Informatics and standards for nanomedicine technology

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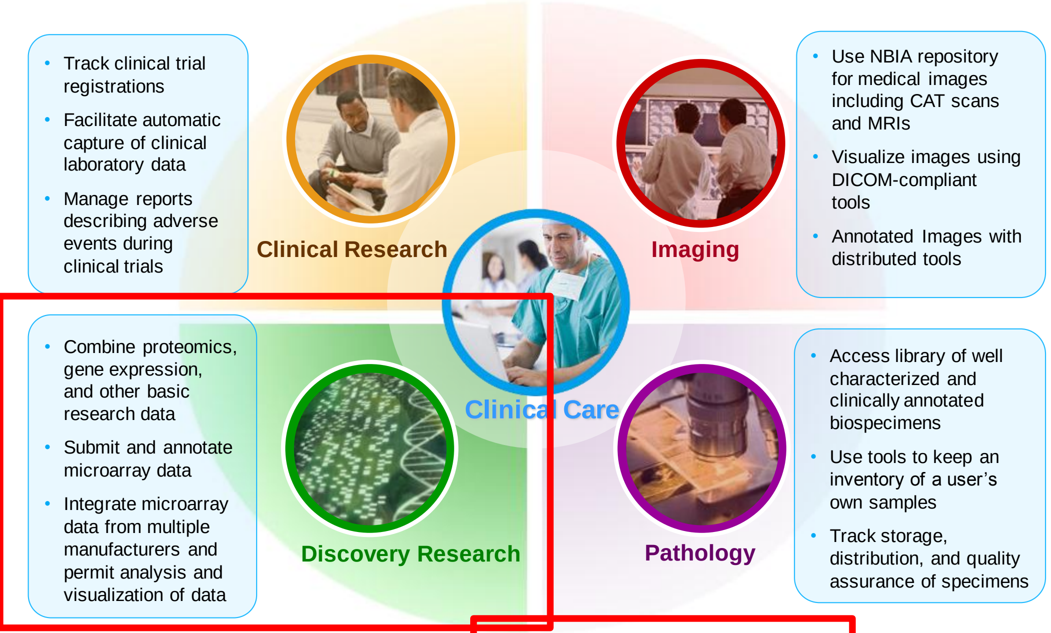
Outline

- **Introduction to the caBIG® Nanotechnology Working Group**
- Overview of nanotechnology informatics challenges
- Research projects
  - Ontology development
  - PubNano resource
  - Data exchange standards
  - Structure-property-activity modeling

National Cancer Institute caBIG® Nanotechnology Working Group

- Government
  - National Institutes of Health
    - NCI, NHLBI, NIBIB, NCL
  - Center for Disease Control
  - Food and Drug Administration
  - Environmental Protection Agency
  - …
- Academia
  - Washington University
  - Pacific Northwest National Lab
  - Oregon State
  - Stanford
  - MIT
  - Georgia Tech
  - UCLA
  - …
- Industry
  - Intel
  - Pennsylvania NanoSysten
  - …
- Standards organizations
  - ASTM E56
  - ISO TC229
- Alliances and organizations
  - International Alliance for NanoEHS Harmonization
  - Oregon Nanoscience and Microtechnologies Institute
  - National Nanotechnology Initiative
  - National Nanomanufacturing Network
  - NCI Nano Alliance

caBIG® Overview (http://cabig.nci.nih.gov/)

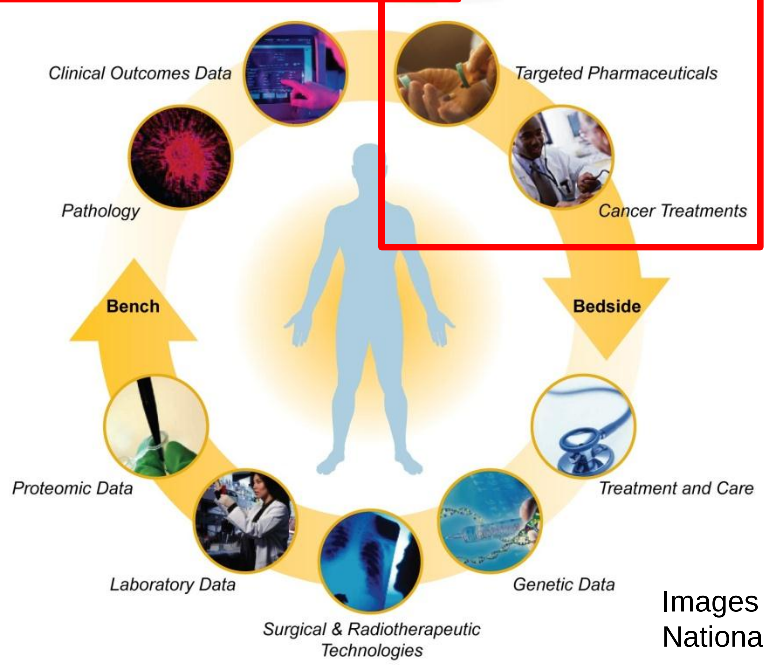

Clinical Research
Imaging
Clinical Care
Discovery Research
Pathology

- Track clinical trial registrations
- Facilitate automatic capture of clinical laboratory data
- Manage reports describing adverse events during clinical trials

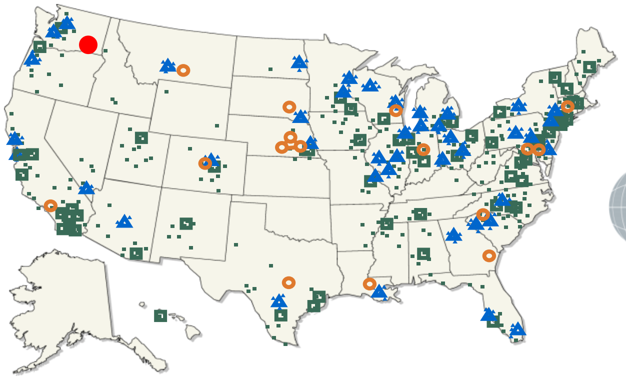
- Use NBIA repository for medical images including CAT scans and MRIs
- Visualize images using DICOM-compliant tools
- Annotated Images with distributed tools

- Combine proteomics, gene expression, and other basic research data
- Submit and annotate microarray data
- Integrate microarray data from multiple manufacturers and permit analysis and visualization of data

- Access library of well characterized and clinically annotated biospecimens
- Use tools to keep an inventory of a user's own samples
- Track storage, distribution, and quality assurance of specimens


Clinical Outcomes Data
Targeted Pharmaceuticals
Pathology
Cancer Treatments
Bench
Bedside
Proteomic Data
Treatment and Care
Laboratory Data
Genetic Data
Surgical & Radiotherapeutic Technologies

- Bench-to-bedside biomedical research infrastructure
- Integrates basic research to clinical research to patient care
- Broad deployment
  - Extensible framework
  - Significant use outside the cancer domain
- Poised for significant growth



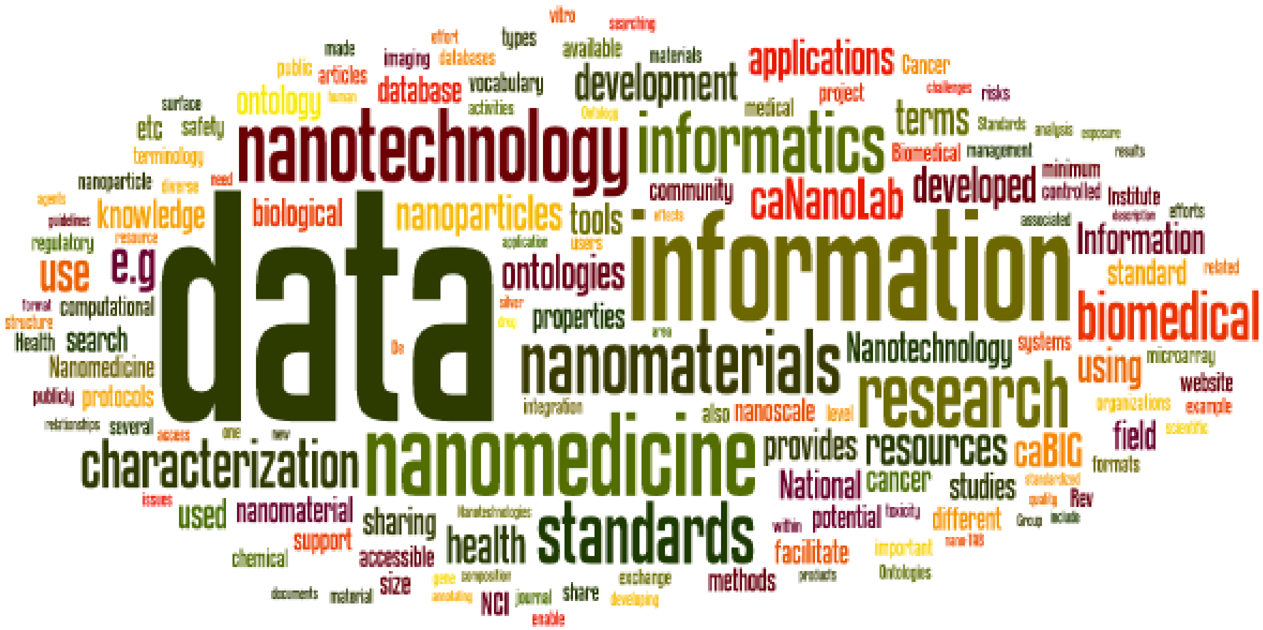
caBIG™ cancer Biomedical Informatics Grid™

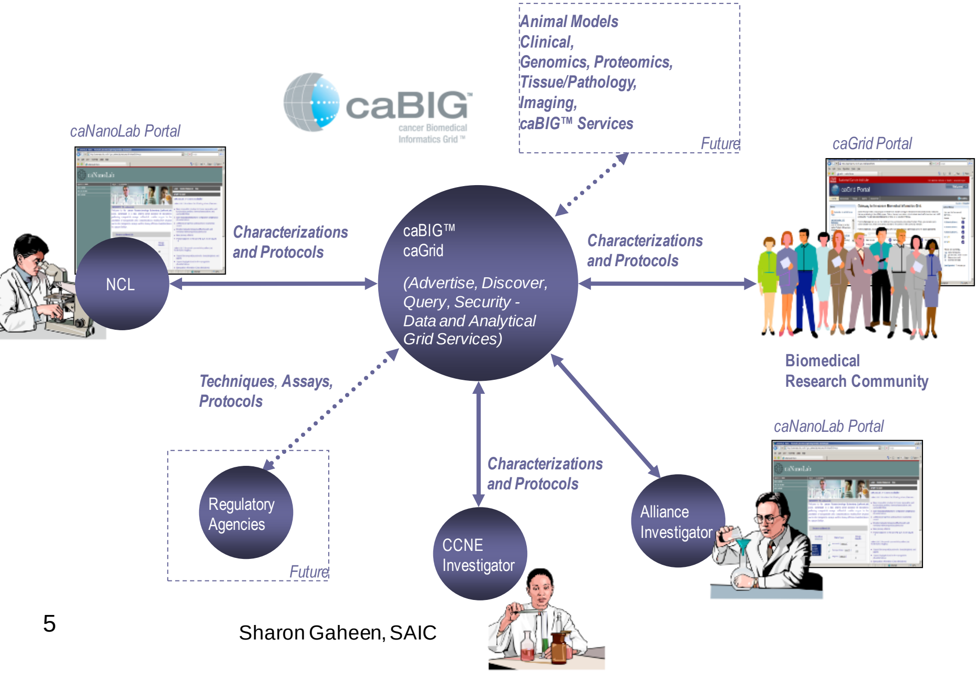
Images courtesy of Juli Klemm, National Cancer Institute

Pacific Northwest NATIONAL LABORATORY

Proudly Operated by Battelle Since 1965

Working Group Scope


data
information
nanotechnology
informatics
nanomedicine
standards
nanomaterials
research
characterization
biomedical
development
applications
caNanoLab
developed
nanoparticles
ontologies
ontology
database
knowledge
biological
health
terms
Information
Nanotechnology
resources
caBIG
provides
National
cancer
studies
sharing
methods
facilitate
different
potential
using
field
standard
use
e.g
search
computational
Nanomedicine
protocols
properties
tools
community
vocabulary
imaging
databases
types
available
materials
project
medical
Cancer
risks
Biomedical
management
minimum
controlled
Institute
efforts
related
microarray
website
organizations
example
scientific
formats
Rev
Ontologies
important
journal
share
exchange
NCI
size
accessible
support
chemical
used
nanomaterial
material
documents
several
access
relationships
publicly
Health
structure
regulatory
resource
guidelines
agents
nanoparticle
terminology
surface
etc
safety
public
articles
made
vitro
searching
integration
also
nanoscale
level
enable
developing
products
Group
include
within
quality
standardized
toxicity



Animal Models
Clinical,
Genomics, Proteomics,
Tissue/Pathology,
Imaging,
caBIG™ Services
Future

caBIG cancer Biomedical Informatics Grid™

caNanoLab Portal

NCL

Characterizations and Protocols

caBIG™
caGrid

(Advertise, Discover, Query, Security - Data and Analytical Grid Services)

Characterizations and Protocols

caGrid Portal

Biomedical Research Community

Techniques, Assays, Protocols

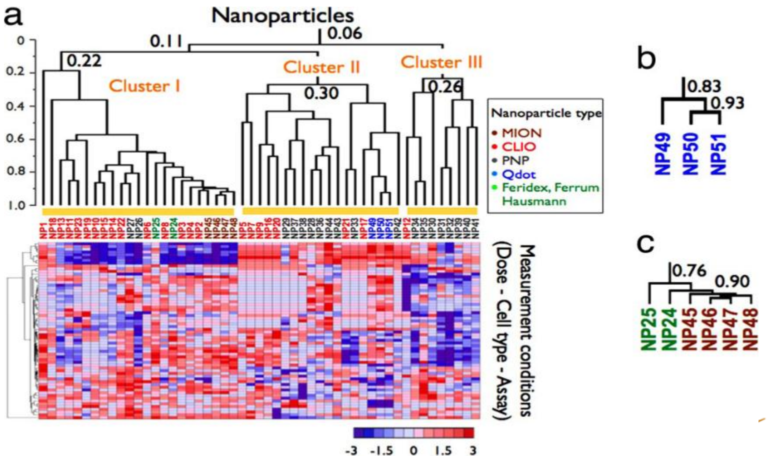
Regulatory Agencies
Future

CCNE Investigator

Characterizations and Protocols

Alliance Investigator

caNanoLab Portal



Shaw et al., 2008. *PNAS*, 105: 7387.

Nano WG current areas of focus

- Nano-TAB development (*enabling*)
  - Nanotechnology data sharing standards
  - Working draft ready
  - Community engaged
  - Need to focus on applications and standards
- NPO support and expansion (*enabling*)
  - Standard vocabulary and ontology for nanomedicine
  - Foundation established
  - Community engaged
  - Need to focus on support for nano-TAB and other annotation projects
- Nano-QSAR (*applying*)
  - Structure-activity relationships for nanomaterial-biological interactions
  - Community engaged; participants identified
  - Many potential areas of focus

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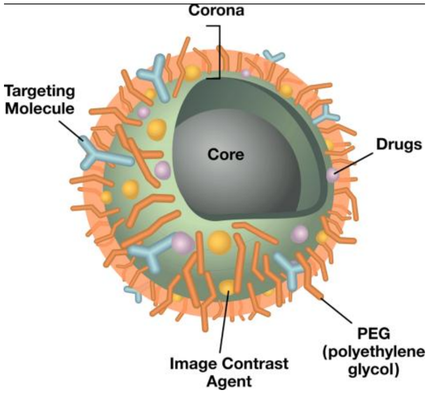
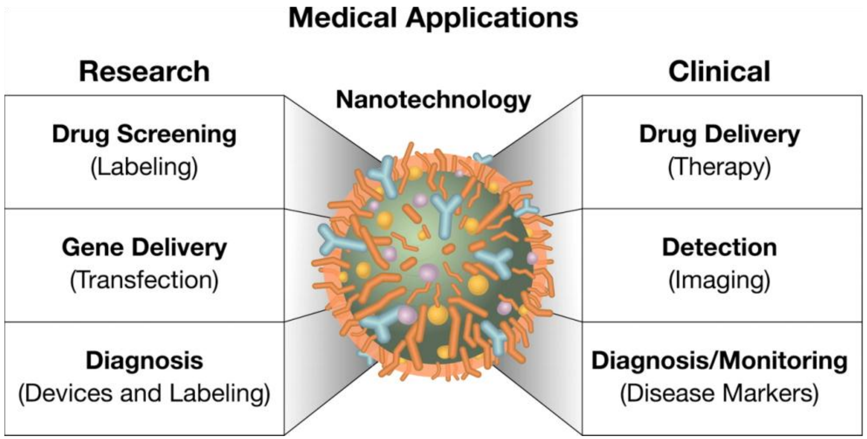
  - Structure-property-activity modeling

What is the problem? *Unrealized potential due to combinatorial complexity*

- Nanomaterials are small and diverse
- The promise:
  - High density
  - Improved biodistribution
  - Multi-modal applications
- The problems:
  - Combinatorial diversity
  - Difficult characterization
- ***An important challenge!***

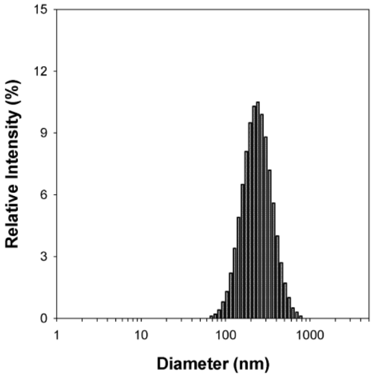

Corona
Targeting Molecule
Core
Drugs
PEG (polyethylene glycol)
Image Contrast Agent


