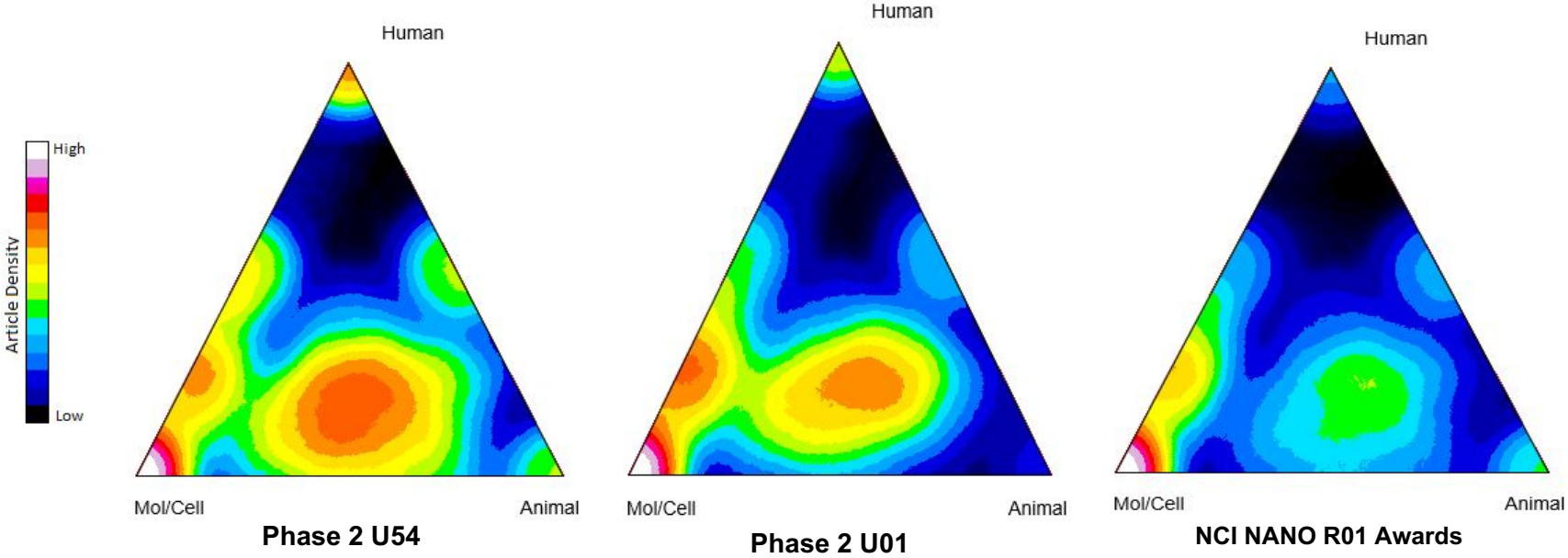
CCNEs	Phase I	Phase II	Phase III
Caltech/UCLA/ISB	■	■	■
Stanford University	■	■	■
Northwestern U.	■	■	■
U. North Carolina	■	■	■
MIT/Harvard	■	■	
Washington U.	■		■
UC San Diego	■		
Emory University	■		
Johns Hopkins U.		■	
University of Texas		■	
Northeastern U.		■	
Dartmouth College		■	
MSKCC/Cornell			■

CCNEs:
Phase I – 8 awards
Phase II – 9 awards
Phase III – 6 awards

IRCNs:
Phase I – 12 awards
Phase II – 12 awards
Phase III – 16 awards

- Healthy turn-over among funded Centers of Excellence
- Only four centers were funded in all 3 Phases

Translational Readiness



Triangle-of-medicine plots of Alliance and Comparison Grant-acknowledging publications. Heat maps of the individual cohorts are displayed with the apex of the triangle as human studies, the lower left corner as molecular/cellular studies, and the lower right corner as animal studies.

Spin-off Companies Collaborating with NCI Alliance Investigators

Therapeutics

- 480 Biomedical
- Adimab, Inc.
- ***Aduro BioTech***
- Alnylam Pharmaceuticals
- Alpine Biosciences
- ***AM Biotechnologies***
- Anterios
- Applied Proteomics
- Arrogene
- Arrowhead Pharma
- Arsenal Vascular (medical)
- Avidimer
- B3 Biosciences/B3Bio
- ***BIND Biosciences***
- Bio-Path Holdings
- Blend Therapeutics
- Calando Pharmaceutcals
- ***Celldex Therapeutics***
- Cellular Bioengineering Inc.
- Cerulean Pharma
- Combinent Biomedical Systems
- Consegna
- Coordination Therapeutics
- ***CytomX Therapeutics***
- Eludica Oncology Inc.
- Exicure
- ExonanoRNA
- Immune Design Corporation
- Indi Molecular
- Initos Pharmaceuticals
- InVivo Therapeutics
- Kala Pharmaceuticals
- Kereos
- Kite Pharma (KITE)
- Kylin Therapeutics
- Leonardo Biosystems
- Lipella Pharmaceuticals
- LipoGen
- ***Liquidia Technologies***
- Magenta
- Memgen
- MitoVec Inc.
- ModeRNA Therapeutics
- ***Molecular Therapeutics, Inc.***
- ***Momenta Pharmaceuticals***
- Nanobio Delivery Pharmaceutical Co.
- NanoMed Pharmaceuticals, Inc.
- NanoMedical Systems
- ***Nanoparticle Biochem, Inc.***
- ***Nanospectra Biosciences, Inc.***
- NanoVici
- ***Nemucore Medical Innovations***
- OncoTrap
- PACT Pharma
- ***PDS Biotechnology Corp.***
- Pervasis Therapeutics
- Pharocore
- PreDx
- Pulmatrix
- ***Qualiber, Inc.***
- Rgene Therapeutics
- RiMO Therapeutics
- Selecta Biosciences
- SemprusBioSciences
- Sienna Labs
- SignPath Pharmaceuticals
- SoluBest
- TARIS BioMedical
- Valence Therapeutics
- Zylem Biosciences

Diagnostics

- Affinity Biosensors
- ***American BioOptics***
- AptaMed
- Arrowhead Research Corporation
- Aurasense
- Calhoun Vision
- Cancer Targeting Systems
- Capio Biosciences
- Carbon
- Carestream Molecular Imaging/Health
- Cellatrix
- ***CellSight Technologies***
- CytoLumina Technology Corp
- DiagNano
- DxNOW
- Eagleye Biosciences
- Eigen Life Sciences
- Eludica Oncology Inc.
- ENDRA Life Sciences
- Enlight Biosciences
- Gensign
- Grzybowski Scientific Inventions/Chematica
- ***ImaginAb***
- ***Imbio***
- Indi Dx
- ***Isoplexis***
- Levitas
- Living Proof
- Lumera Corp
- ***Lumicell Diagnostics***
- ***MagArray***
- Materia
- MDxHealth
- MicroCHIPS Biotech
- Micromod
- Molecular Biomarkers (MoB)
- Molecular Imaging Research
- Nanogen, Inc.
- NanoInk
- ***Nanoplex Technologies***
- NanoSonix
- ***Nanosphere***
- Nine Point Medical
- Nodality
- ***Nvigen***
- ***Ocean Nanotech***
- ***Ohmx***
- Oncovance Technologies Inc
- Optical Micro-Machines
- Oxonica
- Parallel Solutions, Inc
- PixelEXX Systems
- Principio
- ProChimia Surfaces
- RefleXion Medical
- Regis Technologies
- SAMDITech
- Seventh Sense Biosystems
- Sofie Bio
- T2 Biosystems
- Tactic Pharma
- Tera-print
- ***VisEn Medical***
- Visual Sonics
- ***Vivonetics***
- ***XinRay Systems***
- ***Ziva Corporation***
- ***Zymera***

Several companies (in red) received funding through SBIR grants and contracts – total ~$30M

Evolution of Program Focus

Cancers with low survival rates: brain, lung, pancreas, ovarian

Cancer Types
12 years

Encouraged to concentrate on cancers that have been characterized at the molecular genetics level

Pre-clinical, Translational, Technology Driven

Research
12 years

Supported by basic/ fundamental research

Pre-clinical, Translational, Oncology/Cancer Biology Driven

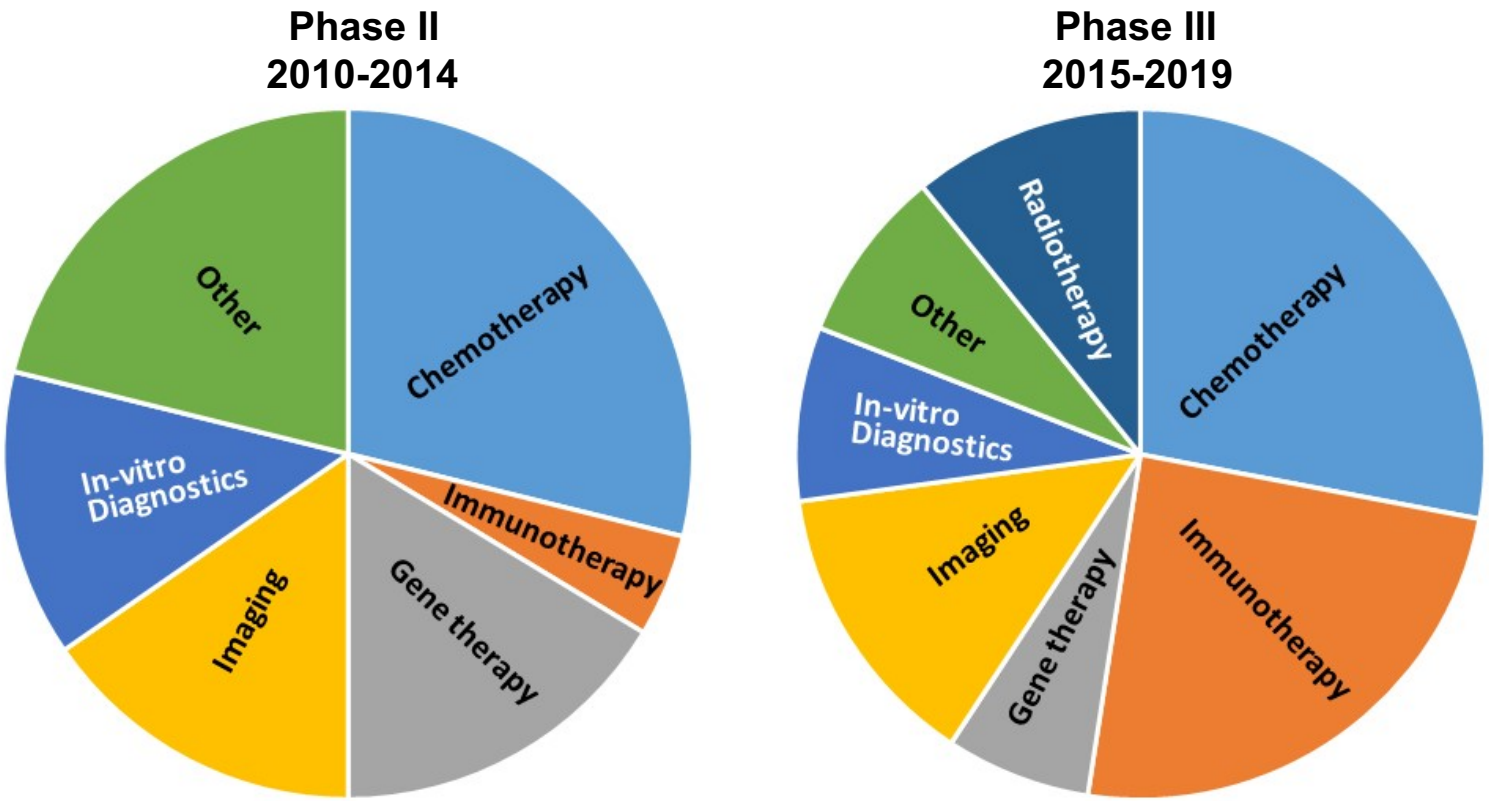
- Nanoparticle development;
- Development of in vitro diagnostic devices;
- Technology platforms applicable to range of solid tumors.

