Scientific Discovery and Application are Driven by Technology and Tools

- Technology and tools drive science and accelerate the pace of significant discoveries.

- Technology/tools needed to advance a discipline can be:
  - Physical
  - Methodological
  - Educational

- The generation of transformational technology/tools requires innovation, scientific rigor, specific expertise, and culture change.

- There are many examples of technology or science infrastructure tools transforming intradisciplinary science.

Impact of Sequencing Technology on Human Genomics

MILESTONES TIMELINE

1952	Electophoresis (Milestone 1)
1967	Discovery of DNA ligase (Milestone 2)
1969	FISH (Milestone 3)
1970	Discovery of restriction enzymes (Milestone 4)
	Discovery of reverse transcriptase (Milestone 5)
1972	Cloning (Milestone 2)
1975	Southern blot (Milestone 6)
1977	DNA sequencing (Milestone 7)
1980	RFLP concept (Milestone 8)
1982	P-element-mediated manipulation of the fly genome (Milestone 9)
	Whole genome shotgun (Milestone 10)
1983	RFLP realization (Milestone 8)
1985	PCR (Milestone 11)
	DNA fingerprinting (Milestone 12)
1987	YACs (Milestone 13)
	Site-directed mutagenesis of the mouse genome (Milestone 9)
1988	ChIP (Milestone 14)
1990	BLAST — the key to comparative genomics (Milestone 15)
1992	BACs (Milestone 13)
1995	Microarray technology (Milestone 16)
1998	RNAi (Milestone 17)
	Sequencing by synthesis (Milestone 18)
	Full-length cDNA technologies (Milestone 5)
2002	Launch of UCSC Genome Browser (Milestone 19)
2003	DNA assembly programs (Milestone 20)
2004	ENSEMBL — an example of a gene annotation tool (Milestone 21)
2005	HapMap (Milestone 22)
	Sequencing by ligation/polony sequencing (Milestone 18)
2006	Genome-wide maps of DNA methylation (Milestone 23)

