



FACTORS CAUSING OR CONTRIBUTING TO INTELLECTUAL AND DEVELOPMENTAL DISABILITIES/ ENVIRONMENTAL EXPOSURES

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INTELLECTUAL DISABILITIES





OVERVIEW

- History of environmental exposures in childhood
- Environmental toxicants from the perspectives of epidemiology, mechanism of toxicity, and effect on brain development
- How environmental toxicants influence epigenetic changes and impact development
- Societal financial implications and cost of environmental toxicant exposure
- Prevention and public policy regarding environmental exposures
- Importance of education about factors that cause or contribute to intellectual and developmental disabilities (i.e., risk factors)
- Overview of causal or contributing factors
- Biomedical, social, behavioral, and educational risk factors
- Prevention of intellectual and developmental disabilities
- Comorbid sensory impairments and mental health disorders
- Future directions in the field

Historical Perspective

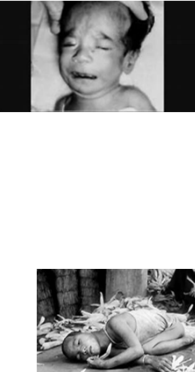
- ☐ Thalidomide, a morning-sickness drug marketed...
- ☐ Caused approximately 10,000 infants to be born with...
- ☐ Methylmercury poisoning caused vision and...
- ☐ Bhopal gas tragedy in 1984, exposure to methyl isocyanate gas

STUDY OF Environmental Risk Factors for Childhood Autism


Effects of Neurotoxicants

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.



Susceptible Periods of Development


- ☐ Before conception, by influencing the...
- ☐ During...
- ☐ After birth
- ☐ For the first 2...



Toxicants

Lead
Found in lead-based ...
No safe level of lead in body; low dose exposure can affect...
Peripheral neuropathy in _____, CNS damage in _____

- 1
- 2
- 3
- 4



Toxicants (cont'd)

Tobacco smoke

Secondhand exposure to tobacco and maternal...
Abnormal cell proliferation, differentiation, and...
Increased risk of:

- 1
- 2
- 3
- 4
- 5



Toxicants (continued)

Mercury

- Found in ...
- Methylmercury is...
- Severe brain damage with
- Cognitive and motor impairments with...
- Minimal effects in...
- Ethylmercury is metabolite of thimerosal...
- No evidence of thimerosal in vaccines and...



Toxicants (continued)

Alcohol

Known teratogen; no safe level...
Fetal alcohol spectrum disorder (FASD) from...
Interferes with

- 1
- 2
- 3
- 4



Range of physical, behavioral, and...



Toxicants (continued)

FASD findings:

- 1
- 2
- 3
- 4
- 5
- 6
- 7

Toxicants (continued)


Illicit drugs

Nonprescription opioids, marijuana, synthetic cannabinoids

Recreational marijuana legalized in more states...

Decreased perception of:

- 1
- 2
- 3
- 4
- 5
- 6
- 7



Long-term use is concerning for...

Prenatal exposure to opioids:

Toxicants (continued)

Polychlorinated biphenyls (PCBs)

In electronics, plastics, paint, pesticides, fish, and...

Cross the placenta and are found in...


High-dose contamination: cognitive delays, behavior disorders...

Low-dose contamination: deficits in neuromotor development...

Pesticides

Over 1,300 registered chemicals

Dichlorodiphenyltrichloroethane (DDT)...



Toxicants (*continued*)

Endocrine disrupting chemicals

Phthalates, PCBs, brominated flame retardants, DDT, bisphenol A

Interfere with homeostatic, reproductive, and...

Estrogenic, antiestrogenic, antiandrogenic, antithyroid, or antiprogestin effects

Decreased IQ and other atypical neurodevelopmental findings



Biologic Agents

Zika virus

Epidemic in South and Central Americas that has spread to the U.S.

Congenital Zika syndrome (CZS)—

- A.
- B.
- C.
- D.
- E.
- F.
- G.



Requires a multidisciplinary approach to support the child

No vaccine currently available

Environmental Exposures and Epigenetics

Actions of genes are altered...

DNA methylation, histone modifications, and miRNA...

Increasing evidence that environmental toxicants induce...



Societal Cost of Environmental Toxicants

Difficult to estimate exact cost

Measured as Disability Adjusted Life Years (DALYs)...

Economic productivity losses to the U.S. economy in excess of \$314 billion in 2010 due to methylmercury, PBDE, & organophosphates

In 2010, \$54 billion economic burden due to lead exposure

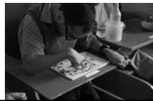


Public Policy Implications

Toxic Substances Control Act (TSCA), passed in 1976

Amended and changed to Frank R. Lautenberg Chemical Safety for the 21st Century Act in 2016

Prioritizes safety and risk evaluation of existing chemicals...



Summary

- ❑ Over 1,000 chemicals are...
- ❑ Exposure to same toxicant at different times =
- ❑ Damage to CNS can persist for...
- ❑ Most damage caused by toxicants is...