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Bioactive lipids in the prevention and management of autism

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ABSTRACT

Autism is a neurodevelopmental disorder in which both genetic and epigenetic factors have a role. Studies revealed that autism is associated with low-grade systemic inflammation with a role for altered essential fatty acid (EFA) metabolism and brain-derived neurotrophic factor (BDNF). Increased concentrations of cytokines IL-6, TNF-α have been described in the amniotic fluid and plasma of the mother and the newborn. BDNF levels tend to be low in those with autism. Decreased concentrations of bioactive lipids such as arachidonic acid (AA), eicosapentaenoic acid (EPA) and docosahexaenoic acid and its anti-inflammatory metabolites such as lipoxin A4 (LXA4) are low in those with autism and in their mothers. We showed that BDNF enhances LXA4 and LXA4 in turn augments BDNF formation suggesting a close interaction between lipids and neurotrophic factors. AA, EPA, and DHA are essential for neuronal growth and synaptic formation and BDNF is an essential neurotrophic factor. AA and DHA improve brain growth and development and improve IQ. Furthermore, these bioactive lipids regulate formation and actions of neurotransmitters: dopamine, serotonin, acetylcholine, GABA (gamma-aminobutyric acid) and catecholamines, and growth factors Hence, administration of AA/EPA/DHA when brain growth and development is occurring may prevent autism. The challenge is to administer bioactive lipids in appropriate amounts to the developing brain. CSF flows from the ventricles throughout the parenchyma towards the subarachnoid space. This transependymal flow of CSF provides a route to distribute ICV-infused drugs throughout the brain. Thus, methods can be developed to infuse bioactive lipids using transependymal CSF flow and thus, prevent and manage autism and other related conditions.

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