

Beneficial effects of fruit extracts on neuronal function and behavior following ^{56}Fe irradiation

J.A. Joseph (1), B. Shukitt-Hale (1), A.N. Carey (1), D. Jenkins (2), and B.M. Rabin (2)

(1) USDA, Human Nutrition Research Center on Aging at Tufts Univ., Boston, MA, U.S.A. 02111, (2) Department of Psychology, UMBC, Baltimore, MD U.S.A. 21250

Exposing young rats to particles of high energy and charge (HZE particles) enhances indices of oxidative stress and inflammation and disrupts the functioning of the dopaminergic system and behaviors mediated by this system in a manner similar to that seen in aged animals. Previous research has shown that diets supplemented with 2% blueberry or strawberry extracts have the ability to retard and even reverse age-related deficits in behavior and signal transduction in rats, perhaps due to their antioxidant and anti-inflammatory properties. This study evaluated the efficacy of these diets on irradiation-induced deficits in these parameters by maintaining rats on these diets or a control diet for 8 weeks prior to being exposed to whole-body irradiation with 1.5 Gy of 1 GeV/n high-energy ^{56}Fe particles. Irradiation impaired performance in the Morris water maze and measures of dopamine release one month following radiation; these deficits were protected by the antioxidant diets. The strawberry diet offered better protection against spatial deficits in the maze because strawberry-fed animals were better able to retain place information (a hippocampally-mediated behavior) compared to controls. The blueberry diet, on the other hand, seemed to improve reversal learning, a behavior more dependent on intact striatal function. These data suggest that ^{56}Fe particle irradiation causes deficits in behavior and signaling in rats which were ameliorated by an antioxidant diet and that the polyphenols in these fruits might be acting in different brain regions.