Session 2 Panel Discussion

- **Questions:**
  - Which technologies do you feel are ready for "prime time" in epidemiologic research and for what purpose?
  - What criteria would you use to determine when emerging technologies should be integrated into epidemiologic research?

- **Moderator:** Stephen J. Chanock, M.D., DCEG, NCI

- **Panelists:**
  - Zdenko Herceg, Ph.D.
    International Agency for Research on Cancer
  - Thomas A. Sellers, Ph.D., M.P.H.
    Moffitt Cancer Center
  - Michael Snyder, Ph.D.
    Stanford University
  - Georgia D. Tourassi, Ph.D.
    Oak Ridge National Laboratory

Stephen Chanock, M.D.
Division of Cancer Epidemiology and Genomics, National Cancer Institute

International Agency for Research on Cancer

World Health Organization

Painting by 8 year…..

How does technology help us recognize the features of human disease?

- **When is it the right time?**
- **Moments of opportunity**
- **Validity- means many different things to different investigators**
- **Sharing perspectives/data**

Time for Somatic Molecular Epidemiology

- **Exposure to Susceptibility to Somatic to Outcomes**

Zdenko Herceg, Ph.D.
International Agency for Research on Cancer

1. Technologies that are ready for "prime time" in epi. research?

- Mechanism-based exposure (second generation) biomarkers: "omics" and pathway-specific approaches
- Advances in epigenomics and complete understanding of "normal" epigenome landscapes and dynamic variability in tissues (early life, aging)
- "Exposome" concept and approaches to capture the totality of environmental exposures. Refinements in personal and environmental monitors, geographic information systems, and more sophisticated questionnaires provide complementary approaches.
- New bioinformatic tools and genomic databases (ability to integrate mol, data across different platforms and provide comprehensive portraits of cancer sub-types to reveal aetiology and prevention opportunities

2. Criteria for integrating emerging technologies into epi. research?

-Sensitive and quantitative measurement (single cell omics?)

-Compatibility with high throughput and genome wide settings (NGS?}

-Applicability to biobanks associated with large prospective studies and population-based cohorts

-Cost effectiveness

Thomas A. Sellers, Ph.D., M.P.H.
Moffitt Cancer Center

MyMoffitt Patient portal

Patient incentives to use:

- Facile interface with Moffitt (schedule appointments, get prescriptions, pay bills, etc.)
- Access to medical record
- Join support groups
- “Smart” web search tailored to their disease
- Find clinical trials tailored to their specific situation

Enables research through:

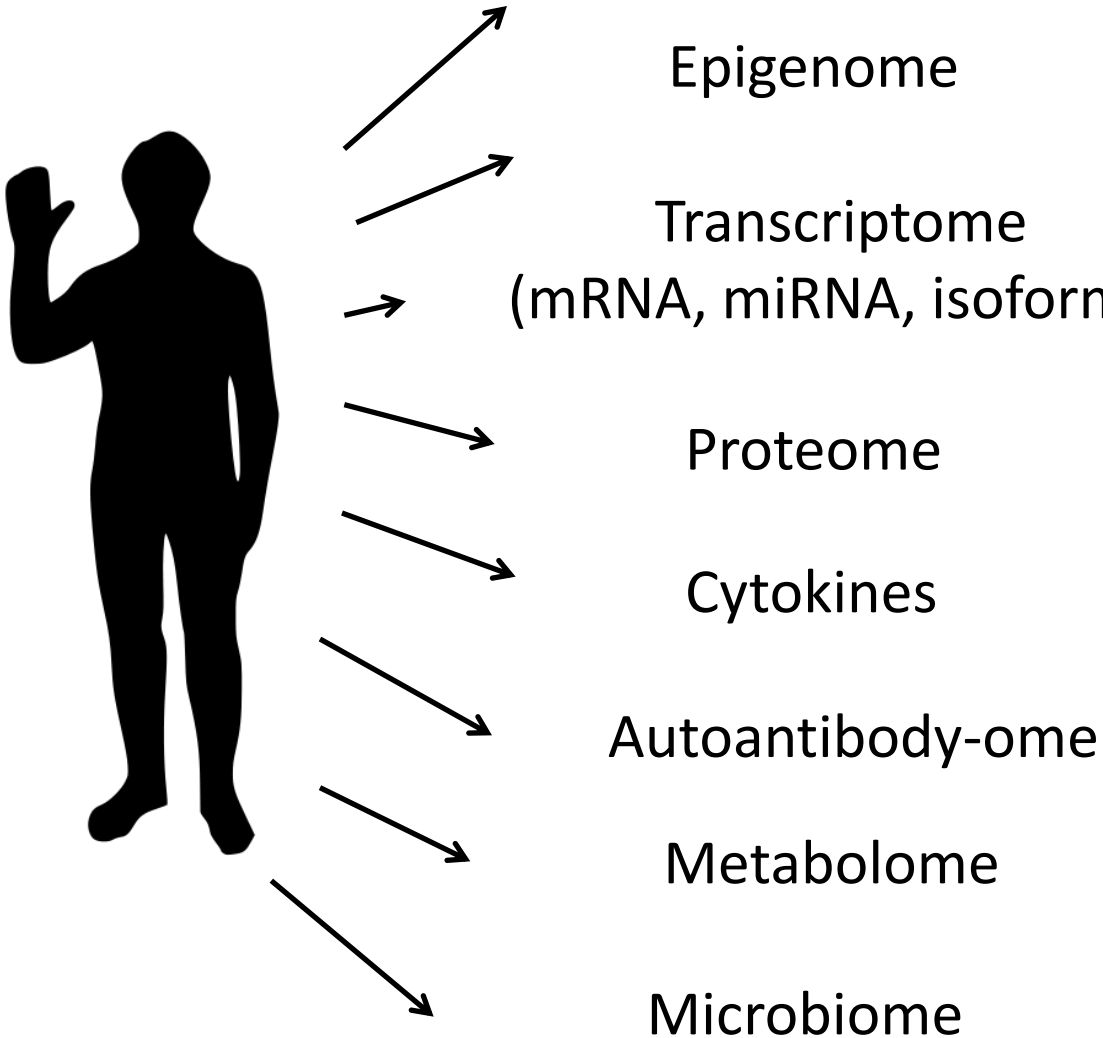
- Cost-effective means to collect patient-provided data in discrete format
- Video consent for protocol
- Copies of consent available
- Vehicle for follow-up surveys
- Patient engagement with the portal ensures high participation

