Effects of aspartame metabolites on astrocytes and neurons.

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Abstract
Aspartame, a widespread sweetener used in many food products, is considered as a highly hazardous compound. Aspartame was discovered in 1965 and raises a lot of controversy up to date. Astrocytes are glial cells, the presence and functions of which are closely connected with the central nervous system (CNS). The aim of this article is to demonstrate the direct and indirect role of astrocytes participating in the harmful effects of aspartame metabolites on neurons. The artificial sweetener is broken down into phenylalanine (50%), aspartic acid (40%) and methanol (10%) during metabolism in the body. The excess of phenylalanine blocks the transport of important amino acids to the brain contributing to reduced levels of dopamine and serotonin. Astrocytes directly affect the transport of this amino acid and also indirectly by modulation of carriers in the endothelium. Aspartic acid at high concentrations is a toxin that causes hyperexcitability of neurons and is also a precursor of other excitatory amino acid - glutamates. Their excess in quantity and lack of astrocytic uptake induces excitotoxicity and leads to the degeneration of astrocytes and neurons. The methanol metabolites cause CNS depression, vision disorders and other symptoms leading ultimately to metabolic acidosis and coma. Astrocytes do not play a significant role in methanol poisoning due to a permanent consumption of large amounts of aspartame. Despite intense speculations about the carcinogenicity of aspartame, the latest studies show that its metabolite - diketopiperazine - is cancierogenic in the CNS. It contributes to the formation of tumors in the CNS such as gliomas, medulloblastomas and meningiomas. Glial cells are the main source of tumors, which can be caused inter alia by the sweetener in the brain. On the one hand the action of astrocytes during aspartame poisoning may be advantageous for neuro-protection while on the other it may intensify the destruction of neurons. The role of the glia in the pathogenesis of many CNS diseases is crucial.

PMID: 23553132 [PubMed - indexed for MEDLINE]
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