



Jerry S.H. Lee, PhD
Deputy Director for Cancer Research and Technology

White House Cancer Moonshot Task Force

Mission

- Make a decade's worth of progress in **cancer prevention, diagnosis, treatment, and care** – ultimately to end cancer as we know it.



NCI Center for Strategic Scientific Initiatives (CSSI): Concept Shop



Director
Douglas R. Lowy, MD



Deputy Director
Jerry S.H. Lee, PhD

Mission

“...to create and uniquely implement exploratory programs focused on the development and integration of advanced technologies, trans-disciplinary approaches, infrastructures, and standards, to accelerate the creation and broad deployment of data, knowledge, and tools to empower the entire cancer research continuum in better understanding and leveraging knowledge of the cancer biology space for patient benefit...”



2003, 2007, 2011, 2013, 2014



2005, 2010, 2015



2008, 2013*



2011, 2014



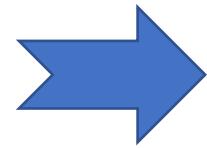
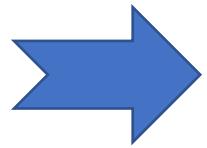
2004, 2008, 2014



2005, 2008



2010



1 million healthy genomes

2001

2010

2015



2006-2015

A Decade of Illuminating the Underlying Causes of Primary Untreated Tumors



(12,000+ patient tumors and increasing)

“What is Water?”: Measurements → Insights



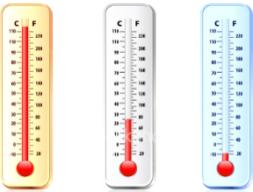
Color (clear, yellow, brown)

Taste (none, metallic, awful)



Phase (liquid, gas, solid)

Phase change (boil, melt, freeze)

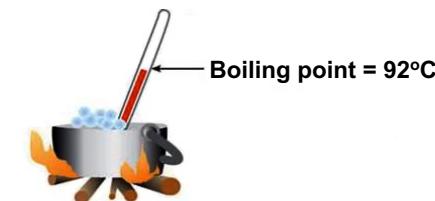


Measurements
Taken

Pressure (kg/cm ²)	Temp (°C)	Saturated steam		Superheated steam	
		Vapour enthalpy (kcal/kg)	Specific volume (m ³ /kg)	Density (kg/m ³)	Specific volume (m ³ /kg) at 250°C
1	99.1	638.8	1.725	0.580	2,454
2	119.6	646.2	0.902	1.109	1,223
3	132.9	650.6	0.617	1.621	0.812
4	142.9	653.7	0.471	2.123	0.607
5	151.1	656.0	0.382	2,618	0.484
6	158.1	657.0	0.321	3,115	0.402
7	164.2	659.5	0.278	3,597	0.343
8	169.6	660.8	0.245	4,082	0.299
9	174.5	661.9	0.219	4,566	0.265
10	179.1	662.9	0.198	5,051	0.238
12	187.1	664.5	0.166	6,024	0.196
14	194.1	665.7	0.143	6,993	0.167
16	200.4	666.7	0.126	7,937	0.145
18	206.1	667.4	0.112	8,929	0.128
20	211.4	668.0	0.101	9,901	0.114
22	216.2	668.4	0.092	10,870	0.103
24	220.7	668.7	0.085	11,765	0.093
26	225.0	669.0	0.078	12,821	0.085
28	229.0	669.1	0.073	13,699	0.078
30	232.7	669.2	0.068	14,706	0.072

*LOTS of
Quantitative
“Data”*

*But also LOTS of
disagreements...*



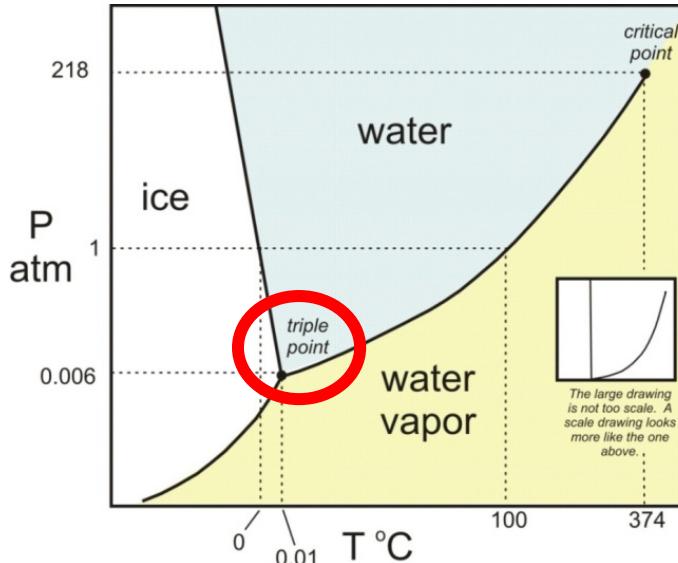
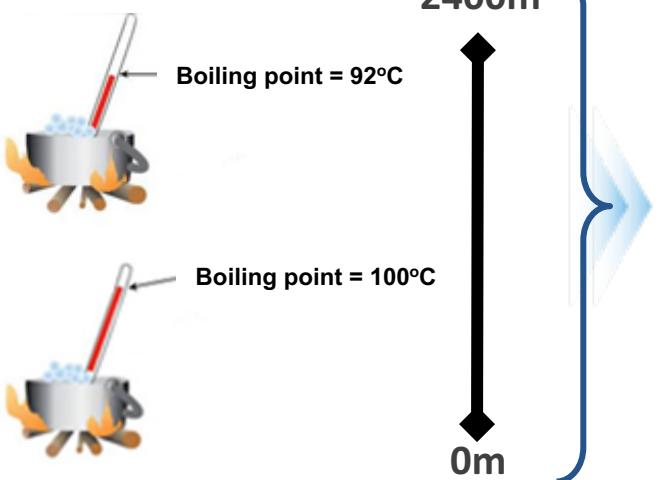
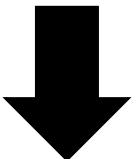
Boiling point = 100°C