Sequencing of the Human Genome

www.nature.com

Impact of Mouse Modeling Technology on Cancer Biology

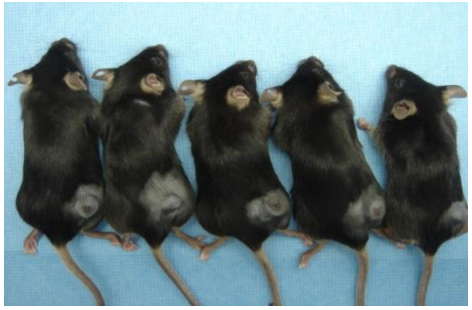
Inbred strains: 1920's

Nude: 1980s

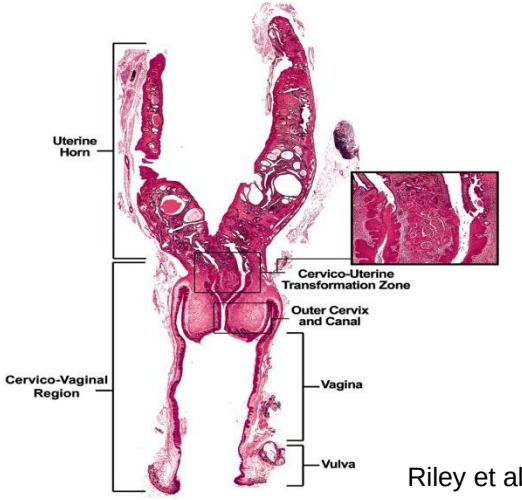
SCID: 1980s

Transgenics
Knock outs: 1990s

Clones: 2000s



Roberts et al Ca Cell, 2004



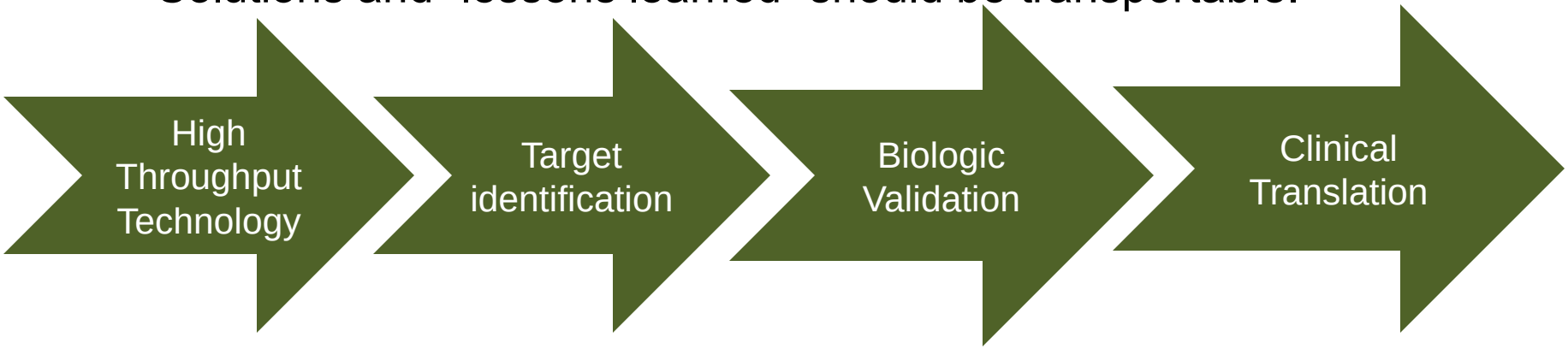
Riley et al Ca Res, 2003

Technology and Tool Development for Translational Science

- Many diverse technologies and tools held by different stakeholders.
  - In silos and scattered
- Until now, translational science technology and tool development has not been prioritized.
- Multidisciplinary research requires a broad array of technology/tools.
- Development often requires scientific collaboration of diverse disciplines.
  - Team approaches to resource development
- Translational research and discovery application requires active participation by the public.
  - Translational science not a public value

Unique CTSA Focus can Provide “Lessons Learned”

- Research the translational research process.
- Identify and solve barriers in innovative ways.
- Transform the environment and outdated translational technology.
- Accelerate translational science technology and tool application.
- Foster team science and eliminate silos.
- Engage the community as partners.
- Solutions and “lessons learned” should be transportable.

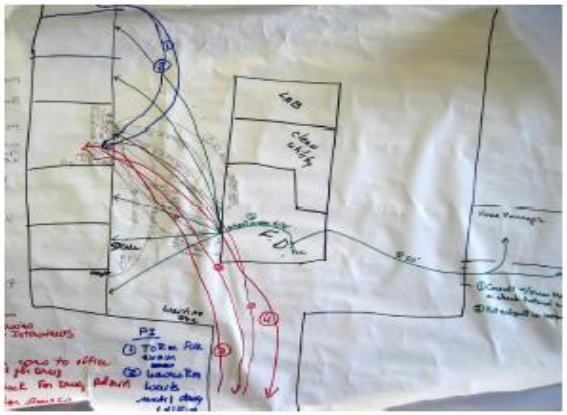


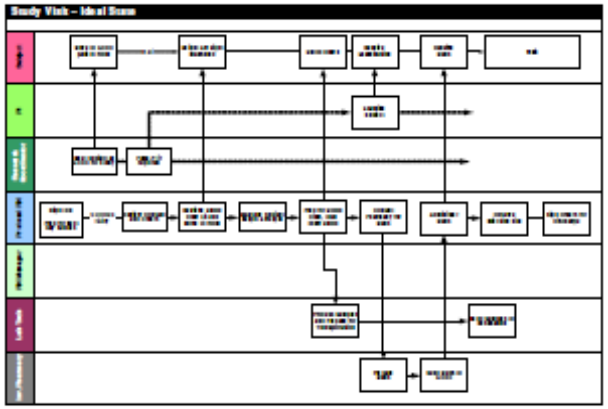
Enhancing the Role of NIH: **Identify and Solve Barriers in Innovative Ways**

CTSA

Transformation of existing CRCs using LEAN.

- Business oriented
- Services based on user need





- Decreased nursing overtime costs by 40% while maintaining same number of patient visits.
- Streamlined processes, eliminating resource based administrative staff and cutting overhead.
- Reduced the time of scientific review and study start-up by 50%.
- Initiated 2 new services (high volume specimen collection in volunteers and clinical laboratory) in spite of an overall 40% reduction in the CRC budget.

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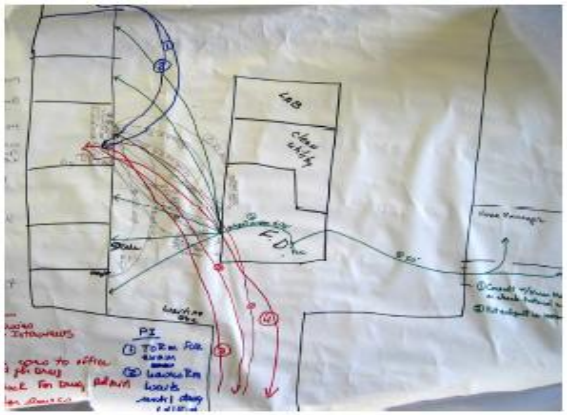

