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Can Broccoli Sprouts Consumption During Pregnancy Protect the Developing Brain?

What is this research about?

Newborn brain injury most often is caused by reduced delivery of oxygen and nutrients to the fetus during pregnancy. Such injury can result in neurodevelopmental disorders such as cerebral palsy. Currently, no preventive intervention is available for the pregnant mother to protect the developing brain. Broccoli Sprouts (BrSp) have shown promising results since they possess sulforaphane, a powerful compound capable of increasing antioxidant production and reducing inflammation. Thus, the researchers investigated whether BrSp consumption during gestation and the lactation period would prevent injury to the newborn brain.

What did the researchers do?

Pregnant rats underwent a bilateral uterine artery ligation (BUAL), which is a surgical procedure involving tying off the uterine arteries, thereby reducing the main blood supply to the fetuses. This mimics a clinical condition referred to as placental insufficiency, and results in fetuses being severely growth restricted. A condition referred to as intrauterine growth restriction (IUGR). The pregnant rats received a dietary supplement of BrSp from the third trimester until two weeks after birth. A total of four groups were examined:

- 1) control (no surgical operation),
- 2) control + BrSp,
- 3) IUGR, and

What you need to know:

Overall, BrSp consumption during pregnancy and the pre-weaning period reduced the behavioral and physical deficits observed in the model of placental insufficiency, a common cause of cerebral palsy.

4) IUGR + BrSp. Pups born from these four groups underwent a battery of tests to examine birth weight, head circumference, reflex and behavior testing, and microscopic signs of brain injury.

What did the researchers find?

The researchers found that rat pups born to mothers that had the surgery were significantly growth restricted (IUGR), had larger heads compared to body length, and had several reflex, behavior, and abnormal brain tissue structure. Supplemental BrSp consumption in this model did not change BUAL pup outcomes, but showed several benefits. Specifically:

- IUGR pups were delayed in acquiring all reflexes tested, and displayed signs of hyperactivity.
- BrSp supplementation prevented these delays and the rat pups showed reduced activity and exploration, such that they were no longer different from control animals.
- IUGR rat pups showed that the number of cells in two areas of the hippocampus, involved in learning and memory, were reduced in the IUGR pups, and the major white matter tracts, corpus callosum and cingulum (involved in

communication between different brain regions), showed that:

1. Astrocytes, a supporting cell in the brain, were more reactive,
 2. The thickness of the white matter tracts was reduced, and
 3. The ventricular area, which consists of cerebrospinal fluid, was enlarged in IUGR pups. IUGR + BrSp pups showed reduced size.
- BrSp supplementation of the pregnant Dam during pregnancy, prevented each of these microscopic aberrations from occurring.

Hence, BrSp supplementation during pregnancy for rat pups exposed to a model of placental insufficiency prevented both the physical, cognitive and behavioral abnormalities from occurring.

How can you use this research?

The use of the natural health product, BrSp, provides a novel approach in preventing fetal brain injury during pregnancy. Researchers can further study how BrSp consumption provides beneficial effects. Policymakers can benefit from this study and understand the use of natural health products as a safe and effective alternative to potentially harmful pharmaceuticals as a treatment during pregnancy. Further research is required to investigate the effects of BrSp during pregnancy

About the Researchers

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This research summary was written by Antoinette Nguyen, BSc.

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