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Protective Effects of Bee Pollen on Multiple Propionic Acid-Induced Biochemical Autistic Features in a Rat Model

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Abstract

Autism spectrum disorders (ASDs) are neurodevelopmental disorders that clinically pre-sented as impaired social interaction, repetitive behaviours, and weakened communication. The use of bee pollen as a supplement rich in amino acids, vitamins, lipids, and countless bioactive substances may lead to the relief of oxidative stress, neuroinflammation, glutamate excitotoxicity, and impaired neurochemistry as etiological mechanisms autism. Thirty young male Western albino rats were randomly divided as: Group I-control; Group II, in which autism was induced by the oral administration of 250 mg propionic acid/kg body weight/day for three days followed by orally administered saline until the end of experiment and Group III, the bee pollen-treated group, in which the rats were treated with 250 mg/kg body weight of bee pollen for four weeks before autism was induced as described for Group II. Markers related to oxidative stress, apoptosis, inflammation, glutamate excitotoxicity, and neurochemistry were measured in the brain tissue. Our results indicated that while glutathione serotonin, dopamine, gamma-aminobutyric acid (GABA), GABA/Glutamate ratio, and vitamin C were significantly reduced in propionic acid-treated group ($p < 0.05$), glutamate, IFN-γ, IL-1A, IL-6, caspase-3, and lipid peroxide levels were significantly elevated ($p < 0.05$). Bee pollen supplementation demonstrates protective potency presented as amelioration of most of the measured variables with significance range between ($p < 0.05$)-($p < 0.001$). This study has ascertained the integration and interaction between apoptosis, in-Flammarion, glutamate toxicity, oxidative stress, and impaired neurochemistry in either the neurotoxic effects of PPA or the protective effects of bee pollen. As all the mechanisms mentioned above are prominently recorded as pathophysiological phenomena inASD, bee pollen can be suggested as a protective strategy, which should be confirmed by future studies.

Keywords:
Autism Spectrum Disorders, Propionic Acid, Neurotransmitter, Cytokines, Apoptosis, Oxidative Stress, Gut Microbiota.