Qualitative Descriptions

“What is Water?”: Standards and Sharing of Data → New Insights and Understanding

- Define samples and protocols
- Share collected data



New Understanding

- Phase boundaries
 - V/L equilibrium
 - Triple Point

(Phase Diagram)

LOTS of
Quantitative
and
Reproducible
Data

Pressure (kg/cm ³)	Temp (°C)	Saturated steam		Superheated steam	
		Vapour enthalpy (kcal/kg)	Specific volume (m ³ /kg)	Density (kg/m ³)	Specific volume (m ³ /kg) at 250°C at 300°C
1	99.1	638.8	1.725	0.580	2,454
2	119.6	646.2	0.902	1.109	1,223
3	132.9	650.6	0.617	1.621	0.812
4	142.9	653.7	0.471	2.123	0.607
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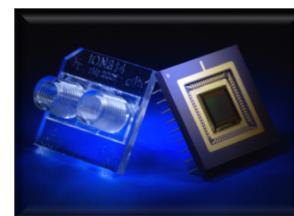
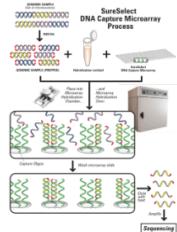
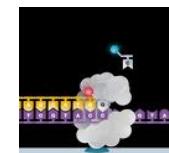


(Steam Table)

