

## **Dietary Fibre and Satiety: Linking Gut Health, GLP-1 and Metabolic Wellbeing**

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### **Abstract**

Dietary fibre is increasingly recognised as a key link between gut health, satiety and metabolic wellbeing. Beyond bowel regularity, fibre influences appetite regulation, post-prandial glucose control and gut microbiome activity through mechanisms that depend on fibre type, viscosity and fermentability. This short communication highlights how soluble, fermentable fibres can support physiological glucagon-like peptide-1 (GLP-1) secretion by slowing gastric emptying, modulating nutrient absorption and providing substrates for microbial fermentation in the colon. The resulting short-chain fatty acids, including acetate, propionate and butyrate, may stimulate intestinal L-cells, contributing to satiety, insulin response and metabolic homeostasis. Insoluble fibres, although less directly linked to GLP-1 stimulation, remain essential for stool bulk, intestinal transit and digestive resilience. Fibre-induced GLP-1 signalling is a natural, transient physiological response rather than a substitute for GLP-1-based therapies. Given growing interest in GLP-1, obesity management and functional nutrition, improving dietary fibre intake offers a practical foundation for healthier eating patterns. Combining diverse fibre-rich foods, responsible food innovation, healthcare guidance and broader lifestyle strategies can support gut health, satiety and long-term metabolic wellbeing.

**Keywords:** *Dietary Fibre; Soluble Fibre; Insoluble Fibre; Satiety; Gut Microbiota; Short-Chain Fatty Acids; GLP-1; Metabolic Health*

### **Abbreviations**

DF: Dietary Fibre; GLP-1: Glucagon-Like Peptide-1; SCFAs: Short-Chain Fatty Acids; PYY: Peptide YY; FFAR: Free Fatty Acid Receptor

### **Introduction**

#### **Role of dietary fibre**

Dietary fibre has regained public and scientific attention as consumers increasingly seek foods that support satiety, digestive comfort and long-term metabolic wellbeing. Although recent consumer trends such as “fibre maxing” have helped raise awareness, the relevance of fibre extends well beyond bowel regularity. Fibre-rich diets contribute to a diverse gut microbiome, improved post-prandial responses, cholesterol management, appetite regulation and overall dietary quality. In this context, fibre should be considered not only as a digestive nutrient, but also as an important dietary component linking gut health with metabolic health [2].

Dietary fibres are commonly grouped into soluble and insoluble fractions, each contributing through distinct but complementary physiological mechanisms. Soluble fibres dissolve or disperse in water and can form viscous gels in the gastrointestinal tract. This viscosity

may slow gastric emptying and nutrient absorption, thereby supporting satiety and a more gradual glycaemic response. Soluble fibres are also associated with cholesterol-lowering effects and are present in foods such as oats, beans, lentils, apples, chia seeds and flax seeds [2].

Insoluble fibres, by contrast, do not dissolve readily in water and are less viscous. Their primary contribution is mechanical: they increase stool bulk, support intestinal transit and promote regular bowel movements. Sources include whole grains, vegetable skins, leafy vegetables and other plant-based foods. Together, soluble and insoluble fibres provide complementary benefits, and a balanced intake from varied plant sources is preferable rather than relying on a single source of fibre [2].

A further important distinction is fermentability. Some fibres, including prebiotic fibres such as inulin, can be fermented by gut microbiota in the colon. This fermentation produces short-chain fatty acids (SCFAs), principally acetate, propionate and butyrate, which act locally within the gut and may also contribute to systemic metabolic signalling. These metabolites help create an intestinal environment that supports beneficial microbial activity. Diets high in refined sugars and low in fibre may reduce microbial diversity and compromise gut health [3].

Researchers are becoming increasingly interested in how fermentable fibre affects health. When gut bacteria break down this type of fibre, they produce short-chain fatty acids (SCFAs), which stimulate the release of GLP-1 (an incretin hormone released from intestinal L-cells that helps regulate appetite, blood sugar, and digestion). SCFAs produced during microbial fermentation can stimulate L-cells through free fatty acid receptors, providing a plausible pathway by which fermentable fibres may enhance endogenous GLP-1 secretion. This does not imply that fibre substitutes for pharmacological GLP-1 therapies; rather, it highlights how habitual dietary patterns may support physiological satiety and metabolic signalling [6]. Together, these complementary pathways explain how soluble and insoluble fibres can support satiety, digestive wellbeing and broader metabolic health [1-3].

Despite these recognised benefits, dietary fibre intake remains below recommended levels in many populations. Across Europe, EFSA advises an adequate intake of 25 g/day for adults, yet average consumption in many EU populations often falls closer to 15 - 20 g/day, leaving a persistent fibre gap. Increasing fibre intake through everyday foods and well-formulated products represents a practical opportunity to enhance satiety, support gut microbiome function and contribute to broader health and wellbeing [2].

