Antioxidant and hepatorenal protective effects of bee pollen fractions against propionic acid-induced autistic feature in rats

By: Al-Saleem, HS (Al-Saleem, Huda S.) [1]; Al-Yousef, HM (Al-Yousef, Hanan M.) [2]; Ashour, AE (Ashour, Abdelkader E.) [3]; Ahmed, AF (Ahmed, Atallah F.) [4]; Amina, M (Amina, Mansour) [5]; Issa, IS (Issa, Iman S.) [1]; Bhat, RS (Bhat, Ramesha Shafi) [6]

Abstract

In the brain, propionic acid (PA) can cross cell membranes and accumulate within cells, leading to intracellular acidification, which may alter neurotransmitter release (NT), communication between neurons, and behavior. Such elevation in levels of PA constitutes a neurodevelopmental metabolic disorder called propionic acidemia, which could clinically manifest as autism. The purpose of this study was to investigate the protective effects of different fractions of bee pollen (BP) on PA-induced autism in rats, and to evaluate their effects on the expression of liver and renal biomarkers. Groups of rats received treatments of different fractions of BP at a dose of 250 mg/kg of body weight/day for a period of 1 month. Normal control group I and group II were orally administered with phosphate-buffered saline and propionic acid, respectively, for 3 days. BP contains various health-promoting phenolic compounds. Different fractions of BP administered pre- and post-treatment with PA showed significant reduction in the levels of liver and renal biomarkers (p < 0.05). Also, a significant enhancement in the levels of glutathione S-transferase (GST), catalase (CAT), and ascorbic acid (VIT C) was observed. Supplementation with BP significantly reduced biochemical changes in the liver, kidneys, and brain of rats with PA-induced toxicity. It exhibited protective effects against oxidative damage and reactive oxygen species produced by PA-induced adverse reactions in rats. Taken together, our study shows that BP possesses protective effects in PA-induced liver and kidney damage.

Keywords

Antioxidants; bee pollen; hepatorenal biomarkers; phenolic compounds

Author Information

King Saud University

Funding

King Saud University
Showing 30 of 69  View All in Cited References page

1. Ameliorative effect of probiotics (Lactobacillus paracasei and Protexin (R)) and prebiotics (propolis and bee pollen) on clindamycin and propionic acid-induced oxidative stress and altered gut microbiota in a rodent model of autism
   By: Aabed, Kawai; Bhat, Ramesa Shafi; Moumayed, Nadeen; et al.
   CELLULAR AND MOLECULAR BIOLOGY Volume: 65 Issue: 1 Pages: 1-7 Published: 2019
   Times Cited: 6

2. Bee pollen and propolis improve neuroinflammation and dysbiosis induced by propionic acid, a short chain fatty acid in a rodent model of autism
   By: Aabed, Kawai; Bhat, Ramesa Shafi; Al-Dibass, Abeer; et al.
   LIPIDS IN HEALTH AND DISEASE Volume: 18 Issue: 1 Article Number: 200 Published: NOV 16 2019
   Times Cited: 3

3. Hepatorenal protective effect of Antistax (R) against chemically-induced toxicity
   By: Ahmed, Atallah F; Al-Yousef, Hanan M; Al-Qahtani, Jawaher H; et al.
   PHARMACOGNOSY MAGAZINE Volume: 11 Issue: 42 Supplement: 1 Pages: S173-S181 Published: MAY 2015
   Times Cited: 5

4. Impact of P404n liver damage in rats
   By: Al-Dihian, S.; Bhat, R. S.
   International Journal of Molecular and Cellular Medicine Volume: 4 Issue: 3 Pages: 188-195 Published: 2015
   Times Cited: 1

5. Autism Spectrum Disorder in a Child with Propionic Acidemia
   By: Al-Gwain, M.; Kaya, N.; Al-Shamrani, H.; et al.
   JIMD REPORTS - CASE AND RESEARCH REPORTS, 2012/4 Book Series: JIMD Reports Volume: 7 Pages: 63-66 Published: 2013
   Times Cited: 33

6. Therapeutic potency of bee pollen against biochemical autistic features induced through acute and sub-acute neurotoxicity of orally administered propionic acid
   By: Al-Salem, Huda S.; Bhat, Ramesa Shafi; Al-Ayadhi, Laila; et al.
   BMC COMPLEMENTARY AND ALTERNATIVE MEDICINE Volume: 16 Article Number: 120 Published: APR 23 2016
   Times Cited: 10

7. Clostridium perfringens induced autism disorders counteract by using natural BP in vitro
   By: Al-Yousef, H. M.; Al-Khulaifi, M. M.; Al-Salem, H. S.; et al.
   Journal of Biology and Medical Research Volume: 2 Issue: 1 Pages: 8 Published: 2018
   Times Cited: 1

8. Association of social and cognitive impairment and biomarkers in autism spectrum disorders
   By: Alabdali, Altaf; Al-Ayadhi, Laila; El-Ansary, Naf
   JOURNAL OF NEUROINFLAMMATION Volume: 11 Article Number: 4 Published: JAN 8 2014
   Times Cited: 52

9. Protective and restorative potency of Vitamin D on persistent biochemical autistic features induced in propionic acid-intoxicated rats pups
   By: Aljawaz, Hanan A.; Bhat, Ramesa Shafi; Al-Ayadhi, Laila; et al.
   BMC COMPLEMENTARY AND ALTERNATIVE MEDICINE Volume: 14 Article Number: 416 Published: OCT 25 2016
   Times Cited: 22

10. Antibacterial activity of honey and bee bread of different origin against S.aureus and S.epidermidis
    By: Baltursaityte, Vilma; Venskutonis, Petras Rimantas; Cekstereyte, Violeta
    FOOD TECHNOLOGY AND BIOTECHNOLOGY Volume: 45 Issue: 2 Pages: 201-208 Published: APR-JUN 2007
    Times Cited: 37