

Exposure Biology Program

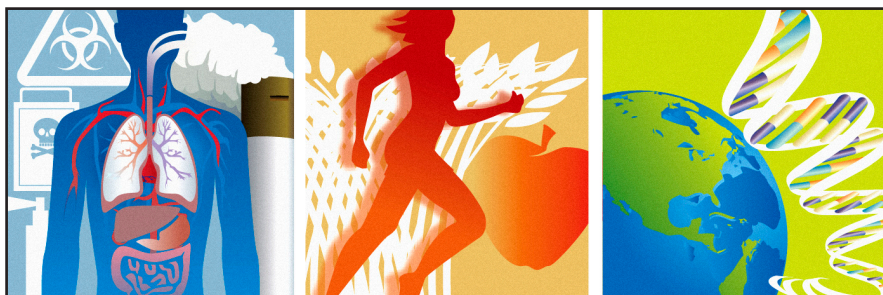
A component of the NIH Genes, Environment and Health Initiative (GEI)

Exposure Biology Program

The Exposure Biology Program funds grants aimed at the development of new technologies for bridging the knowledge gap between environmental exposures and human disease.

Interdisciplinary teams of basic scientists, bioengineers, physician-scientists, and others are working on innovative projects to develop personal sensors for measuring exposure to chemicals, diet, physical activity, psychosocial stressors, and addictive substances; to identify “fingerprints” of the body’s response (biomarkers) that indicate activation of disease mechanisms such as oxidative stress, DNA damage, and epigenetic changes; and to integrate sensor and biomarker technologies so that they can be applied to genome-wide association studies for better understanding of gene-environment interaction.

The Exposure Biology Program is part of the Genes, Environment, and Health Initiative of the National Institutes of Health. For more information, visit: www.gei.nih.gov.



The **NIEHS** vision is to use environmental sciences to understand human biology and prevent disease. We simply need better measures to understand complex human diseases that are caused by the combination of environmental exposures and genetic changes. This new approach will more rapidly move NIH research into advances for the patient and the public.

Current Projects —

Cooperative grants have been awarded in the following areas:

Environmental Sensors for Personal Exposure Assessment

- Colorimetric sensor array to detect volatile toxicants
– *Ken Suslick, U. of Illinois*
- “Deck of cards”-sized sensor to count fine and ultrafine particles
– *Sang-Young Son, U. of Cincinnati*
- Air sampler that fits in the nostrils to detect household allergens
– *Ginger Chew, Columbia U.*
- Nanotech arrays to recognize gasoline and diesel compounds
– *Ashok Mulchandani, U. of California at Riverside*
- Polymer foam to diffuse ozone, heavy metals, and chemicals for optical/ electrochemical detection
– *Markus Erbeldinger, ICx-Agentase*
- Miniaturization of sensors for ozone, PM, and VOCs
– *Charles Rodes, Research Triangle Institute*
- Polymer wire “tuning fork” to detect VOCs
– *Nongjian Tao, Arizona State U.*
- Spinning disk collector of ozone and PM
– *Steve Chillrud, Columbia U.*



Tools to Measure Exposure to Psychosocial Stress and Addictive Substances

- Personal circadian light and activity monitor – *Mark Rea, Rensselaer Polytechnic Institute*
- Hand-held PDAs for real-time, self reports of drug use and stress
– *Gregory Kirk, Johns Hopkins U. and Kenzie Lou Preston, NIDA*
- Wireless skin patch sensors to detect and transmit alcohol/ stress data – *Santos Kumar, U. of Memphis*
- Salivary biosensor and handheld monitor of psychosocial stress – *Vivek Shetty, UCLA*
- eWatch computer-assisted interviewer and real-time stress monitor – *Thomas Kamarck, U. of Pittsburgh*

Improved Measures of Diet and Physical Activity

- Cell phone physical activity monitor with accelerometer and GPS (3 grants)
– *Stephen Intille, MIT; Kevin Patrick, U. of California-San Diego; Patty Freedson, U. of Massachusetts-Amherst*
- Dietary assessment using cell phones to record intake by photo and voice (2 grants)
– *Carol Boushey, Purdue U.-West Lafayette; Rick Weiss, Princeton Multimedia Technologies Corp.*
- Pendant unified sensor system to assess diet and physical activity – *Sun Mingui, U. of Pittsburgh*

Biological Response Indicators of Environmental Stress and Centers

- Epigenetic signatures of xenoestrogens to assess breast cancer risk – *Tim Huang, Ohio State U.*
- Biomarkers of exposure and response to tobacco smoke – *Ian Blair, U. of Pennsylvania*
- Gene-expression biomarker of airway response to tobacco smoke – *Avrum Spira, Boston U.*
- Biomarkers of PCB exposure at birth and early childhood – *Sisir Dutta, Howard U.*
- Comet-Chip high-throughput DNA damage sensor – *Bevin Engleward, MIT*
- Blood-borne protein biomarkers of environmental stress – *David Lawrence, Wadsworth Center*
- Protein biomarkers of organophosphate pesticides – *Charles Thompson, U. of Montana*
- Genomic and metabolomic signatures of alcohol-induced liver disease
– *Frank Gonzalez, NCI; Alberto Fornace, Georgetown U.*
- Biomarkers of exposure to endocrine disruptors – *Coral Lamartinieri, U. of Alabama-Birmingham*
- Biomarkers of effect of diet on mitochondrial physiology – *Bruce Kristal, Brigham and Women's Hospital*
- Center: Biomarkers of tobacco smoke exposure and obesity – *Joel Pounds, Battelle Pacific Northwest Laboratory*
- Center: Biomarkers of exposures involved in the etiology of blood cancers – *Stephen Rappaport, U. of California-Berkeley*

The Exposure Biology Program is coordinated by the National Institute of Environmental Health Sciences (NIEHS).

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Other sponsoring institutes include:
The [National Cancer Institute](#) (NCI)
The [National Heart, Lung, and Blood Institute](#) (NHLBI)
The [National Institute on Drug Abuse](#) (NIDA).

