

# Genes and Environment Initiative (GEI) Exposure Biology Program

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NIEHS



U.S. Department of Health and Human Services  
National Institutes of Health  
National Institute of Environmental Health Sciences

# HHS Secretary's Initiative Announced Feb 8, 2006

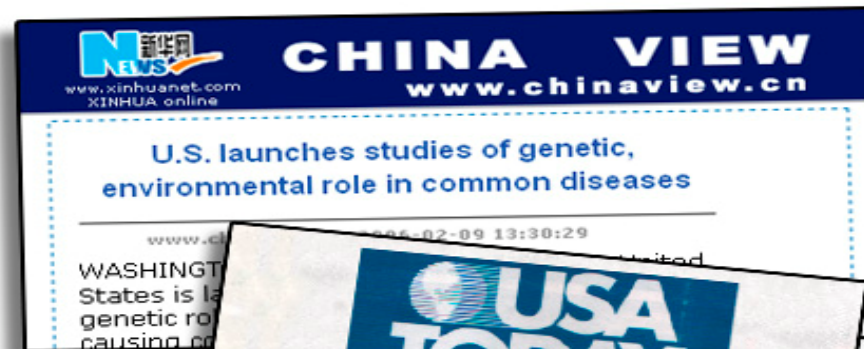
## Genes and Environment Initiative (GEI):

### Two research components:

- Genetics Program
- Exposure Biology Program

### NIH Coordinating Committee:

David Schwartz (NIEHS) and Francis Collins (NHGRI) to co-chair



# Genes and Environment Initiative

## EXPOSURE BIOLOGY PROGRAM



Develop technology and biomarkers

- Diet
- Physical Activity
- Environmental Exposures
- Psychosocial Stress and Addictive Substances

## GENETICS PROGRAM



Identify genetic variants

- GWA Studies
- Data Analysis
- Replication
- Sequencing
- Database
- Function
- Translation

**GXE**

# **The Genes and Environment Initiative (GEI)**

- **Proposed in the President's budget for FY07**
- **Aims to accelerate understanding of genetic and environmental contributions to health and disease**
- **Two components:**
  - **Genotyping of case-control studies of common disease**
  - **Development of innovative technologies to measure environmental exposures, diet, physical activity, psychosocial stress, and addictive substances**

# Genes and Environment Initiative: Exposure Biology Program

## EXPOSURE BIOLOGY PROGRAM



Develop technology  
and biomarkers

- Diet
- Physical Activity
- Environmental Exposures
- Psychosocial Stress and Addictive Substances

## GENOME WIDE ASSOCIATION STUDIES



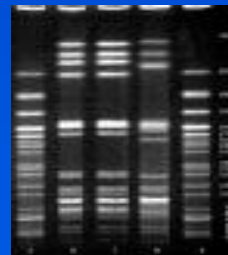
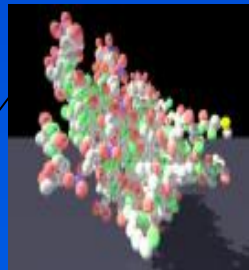
Identify genetic  
variants

**GXE**



# Goal: match precision of exposure and genetics measurements

Genetic analysis (SNPs)