As is known, dietary fibre supports satiety and metabolic wellbeing through mechanisms that depend on type of fibre, physicochemical properties and fermentability. Soluble fibres, particularly viscous and fermentable fibres such as beta-glucans, inulin-type fructans, resistant starches, arabinoxylans, pectins and selected dextrins, are most closely associated with changes in endogenous GLP-1 secretion [5-7,9]. These fibres can slow gastric emptying and nutrient absorption in the upper gastrointestinal tract, while also reaching the colon where they are fermented by gut microbiota into short-chain fatty acids (SCFAs), including acetate, propionate and butyrate. SCFAs can stimulate intestinal L-cells through free fatty acid receptors, contributing to GLP-1 secretion and supporting satiety, insulin response and post-prandial glucose regulation [6-9].

Insoluble fibres, found in foods such as wheat bran, wholegrain cereals, brown rice, nuts, seeds, broccoli, cauliflower and vegetable skins, play a more indirect but still an important role. Because they do not dissolve readily in water and are generally less viscous, their primary effects are to increase stool bulk, support intestinal transit and maintain gut motility. These functions help sustain a healthier intestinal environment and may improve the delivery of fermentable substrates through the gut. However, insoluble fibres are not usually the main drivers of SCFA-mediated GLP-1 release unless they contain fermentable components or are consumed as part of whole foods that also provide soluble fibre [5-7].

Fibre quality therefore matters as much as quantity. A “high-fibre” claim alone does not predict effects on satiety or GLP-1-related pathways; the response depends on whether the fibre is soluble, viscous and fermentable, and whether it supports sustained SCFA

production [5-7,9]. Dietary guidance and product development should therefore combine soluble, fermentable fibres with insoluble fibre-rich whole foods. This balanced approach can support viscosity, fermentation and gut-hormone signalling while maintaining regularity, gut motility and digestive resilience [9].

### Fibre, satiety and appetite regulation

Satiety, the feeling of fullness that persists after a meal is influenced by multiple signals arising from the gastrointestinal tract, circulation and central nervous system. Dietary fibre modulates several of these signals through both physicochemical and microbial mechanisms, thereby contributing to appetite regulation and energy intake control [3].

Viscous soluble fibres can form gels in the stomach and small intestine, increasing the thickness of the luminal contents and slowing gastric emptying. This delays the arrival of nutrients in the small intestine, prolongs gastric distension and enhances the activation of stretch receptors, all of which contribute to earlier and more sustained feelings of fullness. The slower rate of nutrient absorption also moderates post-prandial glucose and insulin responses, which may help reduce subsequent hunger and cravings [3].

In the distal gut, fermentable fibres serve as substrates for microbial production of short-chain fatty acids (SCFAs), including acetate, propionate and butyrate. These metabolites can interact with free fatty acid receptors on enteroendocrine L-cells and other gut cells, stimulating the release of gut hormones such as GLP-1 and Peptide YY (PYY). Both GLP-1 and PYY act on the brain to promote satiety and reduce food intake, and they also influence gastric emptying and insulin secretion. In this way, fibre fermentation provides a mechanistic link between the colonic microbiota and appetite regulation [3].

Insoluble fibres contribute more indirectly to satiety. By increasing stool bulk and accelerating intestinal transit, they help maintain regular bowel function and may influence the timing and pattern of nutrient exposure along the gut. While insoluble fibres are less directly involved in gut-hormone signalling than viscous, fermentable fibres, they remain important components of a fibre-rich diet, particularly when consumed as part of whole plant foods that contain both soluble and insoluble fractions [3].

The magnitude of fibre's effects on satiety depends on several factors, including the type and dose of fibre, its viscosity and fermentability, the food matrix in which it is delivered, and individual differences in gut microbiota and metabolism. No single fibre ingredient can replicate the complex effects of a diverse, fibre-rich diet. Nonetheless, strategic use of specific soluble and fermentable fibres in foods and beverages can complement whole-food approaches to support appetite control, reduce excessive energy intake and contribute to long-term weight management [2].

Importantly, fibre-induced changes in endogenous GLP-1 and other gut hormones should be understood as part of a normal, transient physiological response to meals. These dietary effects are modest compared with the pharmacological activation of GLP-1 receptors achieved by injectable or oral GLP-1-based medicines. Dietary fibre therefore represents one component of a broader lifestyle strategy alongside adequate protein intake, physical activity and overall dietary quality to support sustainable satiety and metabolic wellbeing, rather than a substitute for metabolic wellbeing [7].

Finally, while dietary fibre can support the body's natural GLP-1 response, optimal metabolic health is likely achieved through a combination of healthy dietary patterns and evidence-based medical therapies where appropriate [10-12].

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