- Continuing to build an understanding of delivery mechanisms;
- Nano-constructs tailored to a specific cancer application;
- Approaches to support precision medicine and patient stratification.

Input from Extramural Community
Nano Strategy Meetings – June/Dec 2017

- Expand the range of delivery molecules;
- Explore immunotherapy opportunity;
- Leverage combination therapies;
- Use patient stratification as means to enhance nanodrug efficacy;
- Use imaging to provide insight into heterogeneity of Enhanced Permeability and Retention (EPR) effect;
- Explore further *in vitro* diagnostic opportunities;
- Consider ‘evolutionary’ vs ‘revolutionary’, when identifying applications;
- Remember basic research!!
- Continue building the community by engaging more oncologists and developing training and degree programs;
- Rely on the industry experience for effective translation.

Evolving Focus of Nanotechnology Program at NCI



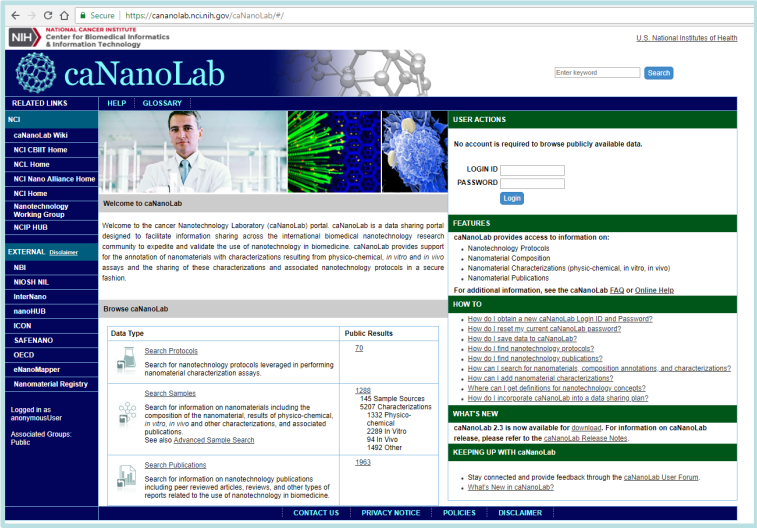
Summary of Accomplishments

- Program has an outstanding scientific productivity, ~3500 publications over 10 years;
- U54 centers established a unique strategy for developing and maturing innovative technologies in academia and transitioning them to translational stage in spin-off companies; over 130 start-ups are associated with the program;
- Over 20 clinical trials (majority in therapeutics, few in intra-operative imaging) have been pursued by start-up companies;
- NCL evaluated over 300 different nanoparticle formulations for academic, industrial, and government researchers. Data produced by NCL was used in 14 successful IND and IDE applications to the FDA;
- Leveraging of NCI program funds is very significant and demonstrated by high number of additional academic grants and funds raised by start-up companies;
- TONIC consortium was formed to establish a discussion forum for pharmaceutical and biotechnology companies interested in cancer nanotechnology;
- Nanotechnology Start-up Challenge in Cancer was conducted to engage young researchers and entrepreneurs through developing business plan proposals around several medical nanotechnology patents held by NIH intramural program investigators;
- **caNanoLab database holds information on: 70 assay protocols, over 1200 curated nanomaterial samples, and almost 2000 publications; they are available for public use through open-access.**

caNanoLab Data Portal: A Resource for Data Sharing

caNanoLab Goal

To provide a nanotechnology resource that facilitates data sharing in the community to expedite and validate the use of nanomaterials in biomedicine

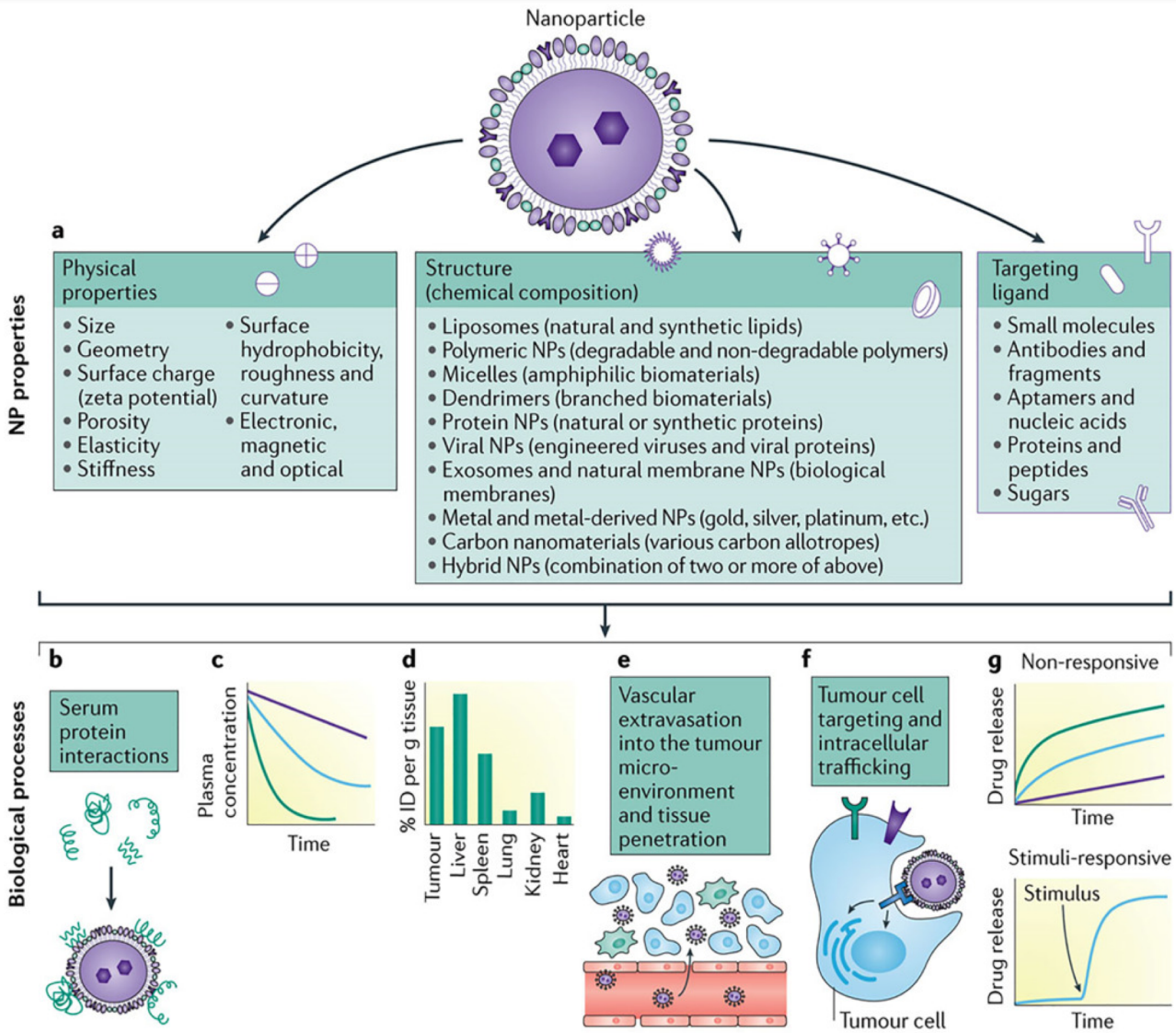


Home Page

- Provides access to samples, protocols, and publications from the NCI Nanotechnology Characterization Laboratory (NCL), NCI Alliance for Nanotechnology in Cancer, and the broader biomedical nanotechnology community
- Provides support for the annotation of nanomaterials with composition information, and physico-chemical, *in vitro*, and *in vivo* characterizations

https://cananolab.nci.nih.gov/caNanoLab/

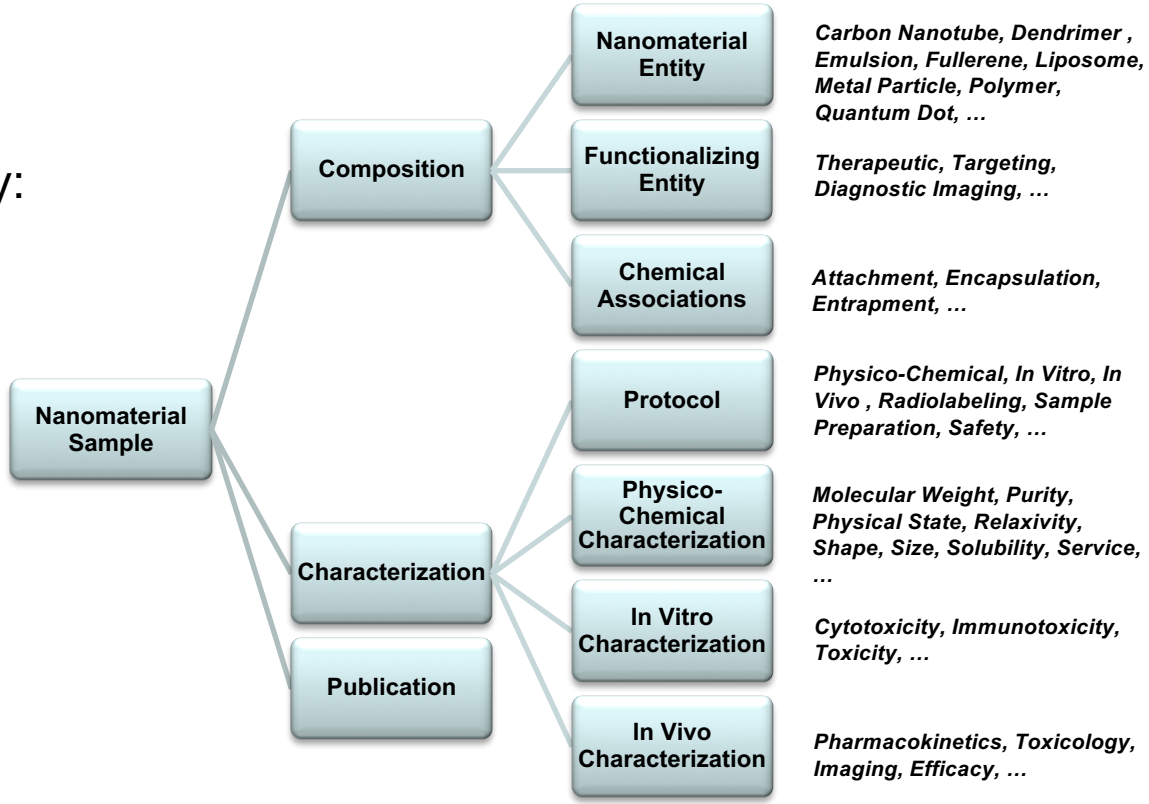
caNanoLab Target: Nanoparticle Characteristics



Shi et al. *Nature Reviews Cancer* 17.1 (2017): 20.

caNanoLab High-Level Concepts

- caNanoLab maintains descriptive metadata
  - NanoParticle Ontology
- Characterizations, can specify:
  - Protocol
  - Instruments
  - Techniques used in the characterization assay
- Submitted protocols can be associated with characterizations
- Similarly, submitted samples can be associated with publications



Gaheen et al., 2013, *Comput Sci Discov;*
Morris et al., 2015, *Beilstein J Nanotechnol*

caNanoLab Features

NATIONAL CANCER INSTITUTE
Center for Biomedical Informatics & Information Technology

U.S. National Institutes of Health

caNanoLab

Enter keyword | Search

RELATED LINKS | HELP | GLOSSARY

- NCI
- caNanoLab Wiki
- NCI CBIIT Home
- NCL Home
- NCI Nano Alliance Home
- NCI Home
- Nanotechnology Working Group
- NCIP HUB

EXTERNAL Disclaimer

- NBI
- NIOSH NIL
- InterNano
- nanoHUB
- ICON
- SAFENANO
- OECD
- eNanoMapper
- Nanomaterial Registry

Logged in as anonymousUser

Associated Groups: Public

Welcome to caNanoLab

Welcome to the cancer Nanotechnology Laboratory (caNanoLab) portal. caNanoLab is a data sharing portal designed to facilitate information sharing across the international biomedical nanotechnology research community to expedite and validate the use of nanotechnology in biomedicine. caNanoLab provides support for the annotation of nanomaterials with characterizations resulting from physico-chemical, *in vitro* and *in vivo* assays and the sharing of these characterizations and associated nanotechnology protocols in a secure fashion.

