Prostate Cancer Biobanking

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Biospecimen and Biobanking
What are biospecimens?

- Tissue
- Blood
- Urine
Biospecimen

SOURCE:
• Biopsy as standard-of-care procedure
• Donation for research
• Excess normal tissue

COLLECTION:
• Blood draw
• Cheek swab
• Urine collection
• Biopsy
• Surgery
Past: Biospecimen collection without consent

Henrietta Lacks’ ‘Immortal’ Cells

Journalist Rebecca Skloot’s new book investigates how a poor black tobacco farmer had a groundbreaking impact on modern medicine

By Sarah Zeinski
Smithsonian.com, January 22, 2010

More from Smithsonian.com

- Gene Therapy in a New Light
- Black History and Heritage Month
- Women's History Month

Medical researchers use laboratory-grown human cells to learn the intricacies of how cells work and test theories about the causes and treatment of diseases. The cell lines they need are “immortal”—they can grow indefinitely, be frozen for decades, divided into different batches and shared among scientists. In 1951, a scientist at Johns Hopkins Hospital in Baltimore, Maryland, created the first immortal human cell line with a tissue sample taken from a young black woman with cervical cancer. Those cells, called HeLa cells, quickly became invaluable to medical research—though their donor remained a

SOURCE: Smithsonian.com

Indian Tribe Wins Fight to Limit Research of Its DNA

Edmond Tlalatwi, 56, who can climb the eight miles to the rim of the Grand Canyon in three hours. More Photos

By AMY HARMON
Published: April 21, 2010

SUPAI, Ariz. — Seven years ago, the Havasupai Indians, who live amid the turquoise waterfalls and red cliffs miles deep in the Grand Canyon, issued a “banishment order” to keep Arizona State University employees from setting foot on their reservation — an ancient punishment for what they regarded as a genetic-era betrayal.

Members of the tiny, isolated tribe had given DNA samples to university researchers starting in 1990, in the hope that they might provide genetic clues to the tribe’s devastating rate of diabetes. But they learned that their blood samples had been used to study

SOURCE: The New York Times
Today: Biospecimen privacy protection

- Sample is coded with a unique identifier.
- Barcode renders biospecimens:
  - Identified
  - Identifiable
  - Anonymized
  - Anonymous

Photo credit: Katherine Briant
Source: Fred Hutchinson Cancer Research Center
Why are biobanks important?

- Centralized, controlled repository of patient data.
- Data/specimen can be processed and stored for later research.
- Can validate emerging tests or treatments.

Photo credit: Linda Bartlett | Source: NCI
Learning from the group to tailor treatments to the individual or **group of individuals** most at risk
Center to Reduce Cancer Health Disparities – NCI

- Biobanking and Biospecimen.
- Collaboration with TCGA.
- GMaP.
- Empowering/funding investigator to pursue the basic science of cancer health disparity
Mission: Cancer Registry

• Meet the challenge to collect racial and ethnic biospecimens to ensure all populations are afforded the best cancer care

• Overcome myths and provide knowledge regarding the importance of biospecimens to communities

• Prepare investigators to utilize platforms and emerging technologies to reduce cancer health disparities
Collaborate with TCGA (The Cancer Genome Atlas (NHGRI & NCI)) to collect racial/ethnic biospecimens

- **Charge:** Drs. Springfield, Shaw and Varmus
- **Cancer focus:** Breast and Prostate

**TCGA - Shared Resource:** Confidential stringent set of criteria in order to conduct ‘omic platforms and sequencing technologies

- Provides biological characteristics for cancer types that may be contributing to a disparity between population groups
- Up to 500 samples each to create genetic profile
- Need statistical power to produce a complete genomic profile of each cancer
- Information essential to determine best targets for drug development
TCGA: “No Platform Left Behind”

25 forms of cancer

- glioblastoma multiforme (brain)
- squamous carcinoma (lung)
- serous cystadenocarcinoma (ovarian)

Etc. Etc. Etc.