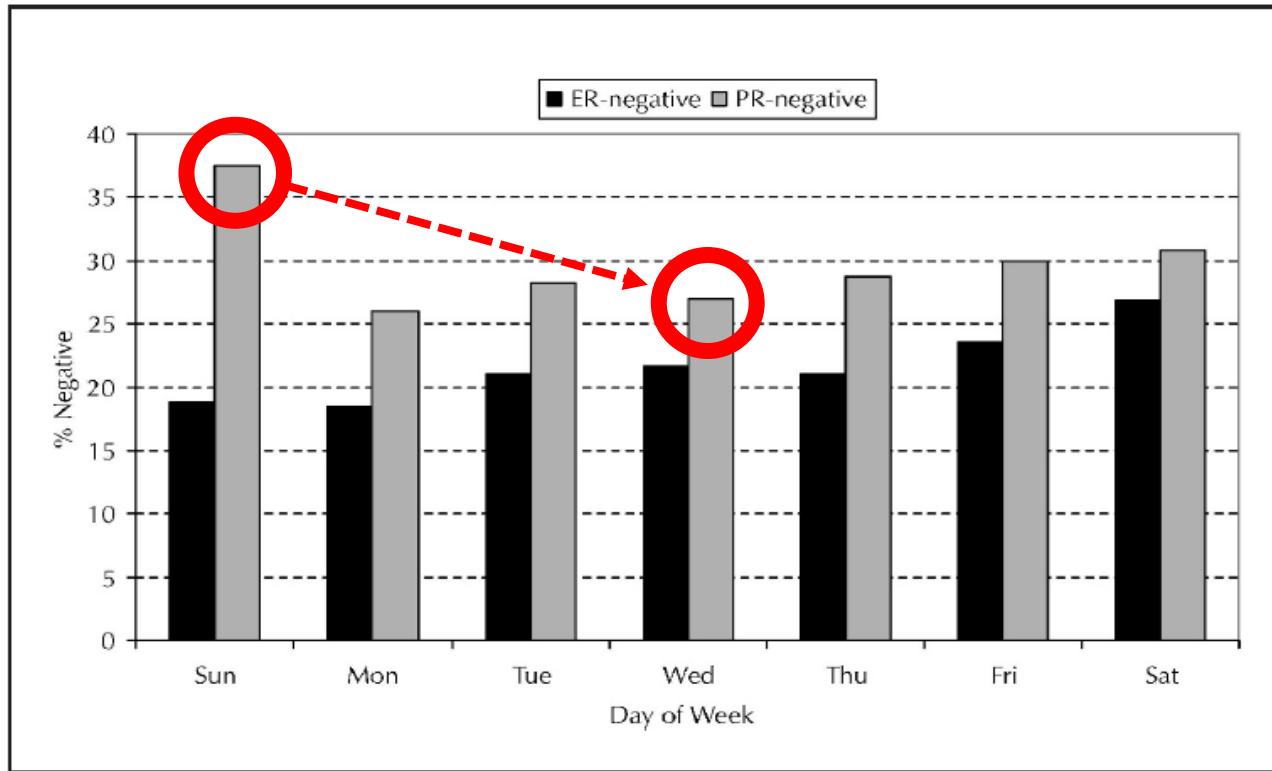


Imo

Many “Thermometers” (Genomics and Proteomics)



Samples AND Handling Matter!



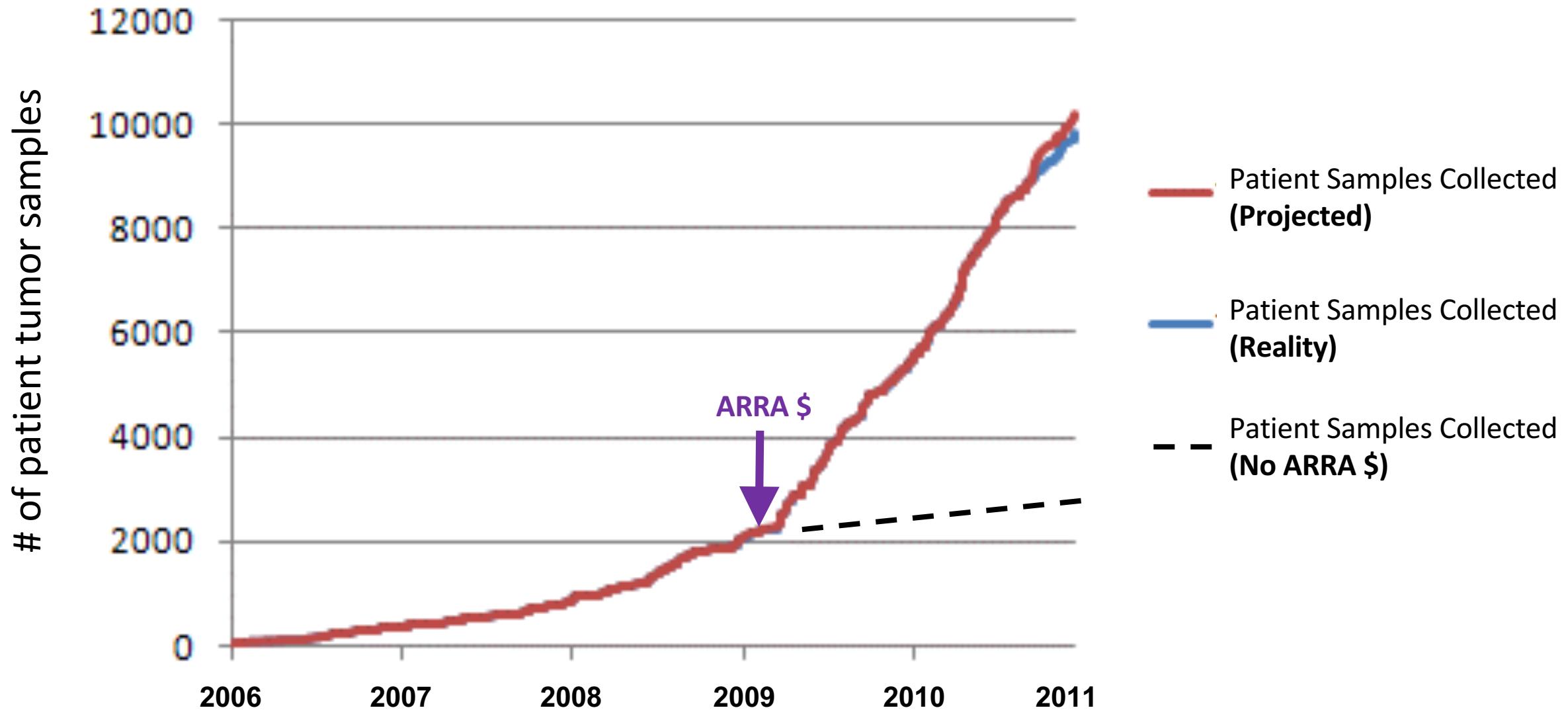
“...We found that specimens obtained late in the week are more likely to be ER/PR negative than specimens obtained on other weekdays...”

