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Improvement of Gut Barrier Function by Potato Anthocyanins Is Dependent on Gut Microbiota

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Objectives: Ulcerative colitis (UC) is characterized by chronic colonic inflammation, impaired barrier function and gut bacterial dysbiosis. Anthocyanin-containing potatoes have been shown to maintain the intestinal barrier function in colitic mice. However, the role of gut microbiota in the anti-colitic effects of anthocyanin-containing potatoes is not clear. This study evaluated the gut barrier protective efficacy of purple- and red-fleshed potatoes using a DSS-induced murine model of colitis with the intact and antibiotic-depleted microbiota.

Methods: Four-week-old mice (C57BL6) were randomized into four groups, receiving a standard control diet, or a 20% purple-/red-fleshed potato (PP/RP) supplemented diet. A broad-spectrum antibiotic cocktail was used to deplete the gut bacteria. After eight weeks, mice were treated with 2% DSS in their drinking water for five days to induce colitis. The polyphenol composition of potatoes was analyzed by LC-MS/MS. Intestinal permeability was measured using FITC-dextran. Colonic myeloperoxidase (MPO) activities were de-

termined using the o-dianisidine dihydrochloride method. The fecal short-chain fatty acids (SCFA) content of mice was measured by GC-FID. RT-PCR was used to analyze the relative gene expression levels of cytokines and bacterial abundance.

Results: The predominant anthocyanin detected in RP was pelargonidin (93.13%). Whereas petunidin (75.57%) and malvidin (21.05%) were the two major anthocyanins present in PP. Administration of antibiotics resulted in a reduction in fecal SCFA. Antibiotic-treated mice were more prone to the DSS-induced increase in gut permeability. Anthocyanin-containing potato diets alleviated DSS-induced colonic damage, elevation in histology score and gut permeability only in non-antibiotic mice. RP alone suppressed the elevated colonic MPO activity and the gene expression levels of MUC2 in mice with intact gut microbiota.

Conclusions: In summary, anthocyanin-containing potatoes alleviated colitis-associated colonic epithelial damage and increased gut permeability in intact microbiota mice but not in microbiota-ablated mice. This suggests that the gut microbiome is essential for the gut barrier protective activity of anthocyanin-containing potatoes.

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