Mechanisms: Prebiotics & chicory root fibre health benefit potentials

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Health Benefit	Mechanism
Weight Management	Helps create a feeling of satiety, subsequent formation of SCFAs (acetate, propionate, butyrate and lactate). These SCFAs influence appetite regulation and food intake by triggering a release of the gut hormones like GLP-1 and PYY. Both hormones secreted (by L-cells) at the end of the small intestine and in the large intestine. They simulate glucose-dependent insulin secretion, inhibit glucagon release in the pancreas and gastric emptying in the stomach as well as directly suppress appetite in the brain.
Diabetes/blood sugar management	In 2014, EFSA evaluated data and had a positive opinion that replacing 20 percent of sugars with chicory root fibre helps achieve lower blood sugar levels and insulin levels. By way of adiponectin, a protein that helps metabolise glucose and fatty acids. In a 2013 study involving 49 women with type 2 diabetes found that inulin reduced both fasting blood sugar and HbA1c levels significantly (2).
Mental well-being	Chicory root fibre has Lactucin – which gives a sense of tranquility.
Immune system support	70-80% immune cells are in the gut. There is increasing evidence that prebiotics can modulate various properties of the immune system, including those of the gut-associated lymphoid tissues (GALT). Changes in intestinal microflora that occur with prebiotic consumption may mediate immune changes via: the direct contact of lactic acid bacteria or bacteria products with immune cells in the intestine; the production of short-chain fatty acids from fibre fermentation; or by changes in mucin production. More studies into the mechanisms, dose-effect relations and structure-function studies are required.
Cardiovascular Health	Parnell and Reiner (1) reported that probiotic supplementation lowers total serum cholesterol in a hypercholesterolemic rat model. In this experiment, rats were adminitstered one of three diets supplemented with 1,10 or 20% prebiotic fibre for 10 weeks. Both doses of prebiotic fibre reduced serum cholesterol concentrations by about 25%. Additionally, this change was correlated with an increase in caeca digesta, as well as the up-regulatation of genes involved in cholesterol biosynthesis and bile production. In obese rates with 10% prebiotic supplementation demonstrated an approximate 40% reduction in triacylglycerol accumulation in the liver.

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Protects the Liver	Helps create a feeling of satiety, subsequent formation of SCFAs (acetate, propionate, butyrate and lactate). These SCFAs influence appetite regulation and food intake by triggering a release of the gut hormones like GLP-1 and PYY. Both hormones secreted (by L-cells) at the end of the small intestine and in the large intestine. They simulate glucose-dependent insulin secretion, inhibit glucagon release in the pancreas and gastric emptying in the stomach as well as directly suppress appetite in the brain.
Anti-inflammatory properties including memory **Takeaway:** Aging can bring forgetfulness, but also dementia and Alzheimer's disease. Evidence linking brain performance to soluble fibre content and resultant short chain fatty acid production is an exciting advance in neuroscience. Data indicates that dietary fibre intake – a great source of SCFAs is about 40% below the recommended adequate intake.	Bacteria feast on prebiotic fibre like guests raiding your pantry, and in the process, leave behind short-chain fatty acids (SCFAs). Chicory root fibre is especially adept at creating a powerful SCFA named 'butyrate'. Butyrate is stellar! It can be anti-inflammatory and may improve memory (at least in mice where it is has shown to improve neuroinflammation (2)). Starting with the premise that aging itself leads to inflammation. *"Taken together, high fiber supplementation in aging is a non-invasive strategy to increase butyrate levels, and these data suggest that an increase in butyrate through added soluble fiber such as inulin could counterbalance the age-related microbiota dysbiosis, potentially leading to neurological benefits."*
Sleep	Dietary prebiotics alter novel microbial dependent fecal metabolites that improve sleep. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7051969/ Dietary Prebiotics and Bioactive Milk Fractions Improve NREM Sleep, Enhance REM Sleep Rebound and Attenuate the Stress-Induced Decrease in Diurnal Temperature and Gut Microbial Alpha Diversity. https://pubmed.ncbi.nlm.nih.gov/28119579/

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Digestive health & regularity	Native chicory root (inulin) "Contributes to normal bowel function by increasing stool frequency" EFSA and GB NHC Article 13.5. As a soluble fibre absorbs water in the gut to form a gel-like substance, which softens stool, reduces hunger, improves motility, and relieves constipation. Furthermore, chicory root fibre is prebiotic and nourishes gut microbes, helping to support a happier, healthier gut microbiome and overall health and well-being by helping to maintain gut pH by producing lactate and acetate.
Colon Cancer	Present studies have suggested that prebiotics also possess protective effects against colon carcinogenesis, mainly attributed to the production of short chain fatty acids (SCFAs) upon its fermentation by gut microflora, and alteration of gene-expressions in tumour cells. In an animal trial Femia *et al* (3), it was reported that the protective effects of oligofructose-inulin (chicory root fibre) and colonic proliferation was statistically lower than probiotics. Authors of the study subsequently conducted further studies on the expression of genes codifying enzymes involved in colon carcinogenesis processes. Glutathione S-transferase and GST placental enzyme pi type were found to be expressed lower when rats were fed the prebiotic individually and when fed in combination with *Lactobacillus rhamnosus GG* and *Bifidobacterium lactis Bb12*. The authors also evaluated the levels of cyclooxygenase-2 – an enzyme found to be upregulated in cancers, and cyclooxygenase-2 inhibitors, which are often associated with chemopreventive activities. Although the exact mechanisms remain unknown, Femia *et al*. postulated that prebiotic reduced carcinogenesis via modification of gene-expressions.
Calcium (bone health) and magnesium absorption	The gut microbiome is emerging as a regulator of bone health through a gut-bone axis. Fermentation by-products are short-chain fatty acids, which could be directly responsible for improved calcium utlisation. Through changes in colonic microbiota can increase mineral absorption, which may be mediated by the gut microbiota, specifically bifidobacterial. Further studies are needed, however results show that there is a beneficial effect on inulin on intestinal calcium and magnesium absorption.(4)