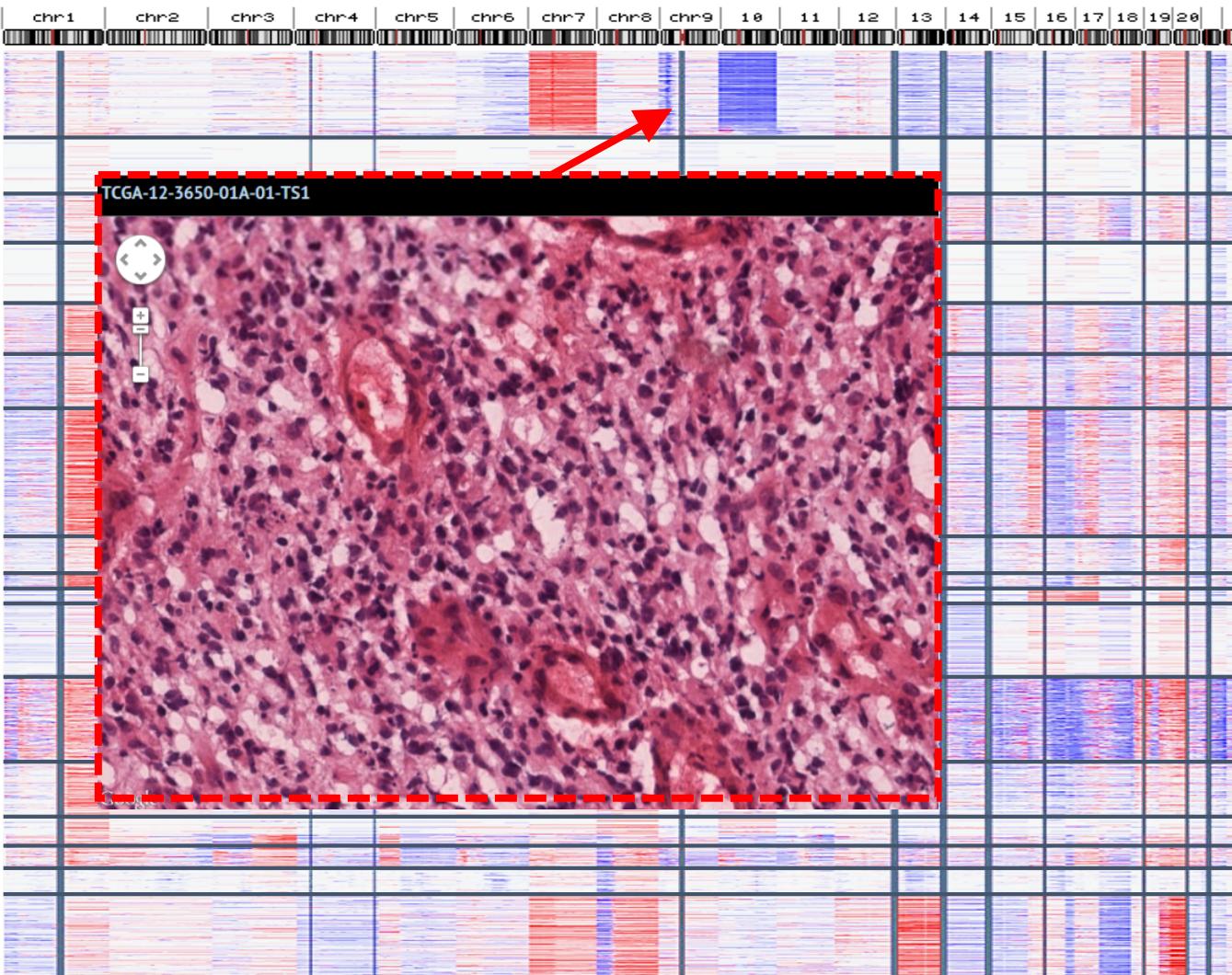
Table 1. Frequency of Specimen Removal by Day of the Week

Day	Cases	ER-Negative	PR-Negative
Sunday	16	3	6
Monday	1252	230	325
Tuesday	1176	248	332
Wednesday	784	170	212
Thursday	904	191	259
Friday	919	216	276
Saturday	26	7	8
System	5077	1065	1418

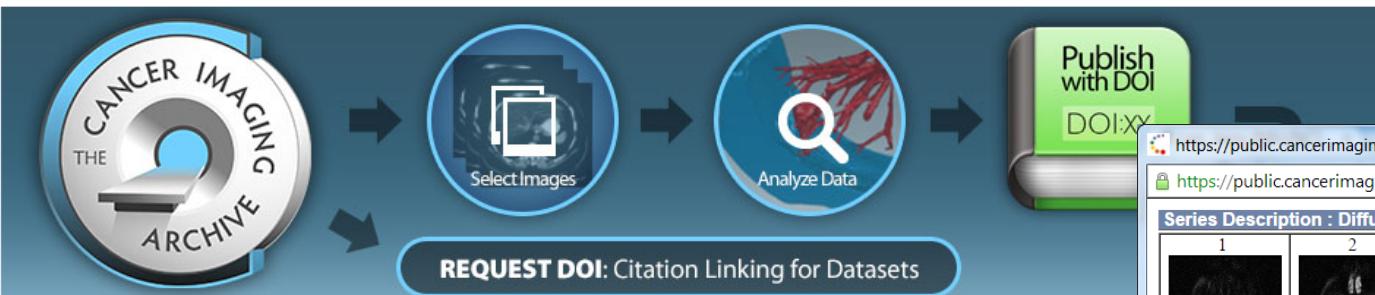
Abbreviations: ER, estrogen receptor; PR, progesterone receptor.

