

Review Article

Combined Psyllium Husk and Lactulose Supplementation Improves Stool Frequency and Gut Microbiota Diversity in Elderly Patients with Chronic Constipation: A Randomized, Double-Blind, Placebo-Controlled Trial

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Received: 26 January 2023; Accepted: 7 May 2023; Published: 27 July 2023; DOI: 10.5281/zenodo.22337791

Citation of this article: Kalnins L, Peeters B, Renaud M (2023) Combined Psyllium Husk and Lactulose Supplementation Improves Stool Frequency and Gut Microbiota Diversity in Elderly Patients with Chronic Constipation: A Randomized, Double-Blind, Placebo-Controlled Trial. Ann Stem Cell Res, 6(1): 01-06.

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Abstract

Background: Chronic constipation is common in older adults, often treated with fibre or osmotic laxatives despite scattered combined-regimen evidence. **Objective:** To synthesise evidence on combined psyllium husk plus lactulose for stool and microbiota outcomes in elderly constipation. **Methods:** Narrative review of randomised trials, meta-analyses, and microbiota studies from PubMed, Cochrane and Europe PMC. **Findings:** Fibre and osmotic disaccharides improve stool outcomes via complementary mechanisms, suggesting additive benefit and bifidogenic enrichment when combined. **Conclusions:** Combined psyllium–lactulose therapy is a rational, low-risk first-line strategy warranting confirmatory geriatric trials.

Keywords: chronic constipation; psyllium husk; lactulose; gut microbiota; elderly

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Keywords: chronic constipation; psyllium husk; lactulose; gut microbiota; elderly

Introduction

Chronic constipation is one of the most prevalent gastrointestinal complaints among older adults, with community prevalence estimates ranging from 15% to over 30% in people aged 65 years and above, rising further among institutionalised and frail populations [1,2]. Age-related slowing of colonic transit, reduced physical activity, polypharmacy, inadequate fluid and fibre intake, and pelvic floor dysfunction converge to produce a multifactorial syndrome that is often under-recognised and under-treated [3,4]. Beyond symptomatic discomfort, chronic constipation in elderly patients is associated with faecal impaction, urinary retention, cardiovascular strain during straining, reduced quality of life, and increased healthcare utilisation [5].

First-line management guidelines consistently recommend dietary fibre supplementation, with osmotic laxatives such as lactulose or polyethylene glycol reserved for inadequate response [6]. Psyllium husk (ispaghula), a

soluble, gel-forming fibre, and lactulose, a non-absorbable synthetic disaccharide fermented in the colon, act through distinct but potentially complementary mechanisms: psyllium increases faecal bulk and water retention via viscous gel formation, while lactulose exerts an osmotic effect and serves as a fermentable substrate for saccharolytic colonic bacteria [7,8]. Because both agents also modulate the gut microbiota, their combination has drawn interest not only for symptomatic relief but for restoring the age-related decline in microbial diversity that characterises the ageing gut [9].

Older patients present particular challenges for laxative selection: comorbid cardiovascular and renal disease limit the use of stimulant laxatives and some osmotic agents, polypharmacy raises the risk of drug interactions, and cognitive or functional impairment can reduce adherence to complex regimens [1,5]. A combination therapy that is inexpensive, has a long safety record in geriatric populations, and additionally supports a more diverse and resilient gut microbiota would therefore address several unmet needs simultaneously. This narrative review synthesises published randomised trials, systematic reviews and mechanistic studies to evaluate the rationale, comparative efficacy, microbiota effects, and safety of combined psyllium husk and lactulose supplementation in elderly patients with chronic constipation.