Browse caNanoLab

Data Type	Public Results
Search Protocols Search for nanotechnology protocols leveraged in performing nanomaterial characterization assays.	70
Search Samples Search for information on nanomaterials including the composition of the nanomaterial, results of physico-chemical, *in vitro*, *in vivo* and other characterizations, and associated publications. See also Advanced Sample Search	1300 146 Sample Sources 5258 Characterizations 1339 Physico-chemical 2300 In Vitro 94 In Vivo 1525 Other
Search Publications Search for information on nanotechnology publications including peer reviewed articles, reviews, and other types of reports related to the use of nanotechnology in biomedicine.	2028

+ NCL

USER ACTIONS

No account is required to browse publicly available data.

LOGIN ID
PASSWORD
Login

FEATURES

caNanoLab provides access to information on:

- Nanotechnology Protocols
- Nanomaterial Composition
- Nanomaterial Characterizations (physic-chemical, in vitro, in vivo)
- Nanomaterial Publications

For additional information, see the caNanoLab FAQ or Online Help

HOW TO

- How do I obtain a new caNanoLab Login ID and Password?
- How do I reset my current caNanoLab password?
- How do I save data to caNanoLab?
- How do I find nanotechnology protocols?
- How do I find nanotechnology publications?
- How can I search for nanomaterials, composition annotations, and characterizations?
- How can I add nanomaterial characterizations?
- Where can I get definitions for nanotechnology concepts?
- How do I incorporate caNanoLab into a data sharing plan?

WHAT'S NEW

caNanoLab 2.3 is now available for download. For information on caNanoLab release, please refer to the caNanoLab Release Notes.

KEEPING UP WITH caNanoLab

- Stay connected and provide feedback through the caNanoLab User Forum.
- What's New in caNanoLab?

CONTACT US | PRIVACY NOTICE | POLICIES | DISCLAIMER

caNanoLab Features

NIH NATIONAL CANCER INSTITUTE Center for Biomedical Informatics & Information Technology

U.S. National Institutes of Health

caNanoLab

Enter keyword | Search

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USER ACTIONS

No account is required to browse publicly available data.

LOGIN ID
PASSWORD
Login

FEATURES

caNanoLab provides access to information on:
- Nanotechnology Protocols

Browse caNanoLab

Data Type

Search Protocols
Search for nanotechnology protocols leveraged in pe nanomaterial characterization assays.

Search Samples
Search for information on n aterials including th composition of the nanomaterial, s of physico-c *in vitro*, *in vivo* and other characterizati d asso publications.
See also Advanced Sample Search

Search Publications
Search for information on nanotechnology publicatio including peer reviewed articles, reviews, and other t reports related to the use of nanotechnology in biom

CON

Sample Search | Advanced Search | Help | Glossary

Keywords
searching characterization keywords, publication keywords and text in characterization descriptions
enter one keyword per line

Sample Name: contains

Sample Point of Contact: contains
searching organization name or person name

Nanomaterial Entity: biopolymer, carbon, carbon black, carbon nanotube

Functionalizing Entity: Magnetic Particle, Monomer, Polymer

Function: Adjuvant, Drug carrier, Drug nanocarrier

Characterization Type

Characterization

Searching without any parameters returns all samples.

Reset | Search

caNanoLab Features

Sample Search Advanced Search Help Glossary

Keywords

searching characterization keywords, publication keywords and text in chara
enter one keyword per line

Sample Name contains

Sample Point of Contact contains

searching organization name or person name

Nanomaterial Entity: biopolymer, carbon, carbon black, carbon nanotube

Functionalizing Entity: Magnetic Particle, Monomer, Polymer

Characterization Type

Characterization

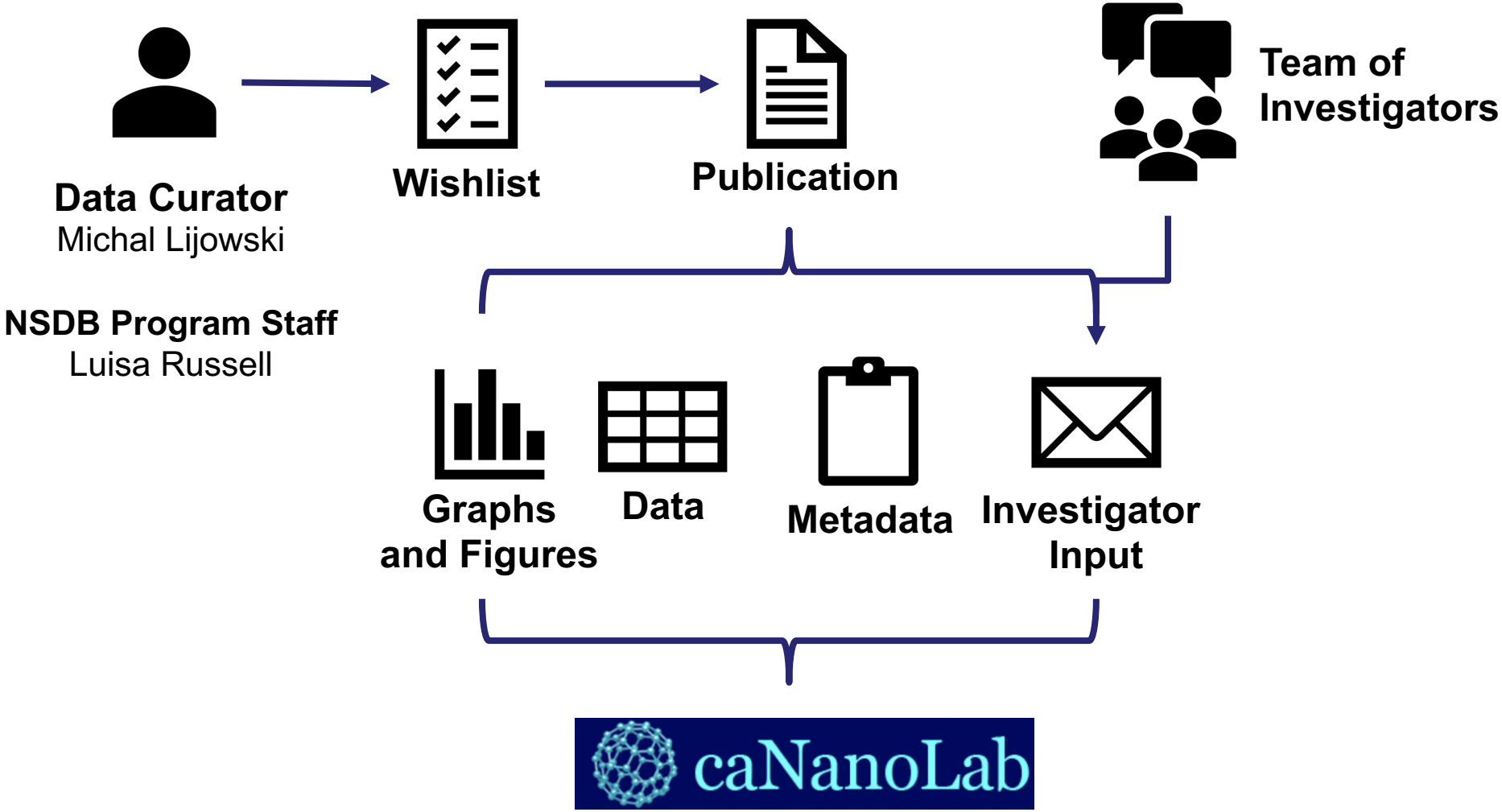
Searching without any parameters returns all s