Rapid Acceleration from Stimulus Funding (2009-2011)





Glioblastoma:	563
Brain lower grade glioma:	180
Head & neck:	306
Thyroid carc:	401
Lung adeno:	356
Lung squamous:	343
Breast carc:	866
Stomach adeno:	237
Liver hep. carc:	97
Kidney pap. cell carc:	103
Kidney clear cell carc:	493
Ovarian serous:	559
Uterine corpus end. carc:	492
Cervical carc:	102
Bladder carc:	135
Prostate adeno:	171
Colon/rectum adeno:	575
Total:	5,979



REQUEST DOI: Citation Linking for Datasets

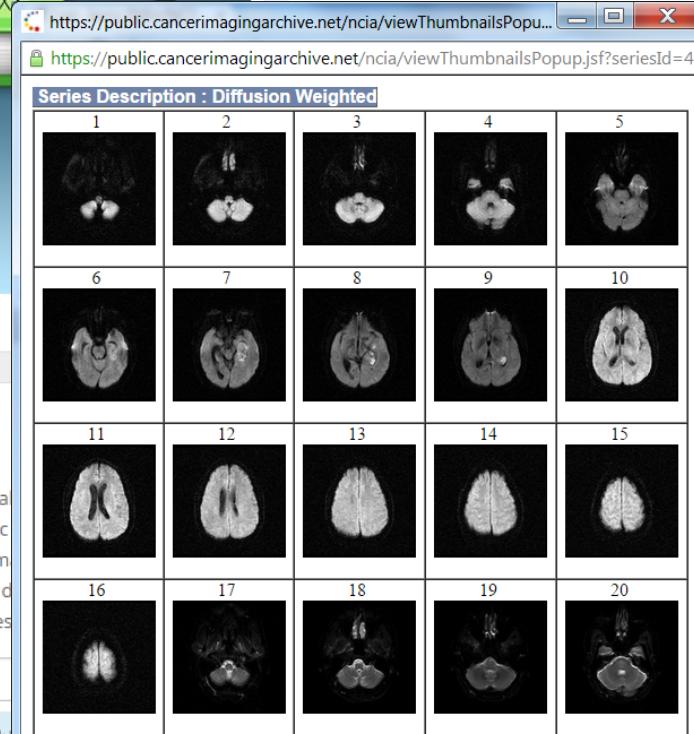
TClA has the ability to create Digital Object Identifier (DOI) linked to subsets of TClA data, which authors may use as data citations in their scholarly papers. [Learn more...](#)

TCIA Collections

The image data in The Cancer Imaging Archive (TClA) is organized into purpose-built collections of subjects. The subjects typically share one or more common characteristics such as cancer type and/or anatomical site (lung, brain, etc.) in common. Each link in the table below contains information concerning the scientific publications associated with the collection, links to the original datasets, and links to the TClA page for the collection. To facilitate the reproducibility in scientific research, TClA supports [Digital Object Identifiers \(DOIs\)](#) which allow users to share subsets of TClA data within their research manuscript. You can subscribe to our [Email List](#) or social media feeds to be notified of new collections and changes.

Show 100 entries Filter table:

Cancer Type	Collection	Location	Subjects
Ovarian Serous	TCGA-OV	Ovary	111
Cystadenocarcinoma			



80 images found, displaying Page 1 / 4.

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<https://public.cancerimagingarchive.net/ncia/viewThumbnailsPopup.jsp?seriesId=4>

<https://public.cancerimagingarchive.net/ncia/viewThumbnailsPopup.jsf?seriesId=4>