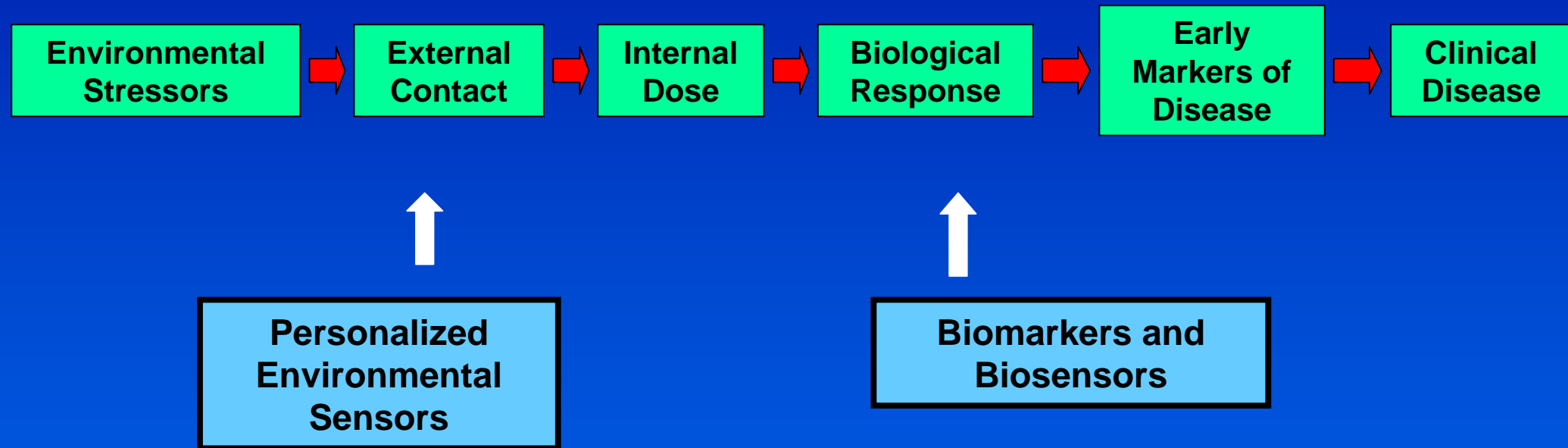


**We need the same level of precision for genetic and exposure data to study GXE in disease**

Personal exposure measurement



# Exposure Biology Program: Areas of Emphasis



**Links personal exposures to biology to disease**

Adapted from National Research Council, 1987



# Exposure Biology Program: Funding Opportunities

- **Environmental Sensors (\$10M/yr, FY07-FY10)**
  - Chemical/biologic agents (\$4M/yr; NIEHS)
  - Diet and physical activity (\$4M/yr; NCI/NHLBI)
  - Psychosocial stress and addictive substances (\$2M/yr; NIDA)
- **Biomarkers of Response (\$8.5M/yr; FY07-FY10)**
  - Biological Response Indicators of Environmental Stress (\$4M/yr; NIEHS)
  - Biological Response Indicators of Environmental Stress Centers (\$4.5M; NIEHS)

# Exposure Biology Program: Deliverables

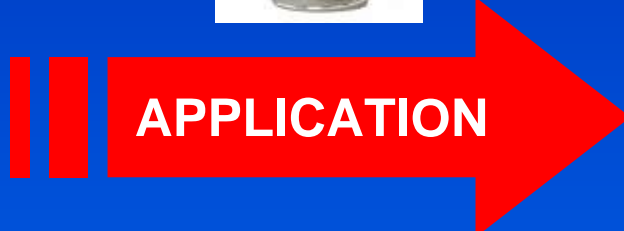
FY07                      FY08                      FY09                      FY10                      FY11

## Environmental Sensors

- Diet/Physical Activity
- Chemicals/Biologics
- Psychosocial Stress/Addictive Substances



**DEVICES**

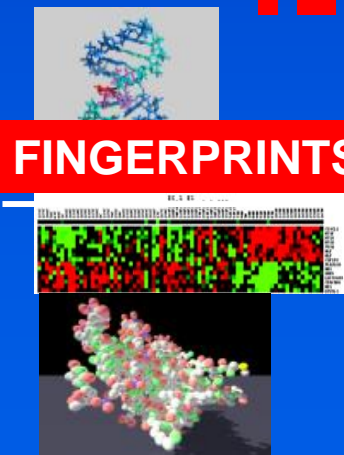


**GWA**

## Biological Response

- Biomarkers
- Centers – biomarkers/biosensors

U01



**FINGERPRINTS**

U54  
SBIR



**DEVICES**

# **Integration of GEI Genetics and Exposure Biology Components**

- **Genetics Program will give priority to selecting studies for GWA genotyping with stored biospecimens, high-quality environmental exposure data, and evidence for environmental influences on the trait**
- **Exposure Biology Program will give priority to developing novel assessment technologies for substances with presumed proximity to genetic effects while focusing on public health problems**
- **New biomarkers developed through GEI will be applied to stored specimens in the genome-wide association studies supported through GEI**

# Genes and Environment Initiative

## EXPOSURE BIOLOGY PROGRAM



Develop technology  
and biomarkers

## GENOME WIDE ASSOCIATION STUDIES



Identify genetic  
variants

**GXE**

- GEI Studies
- IC Priority Diseases
- Future Cohort Studies