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# Probiotics in Irritable Bowel Syndrome

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## Abstract:

Irritable Bowel Syndrome (IBS) is an intestinal issue which may appear in all genders and ages. It is a frequent functional gastrointestinal disorder (FGID). There are symptoms such as bloating, gas, stomach pain, and discomfort, which is correlated with an alteration in bowel movements. Although IBS is a benign condition that cannot cause death, the patients still feel distressing about the symptoms and also have an increased prevalence of sadness and anxiety which can lead to a significant decline in living quality. While the IBS seems to be incurable to people who have undergone medical or dietary modification. However, alternate methods may help alleviate the discomfort. Probiotics may operate by limiting the formation of harmful bacteria, stopping pathogens from rising up in the host, increasing the function of the intestinal barrier and of the recipient, and generating or secreting chemicals such as short chain fatty acids (SCFAs) and neurotransmitters. The recognition of advantageous influence among certain bacterial strains or probiotic supplements might lead to more successful therapeutic treatments.

*Keywords* **—Irritable Bowel Syndrome, frequent functional gastrointestinal disorder, Lactobacillus plantarum, probiotics**

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## I. INTRODUCTION

Irritable Bowel Syndrome (IBS) generates an annoyance or abdominal pain due to the anomaly functioning of gastrointestinal conditions such as stool consistency (1, 2). There was evidence of symptoms established after an infection or post-infectious from clinical observation, suggesting that IBS is somehow being influenced by the variance of the Gut Microbiome (3, 4). IBS symptoms are similar to those of the overgrowth bacteria in the small intestine which occur as bloating from the excess consumption of food stomach pain, and discomfort are related to an alter in bowel movements including diarrhea, constipation, or mix (5, 6). IBS patients seem to be incurable with pharmacological treatment or dietary changes (Wilsher, 2016). Nevertheless, there are alternative approaches that can relieve the symptoms (Shah et al., 2021; Wilsher, 2016). Hence, the review aimed to explore the alternative approach for relieving IBS symptoms by reviewing various types of probiotics to examine how probiotics can help alleviate the issues.

## II. IRRITABLE BOWEL SYNDROME AND DIETARY CHANGES

IBS etiology is suggested as a multifactorial condition influenced by the environment, inherited, and psychosocial factors, however the information has not been proven (7, 8). The mechanisms consisted of visceral hypersensitivity, gut dysfunction, brain axis, disruption to the stability of the epithelial barrier , adjusted gastrointestinal motility, immunereaction, atypicalsignaling of the enteroendocrine, and dysbiosis in the gut microbiota (9-12). The Rome foundation has updated the criteria for colorectal disorders that focused on identifying and treating the indications of IBS as well as other frequent functional gastrointestinal disorder (FGIDs) and also ruled out

  

other serious gastrointestinal conditions and affirmed the diagnosis of IBS (13-15).

Medical treatment of IBS pointed out regarding the predominant symptom of the patient (16). Furthermore, the identification of a limit in fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAPs) diet as a method to treat IBS has been discovered, therefore, it is recommended to include this diet in patients' eating habits (6, 17, 18). In addition, these aspects can lead to a positive impact on improving patient's quality of life. The change in diet IBS have a mild ailment that can not cause death (6). However, the patient will frequently feel uncomfortable with the symptoms, it is also associated with an increasing rate of depression and anxiety (6, 19). Therefore, other alternative approaches are still require for augmenting standard therapy to improve symptoms of IBS patients.

## III. PROBIOTIC

Probiotics are living microorganisms capable of providing advantages to the host when taken in sufficient quantities (20). Food with probiotic-rich cultures are in high demand all over the world, due to a steady stream of scientific discoveries pointing to their beneficial properties for consumers. The intestinal microbiota is made up of hundreds of various bacteria species that are naturally present (21, 22). Probiotics are intestinal microbes that are believed to provide potential contributions to the host's fitness by modulating the intestinal microbiota. Beneficial probiotic bacterial strains have been recorded to relate to the genera Lactobacillus and Bifidobacterium (23, 24).