NATIONAL CANCER INSTITUTE NCI-MATCH CLINICAL TRIAL

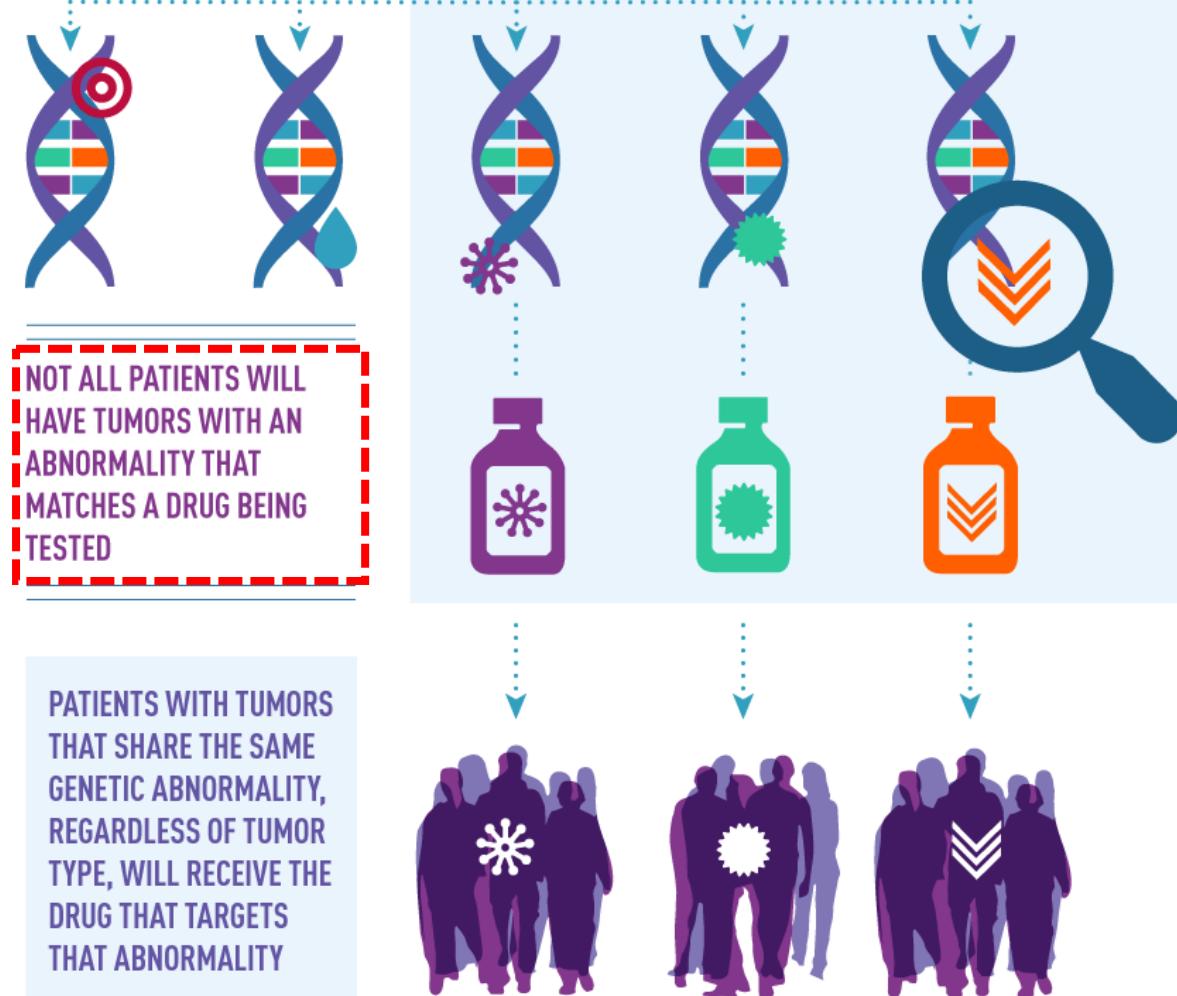
THIS PRECISION MEDICINE TRIAL
EXPLORES TREATING PATIENTS
BASED ON THE MOLECULAR
PROFILES OF THEIR TUMORS

NCI-MATCH* IS FOR ADULTS WITH:

- solid tumors (including rare tumors) and lymphomas
- tumors that no longer respond to standard treatment