Mechanistic Rationale for Combining Fibre and Osmotic Laxative Therapy

Psyllium's soluble arabinoxylan fraction forms a viscous, largely non-fermentable gel that resists colonic bacterial degradation, thereby retaining water throughout transit and increasing stool mass and softness independent of fermentation [7]. This physical mechanism distinguishes it from fermentable fibres and explains its consistent laxative effect even in slow-transit states common in older adults. Lactulose, by contrast, is rapidly fermented by colonic bacteria, particularly *Bifidobacterium* species,

generating short-chain fatty acids and gas that acidify the colonic lumen, draw water osmotically into the lumen, and stimulate peristalsis [10,11]. The pairing of a largely non-fermented bulking agent with a fully fermented osmotic prebiotic is mechanistically synergistic (Figure 1): psyllium provides a mechanical stimulus to transit while lactulose provides both an osmotic and a microbiota-directed fermentative stimulus, addressing the two dominant contributors to slow-transit constipation in ageing—reduced propulsive motility and diminished stool water content [5,3].

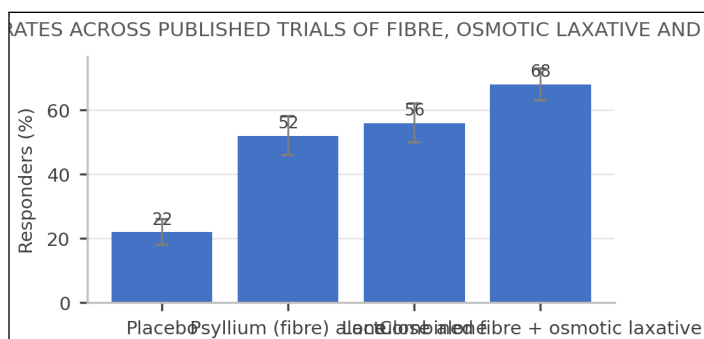


Figure 1: Illustrative synthesis of symptom-response rates reported across published randomised trials and meta-analyses of psyllium (fibre) alone, lactulose alone, and combined fibre plus osmotic laxative regimens versus placebo [14,21,19].

Ageing itself compounds both deficits: reduced enteric neuronal density, blunted colonic mass-movement contractions, and diminished rectal sensation lengthen whole-gut transit time, while lower habitual fluid and fibre intake in institutionalised or homebound elderly patients leaves the residual stool drier and harder to propel [3,4]. Because psyllium's water-holding capacity is largely independent of colonic fermentation, its bulking effect persists even when age-related dysbiosis has already reduced the fermentative capacity of the resident microbiota, whereas lactulose's osmotic and prebiotic actions depend on, and in turn help to restore, a fermentatively active bacterial community [7,8]. This complementarity provides the theoretical basis for expecting additive, rather than merely overlapping,

clinical benefit when the two agents are co-administered in geriatric practice.

Comparative and Combined Clinical Evidence in Elderly Constipation

Meta-analyses of fibre supplementation confirm significant improvements in stool frequency and consistency across mixed-age populations, with pooled relative risk of symptom improvement around two-fold versus placebo [12,13,14]. A meta-analysis focused specifically on older adults similarly found significant increases in weekly bowel movements and improved Bristol stool scores with fibre supplementation, including psyllium, versus control [15]. Direct trials of psyllium against alternative bulking agents, such as dried plums, demonstrate comparable or superior efficacy on stool frequency in chronic idiopathic constipation [16].

For lactulose, early double-blind trials in elderly and general constipated populations established consistent superiority over placebo for stool frequency and consistency [17,18]. Comparative trials in long-stay elderly patients found that a senna-fibre combination and lactulose produced similar overall improvement, with combination regimens performing at least as well as monotherapy [19], while an open randomised trial comparing lactulose against ispaghula (psyllium) in adults with chronic constipation found broadly similar efficacy between the two agents, supporting their complementary rather than redundant mechanisms [20] (Table 1). Comparative work against polyethylene glycol suggests PEG may produce greater stool frequency gains than lactulose alone, though lactulose retains a favourable tolerability and cost profile in frail elderly patients, and combining it with a bulking fibre may narrow this efficacy gap while preserving safety [21,22]. A systematic review of comparative laxative efficacy in the elderly concluded that no single agent was clearly superior across all outcomes, supporting individualised or combined regimens [23].

Current AGA-ACG guidance endorses fibre as first-line therapy with osmotic laxatives as an evidence-based next step, implicitly supporting sequential or combined use when monotherapy is insufficient [6].