Sample Search Results Back Help Glossary

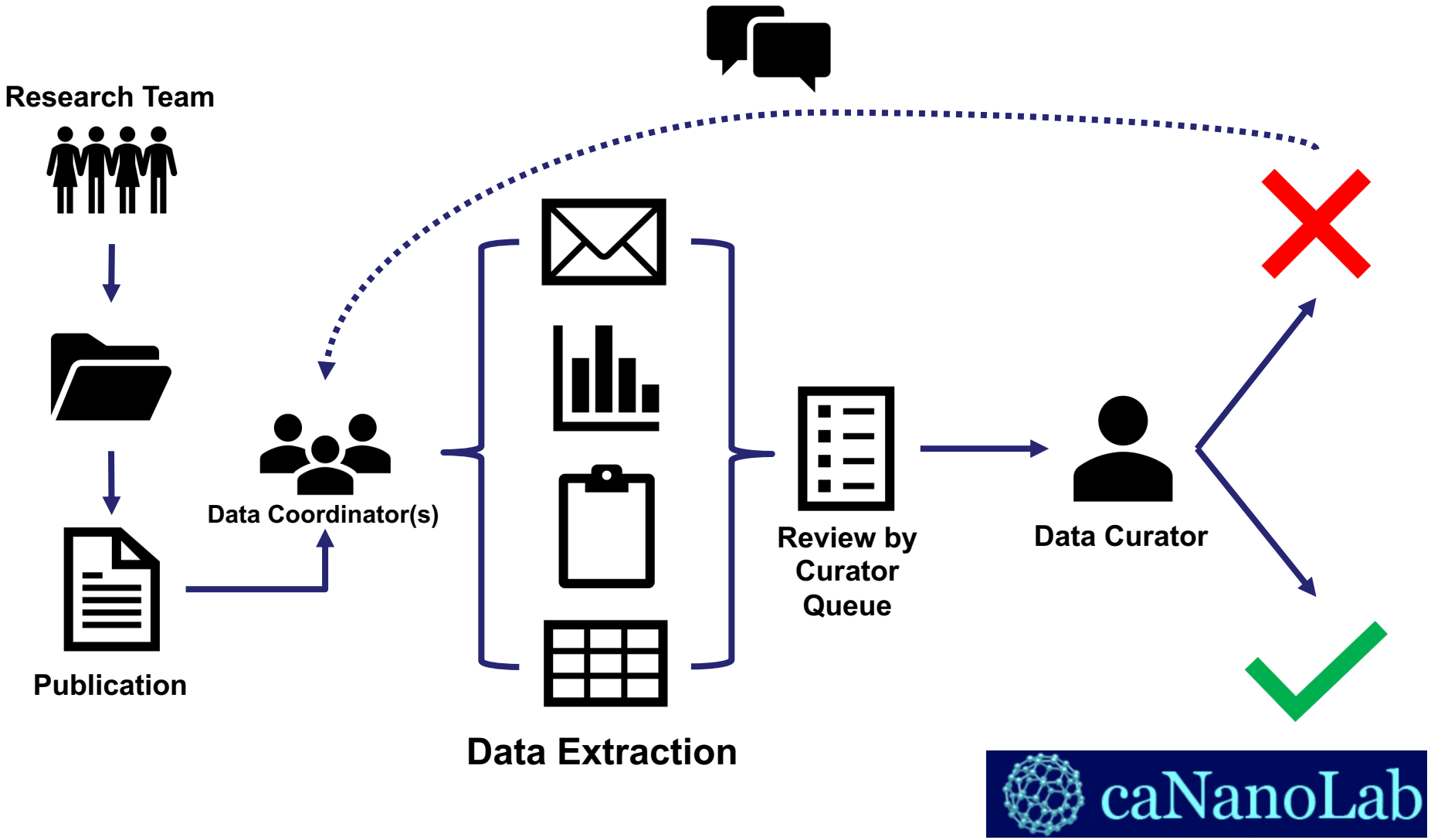
54 items found, displaying 1-10

Actions	Sample Name	Primary Point of Contact	Composition	Functions	Characterizations	Data Availability	Created Date
View	CESPU_UP_NEU-ANascimentoAB2017-05	NEU_DPS Department of Pharmaceutical Sciences, School of Pharmacy Bouvé College of Health Sciences, Northeastern University Boston MA 02115 USA	Liposome		Cytotoxicity	caNanoLab: 16%; MINChar: 11%	4/23/18
View	SZMC_HU_NCL-HShmeedaJDT2016-04	SZMC_HU_NCL Shaare Zedek Medical Center - Oncology Institute POB 3235 Jerusalem 91031 Israel	Liposome	TherapeuticFunction	BloodContact Cytotoxicity Targeting Toxicology other_pc other_vt other_vv	caNanoLab: 36%; MINChar: 11%	8/1/17
View	SZMC_HU_NCL-HShmeedaJDT2016-03	SZMC_HU_NCL Shaare Zedek Medical Center - Oncology Institute POB 3235 Jerusalem 91031 Israel	Liposome	TherapeuticFunction	BloodContact Cytotoxicity Pharmacokinetics Size Surface Targeting Toxicology other_pc other_vt other_vv	N/A	8/1/17
View	SZMC_HU_NCL-HShmeedaJDT2016-02	SZMC_HU_NCL Shaare Zedek Medical Center - Oncology Institute POB 3235 Jerusalem 91031 Israel	Liposome	TherapeuticFunction	BloodContact Cytotoxicity Size Surface Toxicology other_pc other_vt	N/A	8/1/17
View	SZMC_HU_NCL-HShmeedaJDT2016-01	SZMC_HU_NCL Shaare Zedek Medical Center - Oncology Institute POB 3235 Jerusalem 91031 Israel	Liposome		BloodContact other_vt	caNanoLab: 16%; MINChar: 11%	8/1/17

In-house Data Curation – Primary Form of Data Entry (historically)



caNanoLab Data Coordination and Curation



Current Awards and Data Coordinators

- Coordinators responsible for submitting nanomaterial characterizations, protocols, and publications associated with funded award
- caNanoLab activities should be reported in Section G.1 of annual reports

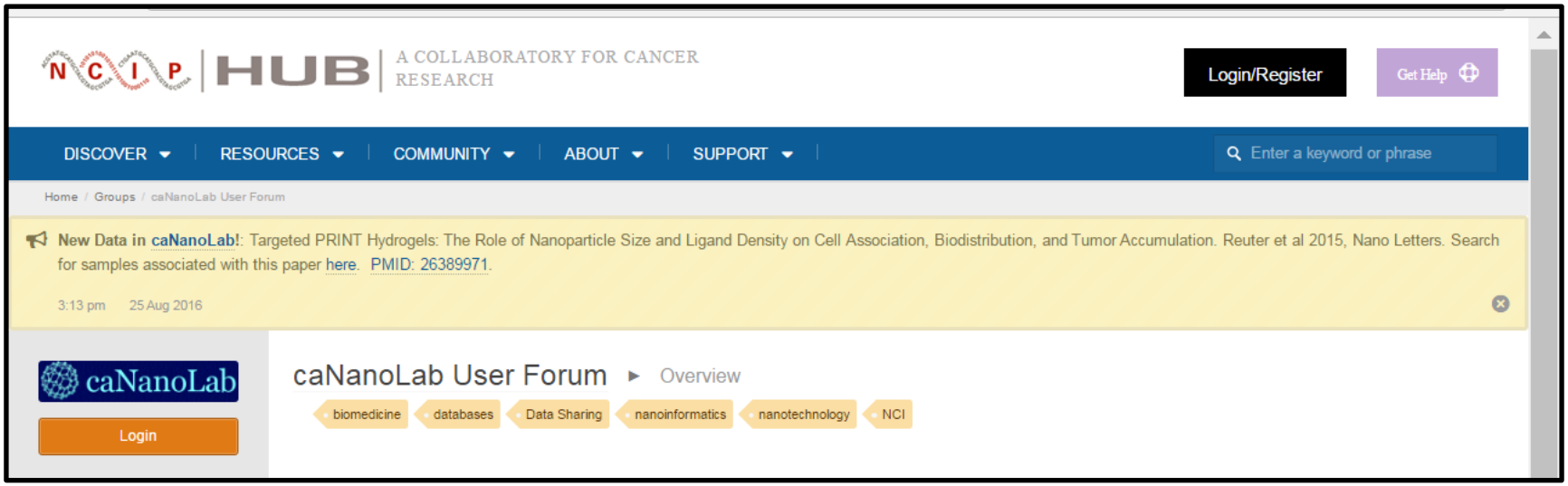
CCNE (U54s)	Data Coordinator
Caltech/UCLA/ISB	Wei Wei Dana Levine (Project 1)
Northwestern*	Gokay Yamankurt (Project 3) Eric Berns (Project 1) Serena Ghelfi (Project 2) Robert Molto Pallares (Core)
Stanford*	Alice Fan Thomas Metzner
UNC-Chapel Hill	Marina Sokolsky Mingzhen Zhang Duhyeong Hwang
Washington U*	Malcolm Tobias Fred Prior Tracy Nolan
MSKCC/Cornell*	Luis Campodonico

CNTCs (T32s)	
MD Anderson/Rice	Stacey Kalovidouris

IRCN (U01s)	Data Coordinator
Case Western (Karathanasis)*	Ketan Ghaghada
UCLA (Tseng)*	Matthew Smalley
UNC-Chapel Hill (Kabanov)	Marina Sokolsky
Emory (Yang)	Tongrui Liu
UC Davis (Lam)	Yuanpei Li
UCLA (Nel)*	Huan Meng Xiangsheng Liu
U of Chicago (Lin)*	Kaiyuan Ni
Ohio State (Guo)*	Daniel Binzel
Masimo (Lapotko)	Katsiaryna Hleb
MGH (Weissleder)*	Miles Miller
University of Texas MD Anderson Cancer Center (Lopez-Berestein)	Pinar Kanlikilicer
UCSD (Steinmetz)	Sourabh Shukla
Iowa State (Narasimhan)*	Kathleen Ross
UT Southwestern (Gao)	Zhaohui Wang

*Submitted data, sent data for review

caNanoLab User Forum

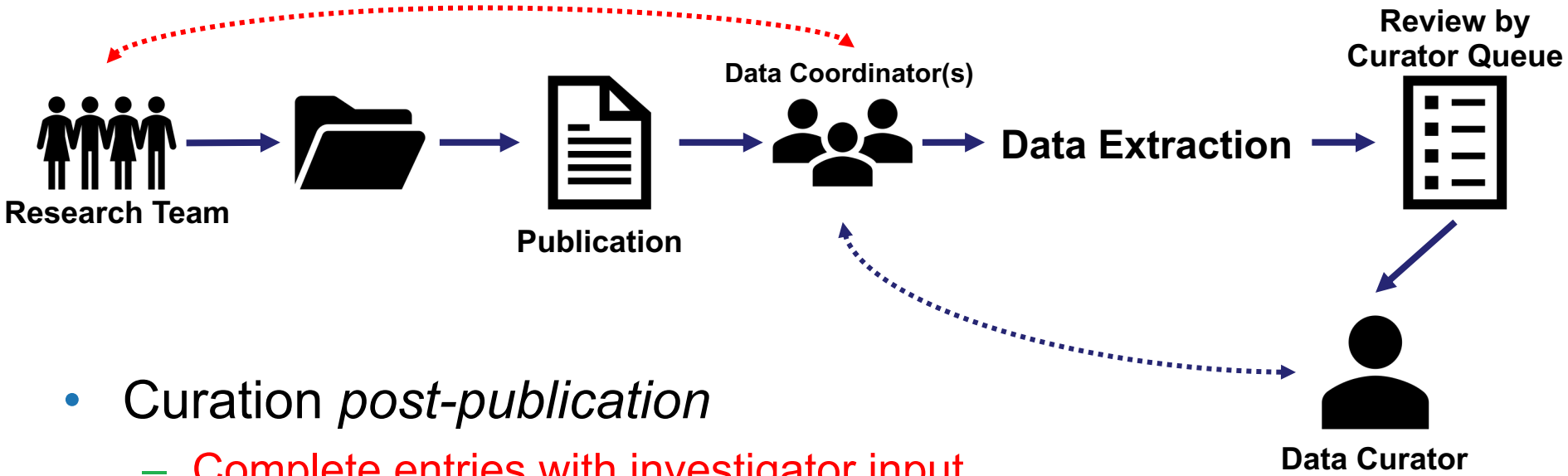


caNanoLab User Forum

- Forum for users to discuss caNanoLab and data sharing
- Provides guidance for data submission, example submission templates accessible to forum group members
- Submit New Feature Request or Defect using Wish List tab

