

# New Vision for NIEHS and NTP

Linda S. Birnbaum, Ph.D., D.A.B.T., A.T.S  
Director

National Institute of Environmental Health Sciences  
National Toxicology Program

Advisory Committee to the Director, NIH  
December 4, 2009



# National Institute of Environmental Health Sciences

- NOT in Bethesda area
  - Research Triangle Park, NC
- Wide variety of programs supporting our mission of environmental health:
  - National Toxicology Program
  - Intramural laboratories
  - Extramural funding programs
- Funding from 3 Congressional Committees
  - Health – Regular NIH appropriation
  - Interior - Superfund Research Program and Worker Training
  - Energy - Worker Training Program



# Our Commitment : *Translating Bench Science into Environmental Public Health*



## NIEHS FY2010 Funding (Dollars in Thousands)

	FY2009 Enacted	FY2009-10 Stimulus	FY2010 President's Request	FY2010 House Mark	FY2010 Senate Mark	FY2010 Appropriation
<b>NIH</b>	\$30,317,024	\$10,380,703	\$30,758,788	\$31,258,788	\$30,758,788	??
<b>NIEHS (from HHS)</b>	\$662,820	\$168,057	\$684,257	\$695,497	\$683,149	??
<b>Superfund</b>	\$78,074	\$19,297	\$79,212	\$79,212	\$79,212	\$79,212
<b>DOE Training</b>	\$10,000			\$10,000	\$10,000	\$10,000
<b>Total NIEHS</b>	\$750,894	\$187,354	\$763,469	\$784,709	\$772,361	??



## NIEHS Division of Intramural Research

- Basic, applied and epidemiological research to understand biological consequences of environmental exposures
- Interactive and interdisciplinary
- High risk and long term research
- 12 laboratories and branches
- Exploring and understanding
  - The epigenome
  - Asthma
  - Neurodegenerative diseases
  - Altered DNA repair
  - Systems biology
  - Gene-environment interactions
  - Fetal basis for adult disease
  - Endocrine disruptors
  - Cancer
- New Clinical Research Unit opened July 2009



# The Environmental Polymorphisms Registry

## Linked DNA Biobank

- N=15,000 subjects in central North Carolina
- GIS coding allows for link to environmental exposure information
- Racial/ethnic diversity (30% minority population)
- Collection of DNA and personal information – contact information, demographics

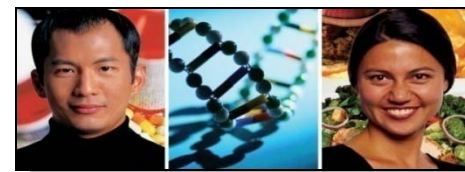


## Recruit by genotype resource

- Screen DNAs to identify subjects with specific genotypes of interest
- Recruit subjects for phenotypic studies based on their genotype
- Examine gene-environment interactions with respect to phenotypes of interest
- Potential to be adult parallel of the National Children's Study

## Phase I

- Establish EPR consortium -- 25 DIR investigators
- 110 environmental response genes nominated for initial study
- Genotyping of functional SNPs underway in N=4000 nested cohort
- Phenotyping studies to begin in early 2010