The ability of probiotics to transiently colonize the gastrointestinal tract and release antimicrobial components is attributed to their ability to modulate the intestinal microbiota (20). Probiotics compete with other bacteria, stopping proliferation and reducing virulence (25). They can influence the intestinal barrier's role via modulating intestinal microbiota and IL-10, complying with intestinal cells and protecting the probity and tolerance of the epithelial barrier, stopping enteric pathogens from attaching to intestinal cells but also prohibiting the impact (26, 27). Probiotics are believed to modify cytokine and chemokine levels in order to affect the immune response to inflammation. Finally, probiotics may greatly reduce visceral hypersensitivity (28-30). Probiotics have an indirect systemic influence of increasing immune immunity in relation to these local effects (31).

Probiotics enhance the amount of good bacteria in the gastrointestinal system, and this results in a lower incidence of intestinal bacterial overgrowth in patients with IBS (25). By the intestinal permeability, iinverting the disparity between pro- and anti-inflammatory cytokines, slowing intestinal passage, and altering gastrointestinal hypersensitivity, this enhances the role of the intestinal barrier. As evidence by the clinical study of Andrés and team demonstrated that participant who received the probiotic had a lower anti-inflammatory ratio interleukin (IL)-10/IL-12 and greater tumour necrosis factor alpha (TNF-α)/IL-10 ratio compared to placebo group meaning that the placebo group had higher pro-inflammatory profile (26, 32, 33). Given the evidence that probiotics cause a rise in populations of immune cells in people with IBS, immunomodulation is likely a key component of their mechanism of action.

### *A. Selection of probiotics*

A variety of conditions must be followed when choosing a probiotic bacterial strain, with protection being of the highest concern (Jäger et al., 2019; Krumbeck et al., 2018). Lactobacillus and Bifidobacterium strains are generally accepted as healthy due to human usage for a long time (Sanders et al., 2019). *Bacillus licheniformis* have also been studied for their potential use as probiotics (Krumbeck et al., 2018). However, there was no evidence that all individuals of the Bacillus family should be used as probiotics (Penaloza-Vazquez et al., 2019). This is based on the fact that certain Bacillus strains have been linked to disorder i.e. *Bacillus cereus*, which may contribute to foodborne disease (Ehling-Schulz et al., 2019). When the probiotics are not from the Lactobacillus or Bifidobacterium genera, it is important to do a quality and safety assessment.

### *B. Effect of Mono-Strain Probiotics*

  

Researches were shown looking at the IBS symptom effects of a single probiotic strain. None of these experiments are using the identical bacteria strain in their probiotic substitution. Majeed and colleagues observed a substantial impact on IBS symptoms by a monoclonal probiotic (*Bacillus coagulans* MTCC 5856), while none of the others were successful in obtaining improved IBS symptoms with mono-strain probiotics (Majeed et al., 2018). They performed a 90-day probiotic treatment trial on 36 IBS-D patients (Majeed et al., 2018). The probiotic supplement included the bacteria Bacillus coagulans MTCC5856, which was given twice daily in the form of two tablets were substantial difference in the experimental class relative to the placebo group in all primary effects after intervention including stool frequency, consistency, and stomach discomfort are associated with bloating ($p = 0.0037$), vomiting ($p = 0.0013$), diarrhea ($p = 0.0026$), and abdominal discomfort(Majeed et al., 2018). Lyra et al. ran a study of 391 IBS patients (Lyra et al., 2016). They examined two probiotic supplements, one with 109 CFU of *Lactobacillus acidophilus* NCFM and one with 1010 CFU (Lyra et al., 2016). Over a 12-week duration, the probiotic was taken once daily. IBS symptoms decreased in every category, with an average IBS-SSS total score drop from baseline (Lyra et al., 2016).

***B. Effect of Multi-Strain Probiotics***

A total of 40 rectal distention-hypersensitive people was studied in this experiment by Ludidi et al. Included six bacterial strains, which were dissolved in water and then given out once a day in granule form for six weeks (Ludidi et al., 2014). The primitive result was an alteration in visceral experience (Ludidi et al., 2014). In probiotic and placebo groups the percentage of patients suffering visceral hypersensitivity declined, however, the outcome did not vary among the groups (Ludidi et al., 2014).

Hod et al. published similar findings in a sample of 107 females with IBS-D who received a twice a day, eight weeks of probiotic pill (Hod et al., 2017). There were 12 distinct bacterial species in the capsule (Hod et al., 2017). The report's findings involved stomach pain, bloating, and bowel movement urgency and frequency (Hod et al., 2017). Both symptoms changed dramatically in all categories, but there were no variations in the placebo and probiotic groups (Hod et al., 2017). Abdominal pain was minimized in the probiotic group (Hod et al., 2017).