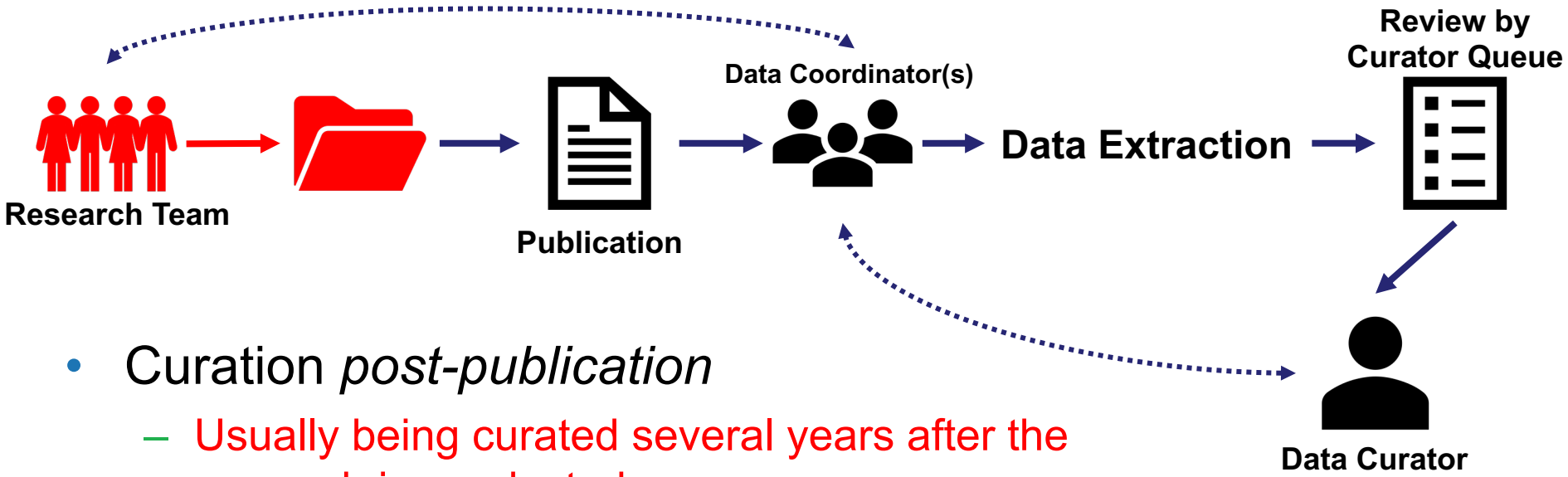
https://nciphub.org/groups/cananolab_usability/

Data Curation Challenges



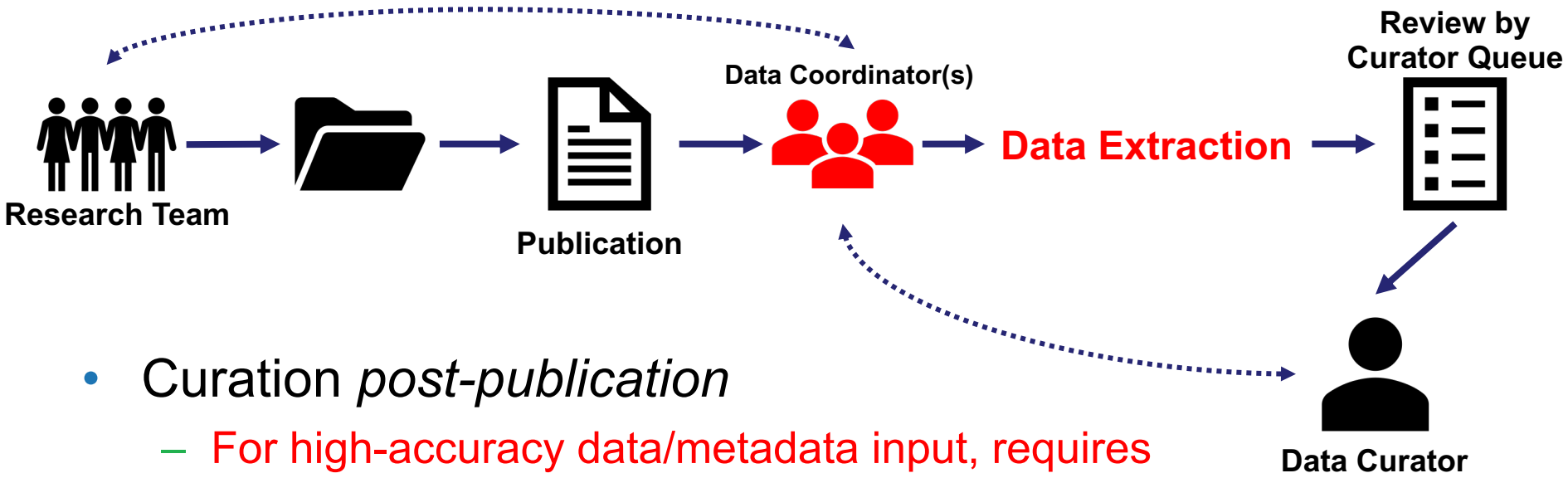
- Curation *post-publication*
  - Complete entries with investigator input
    - Slow
    - Communication issues

Data Curation Challenges



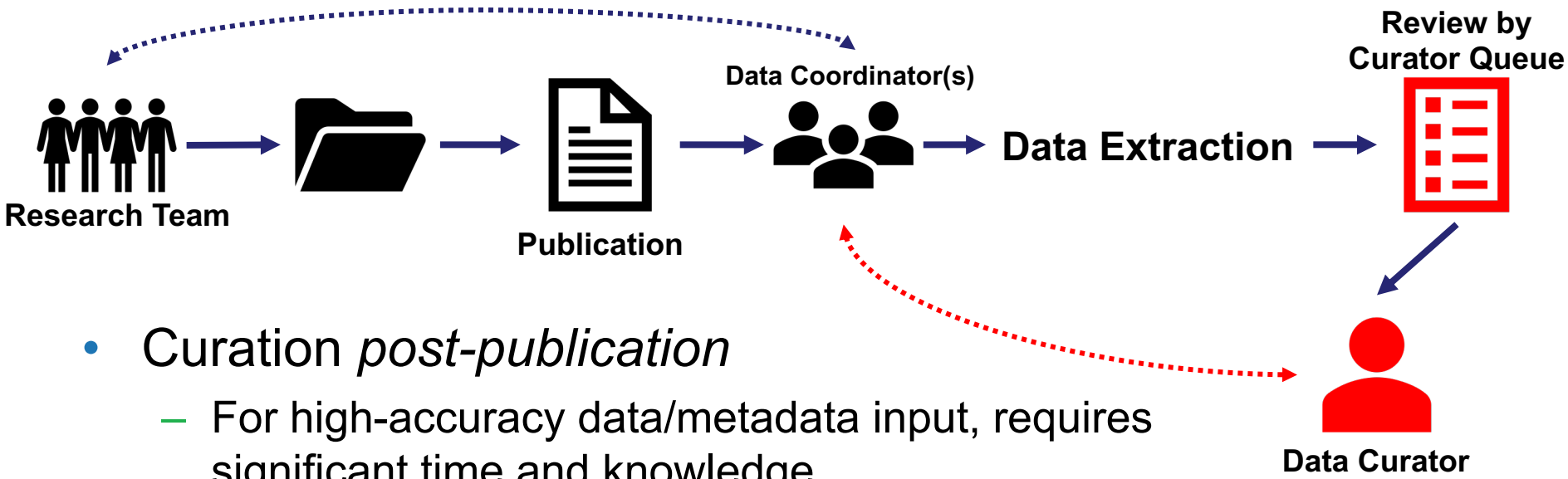
- Curation *post-publication*
  - Usually being curated several years after the research is conducted
    - Students move on
    - Non-standardized data collection
    - Data (and particularly metadata) is lost over time

Data Curation Challenges



- Curation *post-publication*
  - For high-accuracy data/metadata input, requires significant time and knowledge
    - Knowledgeable data coordinators

Data Curation Challenges

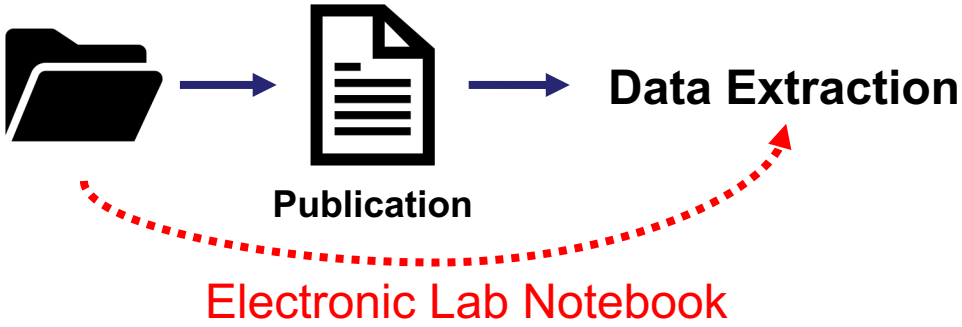


- Curation *post-publication*
  - For high-accuracy data/metadata input, requires significant time and knowledge
    - Knowledgeable data coordinators
    - Common vocabulary across disciplines (not just Nano Ontology)

Data Curation Challenges

- Data extraction from publications
  - Format issues
  - Required reporting varies (+supplemental information)
  - Incomplete information
  - References to past publications

Data Curation Challenges



- Some efforts to promote curation *pre-publication/co-publication*
  - eNanoBook etc. (Tropsha/Prior)

caNanoLab Data Coordination and Submission

- **For all Alliance awards, caNanoLab activities *must* be reported in Section G.1 of annual reports – *Grant Requirement!***

- Alliance Data Coordinators are responsible for coordinating submission of nanomaterial characterizations, protocols, and publications associated with funded awards.
  - Activities also include updating program office if there are changes in the data coordinators

- Curators can monitor submissions by award
  - Annual Reports
  - "Review By Curator" Queue
  - Can also see in curator mode list of samples that are not reported

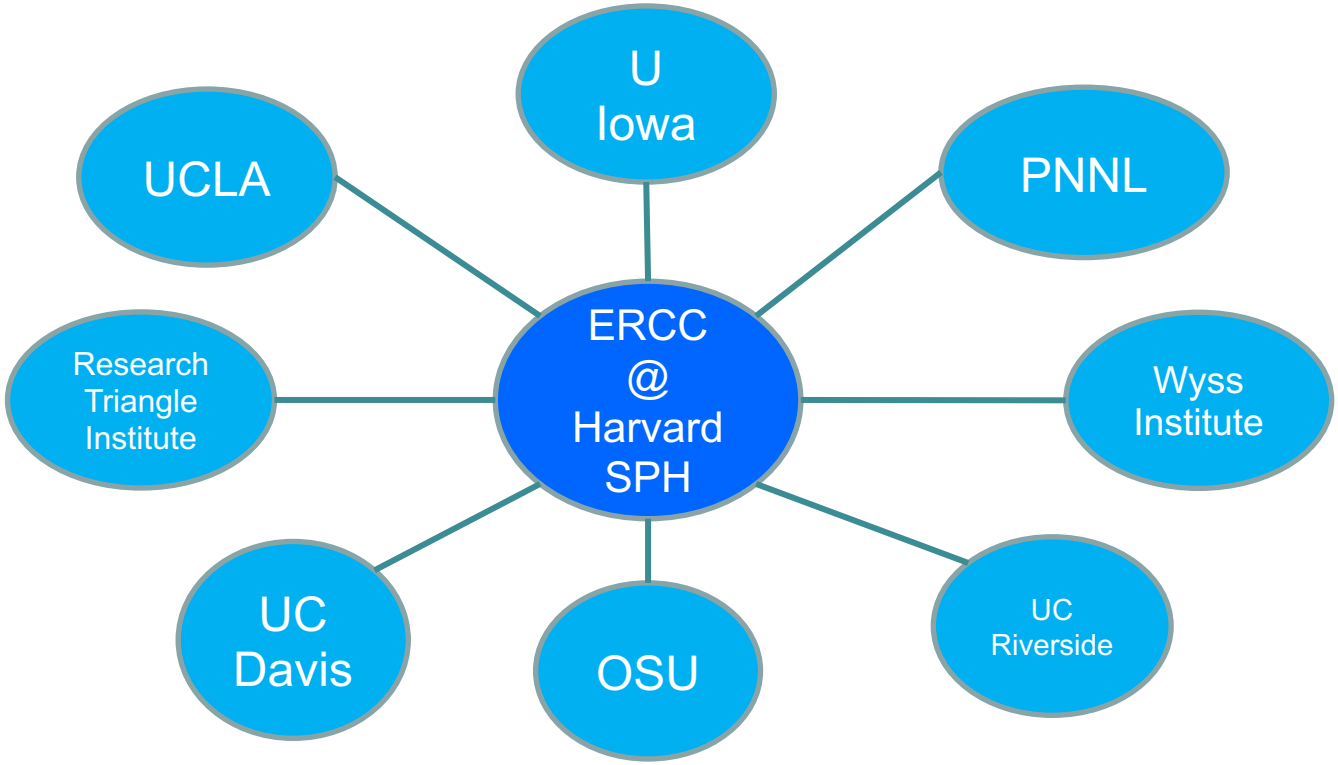
- NIEHS Nanotechnology Health Implications Research (NHIR) program started adding data to caNanoLab since this past summer/fall 2017, final project charter signed January 2018
  - Program launched in September 2016; eight U01s and one U24 Engineered Nanomaterials Resource and Coordination Core (ERCC)
  - Data submissions currently from the U24 center only

NHIR Consortium

NIH National Institute of Environmental Health Sciences
Your Environment. Your Health.