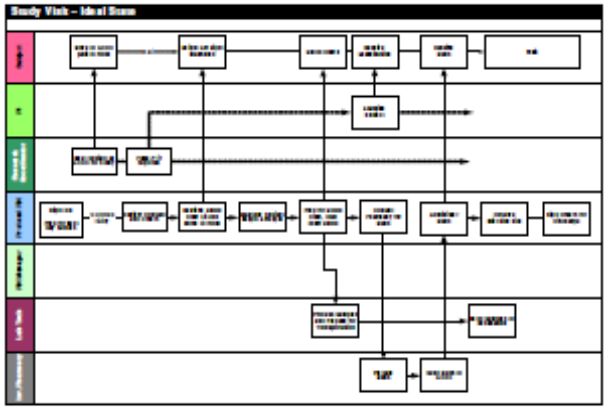

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NIH

NIH RAID Program

- Important and innovative program for translational science
- Slow application process
- Limited users based on eligibility restrictions
- Slow manufacturing
- Unclear capacity
- Complex outsourcing
- Lack of awareness of the resource

http://dpcpsi.nih.gov/eo/documents/NIH_Rapid_Access_to_Interventional_Development_Pilot_Program_Needs_Assessment_Evaluation_07-2010_NIMH.pdf

Enhancing the Role of NIH: **Accelerate translational science technology and tool application**

CTSA

Directory Of Technology Resources

We facilitate access to laboratory and clinical research resources across the greater Pacific Northwest region. Below are resources provided by our member institutions. You may also directly browse Fred Hutchinson shared resources and Seattle Children's resources.

If you prefer, browse resources by location.

To add a new resource, submit a resource center for consideration.

Search for:

Category of resources: <Any>

Campus location: <Any>

Services provided: <Any>

Search

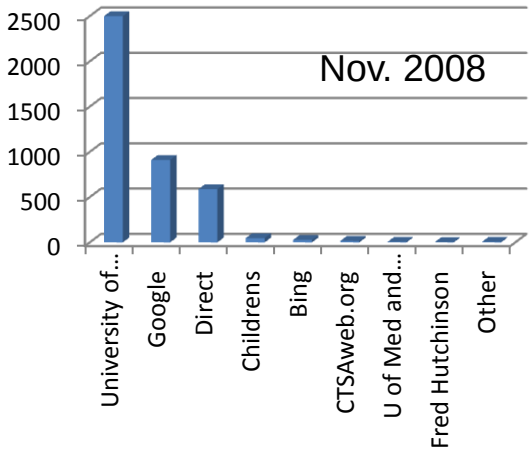
Animal/Living Organisms (bacteria, yeast, nematodes, flies, plants, fish, mice, etc.)

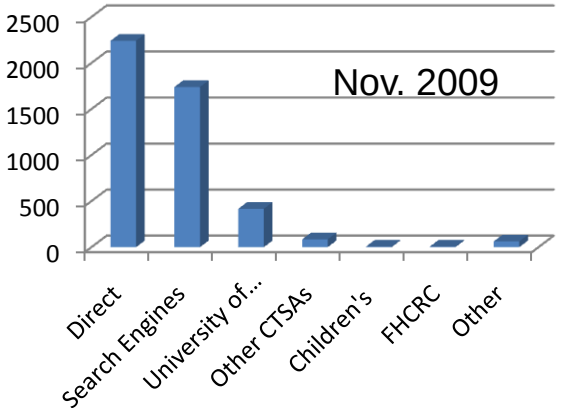
- BioMolecular Imaging Center
- CEEH Analytical Cytology Core (Facility Core 3)
- Center for Nanotechnology
- Center on Human Development and Disability
- Keck Microscopy Facility
- Mouse Behavioral Core
- Mouse Metabolic Phenotyping Center
- Small Animal Tomographic Analysis Facility (SANTA)
- Transgenic Resources Program
- UW Superfund Basic Research Program
- Washington National Primate Research Center

Biological Macromolecule Analysis (proteomics, x-ray crystallography, NMR spectroscopy, etc).