Medical Applications
Research
Nanotechnology
Clinical
Drug Screening
(Labeling)
Gene Delivery
(Transfection)
Diagnosis
(Devices and Labeling)
Drug Delivery
(Therapy)
Detection
(Imaging)
Diagnosis/Monitoring
(Disease Markers)

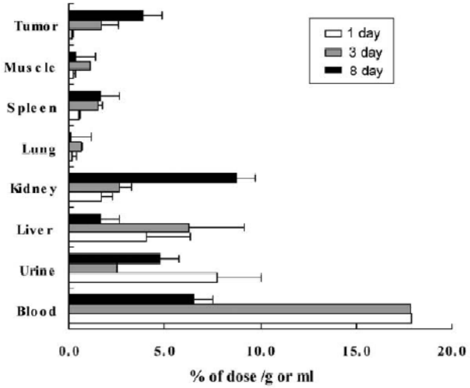
McNeil SE. *J Leukoc Biol*, 2005. **78**(3): p. 585-94. doi:10.1189/jlb.0205074

What is the problem? *Diversity of data*

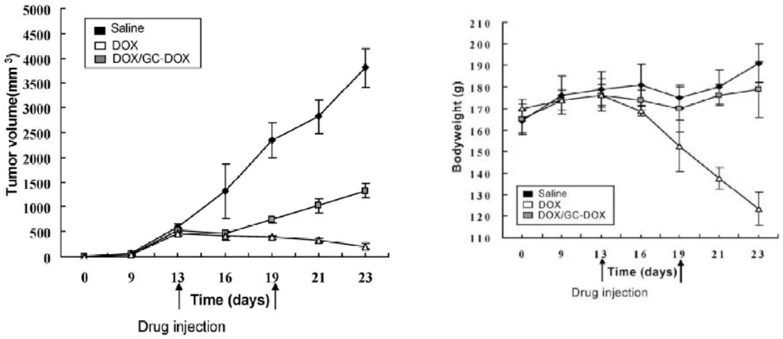
Size distribution data



Tissue biodistribution



Anti-tumor activity



Zeta Potential

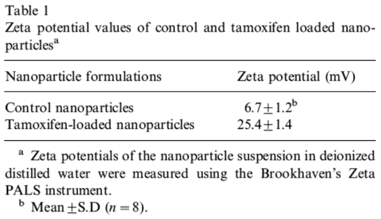


Table 1
Zeta potential values of control and tamoxifen loaded nanoparticles[a]

Nanoparticle formulations	Zeta potential (mV)
Control nanoparticles	6.7±1.2[b]
Tamoxifen-loaded nanoparticles	25.4±1.4

[a] Zeta potentials of the nanoparticle suspension in deionized distilled water were measured using the Brookhaven's Zeta PALS instrument.
[b] Mean ±S.D ($n = 8$).

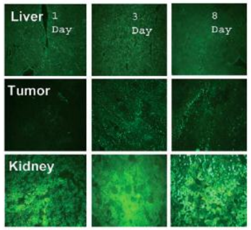
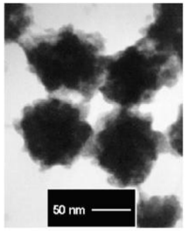
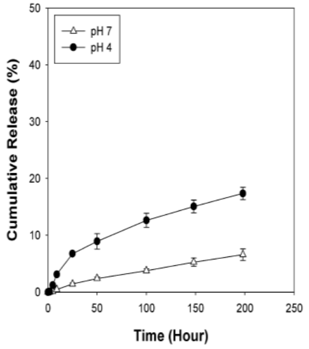


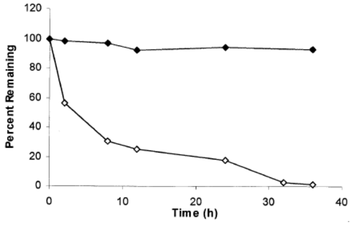
Fig. 8. Tissue accumulation of FITC-conjugated glycol-chitosan (FTC-GC) nanoaggregates for 8 days after i.v. injection in tumor-bearing rats at a dose of 10 mg/kg. Tissue accumulation measured by fluorescence microscopy.

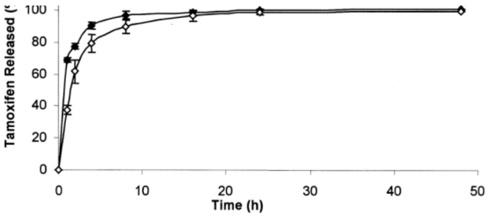
Surface morphology data



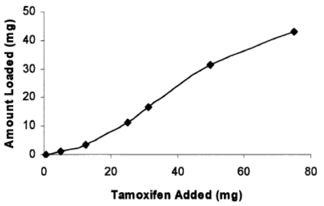
In vitro drug release





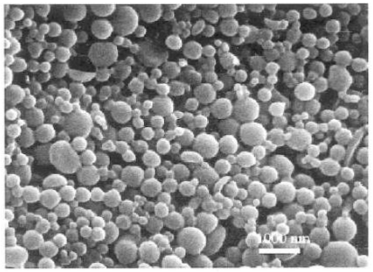


Drug loading data



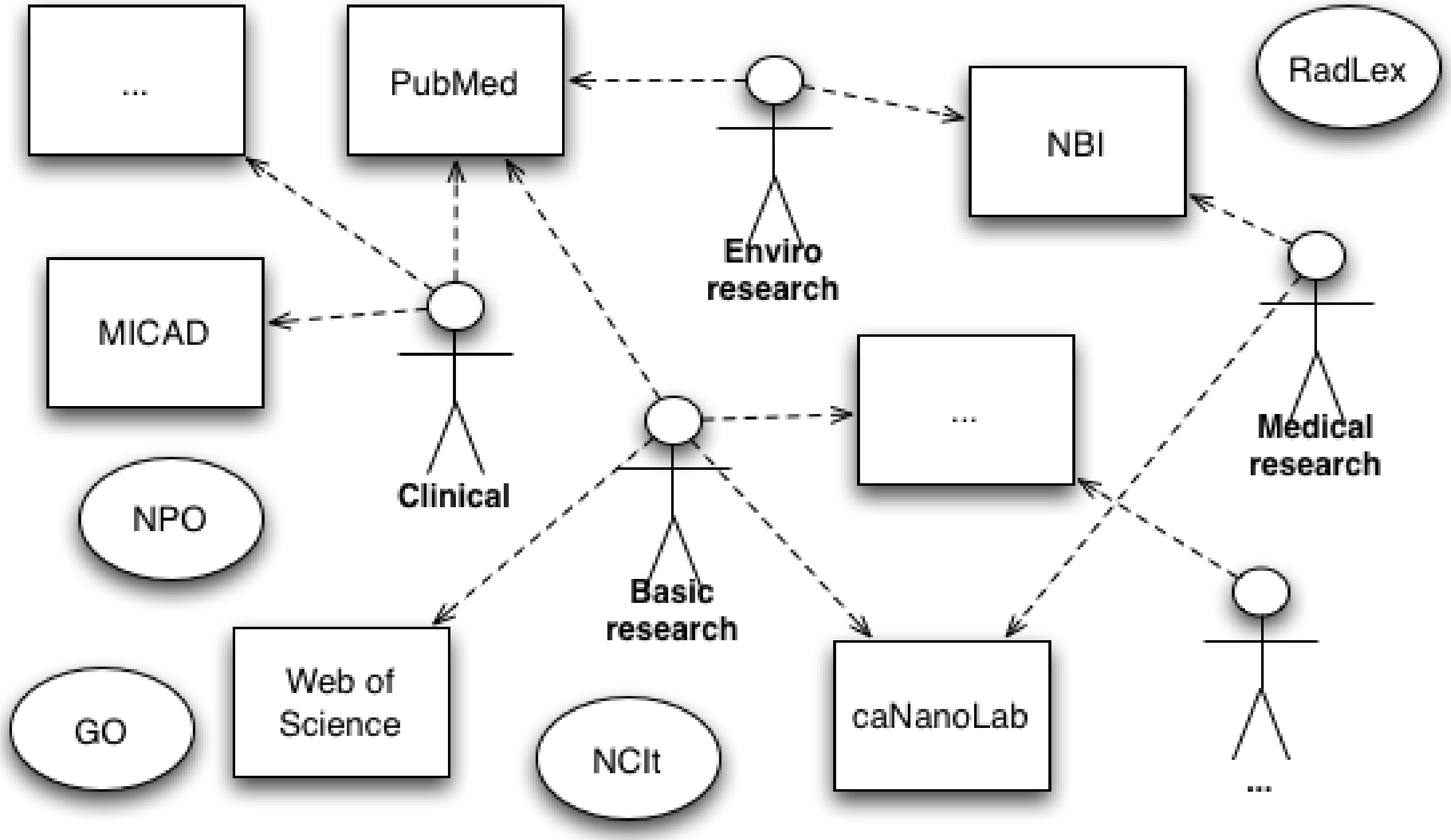
Preparation

Chemical composition of nanoparticle formulation

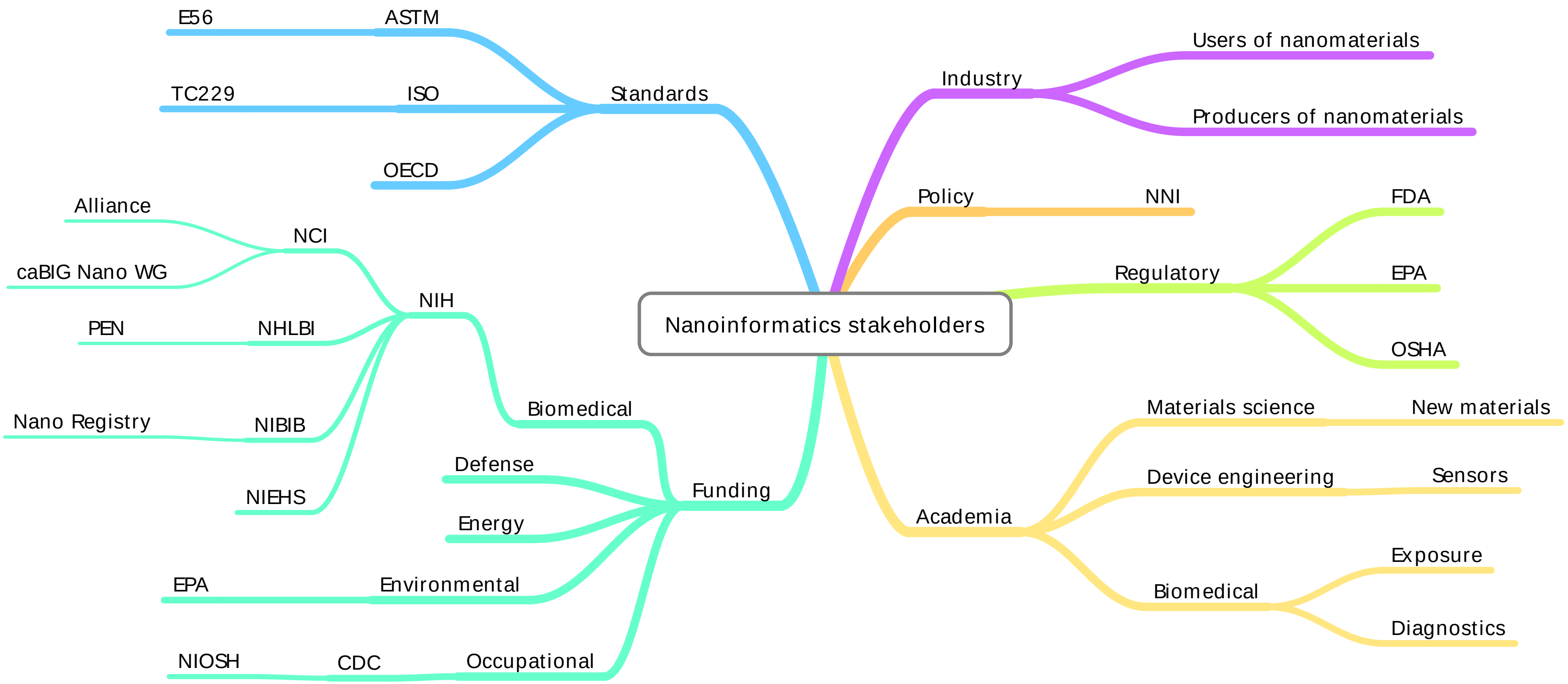


Source: Chawla JS et al, *Int J Pharm*, **249**, 127-38 (2002), Son YJ et al, *J Control Release*, **91**, 135-145 (2003)

What is the problem? *Disconnected resources and users*


...
PubMed
Enviro research
NBI
RadLex
MICAD
Clinical
Medical research
...
Basic research
NPO
GO
Web of Science
NCIt
caNanoLab
...

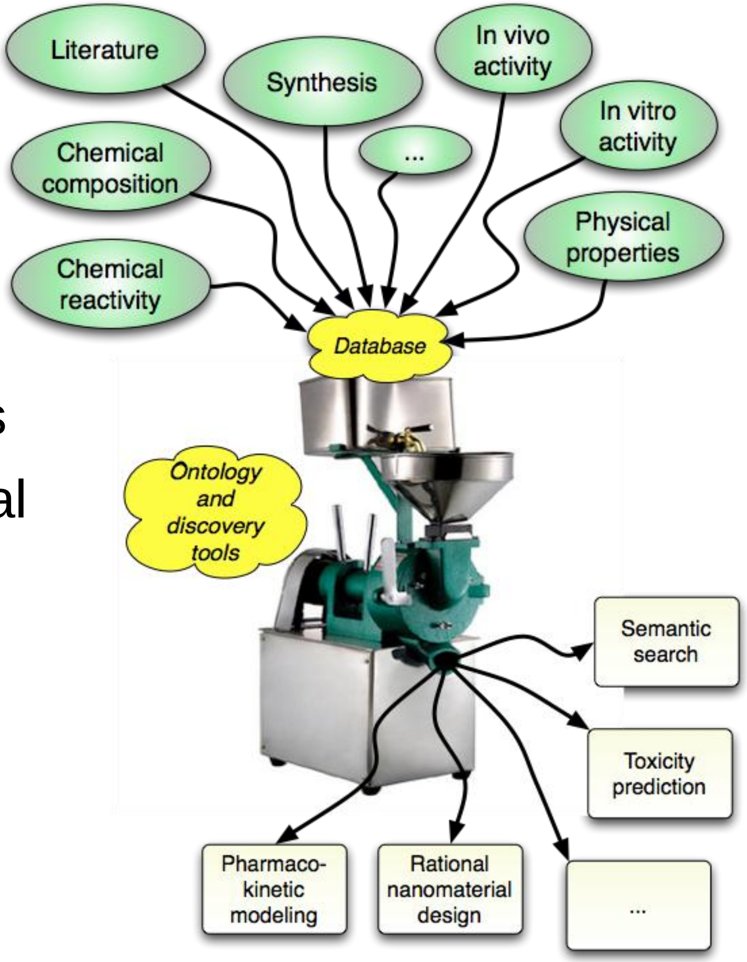
Who are the stakeholders?



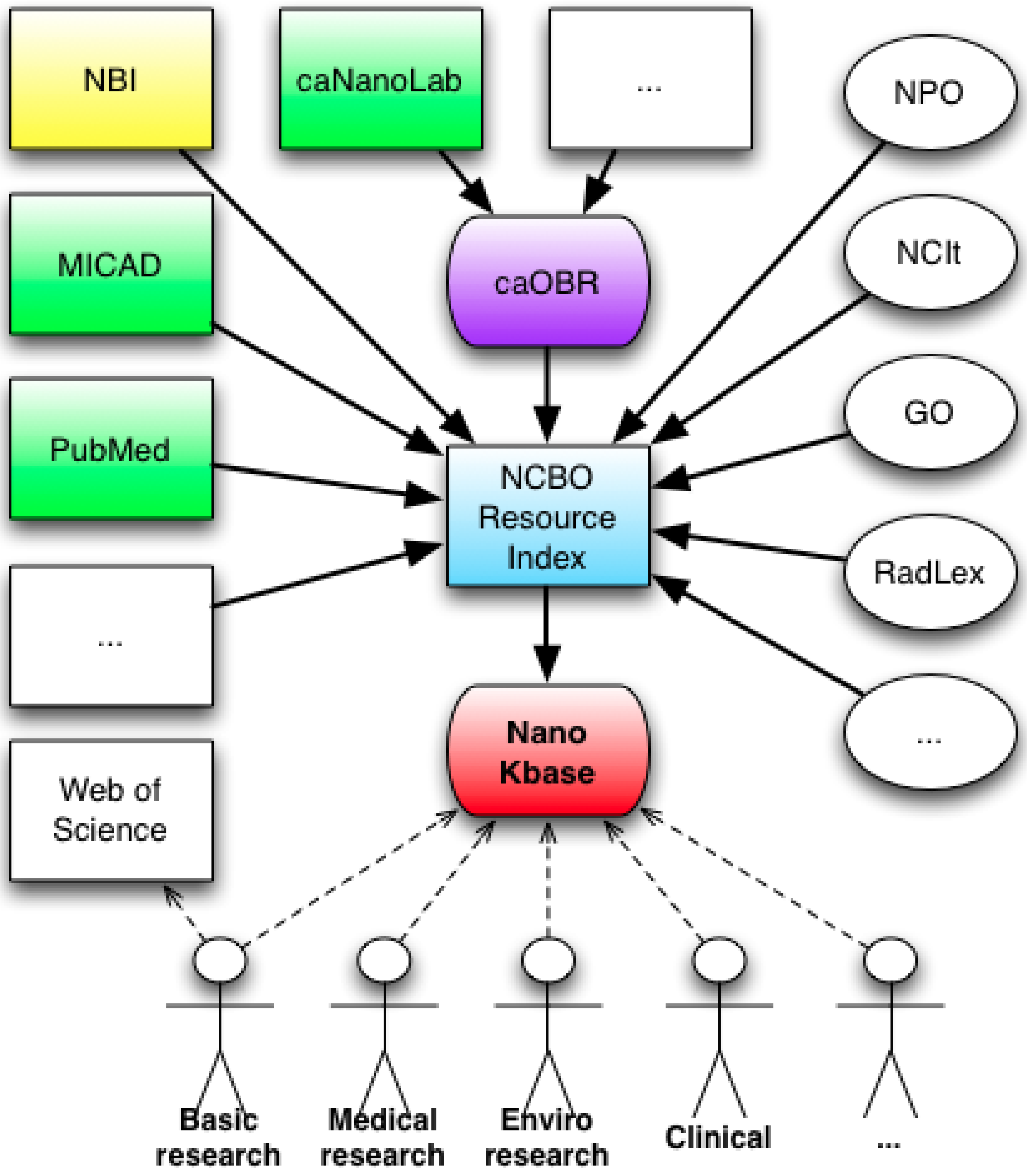
- Nanoinformatics stakeholders
  - Standards
    - ASTM
      - E56
    - ISO
      - TC229
    - OECD
  - Funding
    - Biomedical
      - NIH
        - NCI
          - Alliance
          - caBIG Nano WG
        - NHLBI
          - PEN
        - NIBIB
          - Nano Registry
        - NIEHS
    - Defense
    - Energy
    - Environmental
      - EPA
    - Occupational
      - CDC
        - NIOSH
  - Industry
    - Users of nanomaterials
    - Producers of nanomaterials
  - Policy
    - NNI
  - Regulatory
    - FDA
    - EPA
    - OSHA
  - Academia
    - Materials science
      - New materials
    - Device engineering
      - Sensors
    - Biomedical
      - Exposure
      - Diagnostics

What does the community need?

