Dietary Ganglioside Protects the Degradation of occludin tight junction protein in acute intestinal inflammation

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Lipopolysaccharide (LPS) or inflammatory cytokines (TNF-α and IL-1β) induce expression of nitric oxide (NO) and decrease expression of tight junction proteins. Our previous study demonstrated that feeding ganglioside decreased TNF-α and IL-1β signaling in intestinal mucosa in response to LPS. Thus, we hypothesized that the anti-inflammatory effect of dietary ganglioside will inhibit the production of NO and increase IL-10 in response to LPS, resulting in protection of gut occludin tight junction protein. Rats were fed semi-purified diets with or without (control) ganglioside (0.1%, w/w of total fat). After 2 weeks of feeding, half of animals from each diet group were injected with saline or LPS (O111:B4, ip, 3 mg/kg body wt). Intestinal mucosa and blood was collected after 6 h. The effect of dietary ganglioside on production of NO, IL-10 and occludin protein was determined. Feeding animals the ganglioside diet decreased total NO content in intestinal mucosa and plasma by 44% and 30%, respectively, in response to LPS compared to animals fed the control diet. Dietary ganglioside increased IL-10 content in intestinal mucosa by 32-fold ($P < 0.0001$) and in plasma by 2.4-fold ($P < 0.001$). Finally, the degradation of occludin tight junction protein in response to LPS was significantly inhibited by dietary ganglioside. This study demonstrates that dietary ganglioside inhibits degradation of gut occludin protein in acute inflammation induced by LPS thus suggesting that dietary ganglioside may protect against increased gut permeability of epithelial cells after acute inflammation or perhaps inflammatory bowel disease.