



PREBIOTIC OLIGOSACCHARIDES: DIETARY STRATEGIES FOR IMPROVING GUT HEALTH

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KEYWORDS: Dragon fruit oligosaccharides; Konjac oligo-glucomannan; *Gracilaria fisheri* oligosaccharides; gut motility; gut dysbiosis

INTRODUCTION:

Prebiotic oligosaccharides are produced from many different sources which may alter gut microbiota composition and improve gut health. These novel prebiotics are showing their ability to deliver health benefits compared to well-known prebiotics.

OBJECTIVES:

This research aimed to show the effects of novel prebiotic oligosaccharides: dragon fruit oligosaccharides (DFO), konjac oligo-glucomannan (KOG), and *Gracilaria fisheri* oligosaccharides (GFO) on gut motility in normal, constipated, and colitis mice, respectively.

METHOD / DESIGN:

Normal mice received distilled water, 100, 500, and 1000 mg/kg DFO, 1000 mg/kg fructo-oligosaccharide (FOS), or 10^9 CFU *Bifidobacterium animalis* daily for 1-2 weeks. Constipated mice received distilled water, 100, 500, and 1000 mg/kg KOG, 100 mg/kg konjac glucomannan (KGM), 500 mg/kg lactulose, or 10^9 CFU *Bifidobacterium animalis* daily for 2 weeks. Colitis mice received distilled water, 100, 500, and 1000 mg/kg GFO, or 1000 mg/kg inulin daily for 2 weeks. Gut microbiota composition, defecation frequency, and gut transits were analyzed. Motility patterns, smooth muscle (SM) contractions, and morphological structures of the colons were assessed.

RESULTS:

DFO significantly increased fecal output, reduced gut transit time, and increased the amplitude and duration of colonic SM contractions when compared to the control group. Spatiotemporal maps of colonic wall motions showed that DFO increased the number of colonic non-propagation contractions and fecal pellet velocity. Histological stains showed normal epithelia, crypts, goblet cells, and SM thickness in all groups. KOG ameliorated the effects of loperamide on defecation frequency, gut transit time, and contraction frequency of colonic SM. The motility patterns were changed from non-propagation to propagation contraction. KOG significantly inhibited the effects of loperamide on gut microbiota by increasing the numbers of *Bifidobacterium* spp. and decreasing the numbers of *Clostridium* spp. and *Bacteroides* spp. GFO attenuated histological change and shortening of the colon, reduced body weight loss, and lowered the disease activity index in acetic acid-induced colitis mice. GFO treatment prevented reductions in gut transit, propulsive motility, and SM contractility and also modulated *Enterobacteria* populations and short-chain fatty acids production in the gastrointestinal tract.

CONCLUSIONS:

The prebiotic effects of oligosaccharides derived from dragon fruit, konjac, and red seaweed (*Gracilaria fisheri*) could promote gut health and correct gastrointestinal motility disorders such as constipation and diarrhea symptoms of ulcerative colitis.