- The nanomedicine community has an immediate need for nanomaterial informatics:
  - Understand nanomaterial toxicity and other biological properties
  - Search for existing data on nanoparticle synthesis and properties
  - Systematically represent nanomaterial structure and composition
  - Exchange nanomaterial chemical, physical, and biological data
  - Design nanoparticles, and other materials with custom properties for specific biological applications


Literature
Synthesis
In vivo activity
In vitro activity
Chemical composition
...
Physical properties
Chemical reactivity
Database
Ontology and discovery tools
Semantic search
Toxicity prediction
Pharmaco-kinetic modeling
Rational nanomaterial design
...

Our solution


NBI
caNanoLab
...
NPO
MICAD
caOBR
NCIt
PubMed
GO
NCBO Resource Index
RadLex
...
...
Nano Kbase
Web of Science
Basic research
Medical research
Enviro research
Clinical
...

- Information exchange and analysis through
  - Data exchange standards
  - Ontology
  - Information resources
- Methodology development and applications in nanomaterial prediction:
  - Biological activities
  - Chemical and physical characteristics

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  - Data exchange standards
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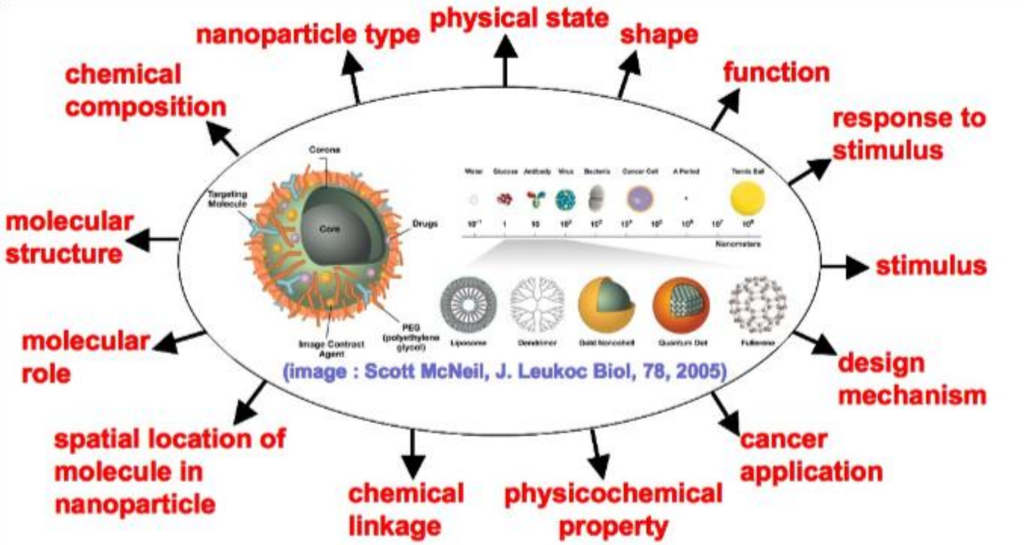
NanoParticle Ontology (NPO)

- Capture knowledge underlying nanomaterial
  - Preparation
  - Chemical composition
  - Physiochemical characterization
  - Biological function/behavior
- Basic Formal Ontology structure
- Initial focus on cancer diagnosis and therapy
- Current growth to include a broader range of nanotechnology concepts
- Supported by the caBIG® Nano WG
- Available through Bioportal


nanoparticle type
physical state
shape
chemical composition
function
response to stimulus
molecular structure
stimulus
molecular role
design mechanism
spatial location of molecule in nanoparticle
chemical linkage
physicochemical property
cancer application
Corona
Targeting Molecule
Core
Drugs
Image Contrast Agent
PEG (polyethylene glycol)
Water
Glucose
Antibody
Virus
Bacteria
Cancer Cell
A Period
Tennis Ball
Nanometers
Liposome
Dendrimer
Gold Nanoshell
Quantum Dot
Fullerene

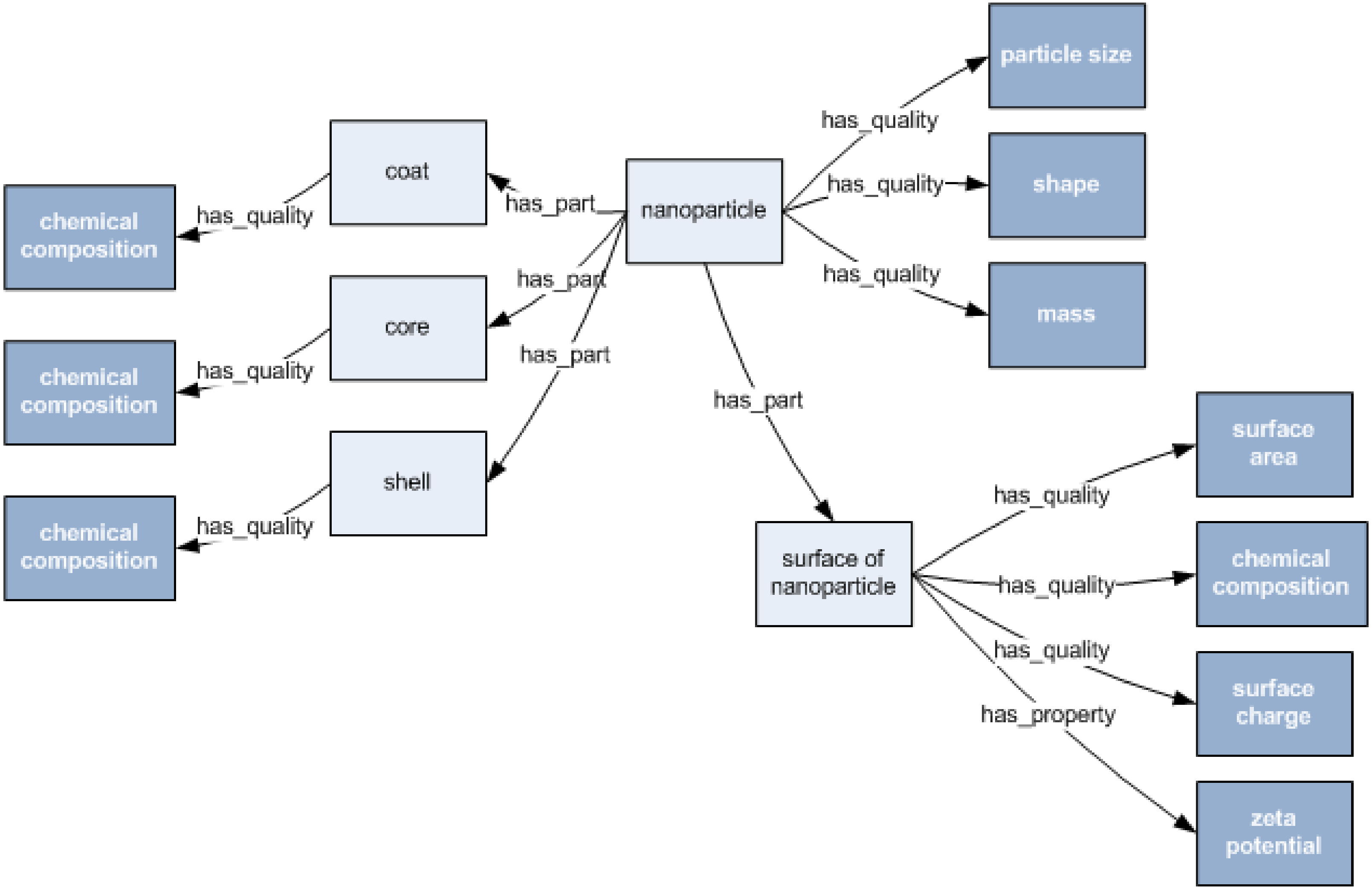
(image : Scott McNeil, J. Leukoc Biol, 78, 2005)

http://purl.bioontology.org/ontology/NPO

http://www.nano-ontology.org/

Thomas DG, Pappu RV, Baker NA. NanoParticle Ontology for Cancer Nanotechnology Research. *J Biomed Inform*, in press. doi:[10.1016/j.jbi.2010.03.001](10.1016/j.jbi.2010.03.001)

Example view into the NPO


nanoparticle
has_part
coat
has_part
core
has_part
shell
has_quality
chemical composition
has_quality
chemical composition
has_quality
chemical composition
has_quality
particle size
has_quality
shape
has_quality
mass
has_part
surface of nanoparticle
has_quality
surface area
has_quality
chemical composition
has_quality
surface charge
has_property
zeta potential

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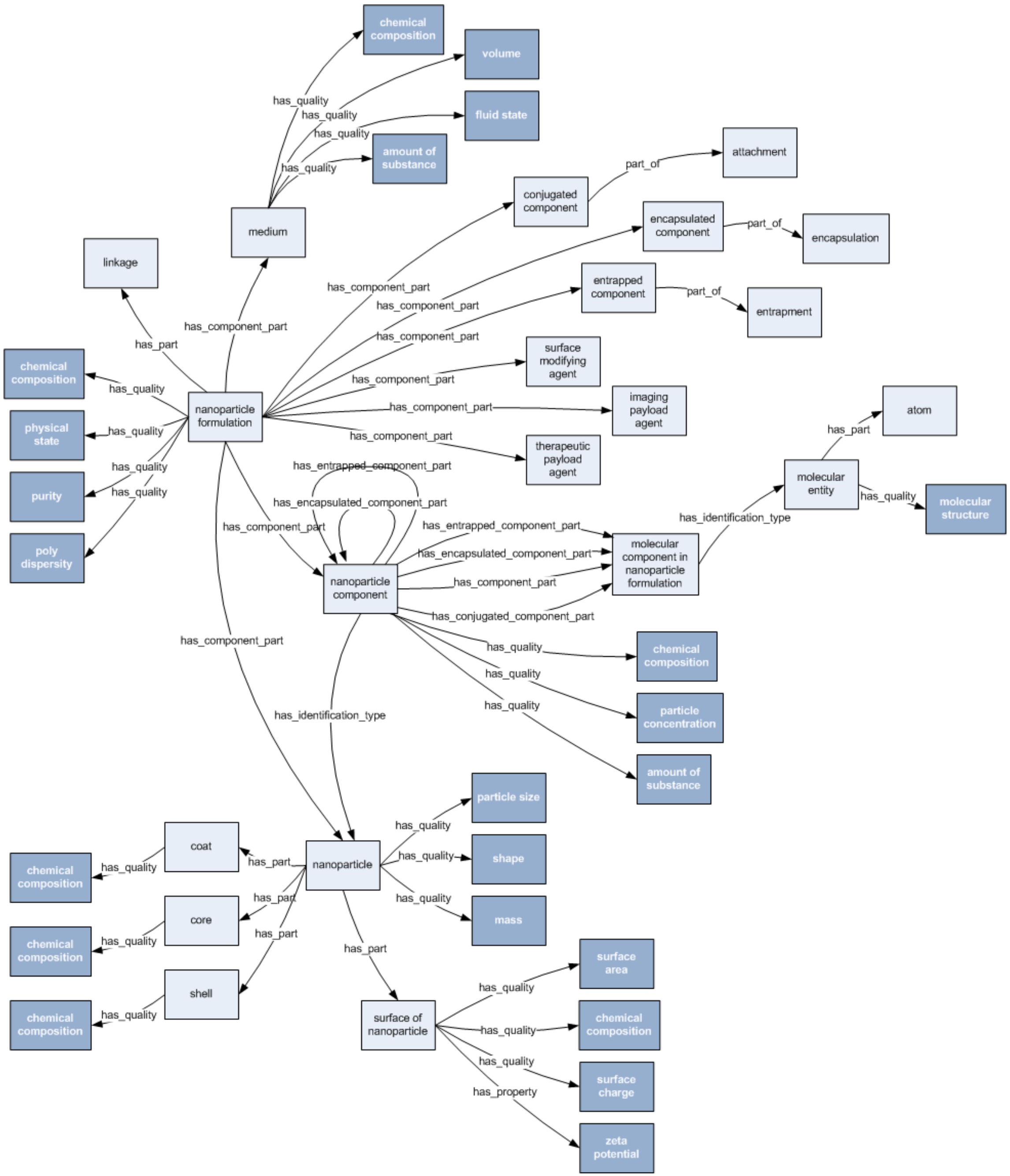
A more detailed view of nanoparticle composition using the NPO


chemical composition
volume
fluid state
amount of substance
has_quality
has_quality
has_quality
has_quality
medium
linkage
conjugated component
part_of
attachment
encapsulated component
part_of
encapsulation
entrapped component
part_of
entrapment
has_component_part
has_component_part
has_component_part
has_component_part
has_component_part
has_component_part
has_component_part
has_part
chemical composition
physical state
purity
poly dispersity
has_quality
has_quality
has_quality
has_quality
nanoparticle formulation
surface modifying agent
imaging payload agent
therapeutic payload agent
atom
has_part
molecular entity
has_quality
molecular structure
has_identification_type
has_entrapped_component_part
has_encapsulated_component_part
has_component_part
has_entrapped_component_part
has_encapsulated_component_part
has_component_part
has_conjugated_component_part
nanoparticle component
molecular component in nanoparticle formulation
has_quality
has_quality
has_quality
chemical composition
particle concentration
amount of substance
has_component_part
has_identification_type
particle size
shape
mass
has_quality
has_quality
has_quality
coat
core
shell
has_part
has_part
has_part
nanoparticle
chemical composition
chemical composition
chemical composition
has_quality
has_quality
has_quality
has_part
surface of nanoparticle
has_quality
has_quality
has_quality
has_property
surface area
chemical composition
surface charge
zeta potential

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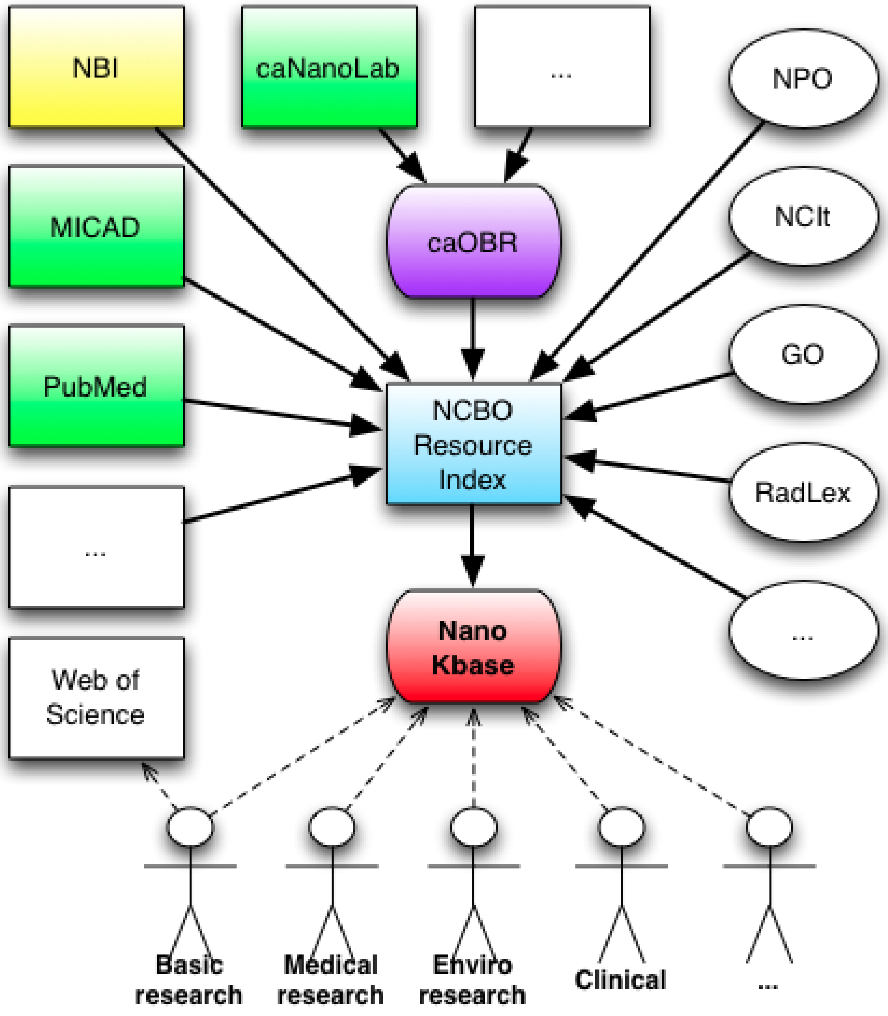
PubNano nanomedicine resource


NBI
caNanoLab
...
NPO
MICAD
caOBR
NCIt
PubMed
GO
NCBO Resource Index
RadLex
...
Nano Kbase
...
Web of Science
Basic research
Medical research
Enviro research
Clinical
...