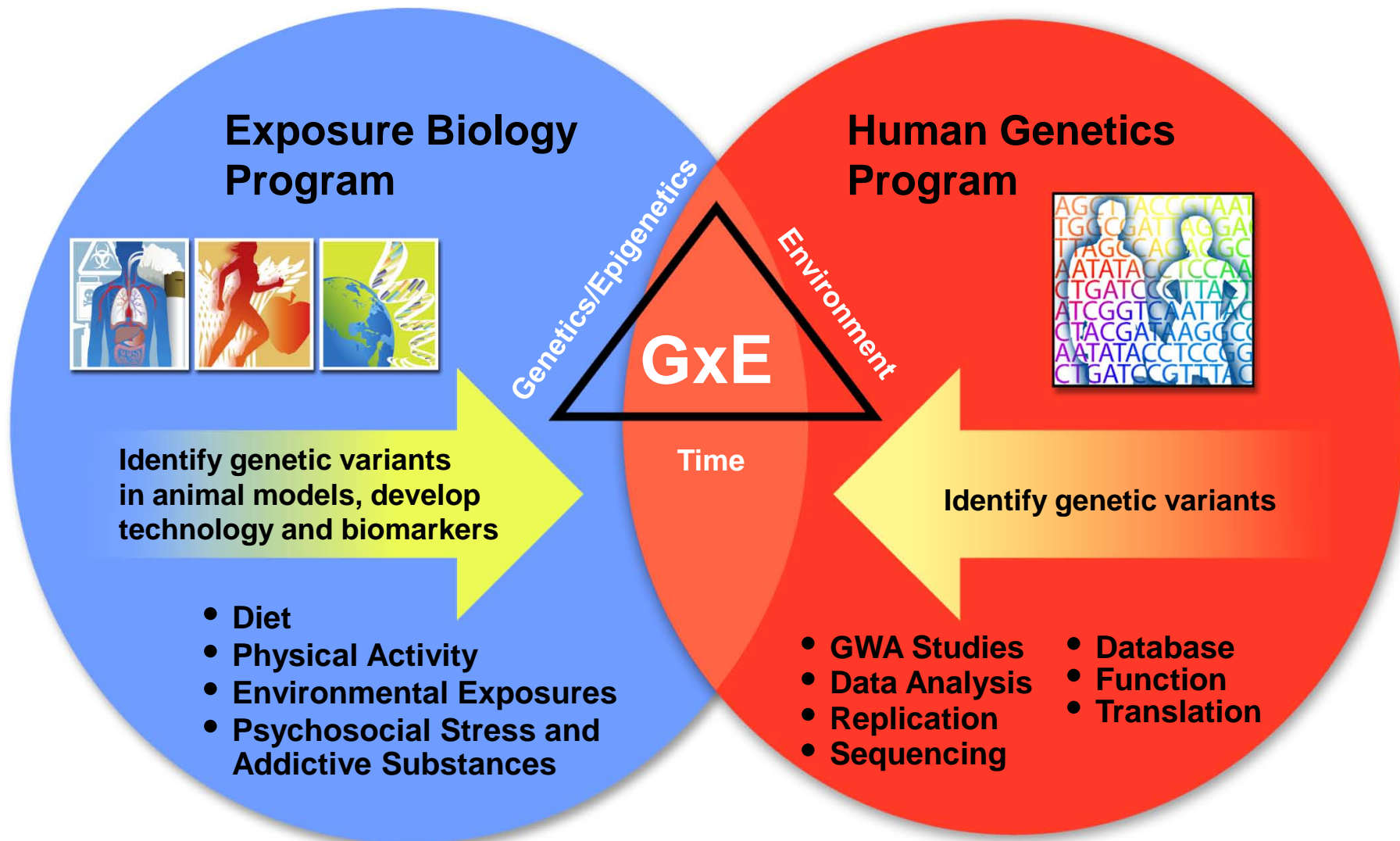
# NIEHS Division of Extramural Research and Training A Collaborative Scientific Enterprise



- Children's Environmental Health and Disease Prevention Research Centers
- Centers for Oceans and Human Health
- Obesity and the Built Environment program
- Autism: Early Autism Risk Longitudinal Investigation
- Many more...

# The Genes, Environment, and Health Initiative

## *Genetic Susceptibility - Linking Exposure to Disease*





# Breast Cancer and the Environment Program

- Define how environmental agents affect lifelong risk of breast cancer
  - Identify potential windows of susceptibility
  - Apply GxE approach using direct measures of exposures & diet, polymorphism analysis, & comparison with animal models
  - Address concerns of communities / advocates in the research arena
  - Provide education and messages to enable informed lifestyle choices through outreach activities, forums, mentor activities



# Partnerships for Environmental Public Health: Goals

- Strategically coordinate and integrate the various new and existing initiatives that involve communities and scientists working together on contemporary issues in Environmental Public Health research
- Develop and evaluate strategies to communicate environmental public health messages to a diversity of audiences
- Create and provide materials to increase awareness and literacy about environmental health risks
- Evaluate program contributions to the advancement of environmental public health



# NIEHS Superfund Program: Two Unique Roles

## SRP Mandates

- Detect hazardous substances in the environment
- Evaluate the risk of hazardous substances on human health
- Develop basic biological, chemical, and physical methods to reduce the toxicity of hazardous substances

## Worker Training

- Create state-of-the-art training programs for hazardous materials handlers, chemical emergency responders, and waste cleanup workers
- Integrate training with National Response Plan