Nanotechnology Health Implications Research Consortium (2016-2021)

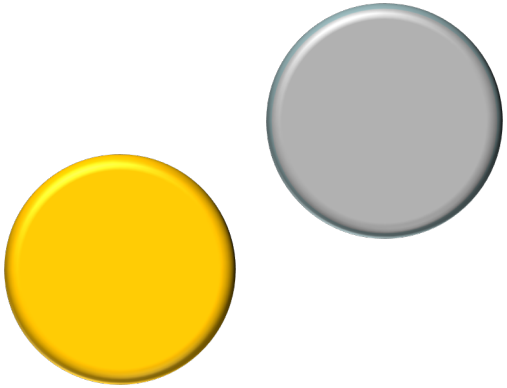
NHIR Consortium



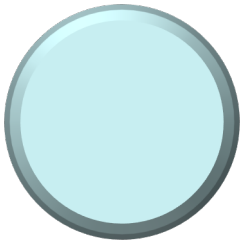
ERCC: Engineered Nanomaterials Resource and Coordination Core

NHIR Consortium – Nanoparticle Types

NP Types: metals, metal oxides, carbon nanotubes, 2-D and 3-D engineered nanomaterials, metal-metal conjugates, and cellulose



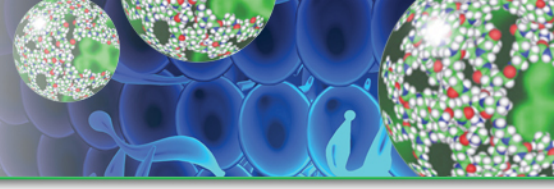
Metal/Metallic:
Silver
Gold
Titanium
Graphene



Metal Oxides:
Aluminum oxide
Silicon oxide
Cerium oxide
Iron oxide
Titanium oxide
Zinc oxide
Copper oxide
Magnesium oxide
Tungsten oxide
Graphene oxide
Vanadium oxide

Organic:
Psyllium husk
Cellulose nanofibrils
Cellulose nanocrystals

NHIR Consortium – Assay Types



National Institute of Environmental Health Sciences
Your Environment. Your Health.

Engineered Nanomaterials → Physico-chemical

In Vitro	3D Culture	*Ex Vivo*	*In Vivo*
Epithelial Endothelial Kupffer BDM BDDC T cell	Human Cardiac Airway muscle Vascular Endothelium Epidermis/dermal Mouse Liver (Kupffer/hepatic)	Rat Mouse NHP	Rat, mouse Transgenic model Pulmonary Ocular Hepatic Neuronal Cardiovascular GI (microbiome)

Biological Response Profiles

Future Modeling Efforts → caNanoLab

Submitted: 23 Protocols
24 Publications 24 Samples

What's New in caNanoLab - Software

Data Portal Releases

2014: Major Update, version 2.0

2015	2016	2017	2017	2017	2018	2018	2018
2.1	2.1.1	**2.2**	**2.3**	2.3.2	2.3.3	2.3.4	2.3.5
NEW!					NEW!	NEW!	

Bug Fixes

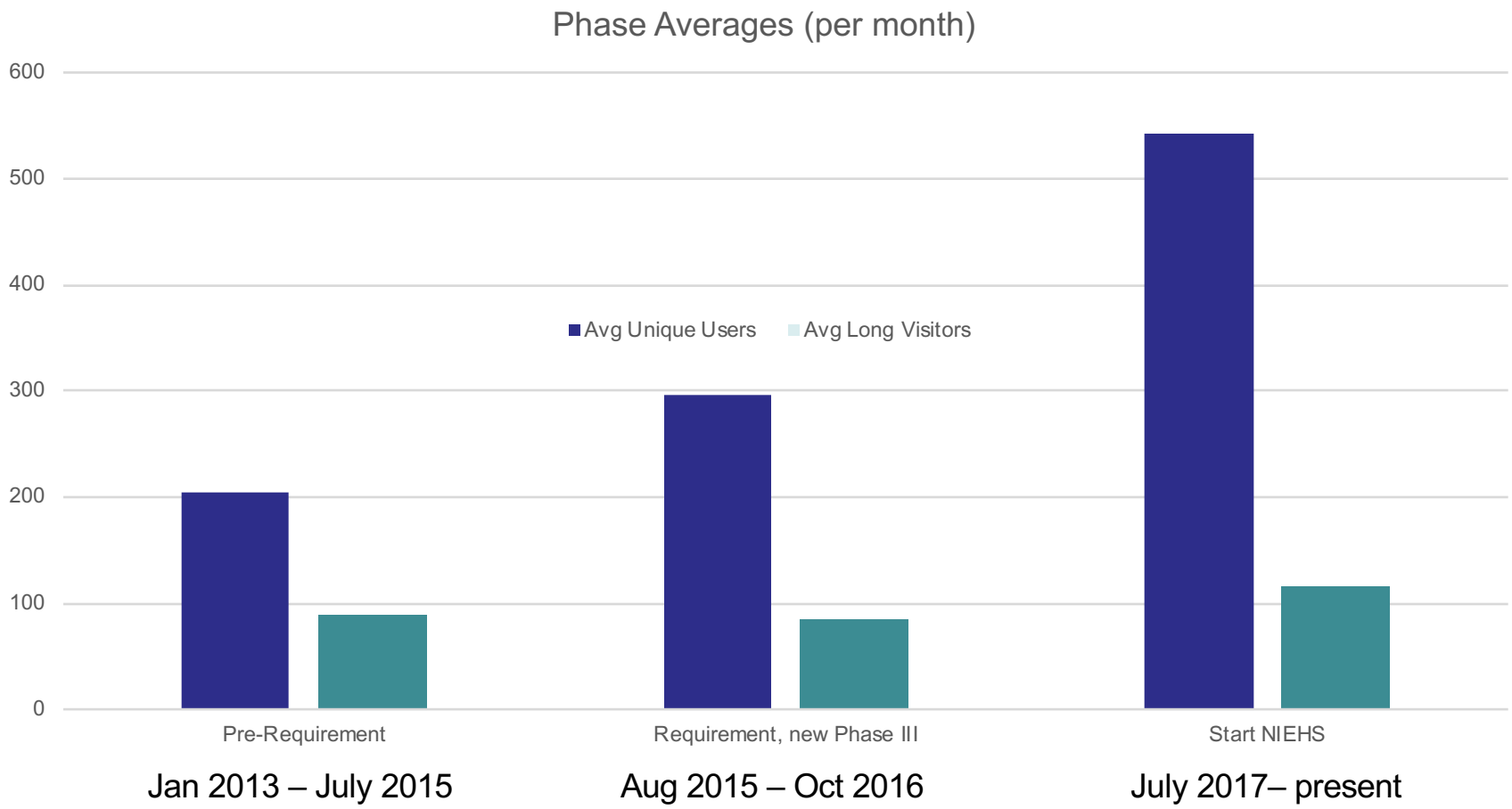
Updates

NEW! New Features

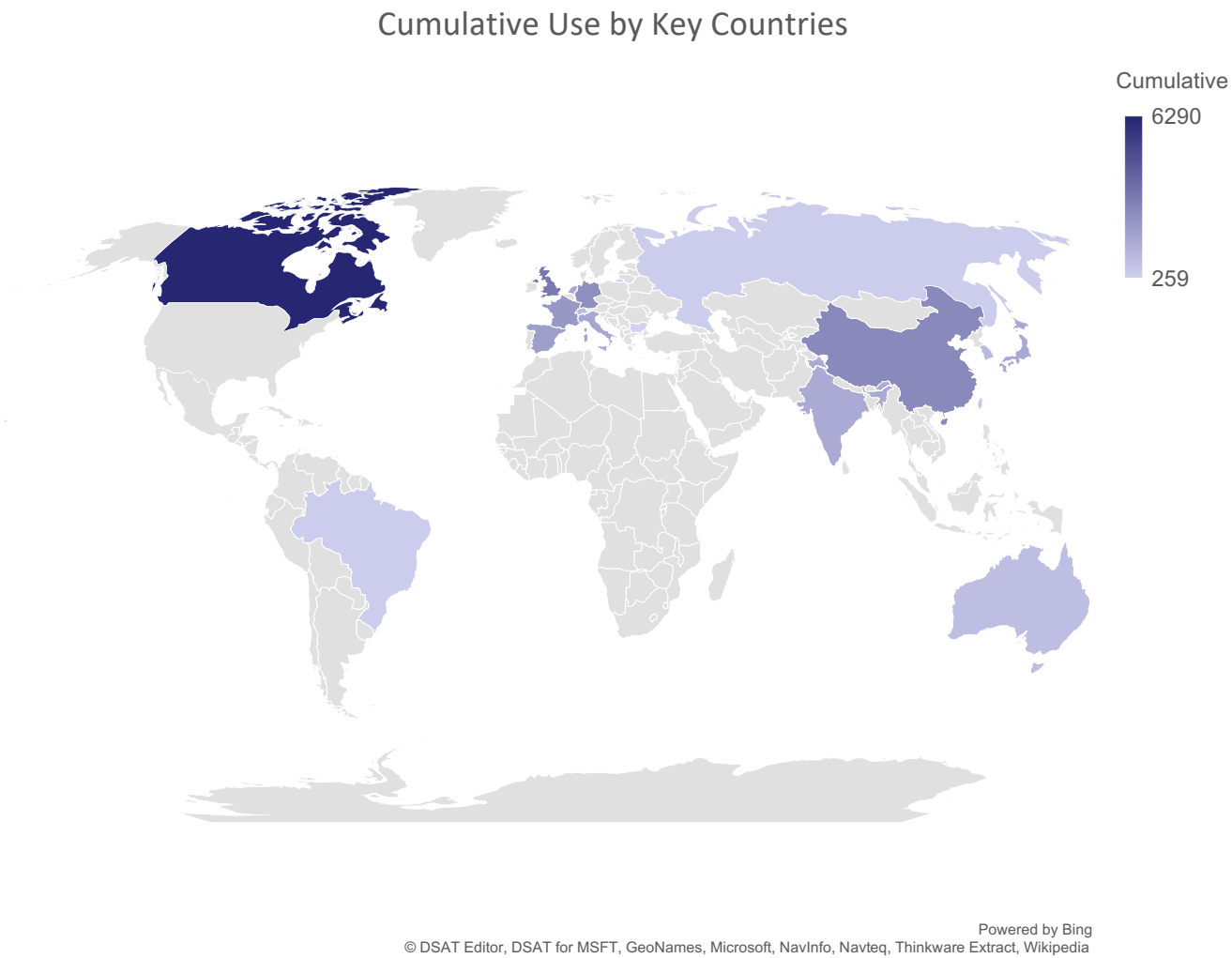
New in 2018: system logout warning, addition of Cell Line field in characterization, cleanup of drop down menus

https://wiki.nci.nih.gov/display/caNanoLab/caNanoLab+Release+Notes

caNanoLab Usage by Time Period



International caNanoLab Usage (cumulative since Jan 2013)