Launched in 2009, 29,000 accounts created and monthly logins are 12,000 and rising. 84% of new patients create an account.

Michael Snyder, Ph.D.
Stanford University

Snyder: Integrative Personal "Omics" Profiling (iPOP)

Assays



Genome

Epigenome

Transcriptome
(mRNA, miRNA, isoforms)

Proteome

Cytokines

Autoantibody-ome

Metabolome

Microbiome

Sampling

Healthy
Every 2-3 months

↓

Ill (Initially)
Every day

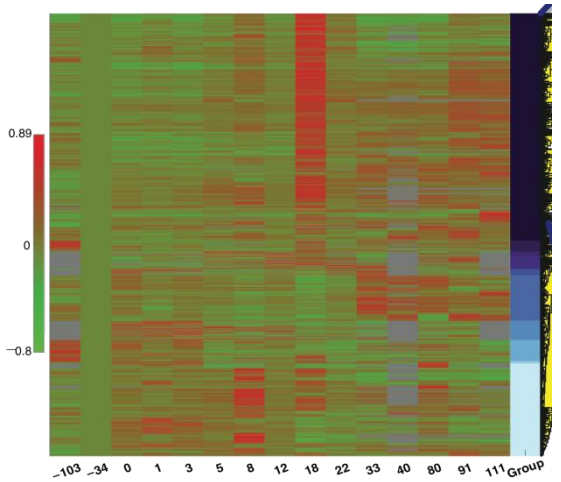
↓

Post Ill
Every 4-7 days

↓

Healthy
(Every 2-3 months

Integrative Analysis



Conflicts: Personalis, Genapsys, Illumina

Georgia D. Tourassi, Ph.D.
Oak Ridge National Laboratory

Information Technologies Can Help Epidemiological Research Bridge The Gap Between Data and Action

Georgia Tourassi, PhD - Oak Ridge National Laboratory

- **Advances in information technologies make possible data-driven epidemiological knowledge discovery in a dynamic, time-efficient, and cost-effective manner.**

- **Critical issues for integrating information technologies into epidemiologic research:**
  - The quality of the discovered knowledge depends on (i) the quality of the available data, (ii) the reliability of the informatics tools, and (iii) the sophistication of the knowledge discovery approach.
  - The clinical significance of the discovered knowledge depends on (i) the allowable margin of error and (ii) the implications of the derived information for the specific application domain.
  - Good practice methods and quantitative performance evaluation metrics are essential.

Good practices from the machine learning community:

- Data repositories
- Benchmark databases to compare alternative technologies
- Sophisticated cross-validation schemes to assess reliability
- Sequestered datasets for final testing

Good practices from the medical community:

- Controlled experiments
- Cost-effectiveness consideration when considering threshold of action

  - Capable, scalable, sustainable infrastructure

- **Effective mechanism for hypotheses generation**