Nutritional Immunology and Inflammation/Immunometabolism

Wheatgerm Supplementation Reduces Gut Inflammation and Epithelial Barrier Dysfunction in IL-10 KO Mice Fed Atherogenic Diet

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Objectives: Wheat germ (WG) contains many bioactive compounds with the potential to maintain an anti-inflammatory gut environment. This study investigated the effects of WG supplementation on gut inflammation and integrity in high-fat fed interleukin (IL)-10 KO mice.

Methods: Eight-wk-old female B6.129P2-Il10^{tm1Cgn}/J (IL-10KO) and C57BL/6 (WT) mice (n = 10/group) were randomly assigned to diets: WT fed a control diet (WTCO; AIN93-M) and IL-10 KO mice fed control (KOCO), high-fat with high-cholesterol (HFHC; 45% fat kcal, 1% cholesterol), or HFHC + 10% WG (HFWG) for 3 m. Disease activity indices (fecal blood, ruffled fur, stool softness, and rectal prolapse) were monitored twice a week. Fecal indole and short chain fatty acids (SCFAs) concentration were assessed at the beginning and end of study. Proinflammatory cytokines were assessed in the serum and ileum. Ileal and colonic protein expression of transcription factors (STAT3, p-STAT3, PPARg, FoxP3, and AhR), tight junction proteins (ZO-1, occludin), and tryptophan catabolizing enzyme (IDO-1) were assessed by immunoblotting. Relative ileal and colonic gene expression of IL-22 and antimicrobial peptides (Reg3b and Reg3g) were assessed using qRT-PCR. $P < 0.05$ was considered statistically significant.

Results: WG increased ($P = 0.003$) colon length compared to the HFHC group. Weight loss (12.2% in HFHC vs WTCO) was not prevented by WG, but disease activity indices were significantly reduced in the WG vs HFHC group. WG also increased fecal indole, total SCFAs and acetate accompanied by an increase in colonic protein expression of PPARg ($P < 0.0001$) and FoxP3 ($P = 0.001$). Ileal STAT3 phosphorylation was reduced ($P = 0.0076$) due to WG supplementation. An increased colon and ileal protein expression of IDO-1 in the HFHS group was reduced by WG, while also increasing the expression of AhR, ZO-1, and occludin. The relative gene expression of the antimicrobial peptides (Reg3b and Reg3g) was increased ($P < 0.05$) while serum and ileal tissue concentration of the proinflammatory cytokine, IL-17 was reduced ($P = 0.0165$ *and* $p = 0.0248$ respectively) by WG.

Conclusions: WG modulated changes that are associated with HF-feeding in IL-10 KO mice, and might be a promising regimen for ameliorating the effects of gut inflammation.

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