NIEHS
National Institute of Environmental Health Sciences

The Challenge

Increased prevalence of neurodevelopmental disorders.

- About 1 in every 150 American children has some form of autism according to information published by the CDC in 2007.
- It is estimated that between 4 and 12 percent of children have ADHD, or approximately 2.6 million children in the United States.

Lack of effective treatment options.

Difficulty in establishing firm linkages between exposures and neurodevelopment disorders such as autism and attention deficit disorders.

Environment and the Developing Brain

Neurodevelopment refers to how the brain and nervous system develops. Scientists have made tremendous progress in understanding how the brain works, and are gaining new insight into the role that environmental exposures may play in the development of disorders such as autism and attention deficit disorder. National Institute of Environmental Health Sciences (NIEHS) supported research has clearly shown that it is not just genetics that impacts the development of diseases such as neurdevelopmental disorders, but the interaction of genes and the environment. Researchers are also making progress in tackling hard questions about the vulnerability of the developing brain as they look at timing and amount of exposures including low-dose exposures in utero and during childhood to unravel some of the mysteries of impaired neurodevelopment.

Autism

Autism spectrum disorders (ASD) are complex neurodevelopmental disorders with early childhood onset. The incidence of ASD is increasing. These disorders, for which there is presently no cure and only limited treatments, generally have lifelong effects.

Attention-Deficit/Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is a condition of the brain that makes it difficult for children to control their behavior or pay attention. It is one of the most common chronic conditions of childhood. The exact cause of ADHD has not been determined, however the condition is thought to have a genetic and environmental component.

Finding Answers

NIEHS will invest in the development of new methodologies to detect and measure environmental exposures in humans.

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NIEHS Focus

The National Institute of Environmental Health Sciences (NIEHS) is one of the federal government's leading supporters of biomedical research on understanding how the environment influences the development and progression of human disease. The NIEHS conducts research in its laboratories in Research Triangle Park, NC and also awards grants to support research at universities and other facilities. NIEHS has a long tradition of supporting research in the neurodevelopment area. Some examples of ongoing research include:

- NIEHS supports basic research to determine the mechanisms and pathways by which toxicants may bring about neural damage to the developing brain.
- Some of the key neurotoxicants that NIEHS researchers are studying include metals such as lead, mercury, and manganese, pesticides, tobacco smoke and polychlorinated biphenyls (PCBs) and polybromated diphenyl ethers (PBDEs), used to make insulating and fire retardant properties.
- With support from NIEHS, the Children's Center at UC Davis is conducting the first large-scale human population study of children with autism. The researchers are looking at a wide range of environmental exposures and their effects on early development in more than 1000 California children.
- NIEHS researchers are developing new and improved animal and cellular models for ADHD and autism. These models will help determine how neurotoxic substances may impact brain development and behavior and will be useful to test therapies.
- NIEHS-supported findings are suggesting that the immune system of both the child and the mother may play a role in early brain development.
- NIEHS researchers are enrolling mothers of autistic children who are pregnant with a subsequent child to determine prenatal, neonatal, and early post natal exposure through age three.
- Researchers are using brain imaging techniques in adults who were known to be exposed to lead as children to determine the impact of early exposure on the brain and behavior in later adulthood.
- Researchers are evaluating pesticide exposure as a potential risk factor for ADHD.
- NIEHS supported researchers are exploring the effect of prenatal exposure to methylmercury on cognition and behavior. Results thus far have been conflicting and seem to depend on the source of the exposure and whether there are other neurotoxicants present.
- Superfund researchers are developing better screening tools to identify chemicals that pose the greatest risk to pregnant women and children.
- Researchers are also trying to determine how diet and nutrition affect central nervous system development from birth.

Lead: A story of Success

One of our greatest success stories in environmental health is related to lead. Research supported by NIEHS and other NIH institutes showed that even low levels of lead causes decreases in children's intelligence and can impact behavior. Our role in supporting research on the effects of lead has helped to mobilize parents, environmental advocates, environmental health researchers, the EPA, and Congress to remove lead from gasoline, paints, and other sources. The result has been a sharp reduction in blood lead levels throughout the country.

Our Collaborators

- NIEHS continues to consult with the scientific community and advocacy groups to help establish its research agenda.
- Most of the NIEHS-EPA Children's Centers focus on neurodevelopment research.
- NIEHS serves on the HHS Interagency Autism Coordinating Committee which coordinates all autism related program and research initiatives at HHS.
- NIEHS is a major partner in the National Children's Study, the largest study to be conducted on the effects of environmental influences on health development of children from birth to 21. It will seek information to prevent and treat some of the nation's most pressing health problems, including autism, birth defects, diabetes, heart disease, and obesity.