Another study conducted by Jafari et al, have prescribed probiotics consisting multiple strains of bacteria namely, *Bifidobacterium animalis*, *Lactobacillus acidophilus*, *Lactobacillus delbrueckii* ssp. *bulgaricus*, and *Streptococcus thermophilus* (Jafari et al., 2014). The study compared placebo-treated patients with patients who were treated with drugs that were prescribed blindly, and found that drugs utilized relieved stomach pain in patients (Jafari et al., 2014). The research enrolled 108 people and had a four intervention period. The overall outcomes of the probiotic class was better than placebo in all observed symptoms including abdominal discomfort and bloating (Jafari et al., 2014).

Mezzasalma et al. evaluated the efficacy of a medication composing two separate forms of multispecies probiotics in 2 distinct treatment groups (F1 and F2), relative to a reference group, on 157 IBS patients with predominantly constipation (IBS-C) (Mezzasalma et al., 2016). Both the F1 and F2 probiotics include Lactobacillus acidophilus, Lactobacillus reuteri, and Lactobacillus rhamnosus, however the latter two species are exclusive to the F2 probiotic (Mezzasalma et al., 2016). Some of the side effects were bloatedness, abdominal discomfort, constipation, abdominal cramps, and gas. Overall, the probiotic groups (F1 and F2) outperformed the control group (F3), and the numbers of patients with each clinical symptom were higher in both groups compared to the control group (Mezzasalma et al., 2016).

Sisson et al. performed a research study in which they investigated the outcomes of a fluid probioticthat included Lactobacillus rhamnosus, Lactobacillus planetarium, Lactobacillus acidophilus, and Enterococcus faecium, and they found comparable outcomes. In 186 IBS patients, the probiotic was given once a day for 12 weeks (Sisson et al., 2014). As a result, IBS-SSS total scores increased substantially, and IBS-SSS sub-scores changed, all with secondary outcomes being changes in quality of life ratings and adjustments in IBS-SSS sub-scores during and after treatment and for 4 weeks after follow-up (Sisson et al., 2014). The multi-strain probiotic supplement was related to a statistically significant reduction in overall symptom severity in patients with irritable bowel

  

syndrome and was well tolerated. These findings imply that this probiotic may be beneficial in the treatment of IBS and further investigation is needed.

A study conducted by Staudacher et al. supports these good outcomes, as a double-blind, placebo-controlled trial with several hundred participants found (Staudacher et al., 2017). Each of the four groups included four people: one who received placebos, one who took low-FODMAPs, one who was given probiotics, and one who was on a low-FODMAP diet (Staudacher et al., 2017). The results in this research were derived from the two groups that took part in the diet study: the placebo and sham diet groups (n with 27 participants) and the probiotic and sham diet groups (with 26 participants) (Staudacher et al., 2017).There were eight different bacterial species in the probiotic supplementation (Staudacher et al., 2017). The probiotic group has a substantially higher percentage of recorded "relieving symptoms" than the placebo group (Staudacher et al., 2017). Although most research do not indicate a strong connection between probiotics and IBS symptoms, several investigations discover contradictory evidence in the results (Wilkins & Sequoia, 2017). Research has shown that multi-strain probiotic pills are more helpful in alleviating IBS symptoms than are placebo and mono-strain probiotic treatments.

The types of probiotic supplements provided in the trials used in this study vary in terms of structure, number, microbial strains, and mixes of microbial strains. The distinction among research that prescribed mono- and multi-strain probiotic supplements revealed a significant discrepancy in outcomes between these two classes of trials, which is compatible with the findings of Ford et al meta-analysis (Ford et al., 2014). Moreover, the multi-strain probiotic supplements utilized in the compose experiments differ significantly. Bifidobacteria and Lactobacilli are two of the most common bacterial groups recommended as probiotics in the stated trials, and eight studies reported supplementing these two bacteria with a multi-strain probiotic supplement.

## IV. CONCLUSIONS

To summarize, it is conceivable that new therapeutic treatments using the human microbiota and dysfunctional gut as a focus for improving gastrointestinal problems in IBS may lead to customized probiotic supplements soon. IBS patients are more likely to recover from probiotic intervention.

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