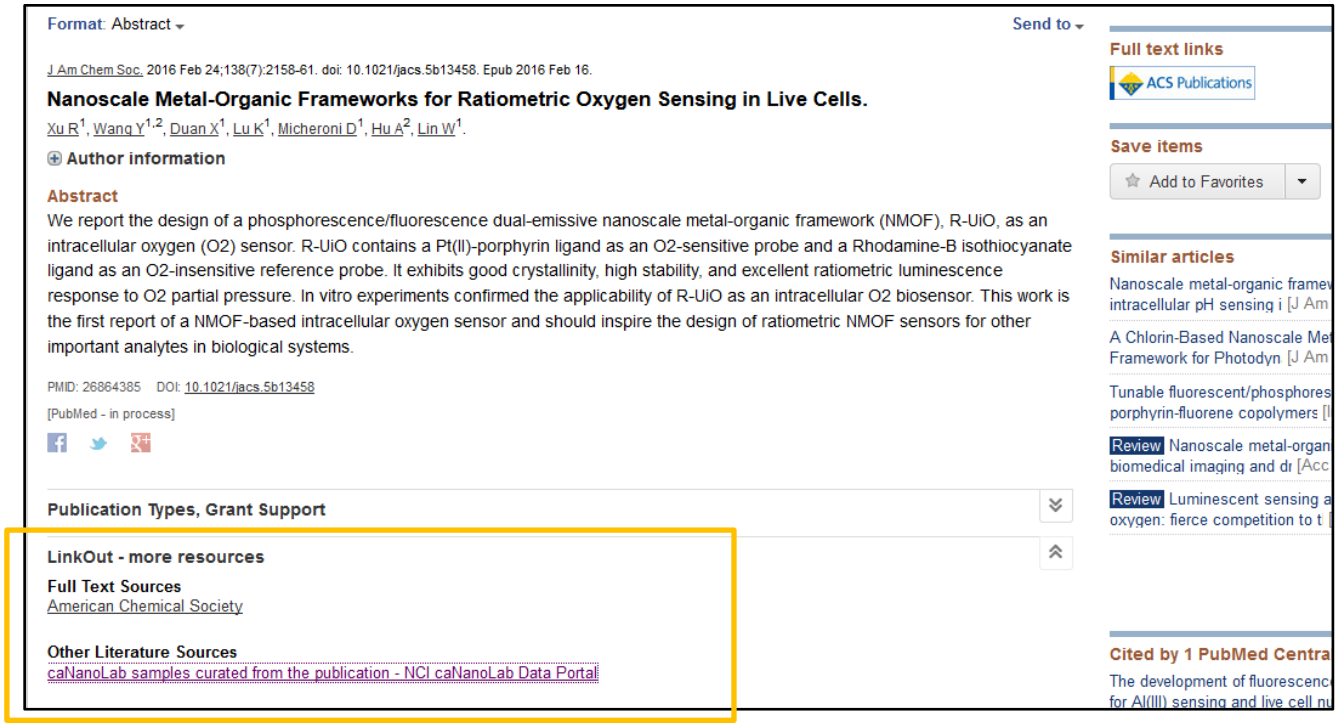
Country	Cumulative Pages Visited
Canada	6290
Great Britain	3350
China	2811
Germany	2609
France	2263
Spain	2059
Netherlands	1791
Italy	1760
Japan	1705
India	1634
South Korea	1059
Switzerland	1025
Australia	933
Taiwan	600
Brazil	448
Russia	447
Bulgaria	259

Cumulative US Usage: 7,104,071 pages (since Jan 2013)

caNanoLab is Highly Visible in Mainstream Scientific Literature

NIH and NCI

- caNanoLab is on the list of NIH Data Sharing Repositories maintained by National Library of Medicine.
- NCI Data Catalog lists caNanoLab—list of data collections produced by NCI initiatives
- PubMed LinkOut Resource



Format: Abstract Send to

J Am Chem Soc. 2016 Feb 24;138(7):2158-61. doi: 10.1021/jacs.5b13458. Epub 2016 Feb 16.

Nanoscale Metal-Organic Frameworks for Ratiometric Oxygen Sensing in Live Cells.

Xu R[1], Wang Y[1,2], Duan X[1], Lu K[1], Micheroni D[1], Hu A[2], Lin W[1].

Author information

Abstract

We report the design of a phosphorescence/fluorescence dual-emissive nanoscale metal-organic framework (NMOF), R-UiO, as an intracellular oxygen (O2) sensor. R-UiO contains a Pt(II)-porphyrin ligand as an O2-sensitive probe and a Rhodamine-B isothiocyanate ligand as an O2-insensitive reference probe. It exhibits good crystallinity, high stability, and excellent ratiometric luminescence response to O2 partial pressure. In vitro experiments confirmed the applicability of R-UiO as an intracellular O2 biosensor. This work is the first report of a NMOF-based intracellular oxygen sensor and should inspire the design of ratiometric NMOF sensors for other important analytes in biological systems.

PMID: 26864385 DOI: 10.1021/jacs.5b13458

[PubMed - in process]

Publication Types, Grant Support

LinkOut - more resources

Full Text Sources

American Chemical Society

Other Literature Sources

caNanoLab samples curated from the publication - NCI caNanoLab Data Portal

Full text links

ACS Publications

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Add to Favorites

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Nanoscale metal-organic framev intracellular pH sensing i [J Am

A Chlorin-Based Nanoscale Met Framework for Photodyn [J Am

Tunable fluorescent/phosphores porphyrin-fluorene copolymers [

Review Nanoscale metal-organ biomedical imaging and dr [Acc

Review Luminescent sensing a oxygen: fierce competition to t

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The development of fluorescenc for Al(III) sensing and live cell nu

https://www.ncbi.nlm.nih.gov/pubmed/?term=loprovncicananolab[SB]

caNanoLab is Highly Visible in Mainstream Scientific Literature

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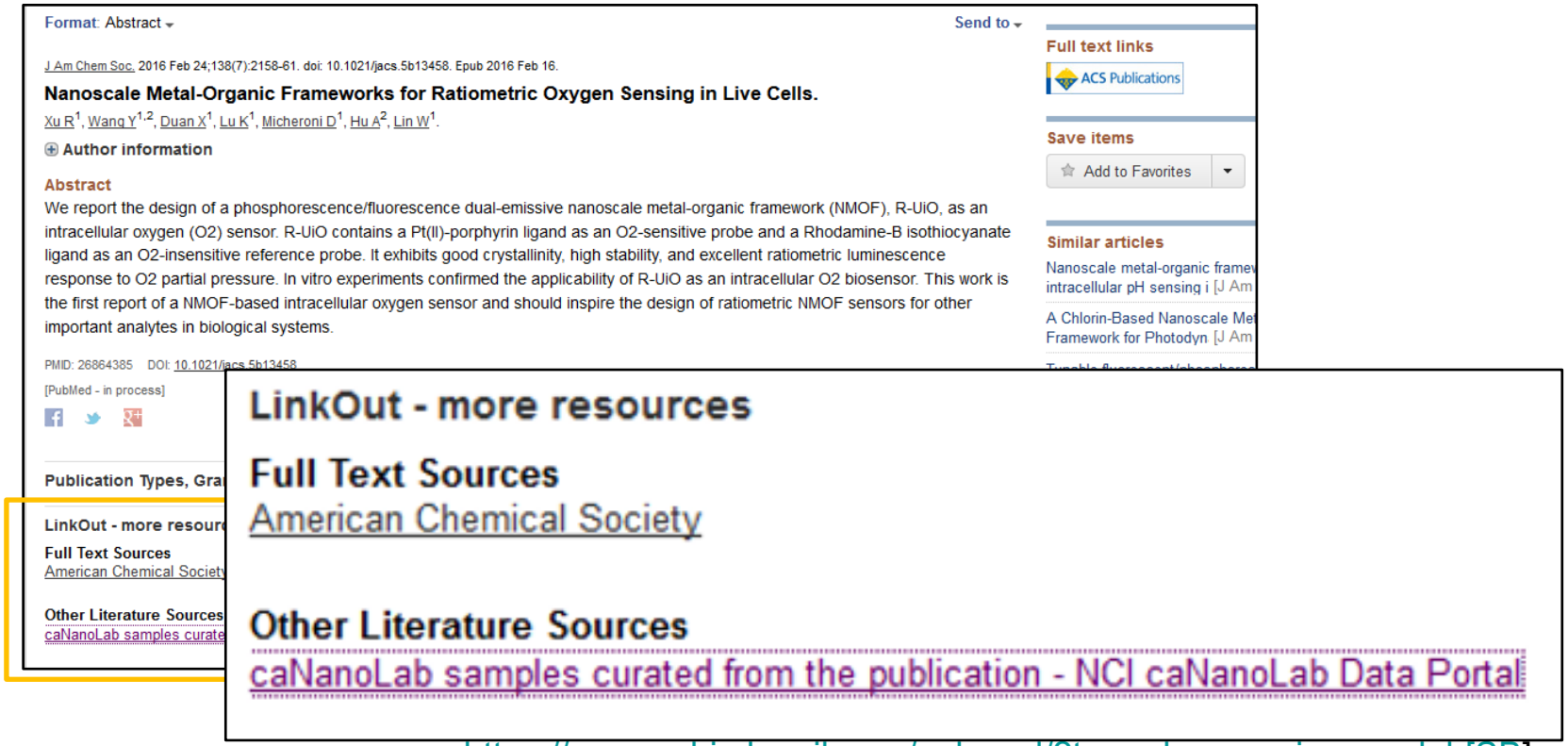
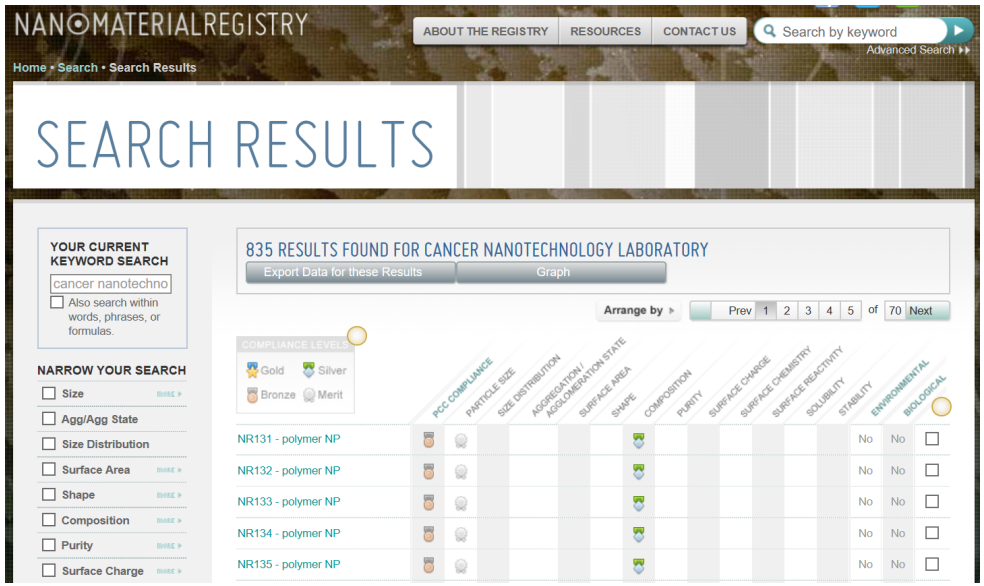