Multiple data types

- Clinical diagnosis
- Treatment history
- Histologic diagnosis
  - Pathologic report/images
- Tissue anatomic site
- Surgical history
- Gene expression/RNA sequence
- Chromosomal copy number
- Loss of heterozygosity
- Methylation patterns
- miRNA expression
  - DNA sequence
  - RPPA (protein)
- Subset for Mass Spec

Biospecimen Core Resource with more than 150 Tissue Source Sites

- 6 Cancer Genomic Characterization Centers
- 3 Genome Sequencing Centers
- 7 Genome Data Analysis Centers

Data Coordinating Center
TCGA: The Pipeline for Comprehensive Characterization

- **Pathology QC**
- **DNA & RNA Isolation, QC**
- **Sequencing**
- **Expression, CNA & LOH, Epigenetics**
- **Data and Results Storage & QC**

**Integrative Analysis**

**Comprehensive Characterization of a Cancer Genome**

- **CRCHD & Other Collaborators**
- **GDAC**

**Legend**
- **= Process**
- **= Data**
- **= Results**

**Color Code**
- **BCR**
- **GSCs**
- **CGCCs**
- **DCC**
- **GDACs**
Cancer Health Disparities
Geographic Management Program (GMaP)

GMaP is a regional strategy to build critical “hubs” for support and efficient management of cancer health disparities research, training and infrastructure programs.

BMaP
Biospecimen Science

IMaP
Bioinformatics

CTMaP
Clinical Trials

EMaP
Advanced & Emerging Technologies

Electives
Prostate Cancer
Screening Guidelines for the Early Detection of Prostate Cancer

American Cancer Society-2005

• The prostate-specific antigen (PSA) test and the digital rectal examination (DRE) should be offered annually, beginning at age 50, to men who have a life expectancy of at least 10 years.

• Men at high risk (African-American men and men with a strong family history of one or more first-degree relatives diagnosed with prostate cancer at an early age) should begin testing at age 45. Starting at age 40 can be considered.

• For men at average risk and high risk, information should be provided about what is known and what is uncertain about the benefits and limitations of early detection and treatment of prostate cancer so that they can make an informed decision about testing.
My 40 yr. old annual checkup - 2011
William Jimenez M.D.
## Risk of Death From Prostate Cancer by Age and by Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Risk during the next 15 years (per 1,000 men)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At age 50</td>
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<tr>
<td><strong>All</strong></td>
<td>2</td>
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<tr>
<td><strong>African American</strong></td>
<td>5</td>
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<tr>
<td><strong>American Indian &amp; Alaska Native</strong></td>
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<td><strong>Asian &amp; Pacific Islanders</strong></td>
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</tr>
<tr>
<td><strong>Hispanic</strong></td>
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</tr>
<tr>
<td><strong>White</strong></td>
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</tbody>
</table>
Prostate Cancer Disparities

Incidence, 1998-2002

Mortality, 1998-2002

Advanced PCa

12.3% Blacks
10.5% Latinos
6.3% Whites

“Latinos are more similar to African Americans on socio-demographic characteristics but more similar to Non-Latino Whites on clinical presentation, treatment received, and 5-year disease-free survival”

Latini et al., Differences in Clinical Characteristics and Disease-free Survival for Latino, African American, and Non-Latino White Men with Localized Prostate Cancer: Data from CaPSURE. Cancer 2006;106(4):789-795.
Prostate Cancer Biobanking And Genetic Disparity
Possible reasons for race-related disparity with prostate cancer

**Incidence**
- Genetic factors
- Environmental/dietary factors

**Mortality**
- Genetic factors
- Choice of treatment
- Stage at presentation
- Economic
- Cultural
Premise – Aberrant fusion proteins are associated with Lethal Prostate Cancer

Hypothesis – Chromosomal abnormalities associated with fusion proteins are associated with ethnicity

- Weill Cornell Biobank AA Male
- North Carolina louisiana Biobank AA Male
- SWOG Biobank AA Male
Premise – Aberrant fusion proteins are associated with AA males in national registries

Hypothesis – There may be differences within AA male populations reflecting regional ancestral origins and dietary choices

Weill Cornell Biobank AA Male
North Carolina Louisinana Biobank AA male
SWOG Biobank AA Male
Hypothesis – These differences can be detected earlier based on fusion proteins found in the urine before the cancer diagnosis.

Premise – There are some regional differences likely reflecting genetic, epigenetic and dietary differences.

Database Mining Part III

- AA Male 10024
- AA Male 10030
- AA Male 11226
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