- Nano-friendly interface to relevant:
  - Ontologies (browse and search)
  - Resources (semantic search)
  - Materials (structural search)
  - Literature (links back to relevant terminologies)
  - News
- Driven by:
  - NCBO Resource Index
  - Knowledge Encapsulation Framework (KEF)

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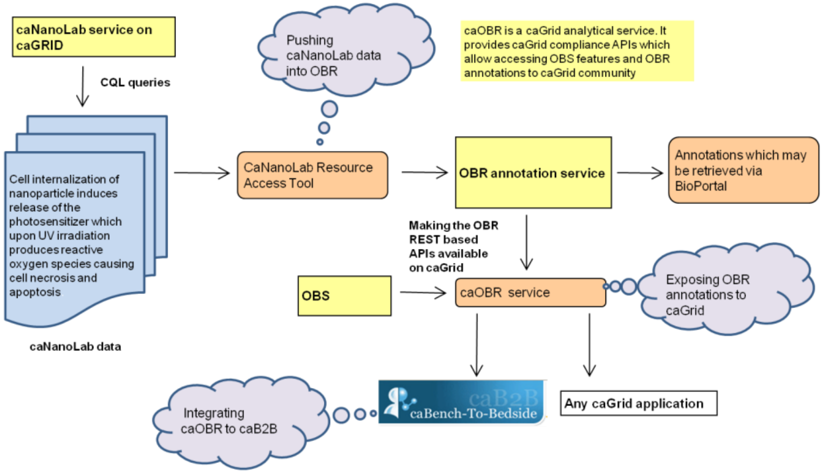
caOBR adds caBIG resources to the NCBO Resource Index

- caOBR: connecting caBIG with Bioportal
- Use the NPO and other ontologies for *semantic* search
- caOBR adds caBIG resources to NCBO Index
- caOBR also exposes NCBO Index to caBIG



caNanoLab service on caGRID

CQL queries

Cell internalization of nanoparticle induces release of the photosensitizer which upon UV irradiation produces reactive oxygen species causing cell necrosis and apoptosis

caNanoLab data

Pushing caNanoLab data into OBR

CaNanoLab Resource Access Tool

OBR annotation service

caOBR is a caGrid analytical service. It provides caGrid compliance APIs which allow accessing OBS features and OBR annotations to caGrid community

Annotations which may be retrieved via BioPortal

Making the OBR REST based APIs available on caGrid

OBS

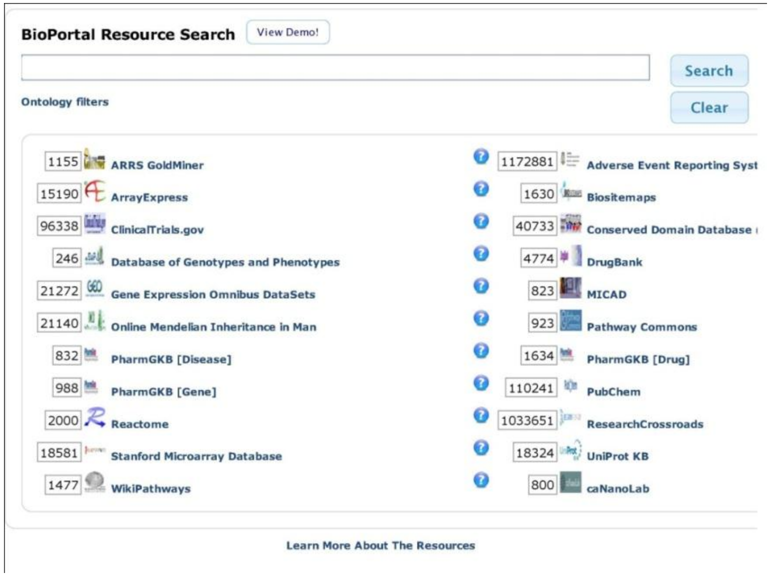
caOBR service

Exposing OBR annotations to caGrid

Integrating caOBR to caB2B

caB2B caBench-To-Bedside

Any caGrid application



BioPortal Resource Search View Demo!

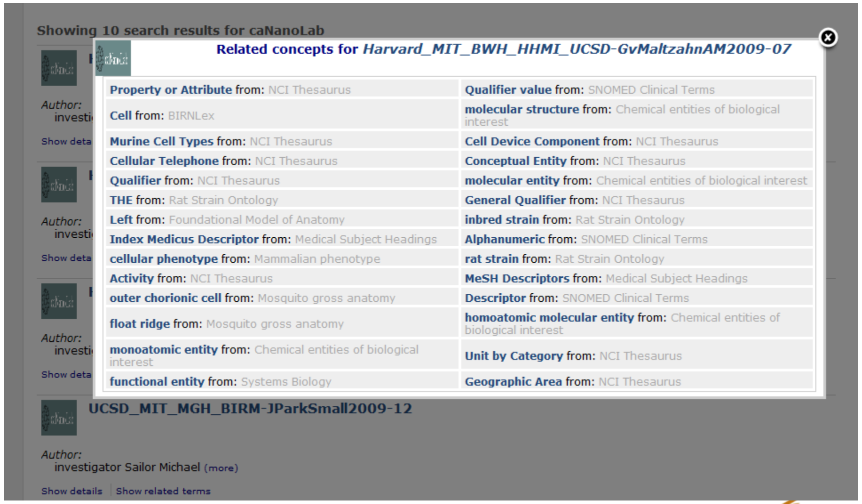
Search

Clear

Ontology filters

1155	ARRS GoldMiner	1172881	Adverse Event Reporting Syst
15190	ArrayExpress	1630	Biositemaps
96338	ClinicalTrials.gov	40733	Conserved Domain Database
246	Database of Genotypes and Phenotypes	4774	DrugBank
21272	Gene Expression Omnibus DataSets	823	MICAD
21140	Online Mendelian Inheritance in Man	923	Pathway Commons
832	PharmGKB [Disease]	1634	PharmGKB [Drug]
988	PharmGKB [Gene]	110241	PubChem
2000	Reactome	1033651	ResearchCrossroads
18581	Stanford Microarray Database	18324	UniProt KB
1477	WikiPathways	800	caNanoLab

Learn More About The Resources



Showing 10 search results for caNanoLab

Related concepts for *Harvard_MIT_BWH_HHMI_UCSD-GvMaltzahnAM2009-07*

Property or Attribute from: NCI Thesaurus	**Qualifier value** from: SNOMED Clinical Terms
Cell from: BIRNLex	**molecular structure** from: Chemical entities of biological interest
Murine Cell Types from: NCI Thesaurus	**Cell Device Component** from: NCI Thesaurus
Cellular Telephone from: NCI Thesaurus	**Conceptual Entity** from: NCI Thesaurus
Qualifier from: NCI Thesaurus	**molecular entity** from: Chemical entities of biological interest
THE from: Rat Strain Ontology	**General Qualifier** from: NCI Thesaurus
Left from: Foundational Model of Anatomy	**inbred strain** from: Rat Strain Ontology
Index Medicus Descriptor from: Medical Subject Headings	**Alphanumeric** from: SNOMED Clinical Terms
cellular phenotype from: Mammalian phenotype	**rat strain** from: Rat Strain Ontology
Activity from: NCI Thesaurus	**MeSH Descriptors** from: Medical Subject Headings
outer chorionic cell from: Mosquito gross anatomy	**Descriptor** from: SNOMED Clinical Terms
float ridge from: Mosquito gross anatomy	**homoatomic molecular entity** from: Chemical entities of biological interest
monoatomic entity from: Chemical entities of biological interest	**Unit by Category** from: NCI Thesaurus
functional entity from: Systems Biology	**Geographic Area** from: NCI Thesaurus

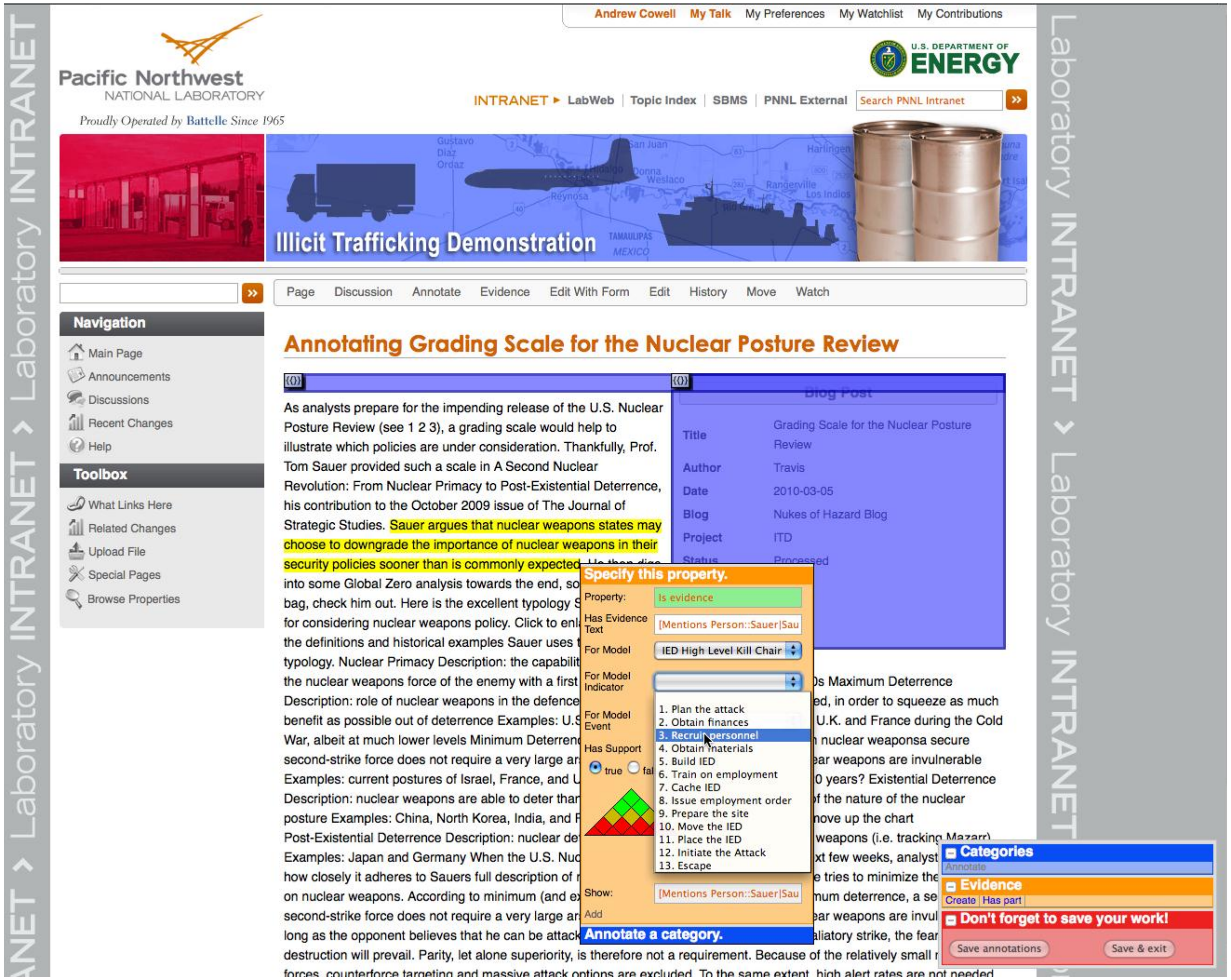
UCSD_MIT_MGH_BIRM-JParkSmall2009-12

Author:
investigator Sailor Michael (more)

Show details | Show related terms

NCBO BioPortal: http://bioportal.bioontology.org/

KEF features: Semantic MediaWiki for annotation, search, and evidence marshalling


Andrew Cowell
My Talk
My Preferences
My Watchlist
My Contributions
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Annotating Grading Scale for the Nuclear Posture Review

As analysts prepare for the impending release of the U.S. Nuclear Posture Review (see 1 2 3), a grading scale would help to illustrate which policies are under consideration. Thankfully, Prof. Tom Sauer provided such a scale in A Second Nuclear Revolution: From Nuclear Primacy to Post-Existential Deterrence, his contribution to the October 2009 issue of The Journal of Strategic Studies. Sauer argues that nuclear weapons states may choose to downgrade the importance of nuclear weapons in their security policies sooner than is commonly expected.

into some Global Zero analysis towards the end, so
bag, check him out. Here is the excellent typology S
for considering nuclear weapons policy. Click to enl
the definitions and historical examples Sauer uses t
typology. Nuclear Primacy Description: the capabilit
the nuclear weapons force of the enemy with a first
Description: role of nuclear weapons in the defence
benefit as possible out of deterrence Examples: U.S
War, albeit at much lower levels Minimum Deterrenc
second-strike force does not require a very large ar
Examples: current postures of Israel, France, and U
Description: nuclear weapons are able to deter than
posture Examples: China, North Korea, India, and P
Post-Existential Deterrence Description: nuclear de
Examples: Japan and Germany When the U.S. Nuc
how closely it adheres to Sauers full description of n
on nuclear weapons. According to minimum (and ex
second-strike force does not require a very large ar
long as the opponent believes that he can be attack

0s Maximum Deterrence
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U.K. and France during the Cold
n nuclear weaponsa secure
ear weapons are invulnerable
0 years? Existential Deterrence
of the nature of the nuclear
nove up the chart
weapons (i.e. tracking Mazarr)
xt few weeks, analyst
e tries to minimize the
mum deterrence, a se
ear weapons are invul
aliatory strike, the fear

destruction will prevail. Parity, let alone superiority, is therefore not a requirement. Because of the relatively small r
forces, counterforce targeting and massive attack options are excluded. To the same extent, high alert rates are not needed

Blog Post

Title	Grading Scale for the Nuclear Posture Review
Author	Travis
Date	2010-03-05
Blog	Nukes of Hazard Blog
Project	ITD
Status	Processed

Specify this property.

Property:	Is evidence
Has Evidence Text	[Mentions Person::Sauer|Sau
For Model	IED High Level Kill Chair
For Model Indicator	
For Model Event	
Has Support	● true ○ fal
Show:	[Mentions Person::Sauer|Sau

1. Plan the attack
2. Obtain finances
3. Recruit personnel
4. Obtain materials
5. Build IED
6. Train on employment
7. Cache IED
8. Issue employment order
9. Prepare the site
10. Move the IED
11. Place the IED
12. Initiate the Attack
13. Escape

Add
Annotate a category.
Categories
Annotate
Evidence
Create | Has part
Don't forget to save your work!
Save annotations
Save & exit

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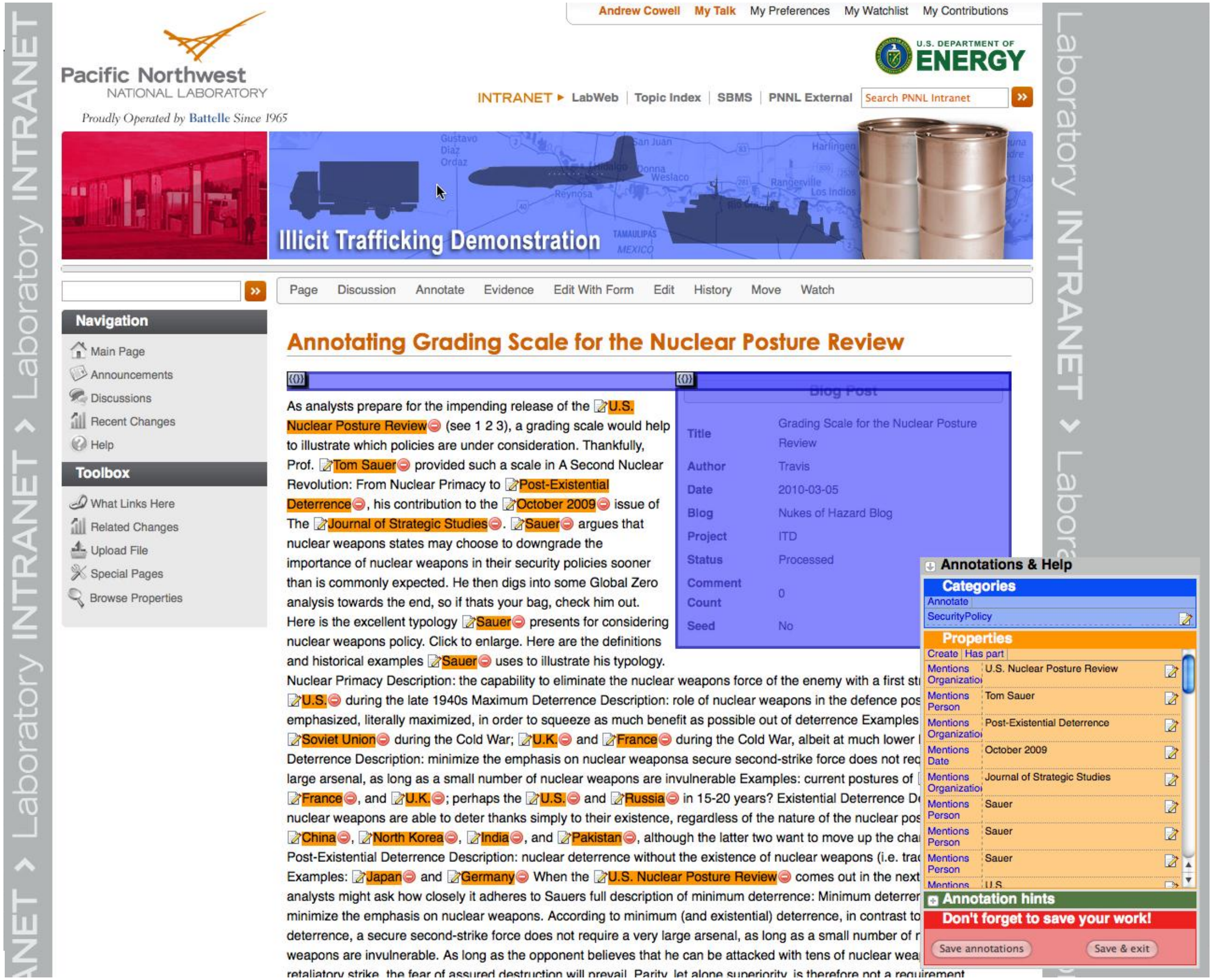
KEF features: Semantic MediaWiki for annotation, search, and evidence marshalling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Main Page
Announcements
Discussions
Recent Changes
Help
Toolbox
What Links Here
Related Changes
Upload File
Special Pages
Browse Properties
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Annotating Grading Scale for the Nuclear Posture Review

