5-29-2020

Maize Flavan-4-ols and Anthocyanins Alleviated Dextran Sulfate Sodium-Induced Colitis in Mice via Intestinal Barrier Function Restoration

Binning Wu

Shiyu Li

Haotian Chang

Ruth Anderson

Surinder Chopra

See next page for additional authors

Authors

Binning Wu, Shiyu Li, Haotian Chang, Ruth Anderson, Surinder Chopra, and Lavanya Reddivari

Maize Flavan-4-ols and Anthocyanins Alleviated Dextran Sulfate Sodium-Induced Colitis in Mice via Intestinal Barrier Function Restoration

Binning Wu,[1] Shiyu Li,[2] Haotian Chang,[2] Ruth Anderson,[2] Surinder Chopra,[1] and Lavanya Reddivari[2]

[1]Penn State University; and [2]Purdue University

Objectives: This study investigated the anti-inflammatory effects of anthocyanins and flavan-4-ols (precursor of phlobaphenes) within a whole-food matrix against dextran sulfate sodium (DSS)-induced colitis using four maize near-isogenic lines (NILs) that differ only in a single class of flavonoids. The four NILs are A (lacks anthocyanins and phlobaphenes), B (phlobaphenes +), C (anthocyanins +) and D (anthocyanins + and phlobaphenes +).

Methods: Conventional male C57BL6 mice were subjected to control diet 25% A, B, C, and D supplemented corn diet. Germ-free (GF) C57BL6 mice were subjected to either control or 25% D supplemented diet. Colitis was induced in both conventional and GF mice by 3% and 1.25% (w/v) DSS in the drinking water, respectively. Intestinal permeability was measured using FITC-dextran. RT-PCR was used to analyze the gene expression levels and 16S rRNA for bacterial relative abundance.

Results: In conventional mice, supplementation of A, B, C, and D prevented DSS-induced colon shortening and body weight loss compared to mice on the control diet ($P < 0.05$). Mice supplemented with B, C, D diets had lower gut permeability than DSS mice ($P < 0.05$). The mRNA expression level of pro-inflammatory interleukin-6 (IL-6) was suppressed in B, C and D supplemented mice whereas, interleukin 1β (IL-1β) expression was lowered in mice supplemented with C and D diets only. Supplementation of the four NILs decreased the abundance of the genus Pseudomonas in colitic mice ($P < 0.05$). In GF mice, D diet ameliorated DSS-induced colon shortening and elevated gut permeability. The expression level of IL-6 and IL-1β were downregulated in GF mice fed with D diet ($P < 0.05$).

Conclusions: In summary, flavan-4-ols and/or anthocyanins in the whole-food matrix exerted their protective effects against DSS-induced chronic inflammation and concommitantly restored intestinal barrier function. GF mice experiment results demonstrated that above mentioned beneficial effects from bioactive corn compounds were partially independent of gut microbiota.

Funding Sources: USDA-NIFA awards 2016-67,017-29,285 and 2019-67,017-29,258.