Plant neurotoxins and brain development
Implications for encephalization in Homo

Mother’s bloodstream and milk

Development of xenobiotic metabolism
Vulnerabilities of children relative to adults
Larger brain/body-weight ratio
Greater blood flow through the CNS
More permeable blood-brain barrier
Immature enzyme function in first year

Advantages of children relative to adults
Larger liver/body-weight ratio and faster xenobiotic clearance after the age of one

Exposure to xenobiotics
Children consume more food per body weight than adults

Diet composition: infants and children

Xenobiotic metabolizing enzymes

Xenobiotic metabolism: Pharmacokinetics for 40 therapeutic drugs–proxies for plant toxins–by mode of elimination and age

Successful development of the mammalian brain depends crucially on the highly coordinated interplay among many systems, including genetics, epigenetics, nutrition, and environment. In this diagram, the clearance rates of various xenobiotic metabolizing enzymes are shown, which illustrate the differences in clearance between adults and children.

Development postnatal growth

Humans 75%
Chimpanzees 50%
Rhesus macaques 25%

Brain development

Postnatal neurodevelopment

Experience-dependent synapse formation and dendritic arborization

Effects of plant neurotoxin nicotine on developing nervous system

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