Update:
The Cancer HUman Biobank (caHUB)

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The Personalized Medicine Universe
Why Is It Difficult to Acquire High-Quality Specimens and Data?

- Collection, procession, storage procedures differ
- Degree and type of data annotation varies
- Scope and type of patient consent differs
- Access policies are lacking or unknown to potential users
- Materials transfer agreement conditions differ
- Supporting IT structures differ in capacity and functionality

→ WIDE VARIATION IN QUALITY OF SPECIMENS AND DATA
The NCI Addresses the Challenge

Consensus of the Broad Scientific Community:
The lack of high-quality, clinically annotated human specimens has become the limiting factor for translational cancer research.

The NCI Moves Stepwise Towards Solutions:

• Standards
  • The NCI’s Best Practices for Biospecimen Resources
• Science
  • The Biospecimen Research Network
• Specimens and Service
  • The Cancer Human Biobank

Key principles for a national biobank:

- **Standardized** procedures for biospecimen collection and distribution
- **Standardized** data sets and data vocabulary
- **Integrated** information technology system to support all functions
- **Harmonized** approached to ethical and legal issues
  - Standardized consent, MTAs
- **Transparent** governance and business models
  - Transparent access policies
- **Large** well-designed, standardized specimen sets
National Biospecimen Resource: caHUB

A unique, centralized, non-profit public resource that will ensure the adequate and continuous supply of human biospecimens and associated data of measurable, high quality acquired within an ethical framework and provide high-quality biobanking services to the community.

- **High-quality** samples and associated data
- **Prospective** scientific design of collection strategies
- **Standardized** processing and annotation of all specimens
- **Centralized** operations for QC, pathology analysis, storage
- **Publicly available** resource for human specimens and specimen-related services serving academia, industry, advocacy, government
- **Transparent** access policies
- **Cutting-edge**: leadership for biospecimen resources (biobanking tools, biospecimen science, training and education)
The Need for caHUB

- The need for caHUB has been clearly enunciated from all sources:
  - Survey of NCI investigators
  - Market research using focus group sessions with academia and industry decision-makers (OMB-approved; Strat@com-executed)
    - Focus group upcoming for regulators
  - Interviews with commercial tissue providers and industry users (economics considerations study by Booz Allen Hamilton)
  - caHUB Users Workshop
  - Mining of request data from the NCI Tissue Locator: last 7 years
  - Direct input to OBRR from potential users: CTEP, NCI Patient Characterization Center (PCC), numerous biomarkers programs
Stakeholder Feedback

Key Findings:
• Biospecimens come chiefly from local sources; little sharing occurs.
• Both the quality and quantity of available biospecimens are unsatisfactory.
• Research findings are questioned because of specimen quality.
• Research scope is limited by biospecimen availability.

Benefits of a National Biobank:
• Inspire confidence in quality of specimens.
• Ensure ethical collection standards.

Development Challenges:
• IP constraints.
• Infrastructure.

Barriers to Contribute:
• IP constraints.

Stakeholder Support:
Strong support for a national biobank concept from all stakeholders.

Benefits of a National Biobank:
• Standardize studies between labs.
• Unite the community around shared sense of mission.

Development Challenges:
• IP constraints.
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Barriers to Contribute:
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NCI Grantees Survey n=727
ASL Sessions with Sr. Academic Decision-Makers n=24 large
ASL Session with Sr. Pharma/Biotech Decision-Makers
Upcoming Interviews with Regulators n=7-9
There is clear and universal need for a National, Standardized, Human Biospecimen Resource (NSHBR)

For all audiences, the level of consistency and standardization that could be offered is the most important benefit

An NSHBR has the opportunity to define standard operating procedures (SOPs) for the field/industry

In fact, stakeholders are counting on it
Importance of Standardized Specimens and the Requirement for a National Biospecimen Resource