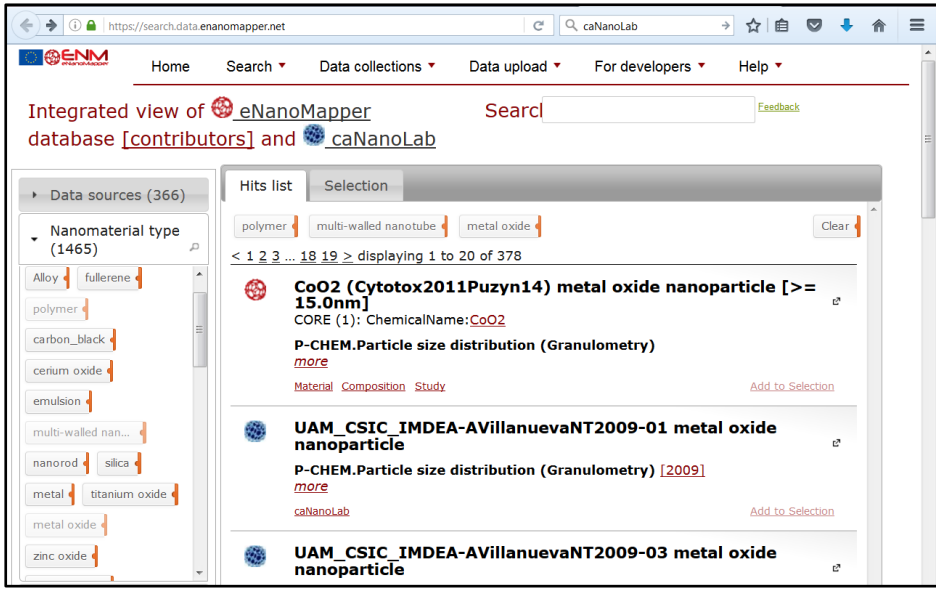
https://www.ncbi.nlm.nih.gov/pubmed/?term=loprovncicananolab[SB]

caNanoLab Linkages to other Relevant Nano Databases

NANOMATERIALREGISTRY

eNM eNanoMapper

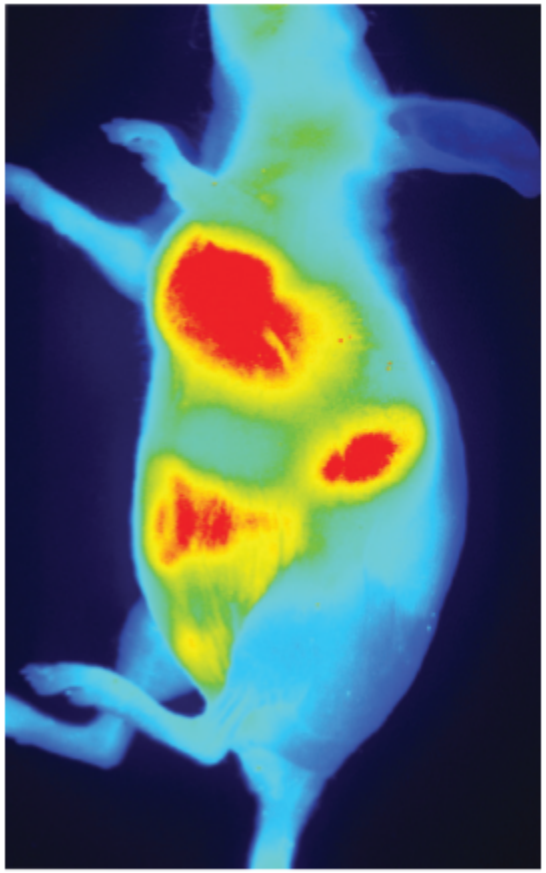


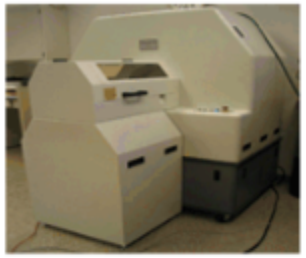


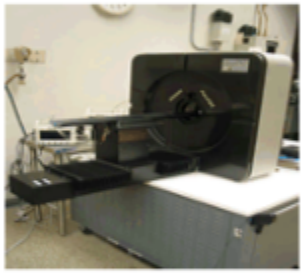
- Nanomaterial Registry
- eNanoMapper –European project focused on the development of a computational infrastructure for engineered nanomaterial toxicological data management

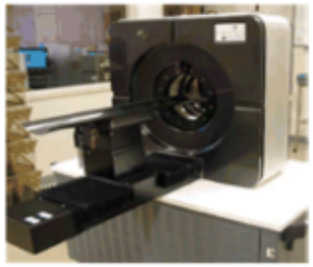
https://search.data.enanomapper.net/

In Progress: caNanoLab Integration with TCIA



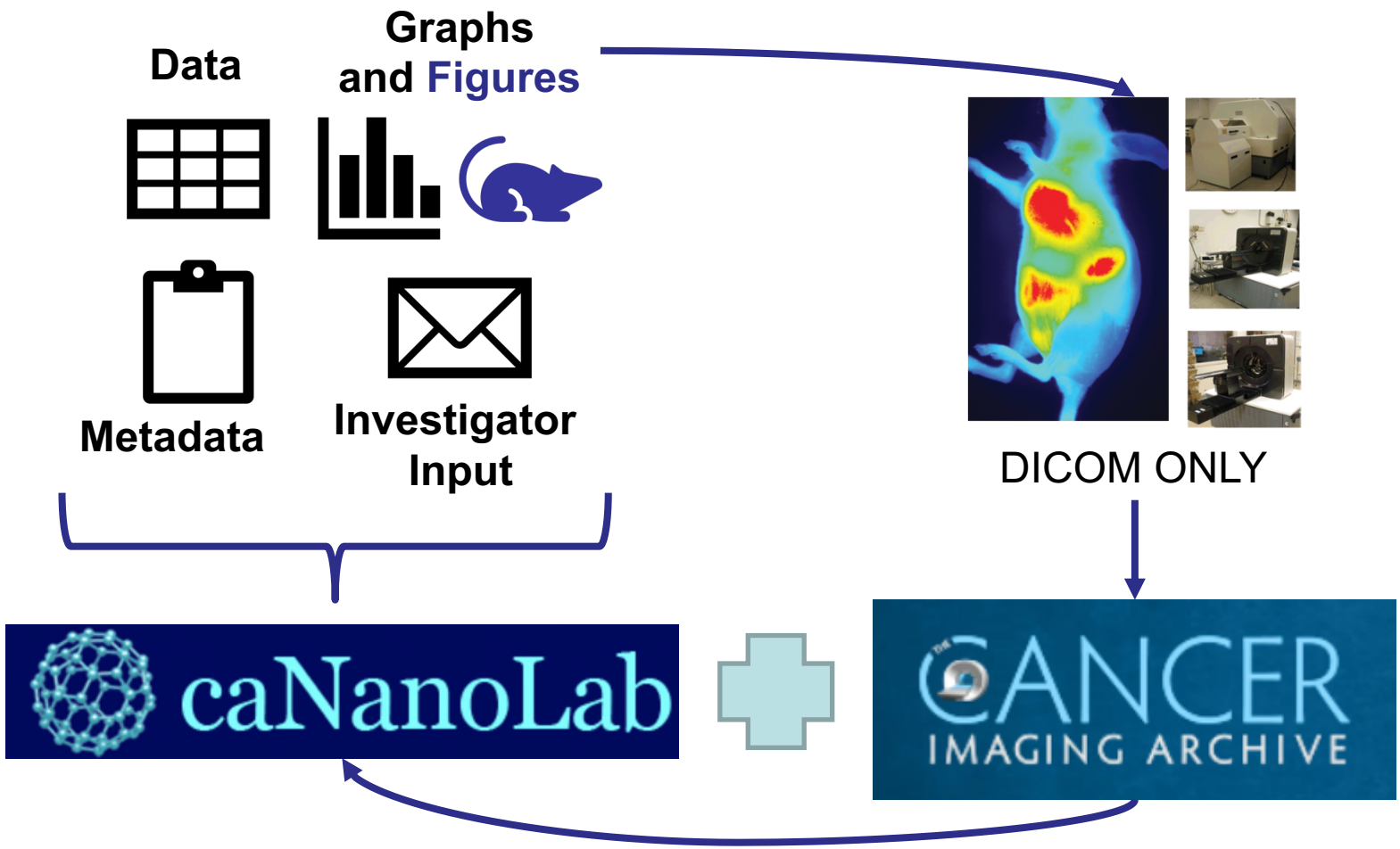






Contacts: Fred Prior, Tracy Nolan

caNanoLab Integration with TCIA



Direct: TCIA DOI
Indirect: PubMed LinkOut

Contacts: Fred Prior, Tracy Nolan, Ulrike Wagner

caNanoLab Future Directions: Conforming to Standards for Data Sharing

FAIRsharing.org
standards, databases, policies

A curated, informative and educational resource on data and metadata *standards*, inter-related to *databases* and data *policies*.

FAIR term	Current Efforts	Proposed Efforts
Findable	Google search, PubMed LinkOut	Inclusion in Google Dataset Search
Accessible	Public resource	Enabling of download/export of data
Interoperable	ISA-TAB Nano file creation	ISA-TAB software compliance, proposed application programming interface (API)
Reusable	High quality data and metadata	Maintain quality and extend to machine searchability

- Inclusion of metadata is extremely important and not very common
  - Without standard methods, inclusion of comprehensive metadata becomes critically important.

Proposed caNanoLab Features

- Refocus of curation efforts
  - Develop one complete sample entry per paper for each site with a sample list
  - Increased uniformity of entries across sites
  - Increased speed of submission
- Assigning DOIs to complete data sets in caNanoLab
  - DataCite
- Expanded social media presence
  - Further exposure for those who submit
  - Reaching a wider audience of submitters
  - Expand number of tweets using #caNanoLab

caNanoLab Team

Philippa Barnes
Developmental Technical Project Manager

Michal Lijowski, PhD
Curator

Mervi Heiskanen, PhD
CBIIT Team Lead

Luisa Russell, PhD
NSDB Team Lead

Nanodelivery Systems and Devices Branch

Cancer Imaging Program

Piotr Grodzinski, PhD
Branch Chief

Christina Liu, PhD, PE
Program Director

Chris Hartshorn, PhD
Program Director

Luisa Russell, PhD
CRTA Fellow

http://www.cancer.gov/sites/nano

Acknowledgements

- *caNanoLab Team, past and present*
  - Mervi Heiskanen
  - Philippa Barnes
  - Michal Lijowski
  - Stephanie Morris
- *NSDB*
  - Piotr Grodzinski
  - Christina Liu
  - Christopher Hartshorn
- *UAMS Team*
  - Tracy Nolan
- *CIP*
- *Administrative staff*

caNanoLab

NIH NATIONAL CANCER INSTITUTE Division of Cancer Treatment & Diagnosis

NIH NATIONAL CANCER INSTITUTE Center for Biomedical Informatics & Information Technology

Questions?