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Nuclear Primacy Description: the capability to eliminate the nuclear weapons force of the enemy with a first st
U.S. during the late 1940s Maximum Deterrence Description: role of nuclear weapons in the defence pos
emphasized, literally maximized, in order to squeeze as much benefit as possible out of deterrence Examples
Soviet Union during the Cold War; U.K. and France during the Cold War, albeit at much lower
Deterrence Description: minimize the emphasis on nuclear weaponsa secure second-strike force does not re
large arsenal, as long as a small number of nuclear weapons are invulnerable Examples: current postures of
France, and U.K.; perhaps the U.S. and Russia in 15-20 years? Existential Deterrence D
nuclear weapons are able to deter thanks simply to their existence, regardless of the nature of the nuclear pos
China, North Korea, India, and Pakistan, although the latter two want to move up the cha
Post-Existential Deterrence Description: nuclear deterrence without the existence of nuclear weapons (i.e. tra
Examples: Japan and Germany When the U.S. Nuclear Posture Review comes out in the next
analysts might ask how closely it adheres to Sauers full description of minimum deterrence: Minimum deterre
minimize the emphasis on nuclear weapons. According to minimum (and existential) deterrence, in contrast to
deterrence, a secure second-strike force does not require a very large arsenal, as long as a small number of
weapons are invulnerable. As long as the opponent believes that he can be attacked with tens of nuclear wea
retaliatory strike, the fear of assured destruction will prevail. Parity, let alone superiority, is therefore not a requirement

Blog Post

Title	Grading Scale for the Nuclear Posture Review
Author	Travis
Date	2010-03-05
Blog	Nukes of Hazard Blog
Project	ITD
Status	Processed
Comment Count	0
Seed	No

Annotations & Help

Categories

Annotate

SecurityPolicy

Properties

Create | Has part

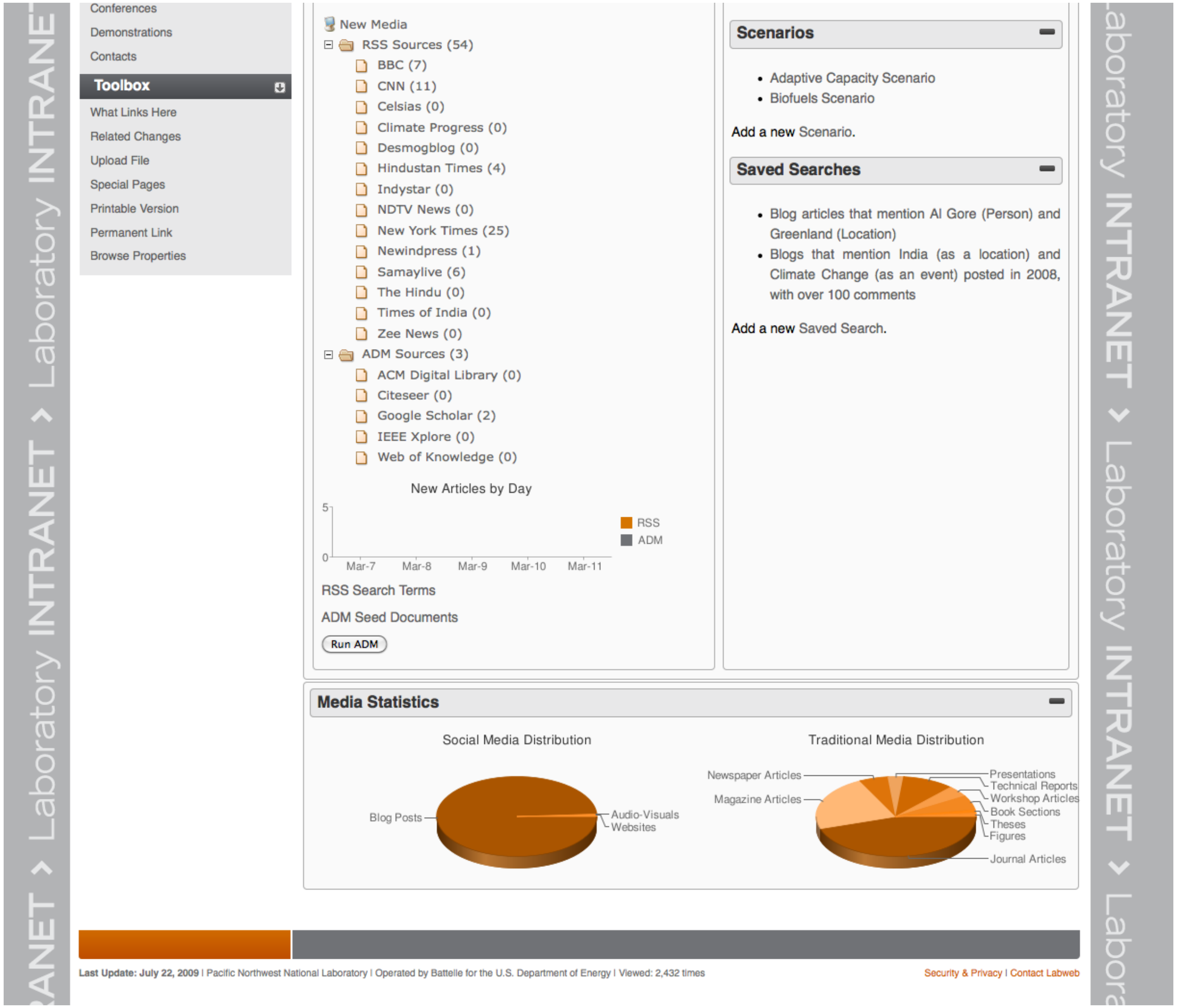
Mentions Organization	U.S. Nuclear Posture Review
Mentions Person	Tom Sauer
Mentions Organization	Post-Existential Deterrence
Mentions Date	October 2009
Mentions Organization	Journal of Strategic Studies
Mentions Person	Sauer
Mentions Person	Sauer
Mentions Person	Sauer
Mentions	U.S.

Annotation hints

Don't forget to save your work!

Save annotations
Save & exit

KEF features: Semantic MediaWiki for annotation, search, and evidence marshalling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Toolbox
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New Articles by Day
5
0
Mar-7
Mar-8
Mar-9
Mar-10
Mar-11
RSS
ADM
Social Media Distribution
Blog Posts
Audio-Visuals
Websites
Traditional Media Distribution
Newspaper Articles
Magazine Articles
Presentations
Technical Reports
Workshop Articles
Book Sections
Theses
Figures
Journal Articles

Conferences
Demonstrations
Contacts

Toolbox

What Links Here
Related Changes
Upload File
Special Pages
Printable Version
Permanent Link
Browse Properties

New Media
- RSS Sources (54)
  - BBC (7)
  - CNN (11)
  - Celsias (0)
  - Climate Progress (0)
  - Desmogblog (0)
  - Hindustan Times (4)
  - Indystar (0)
  - NDTV News (0)
  - New York Times (25)
  - Newindpress (1)
  - Samaylive (6)
  - The Hindu (0)
  - Times of India (0)
  - Zee News (0)
- ADM Sources (3)
  - ACM Digital Library (0)
  - Citeseer (0)
  - Google Scholar (2)
  - IEEE Xplore (0)
  - Web of Knowledge (0)

RSS Search Terms

ADM Seed Documents

Scenarios

- Adaptive Capacity Scenario
- Biofuels Scenario

Add a new Scenario.

Saved Searches

- Blog articles that mention Al Gore (Person) and Greenland (Location)
- Blogs that mention India (as a location) and Climate Change (as an event) posted in 2008, with over 100 comments

Add a new Saved Search.

Media Statistics

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PubNano: coming soon!

- Integration of:
  - PubMed
  - caNanoLab
  - MICAD
  - GEO
  - …
- Coming soon to http://pubnano.bioontology.org !

Outline

- Introduction to the caBIG® Nanotechnology Working Group
- Overview of nanotechnology informatics challenges
- Research projects
  - Ontology development
  - PubNano resource
  - **Data exchange standards**
  - Structure-property-activity modeling

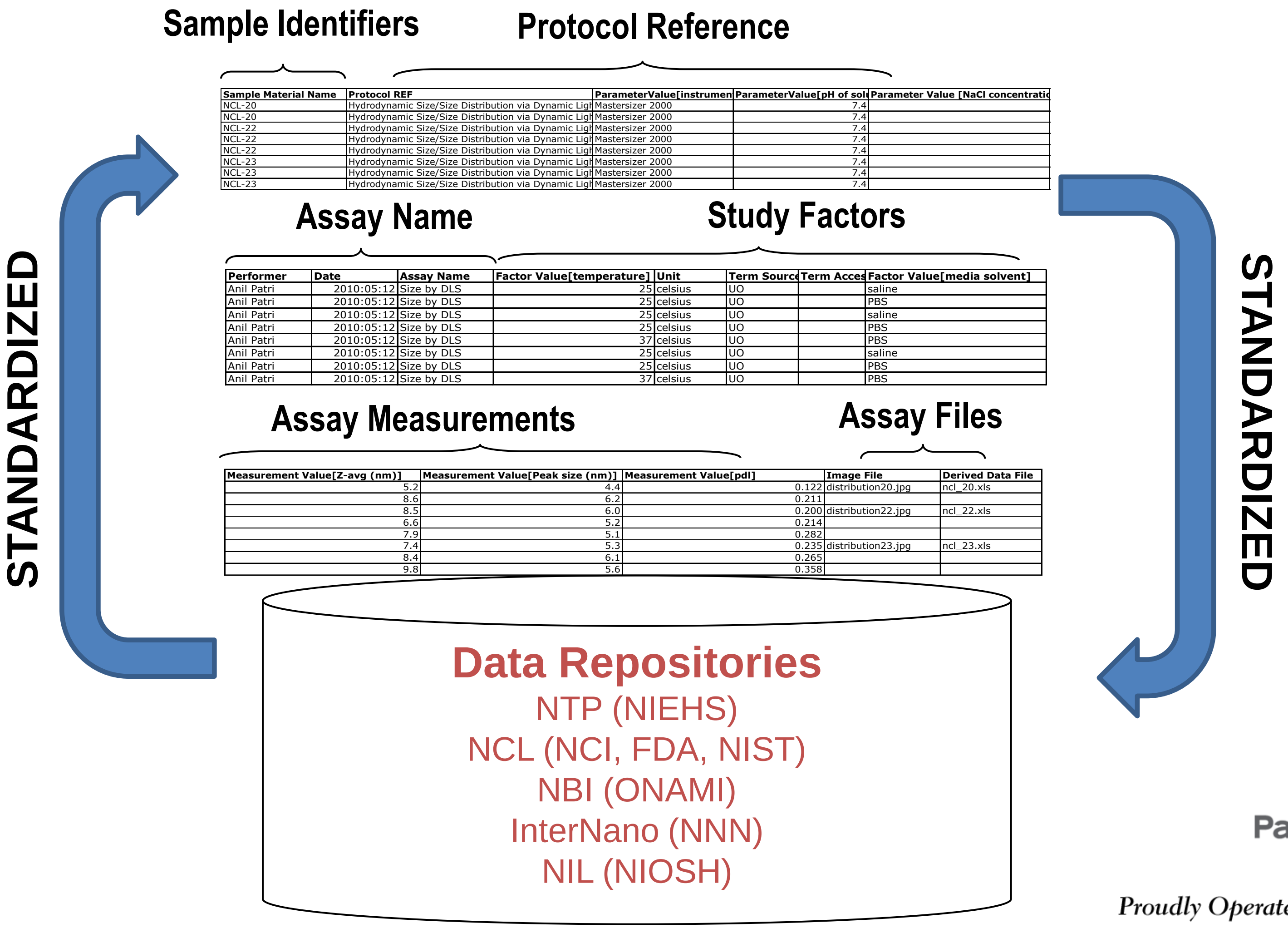
NANO-TAB FOR NANOMATERIAL DATA SHARING

Target audiences and applications

- Audiences
  - Biomedical researchers
  - (Nano)-Materials scientists
  - Toxicologists
  - Regulatory scientists
  - Industrial hygienists
  - …
- Applications
  - Synthesis
  - Therapeutics, diagnostics, imaging
  - Bionics and prosthetics
  - Risk and exposure assessment
  - Toxicity prediction and reduction
  - Laboratory and occupational safety

Goal of nano-TAB

Develop a specification to facilitate the import/export of data on nanomaterials and their characterizations to/from nanotechnology resources



Sample Identifiers **Protocol Reference**

Sample Material Name	Protocol REF	ParameterValue[instrumen	ParameterValue[pH of solu	Parameter Value [NaCl concentratio
NCL-20	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-20	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-22	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-22	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-22	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-23	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-23	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	
NCL-23	Hydrodynamic Size/Size Distribution via Dynamic Ligh	Mastersizer 2000	7.4	

Assay Name **Study Factors**

Performer	Date	Assay Name	Factor Value[temperature]	Unit	Term Source	Term Acces	Factor Value[media solvent]
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		saline
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		PBS
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		saline
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		PBS
Anil Patri	2010:05:12	Size by DLS	37	celsius	UO		PBS
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		saline
Anil Patri	2010:05:12	Size by DLS	25	celsius	UO		PBS
Anil Patri	2010:05:12	Size by DLS	37	celsius	UO		PBS

Assay Measurements **Assay Files**

Measurement Value[Z-avg (nm)]	Measurement Value[Peak size (nm)]	Measurement Value[pdI]	Image File	Derived Data File
5.2	4.4	0.122	distribution20.jpg	ncl_20.xls
8.6	6.2	0.211		
8.5	6.0	0.200	distribution22.jpg	ncl_22.xls
6.6	5.2	0.214		
7.9	5.1	0.282		
7.4	5.3	0.235	distribution23.jpg	ncl_23.xls
8.4	6.1	0.265		
9.8	5.6	0.358		

Data Repositories

NTP (NIEHS)
NCL (NCI, FDA, NIST)
NBI (ONAMI)
InterNano (NNN)
NIL (NIOSH)

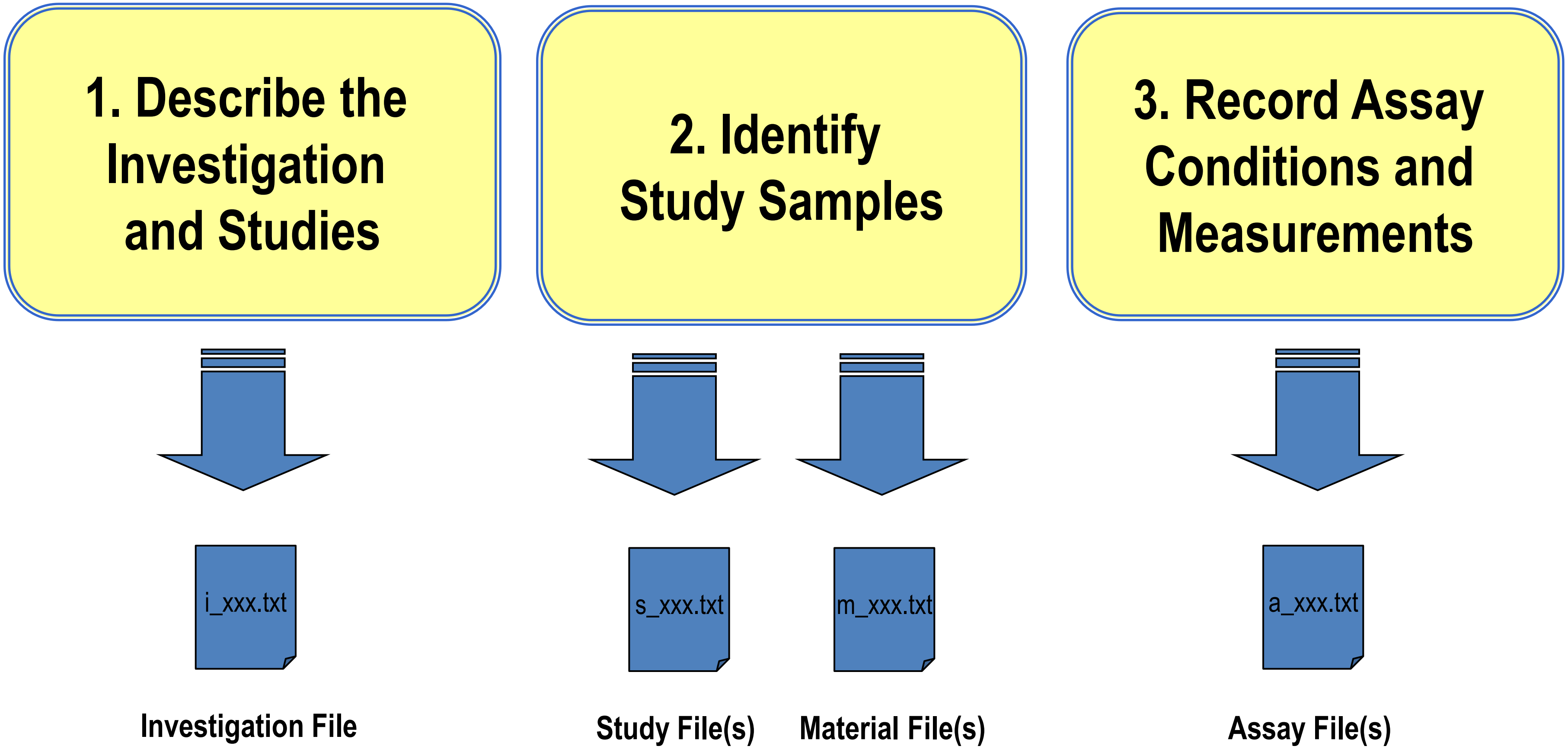
What is nano-TAB?

