Research to Improve Children's Health
Centers for Children's Environmental Health and Disease Prevention Research

Children are likely to be more vulnerable than adults to the effects of environmental contaminants. To better understand the effects of children's exposures, and to explore ways to reduce children's risks from environmental toxicants, the Environmental Protection Agency (EPA), through the Science to Achieve Results (STAR) grants program, the National Institute of Environmental Health Sciences (NIEHS) and the Centers for Disease Control and Prevention (CDC) are supporting a network of Centers for Children's Environmental Health and Disease Prevention Research. A primary goal of the program is the accelerated application of basic research findings into clinical intervention strategies with a view towards preventing adverse health outcomes.

The Centers

The first eight Centers were established in 1998 to study the effects of environmental factors, such as pesticides and air pollution, on childhood asthma and children's growth and development. Four more Centers were established in 2001 to study the basis of neurodevelopmental and behavioral disorders such as autism. An additional Center was established in 2004 to investigate how exposure to mixtures of chemicals affects children's health. Each Center fosters community participation in one or more studies.

1998 Centers
University of Southern California
University of California at Berkeley
University of Washington
University of Iowa (1998 – 2003)
University of Michigan (1998 – 2005)
Johns Hopkins University Schools of Medicine and Public Health
Columbia University School of Public Health
Mount Sinai School of Medicine

2001 Centers
University of California at Davis
University of Cincinnati
University of Medicine and Dentistry of New Jersey
University of Illinois at Urbana-Champaign

2004 Center
Harvard School of Public Health

Recent Research Results and Studies

Asthma

- *Epidemiology* – Increased levels of ozone and particulate matter (PM) are associated with worsening pulmonary function for asthmatic children in Detroit. ★ The prevalence and severity of asthma in rural children appears to be similar to that of children in many urban areas. ★ Infection with RSV, a common virus, in the first year of life increases the risk of developing asthma. ★ Prenatal exposures to environmental tobacco smoke (ETS) and polycyclic aromatic hydrocarbons (PAHs) are associated with respiratory symptoms; high prenatal exposure to certain PHAs increased the risk of immunological response to pest allergens by age two. ★ *In utero* exposure to maternal smoking and early exposure to environmental tobacco smoke have a significant adverse effect on children's asthma symptoms. ★ Genetic susceptibility may be an important risk factor for asthma.
- *Environmental Triggers and Prevention* – Probable asthma triggers include ozone and diesel PM from traffic, urban PM, environmental tobacco smoke, endotoxins and pesticides, and smoking cessation and keeping children away from environmental tobacco smoke should be a focus of asthma prevention. ★ A diet rich in antioxidants enhances lung growth and reduces susceptibility to respiratory illness. ★ A questionnaire developed by one of the Centers can identify children with asthma, then provide appropriate recommendations on how to improve the environment of those children.

Exposure to Household and Agricultural Pesticides

- *Exposure Research* – Maternal pesticide exposure appears to be nearly universal and pesticides can be readily transferred from mother to fetus. ★ An association has been observed between prenatal exposure to chlorpyrifos, an organophosphate pesticide, and small head circumference in mothers with lowered ability to detoxify these pesticides. ★ Higher exposure of mothers to organophosphate pesticides was associated with earlier birth and with a greater number of abnormal reflexes during pregnancy. ★ Adverse birth outcomes are associated with prenatal exposure to pesticides and other environmental contaminants.
- *Exposure Prevention* – Teaching children to wash produce and their hands before eating can help prevent pesticide exposure for children of agricultural workers. Washing work clothes separately from the family's laundry also helps prevent children's exposure to pesticides in agricultural families.★ One of the Centers has developed an environmental health curriculum that is being included as part of prenatal care for low-income women in California. ★ Integrated Pest Management (IPM), which involves building repairs and the use of lower toxicity pesticides, has been shown to be effective in reducing insect populations and cockroach allergen levels and may help prevent asthma.

Neurodevelopmental and Behavioral Disorders

- Prenatal exposure to polychlorinated biphenyls (PCBs) appears to produce persistent decreases in intelligence and alternations in behavior. ★ Researchers are testing children to see whether consistently low blood lead levels will translate into higher IQ test scores.
- Researchers are also studying the effects of PCBs and methyl mercury on cognitive, sensory and motor development in children. Studies are organized around a population of Hmong and Laotian refugees who consume PCB- and mercury-contaminated fish. Preliminary results suggest that combined exposure to PCBs and methyl mercury has a greater effect on motor function than either chemical alone.
- Some PCBs may stimulate cellular responses to a greater degree in autistic children than in other children. ★ Mice exposed to sodium valproate, a medication associated with increased autism risk, exhibit many behavioral defects including retardation.
- Researchers are examining how genetic susceptibility and exposure to environmental toxicants could increase the risk and severity of autism. They are using innovative methods to discover how environmental factors could contribute to abnormal social behavior in children, and to find new strategies for intervention and prevention of autism.

Children's Health continues to be a research priority for EPA's STAR grant program. Previous research solicitations have encouraged proposals in children's valuation, exposure methods and assessments, longitudinal studies, and the development and application of biomarkers of children's exposure, susceptibility, or effects related to environmental threats. See the website for the National Center for Environmental Research at http://www.epa.gov/ncer for more information.

For more information on the Children's Centers, see http://es.epa.gov/ncer/centers/cecehdpr/98 and http://es.epa.gov/ncer/centers/cecehdpr/01
NIEHS offers additional information about the Children's Centers and their research at: http://www.niehs.nih.gov/translat/children/children.htm
The EPA's Office of Children's Health Protection provides information about environmental risks for children at: http://www.epa.gov/children

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