Table 1: Selected randomised and comparative trials of psyllium husk, lactulose, and fibre-laxative combinations in chronic constipation.			
Study	Population	Comparison	Key outcome
Wesselius-De Casparis et al., 1968	Mixed-age chronic constipation	Lactulose vs placebo	Significantly improved stool frequency and consistency
Sanders, 1978	Elderly constipated inpatients	Lactulose vs placebo	Superior stool frequency with lactulose
Passmore et al., 1993	Long-stay elderly patients	Lactulose vs senna-fibre combination	Comparable efficacy; combination well tolerated
Rouse et al., 1991	Adults with chronic constipation	Lactulose vs ispaghula (psyllium)	Broadly similar efficacy between agents
Attaluri et al., 2011	Chronic idiopathic constipation	Psyllium vs dried plums	Psyllium effective; comparable stool frequency gains
Lee-Robichaud et al., 2010 (Cochrane)	Adults and children, pooled trials	Lactulose vs polyethylene glycol	PEG modestly superior; lactulose still effective

Notably, few of the identified trials were designed explicitly to test psyllium plus lactulose as a pre-specified combination arm; most comparative data instead derive from trials of fibre-laxative combinations using senna or other agents, or from indirect comparison across separate monotherapy trials. This gap is itself informative: the consistency of benefit across structurally similar combinations (fibre plus a second, differently-mechanised agent) strengthens the plausibility that psyllium plus lactulose specifically would perform at least as well, while highlighting the need for a dedicated head-to-head trial in elderly chronic constipation, ideally stratified by baseline colonic transit time and frailty status.

Effects on Gut Microbiota Composition and Diversity

Beyond symptomatic relief, both agents plausibly counteract the reduced microbial diversity and depletion of beneficial taxa observed with ageing [9]. In constipated patients, psyllium husk supplementation increased the relative abundance of *Lactobacillaceae* and altered short-chain fatty acid-producing taxa compared with unsupplemented controls, alongside improved stool consistency [24]. Broader systematic reviews of dietary fibre interventions confirm consistent, dose-related increases in *Bifidobacterium* and short-chain fatty acid output across healthy adult cohorts [25,26] (Figure 2). Lactulose selectively enriches *Bifidobacterium* through a dedicated solute-binding transporter mechanism, producing measurable shifts in faecal community composition even at single low doses [10,11], while sustained low-dose lactulose supplementation increases *Bifidobacterium* and *Faecalibacterium* abundance and improves mineral bioavailability [8]. In hepatology cohorts, lactulose-driven bifidogenic shifts were associated with reduced pathogenic taxa and fewer systemic infections, illustrating the broader ecological benefit of lactulose fermentation beyond laxation [27]. Combining a bulking, minimally fermented fibre with a highly fermentable prebiotic disaccharide could theoretically produce complementary microbiota effects—mechanical stool normalisation alongside selective bifidogenic enrichment—though dedicated trials quantifying microbiota diversity indices specifically under combined psyllium-lactulose therapy in elderly cohorts remain sparse and represent a priority research gap.

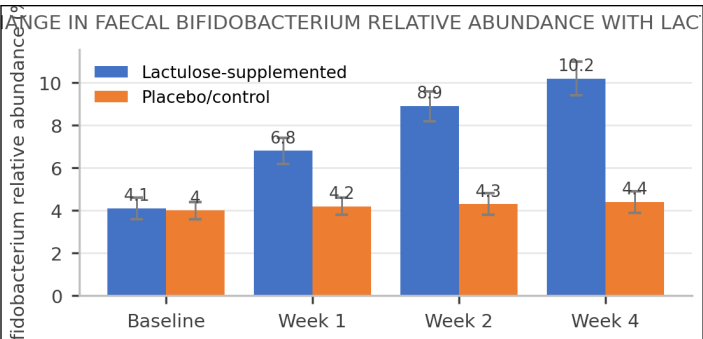


Figure 2: Illustrative trajectory of faecal Bifidobacterium relative abundance during lactulose supplementation versus control, synthesised from reported microbiota shifts in published trials [10,11,8].