- A standard tab-delimited format for describing data related to
  - Investigations
  - Nanomaterials
  - Specimens
  - Assays
- Leverages and extends the Investigation/Study/Assay (ISA-TAB) format
  - Standard tab-delimited file format
  - Developed by the European Bioinformatics Institute (EBI) for representing a variety of assays and technology types
  - Example: MAGE-TAB
- Nano-TAB supports ontology-based curation
  - Nanomaterials and concepts from the NanoParticle Ontology (NPO) as well as other ontologies

Uses and benefits

- Address the data sharing challenges in nanomedicine
- Provide a standard means for identifying nanomaterials and characterizations
- Enable the submission and exchange of nanomaterial data to/from nanotechnology data resources (e.g., NBI, caNanoLab, etc.)
- Empower organizations to adopt standards for representing data in nanotechnology publications
- Provide researchers with guidelines for representing nanomaterials and characterizations to achieve cross-material comparison

nano-TAB structure



1. Describe the Investigation and Studies

2. Identify Study Samples

3. Record Assay Conditions and Measurements

i_xxx.txt

Investigation File

s_xxx.txt

Study File(s)

m_xxx.txt

Material File(s)

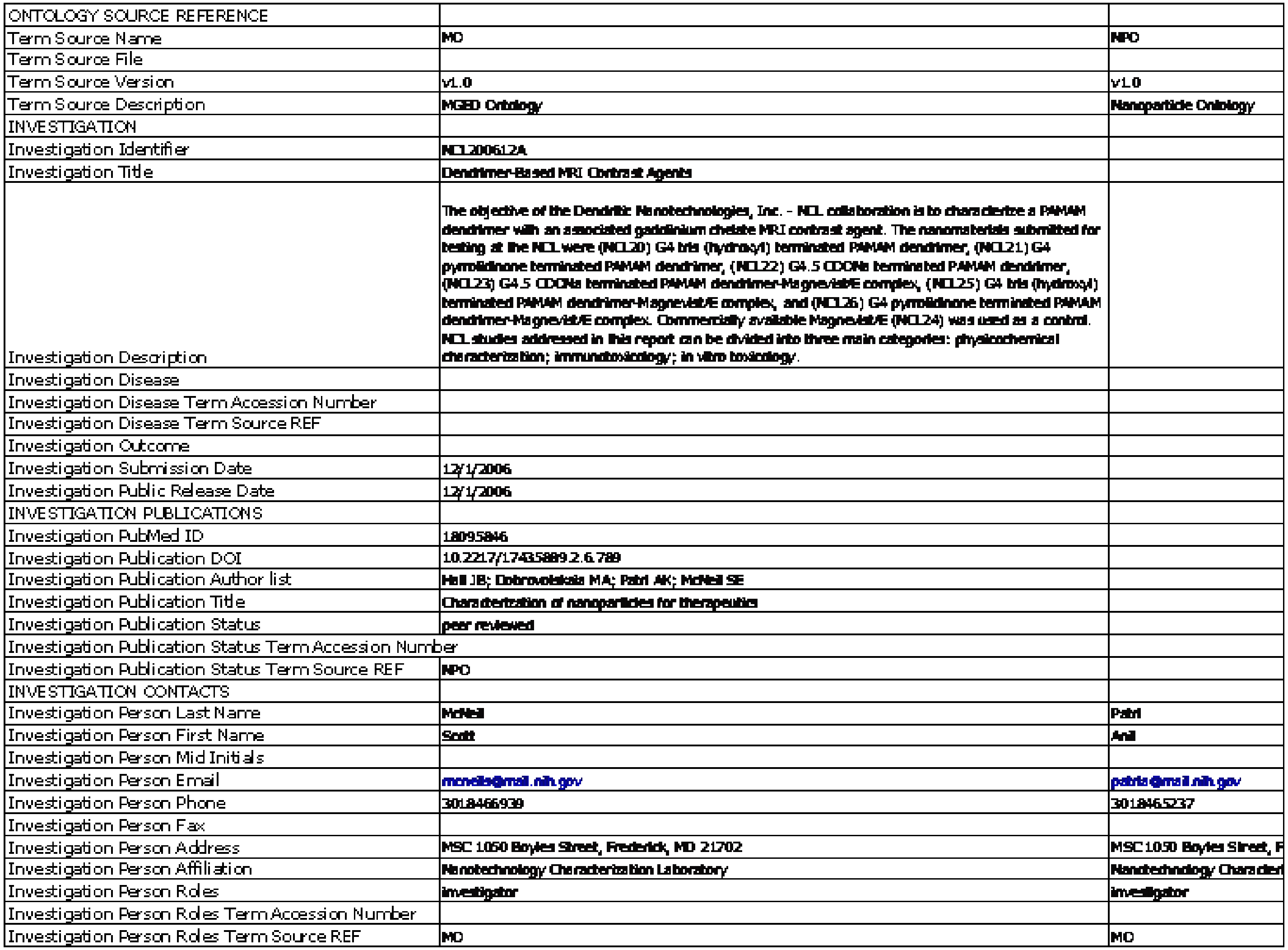
a_xxx.txt

Assay File(s)

nano-TAB Investigation File

- Describes
  - Primary investigation
  - Associated studies, assays, and protocols
- Descriptive information about the study includes
  - Design descriptors and factors
  - Publications
  - Assays and protocols
  - Contacts
- Vertical-based spreadsheet format with columns representing multiple values

Investigation File



ONTOLOGY SOURCE REFERENCE		
Term Source Name	MO	NPO
Term Source File		
Term Source Version	v1.0	v1.0
Term Source Description	MGED Ontology	Nanoparticle Ontology
INVESTIGATION		
Investigation Identifier	NCL200612A	
Investigation Title	Dendrimer-Based MRI Contrast Agents	
Investigation Description	The objective of the Dendritic Nanotechnologies, Inc. - NCL collaboration is to characterize a PAMAM dendrimer with an associated gadolinium chelate MRI contrast agent. The nanomaterials submitted for testing at the NCL were (NCL20) G4 tris (hydroxyl) terminated PAMAM dendrimer, (NCL21) G4 pyrrolidinone terminated PAMAM dendrimer, (NCL22) G4.5 COONa terminated PAMAM dendrimer, (NCL23) G4.5 COONa terminated PAMAM dendrimer-Magnevist/E complex, (NCL25) G4 tris (hydroxyl) terminated PAMAM dendrimer-Magnevist/E complex, and (NCL26) G4 pyrrolidinone terminated PAMAM dendrimer-Magnevist/E complex. Commercially available Magnevist/E (NCL24) was used as a control. NCL studies addressed in this report can be divided into three main categories: physicochemical characterization; immunotoxicology; in vitro toxicology.	
Investigation Disease		
Investigation Disease Term Accession Number		
Investigation Disease Term Source REF		
Investigation Outcome		
Investigation Submission Date	12/1/2006	
Investigation Public Release Date	12/1/2006	
INVESTIGATION PUBLICATIONS		
Investigation PubMed ID	18095846	
Investigation Publication DOI	10.2217/17435889.2.6.789	
Investigation Publication Author list	Hall JB; Dobrovolskaia MA; Patri AK; McNeil SE	
Investigation Publication Title	Characterization of nanoparticles for therapeutics	
Investigation Publication Status	peer reviewed	
Investigation Publication Status Term Accession Number		
Investigation Publication Status Term Source REF	NPO	
INVESTIGATION CONTACTS		
Investigation Person Last Name	McNeil	Patri
Investigation Person First Name	Scott	Anil
Investigation Person Mid Initials		
Investigation Person Email	mcneils@mail.nih.gov	patria@mail.nih.gov
Investigation Person Phone	3018466939	3018465237
Investigation Person Fax		
Investigation Person Address	MSC 1050 Boyles Street, Frederick, MD 21702	MSC 1050 Boyles Street, F
Investigation Person Affiliation	Nanotechnology Characterization Laboratory	Nanotechnology Characteri
Investigation Person Roles	investigator	investigator
Investigation Person Roles Term Accession Number		
Investigation Person Roles Term Source REF	MO	MO

Ontology References

Investigation Description

Publications

Contacts

Pacific Northwest
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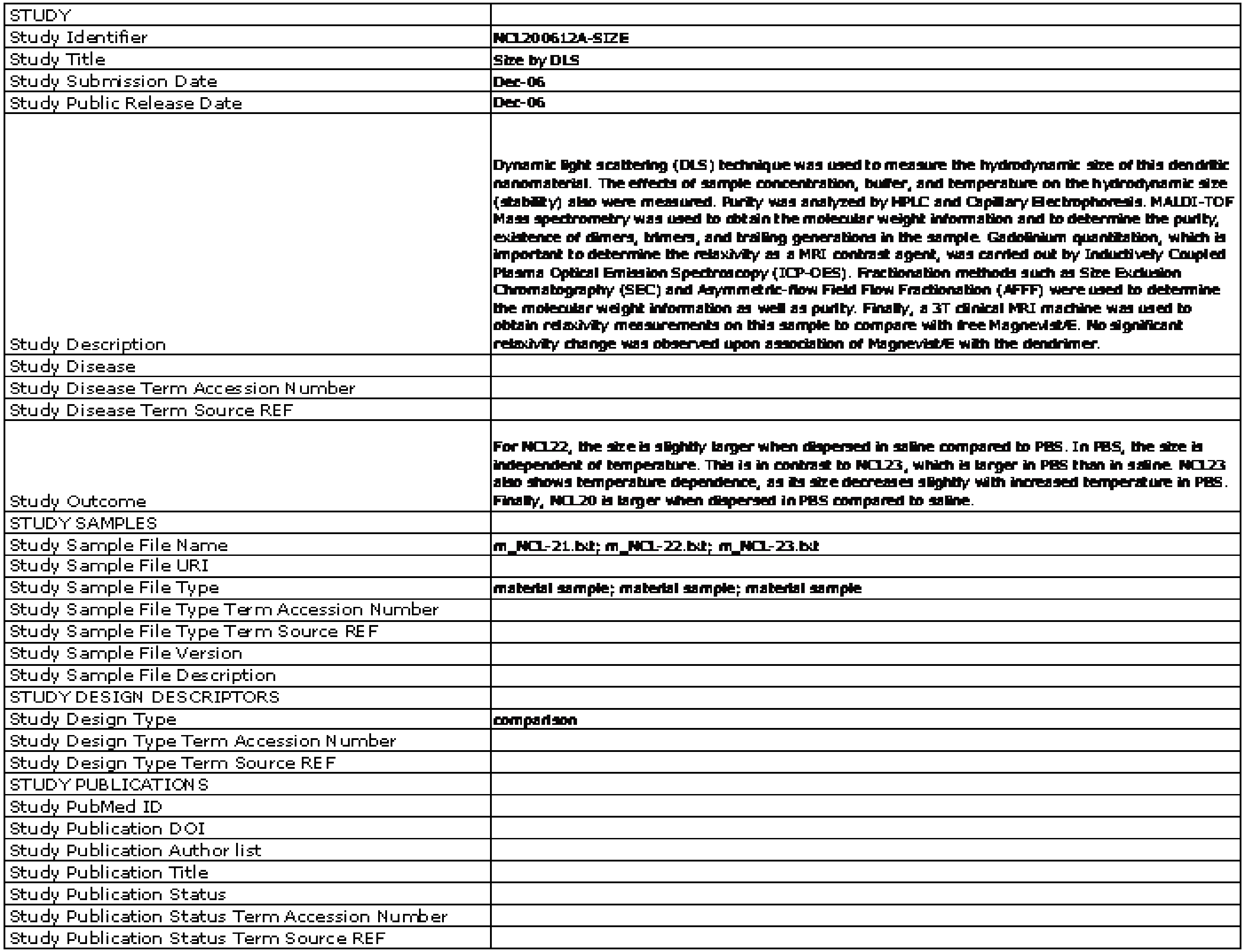
Investigation File (cont.)



STUDY	
Study Identifier	NCL200612A-SIZE
Study Title	Size by DLS
Study Submission Date	Dec-06
Study Public Release Date	Dec-06
Study Description	Dynamic light scattering (DLS) technique was used to measure the hydrodynamic size of this dendritic nanomaterial. The effects of sample concentration, buffer, and temperature on the hydrodynamic size (stability) also were measured. Purity was analyzed by HPLC and Capillary Electrophoresis. MALDI-TOF Mass spectrometry was used to obtain the molecular weight information and to determine the purity, existence of dimers, trimers, and trailing generations in the sample. Gadolinium quantitation, which is important to determine the relaxivity as a MRI contrast agent, was carried out by Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Fractionation methods such as Size Exclusion Chromatography (SEC) and Asymmetric-flow Field Flow Fractionation (AFFF) were used to determine the molecular weight information as well as purity. Finally, a 3T clinical MRI machine was used to obtain relaxivity measurements on this sample to compare with free Magnevist/E. No significant relaxivity change was observed upon association of Magnevist/E with the dendrimer.
Study Disease	
Study Disease Term Accession Number	
Study Disease Term Source REF	
Study Outcome	For NCL22, the size is slightly larger when dispersed in saline compared to PBS. In PBS, the size is independent of temperature. This is in contrast to NCL23, which is larger in PBS than in saline. NCL23 also shows temperature dependence, as its size decreases slightly with increased temperature in PBS. Finally, NCL20 is larger when dispersed in PBS compared to saline.
STUDY SAMPLES	
Study Sample File Name	m_NCL-21.txt; m_NCL-22.txt; m_NCL-23.txt
Study Sample File URI	
Study Sample File Type	material sample; material sample; material sample
Study Sample File Type Term Accession Number	
Study Sample File Type Term Source REF	
Study Sample File Version	
Study Sample File Description	
STUDY DESIGN DESCRIPTORS	
Study Design Type	comparison
Study Design Type Term Accession Number	
Study Design Type Term Source REF	
STUDY PUBLICATIONS	
Study PubMed ID	
Study Publication DOI	
Study Publication Author list	
Study Publication Title	
Study Publication Status	
Study Publication Status Term Accession Number	
Study Publication Status Term Source REF	

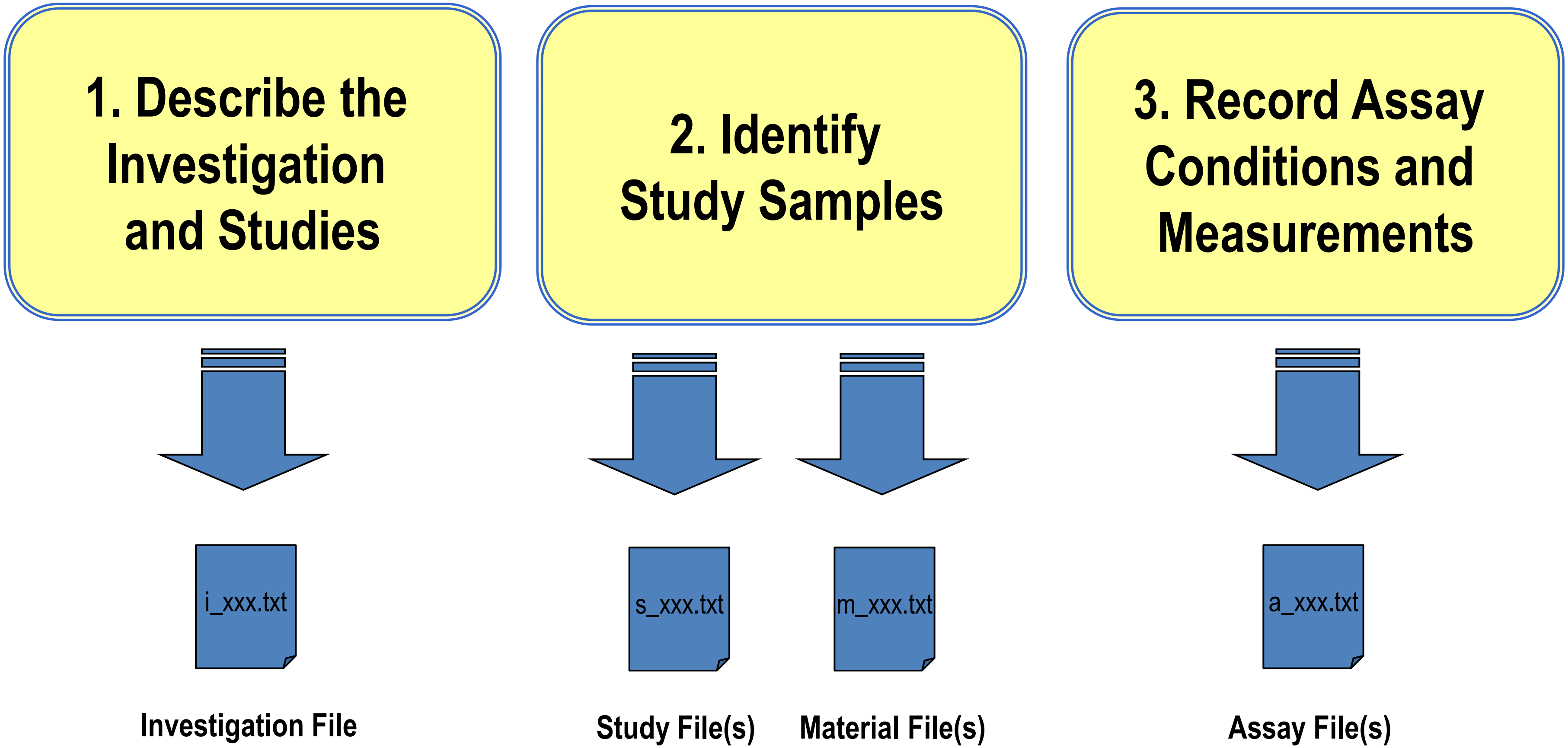
Study Description

Sample Files

Design

Publication

nano-TAB structure


1. Describe the Investigation and Studies
i_xxx.txt
Investigation File
2. Identify Study Samples
s_xxx.txt
Study File(s)
m_xxx.txt
Material File(s)
3. Record Assay Conditions and Measurements
a_xxx.txt
Assay File(s)

nano-TAB Study File

- Study files provide mappings between the samples, materials, and processing events associated with a study.
- Samples can be
  - Biological materials
  - Nanomaterials
  - Small molecules
- For physical-chemical characterizations of nanomaterials, the sample is the nanomaterial.
- For in vitro and in vivo characterizations, the sample is the biological specimen (cell line, animal, etc.)