- Genomics and Personalized Medicine Act of 2007
- Institute Of Medicine Report: *Cancer Biomarkers, 2007*
- Dept. of Health and Human Services, *Personalized Health Care Report, Sept. 2007*
- President’s Council of Advisors on Science and Technology: *Priorities for Personalized Medicine, Sept. 2008*
- President’s Cancer Panel Report, *Maximizing Our Nation’s Investment in Cancer, Sept. 2008*
- Kennedy-Hutchison Cancer Bill (ALERT Bill: “War on Cancer, Part II”), 2009
- The NCI By-Pass Budget for FY2010
Folks at the National Cancer Institute (NCI) are heading up an effort to establish the U.S.'s first national biobank — a safe house for tissue samples, tumor cells, DNA and, yes, even blood — that would be used for research into new treatments for diseases. By fall, the group hopes to have mapped out a plan for a national biobank; the recent stimulus showered on the government by the Obama Administration might even accelerate that timetable.

Time Magazine March 23, 2009
Time Magazine November 25, 2009
caHUB: Centralized Model

• HIGH QUALITY SPECIMENS
• HIGH QUALITY DATA
• FROM PTS RECEIVING HIGH QUALITY CARE

Specimens and Data From Patients in COC-Approved Institutions

caHUB
High Quality Specimens
High Quality Data
From patients who receive High Quality Care

National Biospecimen Resource
Pathology Reference
Training & Education
Consulting Services

caBIG®

Centralized Resource: Cost and Quality Control Efficiencies

NCI/NIH
Other Government
Academia
Advocacy
Industry
Biospecimen Science: Moving Towards Evidence-Based SOPs

**Time 0**

Specimen is **viable** and biologically reactive

Molecular composition subject to further alteration/degradation

**Pre-acquisition**

**Post-acquisition**

- Patient
- Medical/Surgical Procedures
- Acquisition
- Handling/Processing
- Storage
- Distribution
- Scientific Analysis
- Knowledge Base
In high demand and short supply:

- **Benchmark samples**: biospecimens collected through standardized collection, handling, storage, processing and distribution procedures, with strict quality control and associated metrics
  - Data associated with process variables
- **Cases with multiple aliquots**: Confirmation of prior studies or the opportunity to contribute information to prior studies based on new technologies
- **Statistically valid numbers of biospecimen sets**
- **Fully defined “patient case sets”**
  - Tumor
  - Adjacent normal tissue
  - Tumor periphery (invasive border)
  - Pre- and post operative blood samples
  - Urine
  - Rich clinical data and outcome information for patients
caHUB Planning

- Planning committees operating for one year:
  - Administration
  - **Strategic planning**: mission, vision, scope, organizational structure, evaluation, milestones and success factors
  - **Normal tissue acquisition**: rapid autopsy (also metastatic tumor, premalignant disease)
  - **Biospecimens**: SOPs, prioritization strategies, collection design, quality control monitors, and qualifying metrics
  - **ELSI**: Ethical, legal and social issues
  - **Facilities** requirements and design
  - **Informatics** requirements, design, and implementation
  - **Partnerships** and business models
- **210 expert contributors to the process and products**
- **Delivery of final products (white papers, SOPs, other manuscripts) scheduled for March 2010; for publication and/or availability through OBBR website**
  - Independent value to broader biobanking community
caHUB Timeline

Planning

- Pathology Resource Center
- Working Groups
- Cost Recovery
- Market Research

Phase 1

- caHUB pilot
  - procurement
  - operations
  - data coordination
  - R&D
- PPP Development

Phase 2

- Centralization
- Expansion
- Special Collections
- Training Services
caHUB, A Transformative Initiative

- More Efficient Research
  - Reduction in re-experimentation due to higher quality samples
  - Avoided cost of incremental labor from PIs and lab technicians, researchers
  - Avoided cost of replacing failed samples because of higher sample quality
  - Avoided time delays and labor costs for recontact and reconsent of patients for new studies

- More Efficient Use of Resources
  - User leverage of caHUB’s systems infrastructure, reducing the need to purchase and maintain requisite infrastructure
  - User leverage of caHUB goods and services, decreasing labor costs to process samples in order to meet research requirements

- Ensured Implementation of Best Practices
  - Increased comparability (quality and uniformity) of specimen and data sets
  - Ensures compliance reducing implementation and monitoring costs

