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Key role of relative abundance of short chain and polyunsaturated fatty acids in propionic acid-induced autistic features in rat pups

Afaf El-Ansary
King Saud University, Saudi Arabia

Fatty acids are essential dietary nutrients, and one of their important roles is providing polyunsaturated fatty acids (PUFA) for growth and function of nervous tissue. Short chain fatty acids SCFAs represent a group of compounds derived from the host microbiome that are recently known to induce many effects on gut, brain, and behavior and thus can be linked to neurodevelopmental disorders like autism. Reduced levels of PUFA are associated with impairments in cognitive and behavioral performance, effects which are particularly important during brain development. Recent studies suggest that omega -3 fatty acids as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) functions in neurogenesis, neurotransmission, and protection against oxidative stress. Omega-3 PUFAs mediate some of these effects by antagonizing Omega-6 PUFA (arachidonic acid, ARA) - induced proinflammatory prostaglandin E_2 (PGE_2) formation. In this work, absolute and relative concentrations of propionic (PPA), butyric and acetic acids together with PUFA and their precursors (α-Linolenic and linoleic),were measured in brain tissues of PPA- neurointoxicated rat pups (Recieved 250 mg PPA/Kg body weight for 3 consecutive days) as rodent model with persistent autistic features compared to healthy controls. The obtained data recorded remarkably lower levels of omega6/omega3, α-Linolenic/Linoleic, α-Linolenic/EPA, α-Linolenic/DHA, EPA / DHA, and ARA/Linoleic in PPA-intoxicated rats. Role of these impaired ratios was discussed in relation to the activity of desaturases and elongases as two enzymatic groups involved in the synthesis of PUFA from their corresponding precursors. The relationship between the abnormal relative concentrations of the studied fatty acids and oxidative stress, neurotransmission, and neuroinflammation was also discussed in details.

Conclusion: This study proved that fatty acids ratios is useful for the rational understanding of the mechanism of PPA neurotoxicity in rodent model of autism and hence a possibility to use these ratios for predictive implications among patients with this disorder. Additionally, nutritional supplementation of depleted omega-3 fatty acids could be suggested as treatment strategy.

Biography

Afaf El-Ansary has completed her PhD at the age of 37 years from Ain Shams University-Egypt and Postdoctoral studies from National Research Centre. She is a Professor in Biochemistry Department, Science College, King Saud University. She has published more than 85 papers in high impact factor journals and serving as a reviewer and as an Editorial Board Member of repute journals.

elansary@KSU.EDU.SA