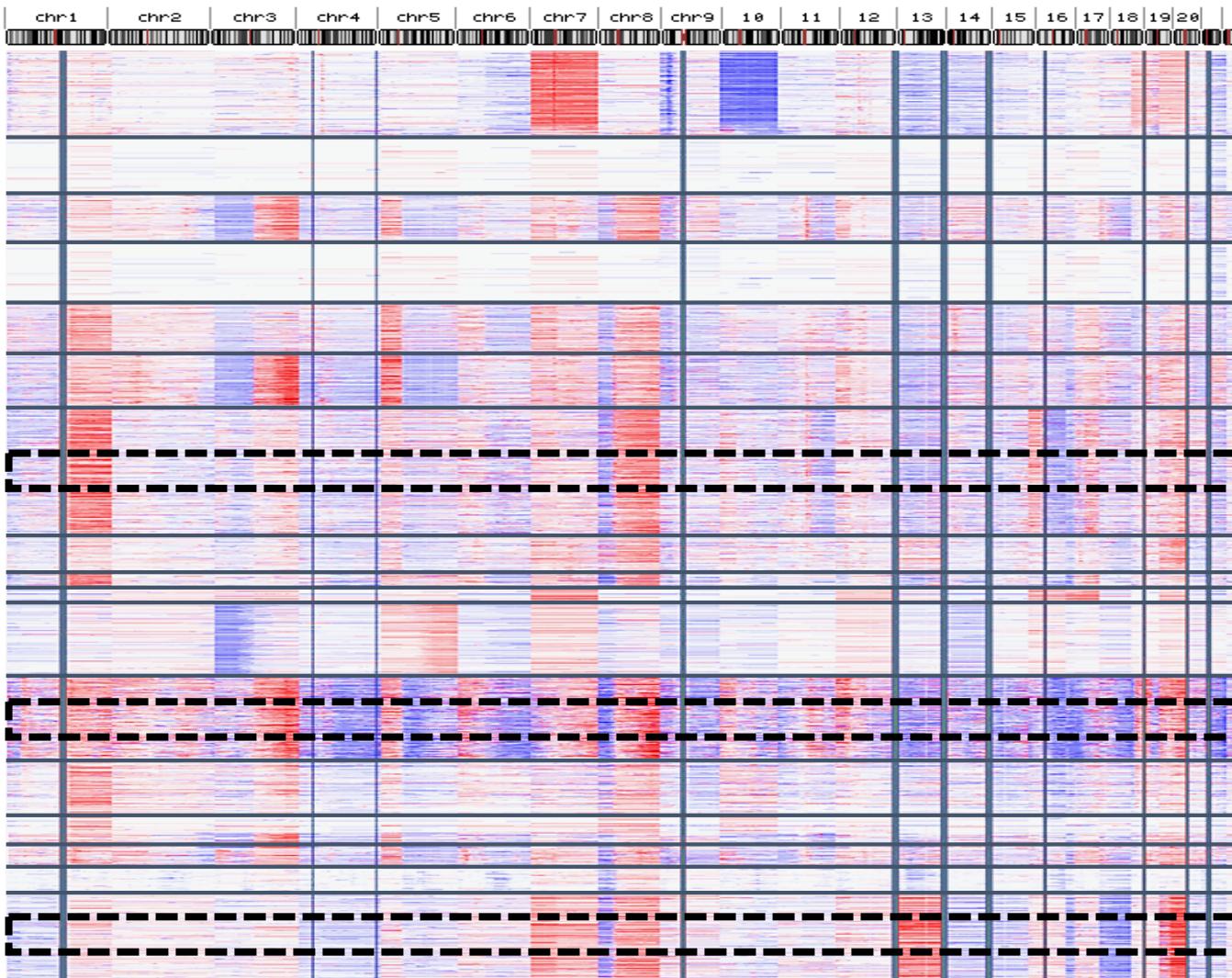
IF A PATIENT'S TUMOR HAS A GENETIC ABNORMALITY THAT MATCHES ONE TARGETED BY A DRUG USED IN THE TRIAL, THE PATIENT WILL BE ELIGIBLE TO JOIN THE TREATMENT PORTION OF NCI-MATCH



