

1. Gut health and inulin

[British Journal of Nutrition](#), 2005 Apr; 93 Suppl 1:S73-90.

1.1 Inulin-type fructans and reduction in colon cancer risk: review of experimental and human data.

Beatrice L Pool-Zobel

Department of Nutritional Toxicology, Institute for Nutritional Sciences, Friedrich-Schiller-University Jena, Germany.

Inulin-type fructans (beta (2,1) fructans) extracted from chicory roots (*Cichorium intybus*) are prebiotic food ingredients, which in the gut lumen are fermented to lactic acid and SCFA. Research in experimental animal models revealed that inulin-type fructans have anticarcinogenic properties. A number of studies report the effects of inulin-type fructans on chemically induced pre-neoplastic lesions or tumours in the colon of rats and mice. In twelve studies, there were twenty-nine individual treatment groups of which twenty-four measured aberrant crypt foci (ACF) and five measured tumours. There was a significant reduction of ACF in twenty-one of the twenty-four treatment groups and of tumour incidence in five of the five treatment groups. Higher beneficial effects were achieved by synbiotics (mixtures of pro biotics and pre biotics), long-chain inulin-type fructans compared to short-chain derivatives, and feeding high-fat Western style diets. Inulin-type fructans reduced tumour incidence in APC (Min) mice in two of four studies and reduced growth and metastasising properties of implanted tumour cells in mice (four studies). The effects have been reported to be associated with gut flora-mediated fermentation and production of butyrate. In human cells, inulin-derived fermentation products inhibited cell growth, modulated differentiation and reduced metastasis activities.

IN CONCLUSION, evidence has been accumulated that shows that inulin-type fructans and corresponding fermentation products reduced the risks for colon cancer. The involved mechanisms included the reduction of exposure to risk factors and suppression of tumour cell survival. Thus, this specific type of dietary fibre exerted both blocking agent and suppressing agent types of chemopreventive activities.

1.2 Selective stimulation of bifidobacteria in the human colon by oligofructose and inulin.

Gibson GR, Beatty ER, Wang X, Cummings JH.

Medical Research Council, Dunn Clinical Nutrition Centre, Cambridge, England.

BACKGROUND/AIMS: Oligofructose and inulin are naturally occurring indigestible carbohydrates. In vitro they selectively stimulate the growth of species of *Bifidobacterium*, a genus of bacteria considered beneficial to health. This study was designed to determine their effects on the large bowel microflora and colonic function in vivo.

METHODS: Eight subjects participated in a 45-day study during which they ate controlled diets. For the middle 15 days, 15g day⁻¹ oligofructose was substituted for 15g.day⁻¹ sucrose. Four of these subjects went on to a further period with 15g.day⁻¹ inulin. Bowel habit, transit time, stool composition, breath H₂ and CH₄, and the predominant genera of colonic bacteria were measured.

RESULTS: Both oligofructose and inulin significantly increased bifidobacteria from 8.8 to 9.5 log 10g stool⁻¹ and 9.2 to 10.1 log 10g stool⁻¹, respectively, whereas bacteroides, clostridia, and fusobacteria decreased when subjects were fed oligofructose, and gram-positive cocci decreased when subjects were fed inulin. Total bacterial counts were unchanged. Fecal wet and dry matter, nitrogen, and energy excretion increased with both substrates, as did breath H₂. Little change in fecal short-chain fatty acids and breath CH₄ was observed. C

CONCLUSIONS: A 15g.day⁻¹ dietary addition of oligofructose or inulin led to *Bifidobacterium* becoming the numerically predominant genus in feces. Thus, small changes in diet can alter the balance of colonic bacteria towards a potentially healthier microflora.

[British Journal of Nutrition](#). 1998 Oct; 80(4):S219-23.

1.3 Prevention of colon cancer by pre- and probiotics: evidence from laboratory studies.

BS Reddy

American Health Foundation, Valhalla, New York 10595, USA.

Oligofructose and inulin, selective fermentable chicory fructans, have been shown to stimulate the growth of bifidobacteria which are regarded as beneficial strains in the colon. Studies were designed to evaluate inulin (Raftiline) and oligofructose (Raftilose), for their potential inhibitory properties against aberrant crypt foci (ACF) formation in the colon of rats. ACF are putative preneoplastic lesions from which adenomas and carcinomas may develop. The results of this study demonstrate that dietary administration of oligofructose and inulin inhibits the formation of preneoplastic lesions in the colon suggesting the potential colon tumour inhibitory properties of chicory fructans. Since these prebiotics selectively stimulate the growth of bifidobacteria, tumour inhibitory activity of lyophilized cultures of *Bifidobacterium longum* (BL) against azoxymethane (AOM)-induced colon carcinogenesis in rats and modulating effect of these cultures on colonic tumour cell proliferation, ornithine decarboxylase (ODC) activity, and ras-p21 oncoprotein expression were investigated.

Dietary administration of lyophilized cultures of BL strongly suppressed AOM-induced colon tumour development. Inhibition of colon carcinogenesis was associated with a decrease in colonic mucosal cell proliferation and colonic mucosal and tumour ODC and ras-p21 activities.