- BioSpectroscopy Core Research Facility

- 135 accessible shared resources from a 5 state region
- Linked with educational material re: resource
- Live technology consulting via PhD level scientist

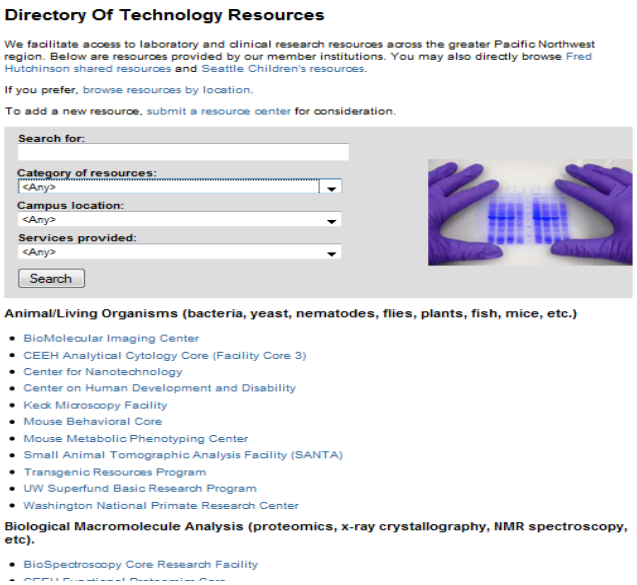




85% go onto to other web pages

Enhancing the Role of NIH: **Accelerate translational science technology and tool application**

CTSA



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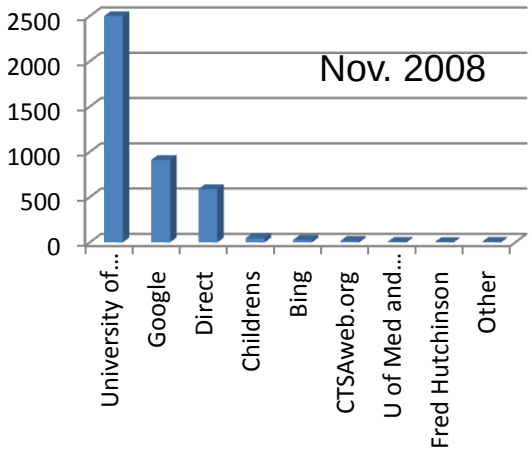

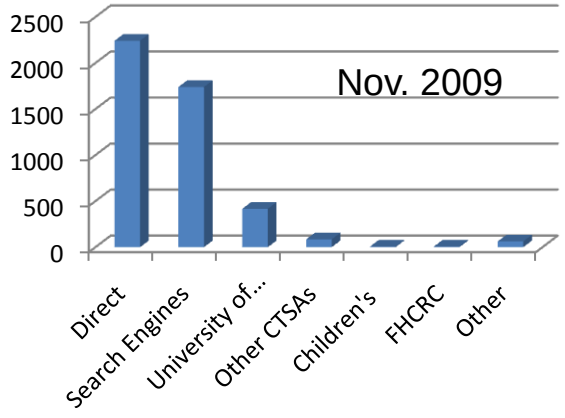

85% go onto to other web pages

NIH

HPV transgenic made in 1992
- 150 publications
- >80% biology based
- Few translational

NIH Repositories and Consortia

http://emice.nci.nih.gov/
http://cancermodels.nci.nih.gov
http://mouse.ncifcrf.gov/ …

Mouse models of human cancer consortium (MMHCC)
Comparative mouse genomics centers consortium (CMGCC)…

Enhancing the Role of NIH: **Engage the community as partners**

CTSA

2010 Summer Workshop for High School Science Students and Teachers

- *"I never realized how critical research is for medicine"*
- *"I would not think that a… researcher would be so caring, nice, and friendly"*
- *"I have always thought that research was for those who were extremely intelligent and tended to lack social skills"*

CTSA Partnership: WWAMI States Practice Based Research Network

- Research capacity in the community
- Teach principles and allow them to evaluate pressing problems
- Data warehousing-LC Data Quest
- Use of contraception in women taking teratogenic drugs
- 328 women identified across 7 rural pratcice sites: majority had no documentation of contraception, 12% evidence of informed consent-intervention
- Changed practice in these communities
- Strong interest for CTSA research partnerships

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NIH

- Numerous programs
- Little unification
- Common mission?
- Many superficial
- Need for a cohesive plan to galvanize the community to support translational research in many ways
- Need for leadership

Successful programs on a smaller scale:
Army of women:
www.dslrf.org/army/
Project LEAD, NBCC

Bridging the Gap: NIH and the CTSAs

- The CTSA program has developed many best practices and has many "lessons learned"-NIH should use it as a resource.

- Many existing resources within NIH could contribute greatly to translational science.
  - Catalogued appropriately?
  - Left in silos?
  - Operating efficiently?

- Evaluate data collected in the CTSA program to assess potential new resources for development.

- Encourage intramural integration around translational science (both within and outside NIH).

- National leadership in community integration and participation in translational science.