

Research Update

PHGG improves gut symptoms and irritability in children with autism spectrum disorder

Article highlights

- Gut dysbiosis and constipation are commonly observed in children with autism spectrum disorders (ASD).
- Microbiome-mediated inflammatory processes result in neuroinflammation, which causes impaired neurogenesis and has been implicated in the pathogenesis of autism and its co-morbidities.
- Supplementation with 6g/day of partially hydrolysed guar gum (PHGG) improved constipation symptoms and gut dysbiosis in ASD children.
- Improvements in gut dysbiosis helped to attenuate the level of serum inflammatory cytokines and significantly ameliorated behavioural irritability.

Autism spectrum disorder (ASD) is a serious neurodevelopmental disorder resulting in a considerable burden for individuals, families, and society. Based on epidemiological studies over the past 50 years, the prevalence of ASD is increasing, and global estimates put its prevalence at 1 in 160 children.¹ Alterations in the composition of gut microbiota (gut dysbiosis) have been linked to the aetiology of ASD, since the gut microbiota makes critical contributions to metabolism and maintenance of immune homeostasis and may control the central nervous system (CNS) activities through neural, endocrine, and immune pathways (this relationship is termed the microbiota-gut-brain axis).² In addition to dysbiosis, gastrointestinal symptoms, including constipation, are four times more prevalent in children with ASD compared to normal population.³ Accordingly, treatments that target the gut microbiota, such as prebiotic fibres, are being explored for ASD.

Partially hydrolysed guar gum (PHGG) is a prebiotic, water-soluble dietary fibre which has been demonstrated to modulate the gut microbiota, and increase the concentration of intestinal short chain fatty acids.^{4,5} It is considered a true bowel modulator with an abundance of research demonstrating its efficacy for both constipation related disorders, and improving stool consistency and reducing duration of diarrhoeal episodes in children and adults.^{4,5}

In a recent pilot study published in the *Journal of Clinical Biochemistry and Nutrition* researchers evaluated the effects of PHGG supplementation on constipation, gut dysbiosis and behavioural irritability in ASD children.⁶ Thirteen children aged 4-9 years of age were supplemented with 6g of PHGG daily for 2 to 15 months. Constipation symptoms were markedly improved after supplementation with PHGG. Nine children were only observed defecating once a week prior to supplementation, and twice a week for the remaining four. A week prior to the end of

supplementation, however, defecation increased to four times a week in all children. Significant differences in irritability were also observed in the children compared to pre-supplementation levels, based on Aberrant Behaviour Checklist, Japanese Version (ABC-J) irritability subscale.

The relative abundance of microbiota genera changed significantly with PHGG supplementation and the inflammatory marker interleukin-1 β (IL-1 β) was significantly decreased from baseline. Other inflammatory markers were decreased with PHGG supplementation, including IL-6 and TNF- α , however changes were not significant. Changes in the relative abundance of certain bacterial species showed a significant correlation with the frequency of defecation.

Gut dysbiosis is known to increase intestinal permeability, which leads to the increase in circulating endotoxins and release of inflammatory mediators that contribute to pathogenesis of many conditions including ASD. A higher percentage of intestinal permeability has been observed in ASD patients (36.7% of patients) compared to control children (4.8% of patients)⁷ and higher levels of inflammatory cytokines have been observed in ASD children.⁸ Microbiome-mediated inflammatory processes result in neuroinflammation, which causes impaired neurogenesis and has been implicated in the pathogenesis of autism and its co-morbidities.^{8,9}

In the current study, PHGG supplementation improved constipation symptoms, gut dysbiosis and intestinal permeability, which in turn helped to attenuate the level of serum cytokines and behavioural irritability. The results of the study highlight the potential role for therapeutics that target the microbiome for treating ASD.

References

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