Indian Biobanks: Concepts and Prospects

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What is a Biobank?

► A Biobank is a **depository for biomaterials** from a representative portion of a human population.

► The Biobank acts as a **vault with intricate detailed information** pertaining to the individuals from whom biological materials have been collected.

► **Data collection** and proper **cataloging** are essential components for the success of a Biobank.
Types of Biobanks

- Tissue bank – (i) Surgical tissues, (ii) Transplant tissues
- Cancer / Tumor bank
- Cord blood / Stem cell bank
- Blood bank – Dried Blood Spots
- Body fluids – (i) Synovial, (ii) Urine, (iii) Sputum, (iv) Buccal scrapings, (v) Sperm
- DNA / RNA bank
- Cornea bank
Functional Divisions of a Biobank

- Cell and Molecular Biology
- Blood Center
- Pathology
- Genetics
- Bioengineering
- Cryobiology
- Bioinformatics
- Ethics
Utilities of a Biobank

► **Routine work** – health centers, hospitals, blood transfusion centers and Public / Private pathological laboratories.

► **Research work** – biomedical experiments for a particular disease in a specific population.

► **Epidemiological work** – monitoring in susceptible populations after disease outbreak, poisoning and / or pollution.
Biobanks to Aid Research

Patient Samples in Biobank

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Molecular Profiling of Samples

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Isolation of Genes and Proteins

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Genomic Analysis

Identification of Novel SNPs

Proteomic Analysis

Identification of Disease-specific Novel Proteins
Biobanks:

Ethical / Safety Issues

- For tissue banking, freely given informed patient consent is mandatory.
- Patient consent forms need to be upgraded from time-to-time following IRB regulations.
- Model Consent Form: University Hospital Aintree, Liverpool, U.K.
- Confidentiality – very important!
- QA and QC checks necessary right from planning, implementation, up to documentation and analysis.
- Safety is crucial: MSDS to be distributed among staff for entire chemical compounds kept at the biobank.
SOME OF THE WORLD’S LARGEST BIOBANKS

UK Biobank
- Blood: Yes
- Urine: Yes
- Saliva: No
- Goal: 500,000
- Status: 100,000
- Cost: $122 Million
- Any other comments: Recruits only adults aged 40–69. Planned completion by 2010.

LifeGene (Sweden)
- Blood: Yes
- Urine: Yes
- Saliva: No
- Goal: 500,000
- Status: Planning stage
- Any other comments: Pilot study planned for 2009.
- Cost: $169 Million

Children’s Hospital of Philadelphia
- Blood: Yes
- Urine: Yes
- Saliva: No
- Goal: 100,000
- Status: 48,000
- Cost: $60 Million
- Any other comments: Follow-up of medical records via hospital’s integrated databases. Status includes 36,000 children.

Estonian Genome Project
- Blood: Yes
- Urine: Yes
- Saliva: Yes
- Goal: 100,000
- Status: 17,000
- Cost: $20 Million
- Any other comments: Project stalled for several years. Recruitment has restarted under government control.

Joondalup Family Health Study (Australia)
- Blood: Yes
- Urine: Yes
- Saliva: Yes
- Goal: 80,000
- Status: Recruiting
- Cost: $140 Million
- Any other comments: Measures as many as 3,500 traits. Cost is for first 3 years only.

Kadoorie Study of Chronic Disease (China)
- Blood: Yes
- Urine: Yes
- Saliva: Yes
- Goal: 500,000
- Status: 480,000
- Cost: UNAVAILABLE
- Any other comments: Aims to study genetic and environmental factors including smoking and premature death.
• The MD Anderson Cancer Center is an example of a model Tumor Biobank.

• India can follow the MD Anderson model to start cancer tissue repositories in various cancer hospitals.
Concept of an Indian Biobank

Steering / Ethics Committee

International Advisory Board

Indian Biobank Board

Funding Agencies

MANAGEMENT & GOVERNANCE:
Clinicians, Geneticists, Lawyers, Basic Scientists, Sociologists, Epidemiologists, Statisticians, Ethicists
Biobanks in India

Brain Biobank

NI MHANS, Bangalore

Cancer Biobank

ACTREC, Mumbai
Repositories in India

Organ Retrieval Banking Organization (ORBO), AIIMS, New Delhi

National Repository for Cell Lines / Hybridomas, NCCS, Pune

Mycobacterial Repository, JALMA, Agra
Dried Blood Spots (DBS) : A Novel, Cost-Effective Alternative to Serum Samples

- Cheap – per person cost 20 times lesser than UK biobank!
- Convenient for patient and collector.
- Patient Compliance – only 5% refusal as compared to 40% refusal for blood samples.
- Storage at room temperature.

Health surveyor collecting a DBS sample in the field

Source: Science 2007; 318: 1074-1075
India’s Prospects

- India has a population of over a billion and is the world’s largest democracy.
- India has a very high burden of both communicable and non-communicable diseases.
- India has the means to make a modest start towards establishing a Biobank.
Thank You !