nano-TAB Material File

- Primary file for describing
  - Nanomaterial composition and formulation
  - Physical properties
  - Structure
- Allows for
  - Comparison of nanomaterials across nanotechnology resources
  - Association with optional files; e.g., a Structure file for representing the 3D structure of the nanomaterial
- Vertical-based spreadsheet with the following sections:
  - MATERIAL SAMPLE
  - MATERIAL COMPONENT
  - MATERIAL LINKAGE

Material File

Material Sample Section

Material Identifiers

Material Characteristics

Material Files

MATERIAL SAMPLE			
Material Sample Source Name	NCL-23		
Material Sample Name	NCL-23-F1		
Material Sample Type	nanoparticle sample		
Material Sample Type Term Accession Number	NPO_1404		
Material Sample Type Term Source REF	NPO		
Material Sample Description	G4.5 COONa terminated PAMAM dendrimer-MagnevistÂ® complex		
Material Sample Synthesis			
Material Sample Design Rationale			
Material Sample Design RationaleTerm Accession Number			
Material Sample Design Rationale Term Source REF			
Material Sample Characteristic			
Material Sample Characteristic Term Accession Number			
Material Sample Characteristic Term Source REF			
Material Sample Characteristic Value			
Material Sample Characteristic Value Term Accession Number			
Material Sample Characteristic Value Term Source REF			
Material Sample Characteristic Statistic			
Material Sample Characteristic Statistic Term Accession Number			
Material Sample Characteristic Statistic Term Source REF			
Material Sample Characteristic Unit			
Material Sample Characteristic Unit Term Accession Number			
Material Sample Characteristic Unit Term Source REF			
Material Sample Intended Application	MRI Contrast Agent		
Material Sample Intended Application Term Accession Number	NPO_581		
Material Sample Intended Application Term Source REF	NPO		
Material Sample File Name	ncl-23_composition.png; ncl-23_structure.pdb		
Material Sample File Location			
Sampe Material File Type	image; structure		
Material Sample File Type Term Accession Number			
Material Sample File Type Term Source REF			
Material Sample File Version	1.0; 1.0		
Material Sample File Description	NCL23 composition schematic; 3D structure of the dendrimer with annotated voids		

Material File

Material Component Section

	MATERIAL COMPONENT			
Material Component Identifier	Material Component Name	NCL-23-F1-N1	NCL-23-F1-N1-M1	NCL-23-F1-N1-M2
	Material Component Type	dendrimer	core	small molecule
	Material Component Type Term Accession Number	NPO_735	NPO_279	
	Material Component Type Term Source REF	NPO	NPO	
	Material Component Description			
	Material Component Chemical Name		diaminobutane	magnevist
	Material Component Chemical Term Accession Number			CHEBI.31797
	Material Component Chemical Term Source REF			CHEBI
Material Component Characteristics	Material Component Characteristic	branch; generation		amount; molecular formula
	Material Component Characteristic Term Accession Number	NPO_776; NPO_224		NPO_1217;
	Material Component Characteristic Term Source REF	NPO; NPO		NPO;
	Material Component Characteristic Value	1-4; 4.5		0; [Gd+3] .CNC[C@H] (O) [C@@H] (O) [C@H] (O) [C@H] (O) CO.CNC[C@H] (O) [C@@H] (O) [C@H] (O) [C@H] (O) CO.OC(=O) CN(CCN(CCN(CC(O) =O) CC([O-]) =O) CC([O-]) =O) CC([O-]) =O
	Material Component Characteristic Value Term Accession Number			
	Material Component Characteristic Value Term Source REF			
	Material Component Characteristic Statistic			
	Material Component Characteristic Statistic Term Accession Number			
	Material Component Characteristic Statistic Term Source REF			
	Material Component Characteristic Unit			mL; SMILES
	Material Component Characteristic Unit Term Accession Number			UO_0000101;
	Material Component Characteristic Unit Term Source REF			UO;
	Material Component Intended Application			MRI Contrast Agent
	Material Component Intended Application Term Accession Number			NPO_581
	Material Component Intended Application Term Source REF			NPO
Material Component Files	Material Component File Name			magnevist_structure.png
	Material Component File Type			image
	Material Component File Type Term Accession Number			
	Material Component File Type Term Source REF			
	Material Component File Version			

Material File

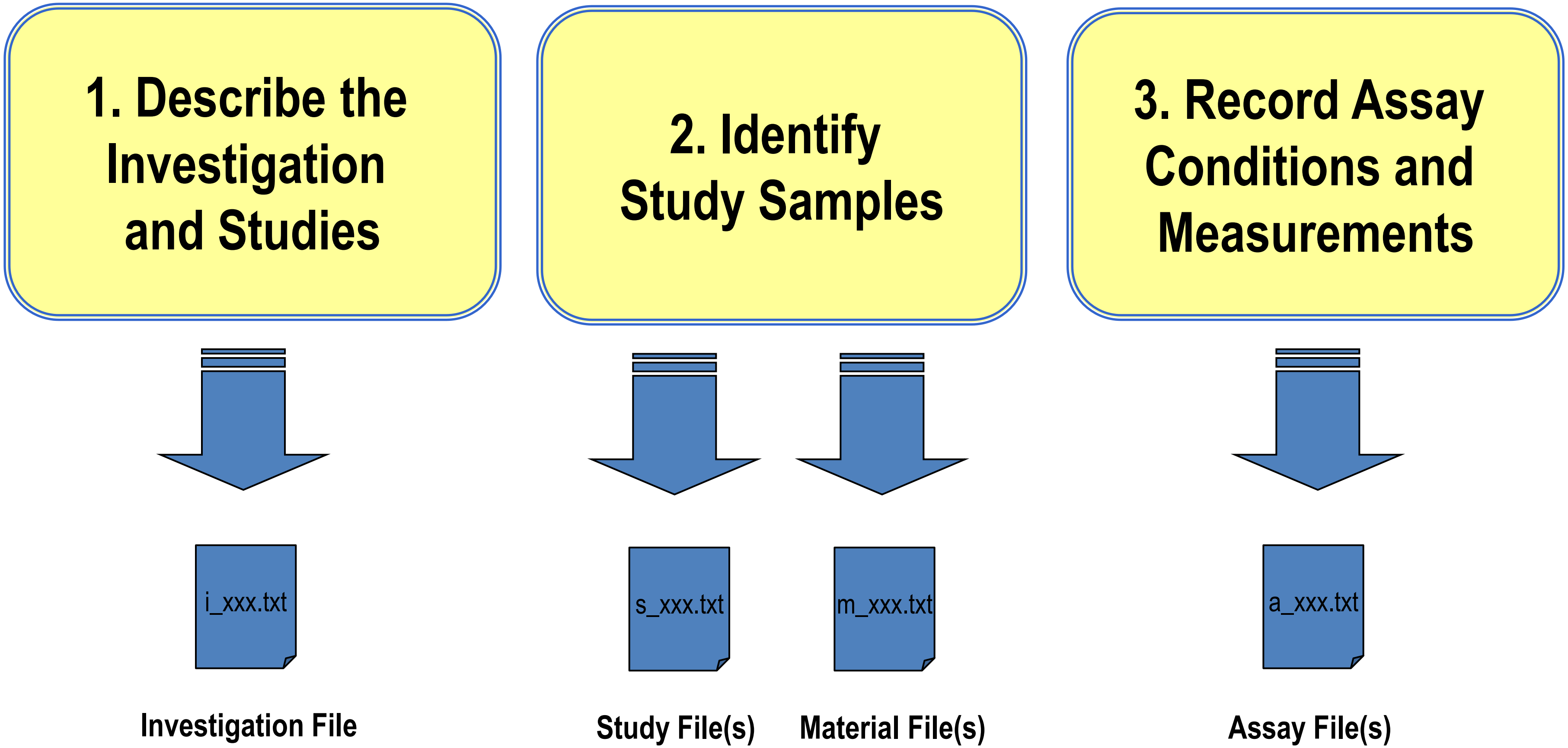
Material Linkage Section

Material Linkage Identifier

Material Linkage Characteristics

MATERIAL LINKAGE			
Material Linkage Name	NCL-23-F1-L1		
Material Linkage Type	association		
Material Linkage Type Term Accession Number			
Material Linkage Type Term Source REF			
Material Linkage Component A	NCL-23-F1-N1-M1		
Material Linkage Component B	NCL-23-F1-N1-M2		
Material Linkage Component Location	exterior dendrimer surface		
Material LinkageComponent Location Term Accession Number			
Material Linkage Component Location Term Source REF			
Material Linkage Characteristic	bond type		
Material Linkage Characteristic Term Accession Number			
Material Linkage Characteristic Term Source REF			
Material Linkage Characteristic Value			
Material Linkage Characteristic Value Term Accession Number			
Material Linkage Characteristic ValueTerm Source REF			
Material Linkage Characteristic Statistic			
Material Linkage Characteristic Statistic Term Accession Number			
Material Linkage Characteristic Statistic Term Source REF			
Material Linkage Characteristic Unit			
Material Linkage Characteristic Unit Term Accession Number			
Material Linkage Characteristic Unit Term Source REF			

nano-TAB structure



1. Describe the Investigation and Studies

2. Identify Study Samples

3. Record Assay Conditions and Measurements

i_xxx.txt
s_xxx.txt
m_xxx.txt
a_xxx.txt

Investigation File

Study File(s)

Material File(s)

Assay File(s)

nano-TAB Assay File

- Describes the protocol parameters and factors, including:
  - Temperature
  - Media/solvent
  - Concentration
- Provides references or links to assay results, including:
  - Measurements
  - Instrumentation
  - Derived data files
- Templates available for the “top Nano WG assays”
  - Size by DLS (Physico-Chemical)
  - Zeta Potential (Physico-Chemical)
  - Hemolysis (In Vitro)
  - Hepatocarcinoma Cytoxicity (MTT and LDH) (In Vitro)
  - Caspase 3 Apoptosis (In Vitro)
  - Toxicity (ADME, Single/Repeat Dose) (In Vivo)
  - ***Your assay here!***

nano-TAB Assay File

- Horizontal-based spreadsheet format with the following sections:
  - SAMPLE NAMES
  - PARAMETERS
  - FACTORS
  - ASSAY MEASUREMENTS
  - ASSAY FILES

Assay File

Size by DLS

Sample Identifiers

Protocol Reference

Material Sample Name	Protocol REF	ParameterValue[pH of solutio	Parameter Value [NaCl concentratio	Performer	Date
NCL-20-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-20-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-22-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-22-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-22-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-23-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-23-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12
NCL-23-F1	Hydrodynamic Size/Size Distribution via Dynamic Ligh	7.4		Anil Patri	2010:05:12

Assay Name

Study Factors

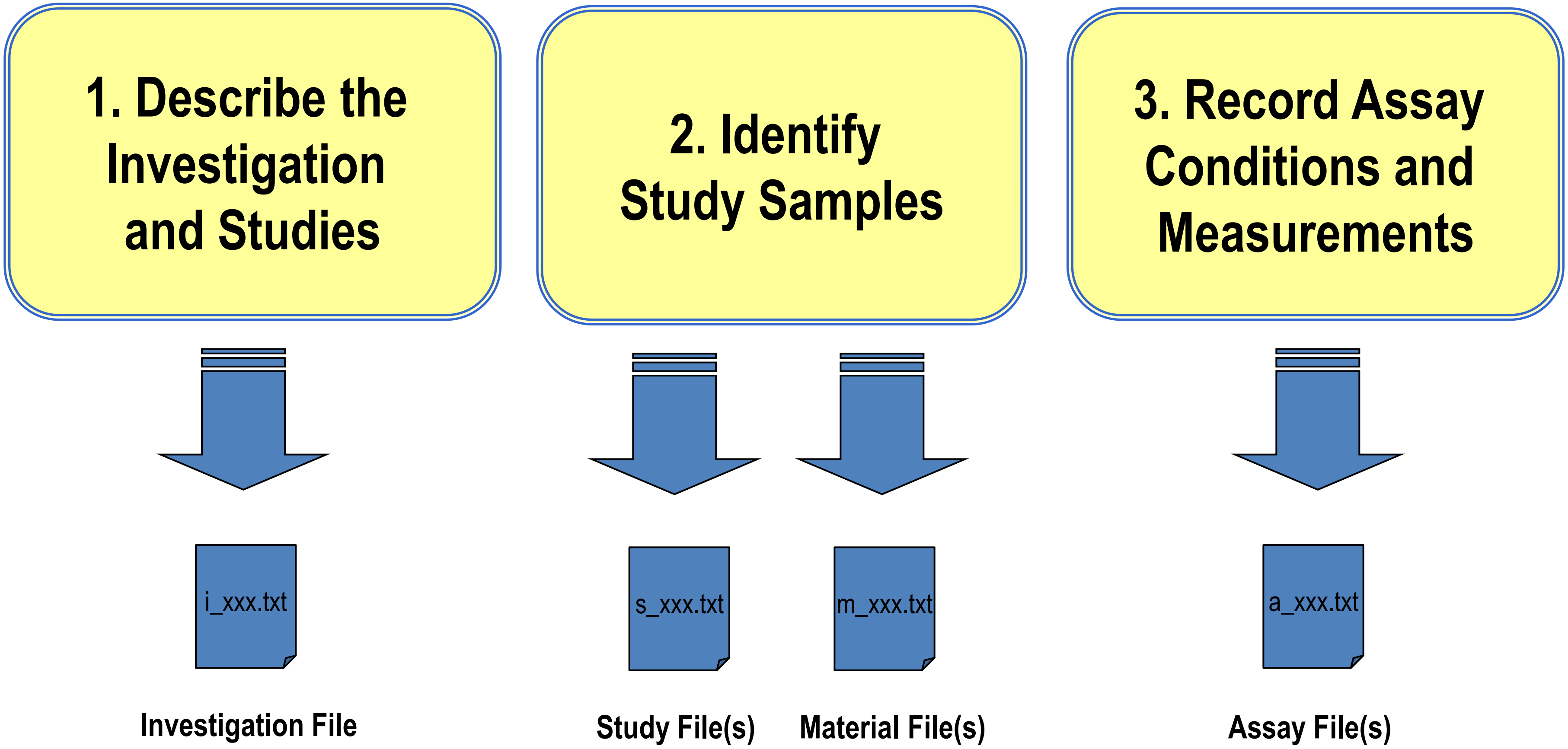
Assay Name	Factor Value[temperature]	Unit	Term Sourc	Term Acces	Factor Value[media solvent]	Measurement Value[size]	Statistic	Unit	Term Sourc
Size by DLS	25	celsius	UO		saline	5.2	z-average	nm	UO
Size by DLS	25	celsius	UO		PBS	8.6	z-average	nm	UO
Size by DLS	25	celsius	UO		saline	8.5	z-average	nm	UO
Size by DLS	25	celsius	UO		PBS	6.6	z-average	nm	UO
Size by DLS	37	celsius	UO		PBS	7.9	z-average	nm	UO
Size by DLS	25	celsius	UO		saline	7.4	z-average	nm	UO
Size by DLS	25	celsius	UO		PBS	8.4	z-average	nm	UO
Size by DLS	37	celsius	UO		PBS	9.8	z-average	nm	UO

Assay Measurements

Assay Files

Term Acce	Measurement Value[Peak size]	Unit	Term Sourc	Term Acce	Measurement Value[pdl]	Image File	Derived Data File
	4.4	nm	UO		0.122	distribution20.jpg	ncl_20.xls
	6.2	nm	UO		0.211		
	6.0	nm	UO		0.200	distribution22.jpg	ncl_22.xls
	5.2	nm	UO		0.214		
	5.1	nm	UO		0.282		
	5.3	nm	UO		0.235	distribution23.jpg	ncl_23.xls
	6.1	nm	UO		0.265		
	5.6	nm	UO		0.358		

nano-TAB structure



1. Describe the Investigation and Studies

i_xxx.txt

Investigation File

2. Identify Study Samples

s_xxx.txt

Study File(s)

m_xxx.txt

Material File(s)

