

A Specific Broccoli Sprout Preparation Reduces Chemically-Induced Colitis Via Gut Microbiota

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Objectives: Sulforaphane is a bioactive metabolite with anti-inflammatory activity that is derived from glucosinolates, which are highly abundant in cruciferous vegetables including broccoli sprouts. There have been limited studies to investigate a whole foods approach to increase sulforaphane levels with therapeutic effect and reduce inflammation. In the current study, using a mouse model of inflammatory bowel disease, we aimed to investigate the ability of steamed broccoli sprouts to ameliorate colitis and the role of the microbiota in mediating any effects.

Methods: C57BL/6J male mice were fed base diet or 5% steamed broccoli sprout diet for 2 weeks prior to induction of colitis with 2–3% DSS (5–7 days) and kept on their respective diets until sacrifice. Body weight and disease activity index scores were recorded daily, and histological assessment was performed on H&E sections of colon. Urine, feces, blood, and GI tract tissues and intestinal content

were collected for LC-MS/MS quantification of sulforaphane and glucoraphanin. The 16S rRNA sequencing was performed to analyze gut microbiome. Germ-free mice were fed base diet or 5% steamed broccoli sprout diet for 2 weeks followed by treatment with 5 days of DSS to determine the role of gut microbiota in mediating the anti-inflammatory effects of the steamed broccoli sprout diet.

Results: We observed that despite inactivation of the plant myrosinase enzyme responsible for the generation of sulforaphane via steaming, measurable levels of sulforaphane were detectable in the colon tissue and feces of mice after ingestion of steamed broccoli sprouts. In addition, this preparation of broccoli sprouts was also capable of reducing chemically-induced colitis. This protective effect was dependent on the presence of an intact gut microbiota, highlighting an important role for the microbiota in the metabolism of cruciferous vegetables to generate bioactive metabolites and promote their anti-inflammatory effects.

Conclusions: Altogether, these results suggest that the incorporation of a steamed broccoli sprouts diet is a viable dietary intervention to complement current medical therapies for patients with inflammatory bowel disease.

Funding Sources: This work was supported by USDA-NIFA-AFRI Foundational Program [Grant No. 2018–67,017-27,520].