## NIEHS

Use environmental sciences to understand human biology and human disease

## EPA

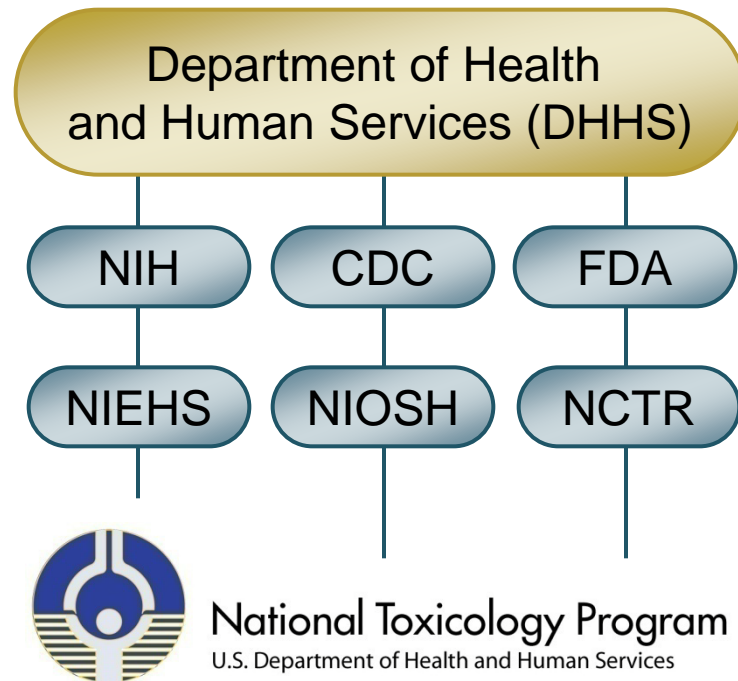
Regulate to protect human health and the environment

## ATSDR

Prevent harmful exposures and diseases related to toxic substances

# National Toxicology Program

- Interagency program
  - Established in 1978 to coordinate toxicology research across the Department of Health and Human Services (DHHS)
  - Headquartered at NIEHS
- Research on “nominations”
  - Thousands of agents evaluated in comprehensive toxicology studies
  - Results communicated through technical reports, scientific publications and the web
- Analysis activities
  - Report on Carcinogens (RoC)
  - Center for the Evaluation of Risks to Human Reproduction (CERHR)
  - NTP Interagency Center for the Evaluation of Alternative Toxicological Methods (NICEATM)

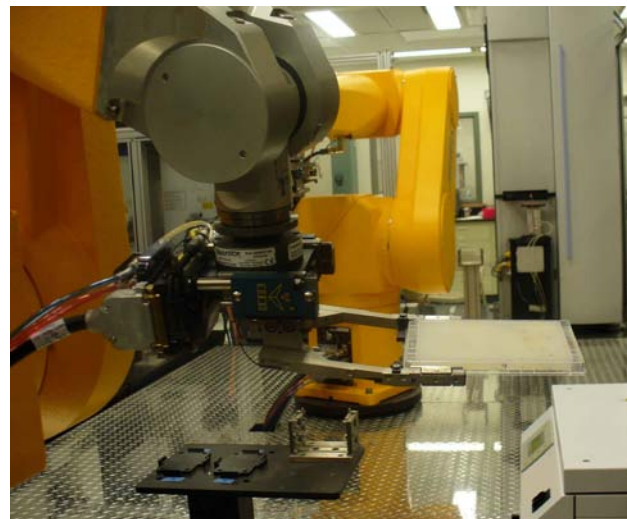


<http://ntp.niehs.nih.gov>



## New and Renewed Areas of Emphasis for NTP

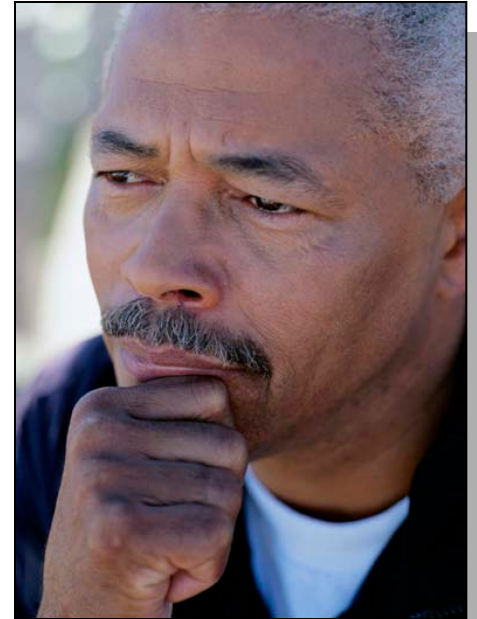
- Better coordination across the Federal government
- Develop new methods for efficient, thorough toxicological assessments
- Increase understanding of exposure-response relationships and issues of dosimetry
- Integrate results from new “data rich” techniques (i.e. genomics, high through-put screening) with traditional toxicology data to provide public health context
- Toxicity for the 21<sup>st</sup> Century or “Tox21”
  - MOU between NTP, EPA and NHGRI
  - High throughput, robotic testing of toxic compounds in cell and molecular assays
  - Using knowledge of biological response to identify toxicity pathways
  - Prioritization for further testing