3. Record Assay Conditions and Measurements

a_xxx.txt

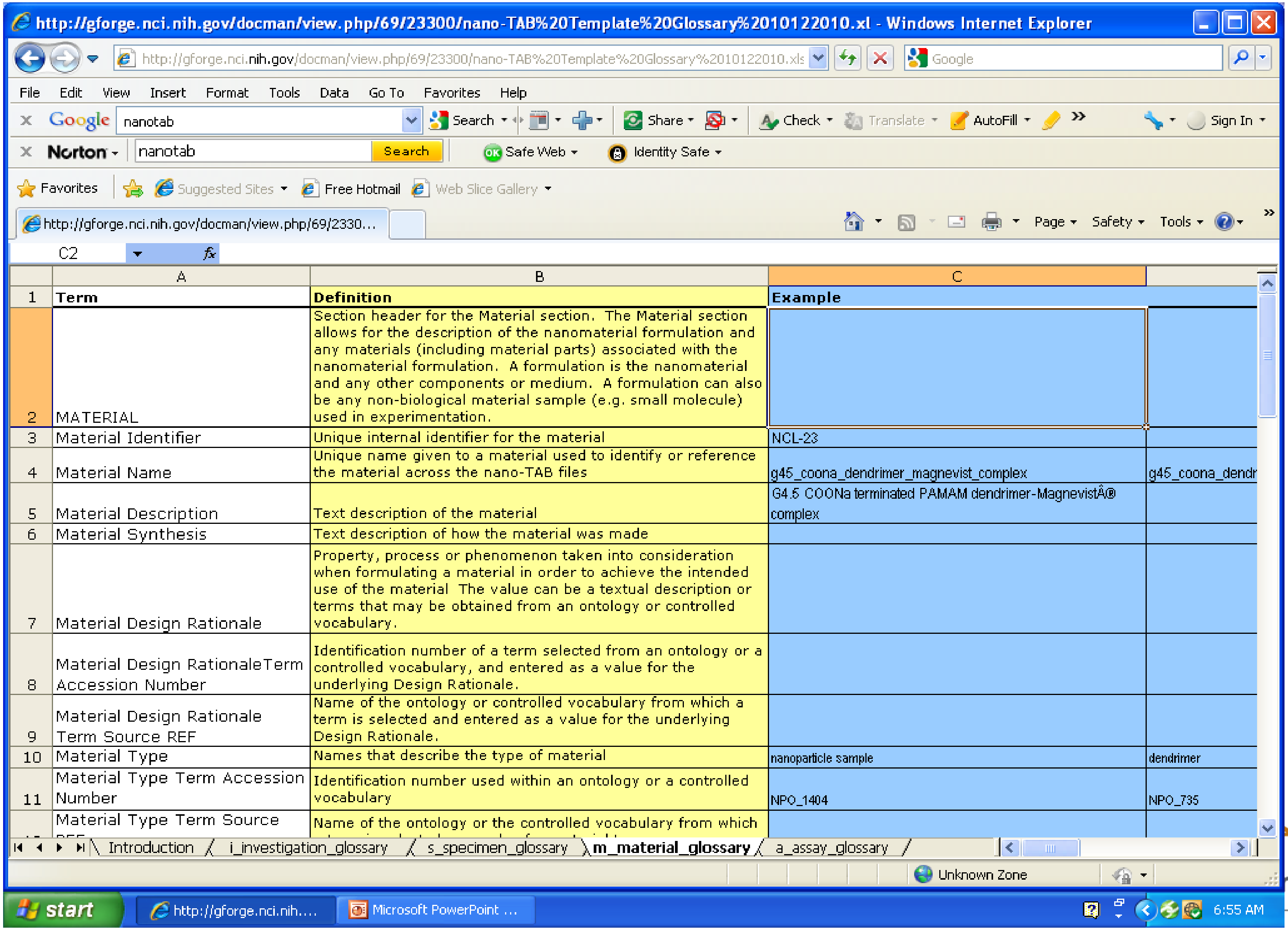
Assay File(s)

Getting Started

1. Contact us for help! nano-tab-l@list.nih.gov
2. Use nano-TAB template to create nano-TAB files: http://goo.gl/T7Mwi
3. Leverage template glossary for definitions: http://goo.gl/YkRZM
4. View example files: http://goo.gl/yKFew
5. Navigate the BioPortal ontology for terms: http://goo.gl/SVmNZ
6. Complete nano-TAB files and send to the nano-TAB Listserv: nano-tab-l@list.nih.gov

caBIG® Nano WG nano-TAB Site:
http://goo.gl/yKFew

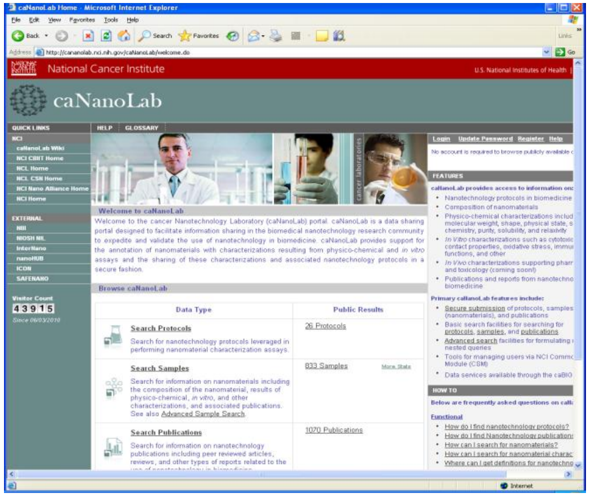
nanoTAB Template Glossary


http://gforge.nci.nih.gov/docman/view.php/69/23300/nano-TAB%20Template%20Glossary%2010122010.xl - Windows Internet Explorer
http://gforge.nci.nih.gov/docman/view.php/69/23300/nano-TAB%20Template%20Glossary%2010122010.xls
File Edit View Insert Format Tools Data Go To Favorites Help
Google nanotab Search Share Check Translate AutoFill Sign In
Norton nanotab Search Safe Web Identity Safe
Favorites Suggested Sites Free Hotmail Web Slice Gallery
Page Safety Tools
C2
Introduction
i_investigation_glossary
s_specimen_glossary
m_material_glossary
a_assay_glossary
Unknown Zone
start
http://gforge.nci.nih....
Microsoft PowerPoint ...
6:55 AM

	A	B	C	
1	**Term**	**Definition**	**Example**	
2	MATERIAL	Section header for the Material section. The Material section allows for the description of the nanomaterial formulation and any materials (including material parts) associated with the nanomaterial formulation. A formulation is the nanomaterial and any other components or medium. A formulation can also be any non-biological material sample (e.g. small molecule) used in experimentation.		
3	Material Identifier	Unique internal identifier for the material	NCL-23	
4	Material Name	Unique name given to a material used to identify or reference the material across the nano-TAB files	g45_coona_dendrimer_magnevist_complex	g45_coona_dendr
5	Material Description	Text description of the material	G4.5 COONa terminated PAMAM dendrimer-MagnevistÂ® complex	
6	Material Synthesis	Text description of how the material was made		
7	Material Design Rationale	Property, process or phenomenon taken into consideration when formulating a material in order to achieve the intended use of the material The value can be a textual description or terms that may be obtained from an ontology or controlled vocabulary.		
8	Material Design RationaleTerm Accession Number	Identification number of a term selected from an ontology or a controlled vocabulary, and entered as a value for the underlying Design Rationale.		
9	Material Design Rationale Term Source REF	Name of the ontology or controlled vocabulary from which a term is selected and entered as a value for the underlying Design Rationale.		
10	Material Type	Names that describe the type of material	nanoparticle sample	dendrimer
11	Material Type Term Accession Number	Identification number used within an ontology or a controlled vocabulary	NPO_1404	NPO_735
	Material Type Term Source	Name of the ontology or the controlled vocabulary from which		

nano-TAB future

- ASTM ballot
- User guide
  - Basic descriptions of elements, glossary
  - Organized collection of examples
  - Tutorials
- Easier NPO annotation and integration
  - List of most relevant terms
  - List of missing terms
- Real world applications
  - “Client” engagement
  - Friendly user support


caNanoLab Home - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://cananolab.nci.nih.gov/caNanoLab/welcome.do
National Cancer Institute
U.S. National Institutes of Health
caNanoLab
QUICK LINKS
HELP GLOSSARY
NCI
caNanoLab Wiki
NCI CBIIT Home
NCL Home
NCL CSN Home
NCI Nano Alliance Home
NCI Home
EXTERNAL
NBI
NIOSH NIL
InterNano
nanoHUB
ICON
SAFENANO
Visitor Count
43915
Since 06/03/2010
cancer laboratories
Login Update Password Register Help
Internet

No account is required to browse publicly available c

Welcome to caNanoLab

Welcome to the cancer Nanotechnology Laboratory (caNanoLab) portal. caNanoLab is a data sharing portal designed to facilitate information sharing in the 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 and *in vitro* 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.	26 Protocols
Search Samples Search for information on nanomaterials including the composition of the nanomaterial, results of physico-chemical, *in vitro*, and other characterizations, and associated publications. See also Advanced Sample Search.	833 Samples More Stats
Search Publications Search for information on nanotechnology publications including peer reviewed articles, reviews, and other types of reports related to the	1070 Publications

FEATURES

caNanoLab provides access to information on:
- Nanotechnology protocols in biomedicine
- Composition of nanomaterials
- Physico-chemical characterizations includ molecular weight, shape, physical state, s chemistry, purity, solubility, and relaxivity
- *In Vitro* characterizations such as cytotoxic contact properties, oxidative stress, immu functions, and other
- *In Vivo* characterizations supporting pharr and toxicology (coming soon!)
- Publications and reports from nanotechno biomedicine

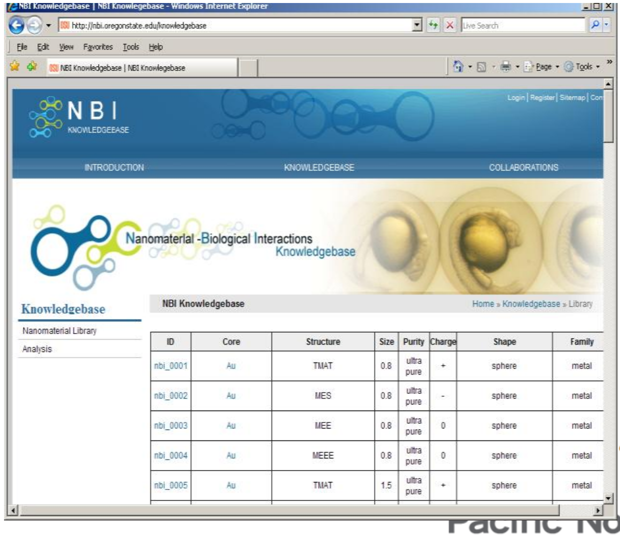
Primary caNanoLab features include:
- Secure submission of protocols, samples (nanomaterials), and publications
- Basic search facilities for searching for protocols, samples, and publications
- Advanced search facilities for formulating nested queries
- Tools for managing users via NCI Commo Module (CSM)
- Data services available through the caBIO

HOW TO

Below are frequently asked questions on caN

Functional
- How do I find nanotechnology protocols?
- How do I find Nanotechnology publication
- How can I search for nanomaterials?
- How can I search for nanomaterial charac
- Where can I get definitions for nanotechno

http://cananolab.nci.nih.gov/caNanoLab/welcome.do

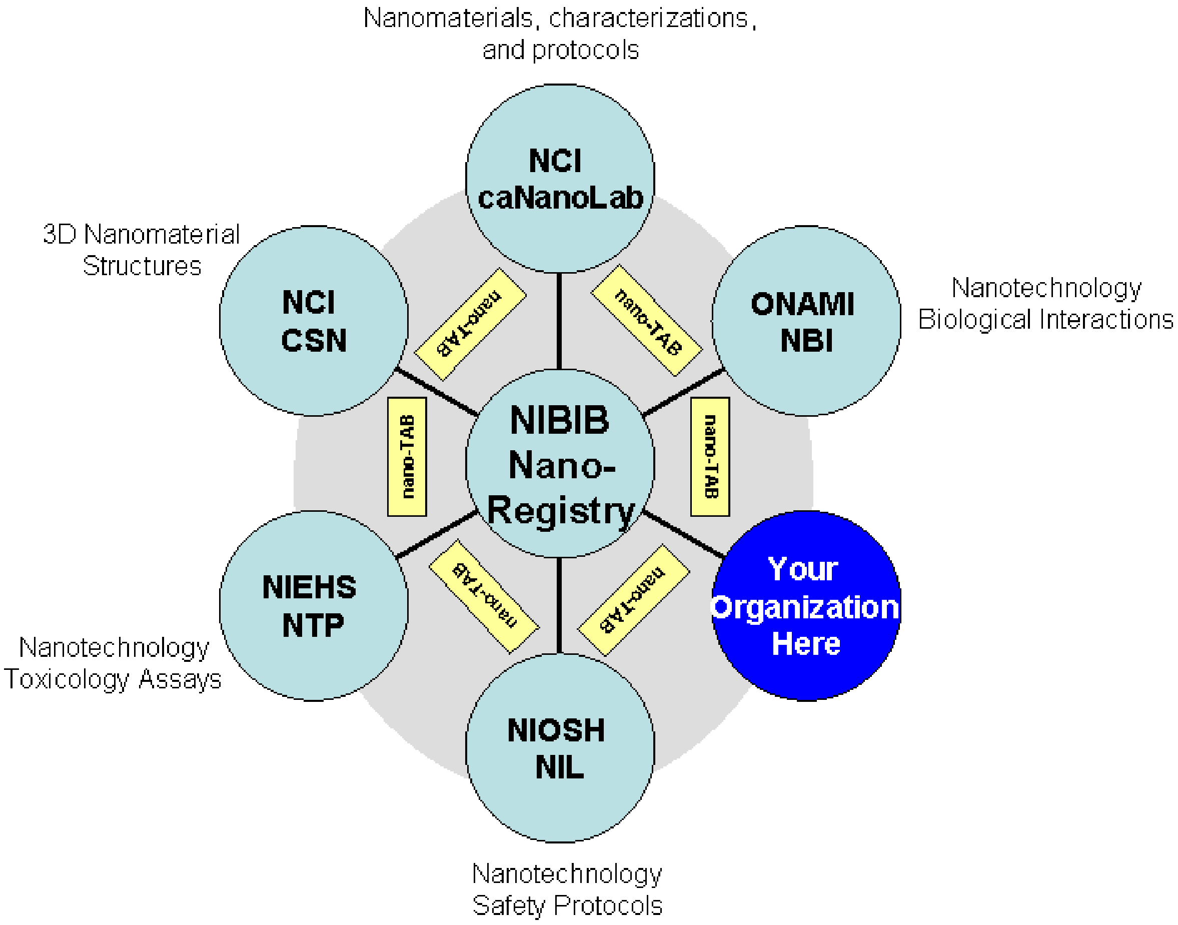

NBI Knowledgebase | NBI Knowlegebase - Windows Internet Explorer
http://nbi.oregonstate.edu/knowledgebase
Live Search
File Edit View Favorites Tools Help
NBI Knowledgebase | NBI Knowlegebase
Page Tools
Login | Register | Sitemap | Con
NBI
KNOWLEDGEBASE
INTRODUCTION
KNOWLEDGEBASE
COLLABORATIONS
Nanomaterial -Biological Interactions
Knowledgebase
Knowledgebase
Nanomaterial Library
Analysis
Home » Knowledgebase » Library

NBI Knowledgebase

ID	Core	Structure	Size	Purity	Charge	Shape	Family
nbi_0001	Au	TMAT	0.8	ultra pure	+	sphere	metal
nbi_0002	Au	MES	0.8	ultra pure	-	sphere	metal
nbi_0003	Au	MEE	0.8	ultra pure	0	sphere	metal
nbi_0004	Au	MEEE	0.8	ultra pure	0	sphere	metal
nbi_0005	Au	TMAT	1.5	ultra pure	+	sphere	metal

http://nbi.oregonstate.edu/knowledgebase

nano-TAB is a community-driven effort


Nanomaterials, characterizations, and protocols
NCI caNanoLab
3D Nanomaterial Structures
NCI CSN
ONAMI NBI
Nanotechnology Biological Interactions
NIBIB Nano-Registry
nano-TAB
nano-TAB
nano-TAB
nano-TAB
nano-TAB
nano-TAB
NIEHS NTP
Nanotechnology Toxicology Assays
Your Organization Here
NIOSH NIL
Nanotechnology Safety Protocols

Additional nano-TAB reading and project team

- nano-TAB Project Site: http://goo.gl/yKFew
- ASTM nano-TAB Work Item WK28974: http://goo.gl/OjSOX
- ISA-TAB: http://isatab.sourceforge.net
- caBIG ICR Nano WG Data Standards Document: http://goo.gl/sDEvp
- NanoParticle Ontology (NPO): http://www.nano-ontology.org

Nano-TAB project team

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David Paik, Stanford University
Sue Pan, SAIC
Grace Stafford, The Jackson Laboratory
Todd Stokes, Georgia Tech
Dennis Thomas, PNNL

Summary

- Introduction to the caBIG® Nanotechnology Working Group
- Overview of nanotechnology informatics challenges
- Research projects
  - Ontology development
  - PubNano resource
  - Data exchange standards
  - Structure-property-activity modeling

Collaborators

caBIG® ICR Workspace, NCBO staff, ASTM, Raul Cachau, Gilbert Fragoso, Elaine Freund, Marty Fritts, Sam Gambhir, Sharon Gaheen, Liz Hahn-Dantona,Stacey Harper, Mark Hoover, Fred Klaessig, Juli Klemm, Michal Lijowski, David Paik, Sue Pan, Rohit Pappu, Persistent Systems Ltd, Daniel Rubin, Stan Shaw, Dennis Thomas, Eddie Xu, Kilian Weinberger, Trish Whetzel, …and many more!

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