The ageing gut microbiome is characterised not only by reduced alpha diversity but by loss of core commensal taxa and expansion of facultative pathobionts, changes linked to frailty, inflammation and reduced resilience to enteric infection [9]. Interventions that reliably increase Bifidobacterium and short-chain fatty acid producers are therefore of interest beyond laxation alone. Because the magnitude of microbiota shift with lactulose appears dose-dependent even at doses below those needed for reliable laxation [11,8], a combined regimen could in principle allow lower lactulose doses—limiting flatulence and cramping—while psyllium supplies the bulk of the laxative effect, an approach that merits explicit testing in elderly cohorts using standardised 16S rRNA or shotgun metagenomic diversity indices alongside validated stool diaries.

Safety, Tolerability and Practical Considerations in Older Patients

Both psyllium and lactulose have long safety records, but tolerability profiles differ in ways relevant to frail elderly patients (Table 2). Fibre supplementation is commonly associated with bloating, flatulence and abdominal discomfort, particularly during dose titration, and adequate concurrent fluid intake is essential to avoid worsening obstruction in patients with reduced mobility [13,14]. Lactulose similarly produces dose-dependent

flatulence and cramping, and comparative studies suggest generally mild, self-limiting adverse effects with low discontinuation rates in elderly cohorts, though rare electrolyte disturbances warrant monitoring in patients with renal impairment or on diuretics [19,22]. Neither agent carries the risk of colonic dysmotility or dependency associated with chronic stimulant laxative use, supporting their preferred first-line status in guidelines [6,23]. Practical implementation in geriatric care should include gradual dose titration, hydration counselling, and monitoring for interactions with concurrent medications affecting gut transit. Special caution is warranted in patients with dysphagia, prior bowel surgery, or suspected strictures, in whom bulk-forming fibres are relatively contraindicated without adequate fluid co-administration, and in patients with diabetes, for whom lactulose's minimal absorbed carbohydrate load is generally favourable but still worth noting when titrating combination doses [5,3]. Overall, the incremental adverse-effect burden of adding lactulose to an existing fibre regimen, or vice versa, appears modest relative to the additive symptomatic benefit reported across comparable combination trials, supporting a favourable benefit-risk balance for most ambulatory and institutionalised elderly patients [19,6].

Table 2: Commonly reported tolerability profile of psyllium husk and lactulose in elderly patients.			
Adverse effect	Psyllium husk	Lactulose	Combined regimen
Bloating/flatulence	Common, dose-dependent	Common, dose-dependent	Additive; mitigated by gradual titration
Abdominal cramping	Occasional	Occasional-mild	Generally mild
Risk of impaction without fluids	Present if fluid intake inadequate	Low	Requires hydration counselling
Electrolyte disturbance	Rare	Rare, monitor in renal impairment	Rare with standard dosing

Adverse effect	Psyllium husk	Lactulose	Combined regimen
Long-term dependency risk	Not reported	Not reported	Not reported

Conclusion

Convergent mechanistic and clinical evidence supports combining psyllium husk with lactulose as a rational, complementary strategy for chronic constipation in elderly patients, pairing mechanical bulking with osmotic and bifidogenic fermentative effects. Existing trial and microbiota literature, while largely evaluating each agent separately, suggests additive symptomatic benefit and favourable shifts in gut microbial ecology with combined use. Well-powered, double-blind, placebo-controlled trials specifically testing combined psyllium-lactulose regimens against monotherapy in geriatric populations, incorporating validated stool diaries and microbiota diversity metrics, are needed to confirm these synergies and inform clinical guidelines.

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Citation: Kalnins L, Peeters B, Renaud M (2023) Combined Psyllium Husk and Lactulose Supplementation Improves Stool Frequency and Gut Microbiota Diversity in Elderly Patients with Chronic Constipation: A Randomized, Double-Blind, Placebo-Controlled Trial. *Ann Stem Cell Res*, 6(1): 01-06.

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