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Gut-brain axis-based biomarkers as predictive tools in testing efficacy of carnosine and carnitine in rodent model of autism

Exposures to environmental toxins are now thought to contribute to the development of autism spectrum disorder. Progress in understanding and treating autism will require translational research efforts to transfer knowledge through successive fields of research from basic scientific discovery to public health impact. A developmentally abnormal gut microbiota may in turn affect both the gut-brain axis and brain development and contribute to the etiology of autism. Propionic acid (PA) found as a metabolic product of gut bacteria has been reported to mimic/mediate the neurotoxic effects of autism. Results from animal studies may guide investigations on human populations toward identifying environmental contaminants that produce or drugs that protect from neurotoxicity.

In a three successive independent experimental design, we tested the neurotoxic effect of PA either orally administered or biologically induced in clindamycin-treated rat pups. The oral administration was used to confirm the role of gut-brain axis in the induction of autistic features probably found in treated rats. Additionally, Clindamycin was used to ascertain the role of overgrowth of Clostridia species as PA producer in inducing autistic features in animals. In both groups, a panel of biomarkers were measured compared to healthy untreated rat pups. These biomarkers were selected to represent DNA damage, oxidative stress, and neurochemistry, and neuroinflammation related signaling. The selection of these markers was based on our clinical data obtained from patients with autism which recorded highspecificity and sensitivity when analyzed usingReceiver Operating Characteristics (ROC) and excellent predictive values using predictiveness curves.

Our work was extended to test the therapeutic efficacy of carnosine, and carnitine. The obtained data confirm the role of propionic acid in inducing persistent autistic features in rat pups with oral administration being more neurotoxic than theinduction of propionic acid bacterial producers. Additionally, both supplements were effective in ameliorating the toxic effects of PA.

In conclusion, although our investigations show evidences of the efficacy of the tested supplementsin ameliorating most of the impaired biomarkers in PA- rodent model of autism, still there is need for better designed and registered trials for at least six months in order reliably to identify a confirmed proper effect.

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.

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