# Conceptual Shift for Environmental Health Sciences

**OLD...** chemicals act by overwhelming the body's defenses by brute force at very high doses

**NEW...** chemicals can act like hormones and drugs to disrupt the control of development and function at very low doses to which the average person is exposed



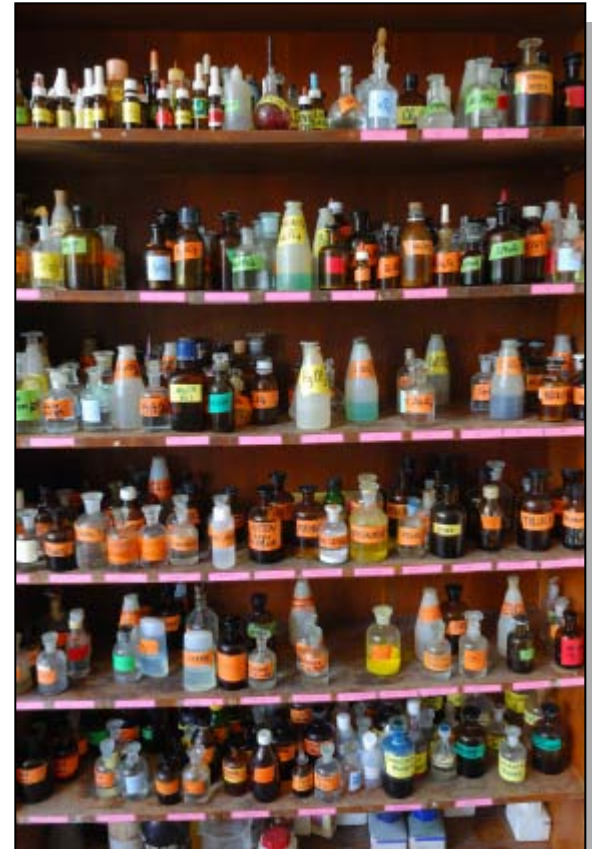
# Concept Shift

- **Definition of Low Dose**
- Low Dose Examples
- Focus on Sensitive Windows of Exposure
  - Developmental Exposures
- Developmental Basis of Disease: A New Paradigm
  - Epigenetics



## A Confounding Problem...

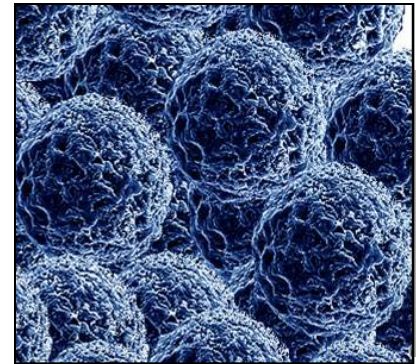
- Humans are always exposed to multiple environmental agents
- It is difficult to decipher how exposure to many agents will influence the effects of each one – both in time and space
- Linking exposure and disease has to take multiple exposures into account





# Evaluating the Safety of Engineered Nanomaterials: The NIEHS NanoHealth & Safety Initiative

- To expand the base of knowledge on nanomaterials safety and how structural aspects affect biological activity
- Extramural research: Biological interactions
  - Methods for exposure measurement
  - Linking physical/chemical properties to response
  - Capture results in database for meta-analysis
- Intramural research: Impact on chronic disease
  - Carbon nanotubes and asthma
- NTP: Nanotechnology toxicity research
  - Dermal penetration studies of nanoscale titanium dioxide
  - Pharmacokinetics of quantum dots
  - Toxicity studies of carbon fullerenes



# Climate Change and Human Health

- NIEHS is providing Departmental leadership on climate change and health
  - With FIC, heading trans-NIH workgroup
  - Leading interagency workgroup to develop white paper on research needs for health effects of climate change
  - Helping organize White House stakeholder briefing with HHS and EPA
  - Partnering with Wellcome Trust on a series of papers in *Lancet*
- Worked with FIC on ARRA Challenge Grants initiative to:
  - Collect new and existing data on changes in ambient temperature, precipitation, humidity, and other climate variables and industrial pollutants
  - Identify related human health risks and vulnerabilities in the U.S. and around the world
- Adds to ongoing NIEHS work on oceans and human health



## A New Vision for NIEHS and NTP

- A strong desire to partner with our sister institutes and other federal agencies: EPA, CDC, FDA, DOE....
- Health and Environment is a priority
- New issues and technologies are emerging
- We need the best individual and team science to address complex diseases and complex environmental impacts
- We need to improve integration across research disciplines and with all partners
- We need to improve our translation and communication of basic science findings into human health protection



# Thank You