*NCI-Molecular Analysis for Therapy Choice

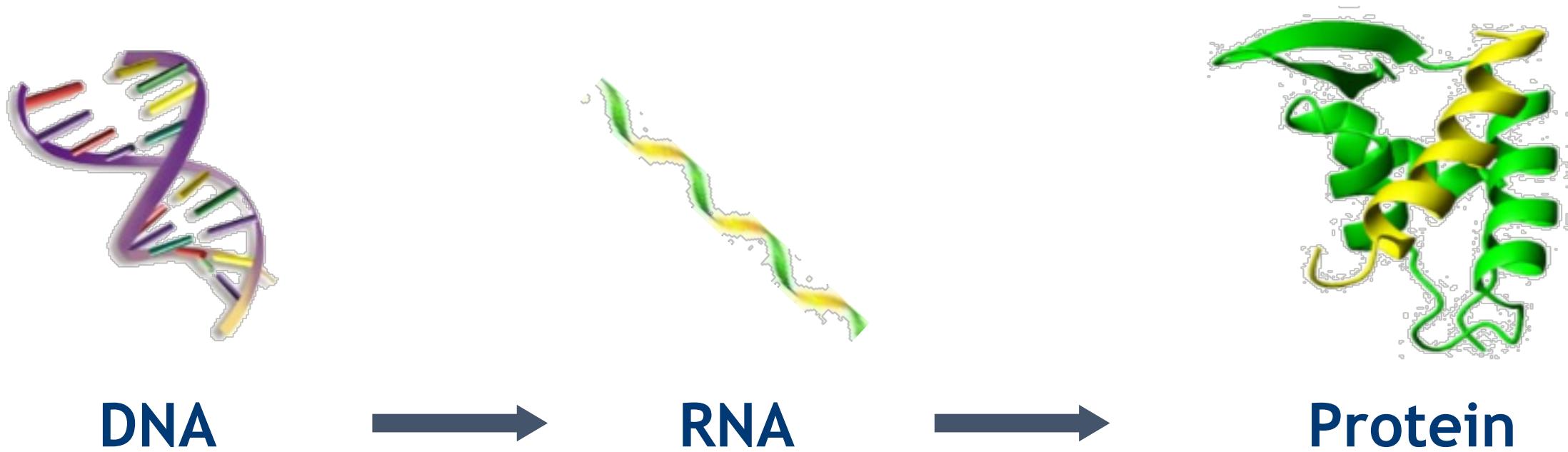
www.cancer.gov/nci-match

To learn more, call 1-800-4-CANCER



Glioblastoma:	563
Brain lower grade glioma:	180
Head & neck:	306
Thyroid carc:	401
Lung adeno:	356
Lung squamous:	343
Breast carc:	866
Stomach adeno:	237
Liver hep. carc:	97
Kidney pap. cell carc:	103
Kidney clear cell carc:	493
Ovarian serous:	559
Uterine corpus end. carc:	492
Cervical carc:	102
Bladder carc:	135
Prostate adeno:	171
Colon/rectum adeno:	575
Total:	5,979

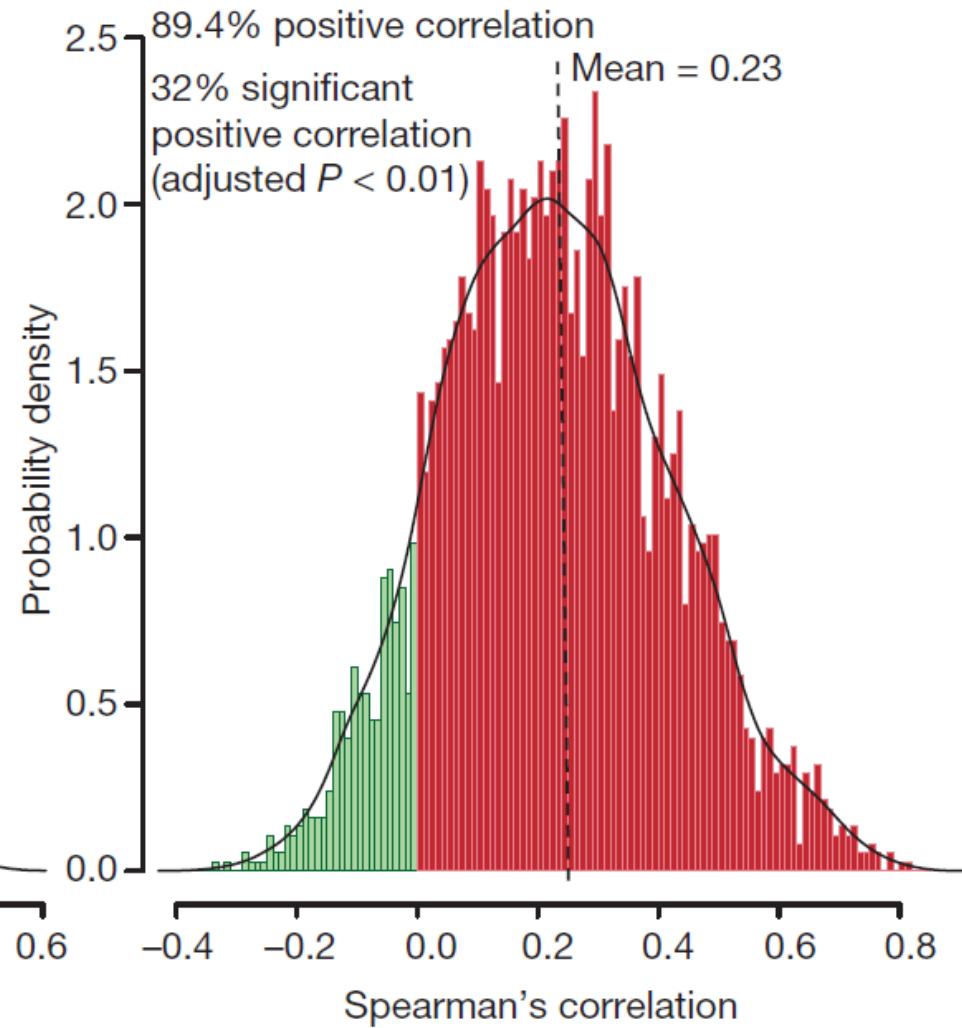
Central Dogma of Biology



The Cancer Genome Atlas

CLINICAL PROTEOMIC
TUMOR ANALYSIS CONSORTIUM

Re-writing Central Dogma “Rule”



On average across 375 tumor samples, **ONLY 33%** of DNA/RNA predicted cancer protein abundance



"...there is great potential for **new insights** to come from the **combined analysis** of cancer proteomic and genomic data, as proteomic data can now **reproducibly provide information** about protein levels and activities that are **difficult or impossible to infer from genomic data alone**..."

Douglas R. Lowy, MD

Acting Director of the National Cancer Institute, National Institutes of Health