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In Vitro Fermentation Of Rich In B-glucan Pleurotus Eryngii Mushroom: Impact On Faecal Bacterial Populations And Intestinal Barrier In Autistic Children

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Abstract : Autism Spectrum Disorder (ASD) is a complex group of developmental disorders of the brain, characterized by social and communication dysfunctions, stereotypes and repetitive behaviors. The potential interaction between gut microbiota (GM) and autism has not been fully elucidated. Children with autism often suffer gastrointestinal dysfunctions, while alterations or dysbiosis of GM have also been observed. Treatment with dietary components has been postulated to regulate GM and improve gastrointestinal symptoms, but there is a lack of evidence for such approaches in autism, especially for prebiotics. This study assessed the effects of Pleurotus eryngii mushroom (candidate prebiotic) and inulin (known prebiotic compound) on gut microbial composition, using faecal samples from autistic children in an in vitro batch culture fermentation system. Selected members of GM were enumerated at baseline (0 h) and after 24 h fermentation by quantitative PCR. After 24 h fermentation, inulin and P. eryngii mushroom induced a significant increase in total bacteria and Faecalibacterium prausnitzii compared to the negative control (gut microbiota of each autistic donor with no carbohydrate source), whereas both treatments induced a significant increase in levels of total bacteria, Bifidobacterium spp. and Prevotella spp. compared to baseline (t=0h) (p for all <0.05). Furthermore, this study evaluated the impact of fermentation supernatants (FSs), derived from P. eryngii mushroom or inulin, on the expression levels of tight junctions' genes (zonulin-1, occludin and claudin-1) in Caco-2 cells stimulated by bacterial lipopolysaccharides (LPS). Pre-incubation of Caco-2 cells with FS from P. eryngii mushroom led to a significant increase in the expression levels of zonulin-1, occludin and claudin-1 genes compared to the untreated cells, the cells that were subjected to LPS and the cells that were challenged with FS from negative control (p for all <0.05). In addition, incubation with FS from P. eryngii mushroom led to the highest mean expression values for zonulin-1 and claudin-1 genes, which differed significantly compared to inulin (p for all <0.05). Overall, this research highlighted the beneficial in vitro effects of P. eryngii mushroom on the composition of GM of autistic children after 24 h of fermentation. Also, our data highlighted the potential preventive effect of P. eryngii FSs against dysregulation of the intestinal barrier, through upregulation of tight junctions' genes associated with the integrity and function of the intestinal barrier. This research has been financed by "Supporting Researchers with Emphasis on Young Researchers - Round B", Operational Program "Human Resource Development, Education and Lifelong Learning."

Keywords : gut microbiota, intestinal barrier, autism spectrum disorders, Pleurotus Eryngii
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