- Stronger Clinical Correlation
  - Quality and uniformity of data promotes more accurate modeling
  - Avoided re-collection of data, saving time and cost
caHUB, A Transformative Initiative

**More Efficient Product Development and Regulatory Approval**
- Higher quality samples helps advance biomarker research
- Higher quality specimens helps reduce clinical trials timeframes and costs
- FDA recognition of “platinum” status specimens may lead to more rapid approvals for new drugs and diagnostics

**More Efficient Technology Development and Clinical Implementation**
- Standardized biospecimens allows direct performance comparisons
- Benchmark biospecimens allows calibration, performance monitoring and operator proficiency testing

**Added Clinical Value: Improved Standards of Care**
- Speed the transition from research standards to standards of care
- More rapid implementation and standardization of diagnostic assays in clinical laboratories

**Improved Outcomes for Cancer Patients**
- Increase in lives saved
- Improvements in quality of life
- Positive impact on personal economics
- Savings to healthcare systems
- Positive impact on national economics (GDP, tax revenues)
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The Cancer Human Biobank vision:

- unique, centralized, non-profit public resource
- source of adequate and continuous supplies of human biospecimens and associated data of *measurable, high quality* acquired within an ethical framework
- source of high-quality biobanking services for the community
Update on Key Issues

- Verification of the need for caHUB
- Development planning
- Fundamental details
  - Who will provide the specimens
  - Who will use the specimens
  - How data will be collected and handled
  - How the specimens will be used (scientific purposes)
- Business plans and timelines
- Funding: $60M ARRA funds allotted to caHUB in 2009
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**Upcoming Interviews with Regulators**
- n = 7-9

**ASL Sessions with Sr. Pharma/Biotech Decision-Makers**
- n = 10

**ASL Sessions with Sr. Academic Decision-Makers**
- n = 24 large
- n = 13 small

**NCI Grantees Survey**
- n = 727

**caHUB User Workshop**

**Economic Considerations Study**

**Specimen Resource Locator**

**caHUB User Workshop**

**Dec 2008 Present**

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Importance of a National Biospecimen Resource Cited on Many Levels

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Process goal: Objective, realistic, quantitative

A quantitative prioritization matrix was developed using 9 criteria and a 3-tiered scoring system of importance for each.

9 criteria:
- Ease of collection
- Size of tumor at diagnosis
- Treatment by surgery
- Pre-resection treatment
- Need for new clinical tools for diagnosis and treatment
- Prevalence
- Increasing incidence
- Survival rates
- Cost to society

60 cancers selected (of 850) using NLM/SEER data

Weighting against scientific demand during launch phase
The caHUB Business Model: Economic Considerations

- A detailed 15-year Total Life Cycle Cost of Ownership (TLCO) planning model for building and operating caHUB developed based on:
  - Comprehensive caHUB supply chain/value chain framework
    - Encompasses all costs for (1) collection; (2) processing; (3) storage; (4) distribution; (5) infrastructure; and (6) administration
  - Data derived from an analysis of the current biobanking landscape
    - Interviews with >75 commercial and academic biobanking experts
  - "Risk-based" approaches to changing business parameters and impacts on costs
  - An iteratively refined approach to estimated costs
    - Cost baseline was revised and narrowed through numerous working sessions with key experts to inject realism into estimated costs
    - Continuous refinement of case flow accrual projections and processing protocols.
caHUB Collection Design:
Informed by User Need

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The caHUB Business Model: A Commodities and Services Model

**COMMODITIES:** Cost Recovery

Distribution of specimens and data
Increasing value of aliquots over time with increasing data richness: Time-dependent maturity

**SERVICES:** Revenue Generation

Build on existing infrastructure and improve return on investment: Not time-dependent

- **Biobanking services to other initiatives**
  - Other NCI/NIH
  - Rare diseases
  - Advocacy
- **Education and training**
  - Pathology and laboratory functions
  - Operating room functions
  - IT and data management
  - Biostatistical and analytic methods
- **Consulting services**
  - Biobanking methods and best practices
- **Biobanking support service to industry**
  - Assay development
  - Clinical trials
- **Laboratory space and services**
  - Research incubator functions
  - Longer term in-house research contracts
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