

## Role of gut microflora and probiotic effects in the irritable bowel syndrome

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**Abstract.** *Background.* Even though the cause of irritable bowel syndrome (IBS) is not yet known, alterations of the intestinal microflora may be important in its pathogenesis. *Aim.* To evaluate the efficacy of rifaximin alone or in association with the probiotic strain of *Bifidobacterium longum* W11 in reducing symptoms in patients with IBS. *Methods.* We performed a monocentric, prospective, randomized open trial including 70 patients randomized in to two groups: Group A (41 patients) receiving rifaximin 200 (2 cp bid for ten days in a month) followed by a formulation of the probiotic strain of *Bifidobacterium longum* W11 (one granulated suspension for 6 days on alternate weeks) and Group B (29 patients) receiving only rifaximin 200 (2 cp bid for ten days in a month). The clinical evaluation was performed at admission and after 2-months, taking into account the method of visual analogues. *Results.* At the 2-month follow-up, Group A patients reported a greater improvement of symptoms compared to patients in group B ( $p = 0.010$ ) even if the physician's opinion at T1 did not confirm these results ( $p = 0.07$ ). *Conclusion.* The increased colonisation by *Bifidobacterium longum* W11, after the cyclic administration of rifaximin, which eradicates the bacterial overgrowth of the small intestine, may reduce symptoms, especially those related to bowel habit and stool frequency in patients with IBS. The abnormalities observed in the colonic flora of IBS suggest, in fact, that a probiotic approach will ultimately be justified. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** Irritable bowel syndrome, intestinal microflora, probiotic strain, poorly absorbable antibiotic, small intestinal bacterial overgrowth, stool frequency.

### Introduction

The irritable bowel syndrome (IBS) belongs to the group of functional gastrointestinal disorders, which includes functional dyspepsia and non-cardiac chest pain (1, 2).

IBS is a frequent disease in adulthood affecting from 10 to 20% of the general population (3). Moreover, from 25 to 50% of gastroenterological outpatients suffer from IBS and it is estimated that from 60 to 75% of symptomatic subjects do not seek medical attention (4). The female/male ratio ranges from 1.1 to

2.6% depending on the importance given to individual symptoms (5).

Age and race have no consistent effect on the incidence of symptoms (6); on the other hand, cultural factors including diet and socioeconomic status are thought to be of some importance (7).

Abdominal pain, excessive gas production and variable bowel habit for which no endoscopic, radiological, histological, biochemical or microbiological cause is apparent, are typical symptoms of IBS. The lack of positive tests makes the diagnosis of IBS one of exclusion (8). Modified Rome Criteria provide a way of

standardisation of patients affected by IBS, but do not allow a specific diagnosis. According to Rome 2 (9), which represents a modification of Rome 1 (10), the irritable bowel syndrome is defined as follows: at least 12 weeks (which do not need to be consecutive) in the preceding 12 months of abdominal discomfort or pain relieved by defecation and/or associated change in stool frequency and/or stool altered form or appearance. Non-gastroenterological features such as lethargy, poor sleep, fibromyalgia, backache, frequency and urgency of micturition, nocturia, incomplete bladder emptying, an unpleasant taste in the mouth, early satiety, and dyspareunia are symptoms that are more common in patients with IBS than in controls and support the diagnosis (11, 12).

The cause of IBS is not yet known. Some factors that are likely to give rise to symptoms like those of IBS, are, for example, genetic influences, food intake, endocrine imbalances, malabsorption, post-operative changes (7), altered gastrointestinal motility, heightened sensory function of the intestine, or malfermentation of food residues (13, 14) and psychosomatic factors such as a psychological morbidity (15), stress (16) and an abnormal illness behaviour (17).

The intestinal microflora has an important pathogenetic role in IBS: a study by King found that colonic-gas production was greater in patients with IBS than in controls and both symptoms and gas production were reduced by an exclusion diet (18). This might indicate a role of gut bacteria in the IBS symptoms.

An abnormal lactulose breath test in some of the patients with IBS suggested bacterial overgrowth of the small intestine (19). The normalization of the lactulose breath test with antibiotics in these subjects resulted in a consistent improvement of IBS symptoms, and almost 50% of the subjects no longer met the Rome I criteria.

The evidence that the intestinal microflora of patients with IBS differs from that of healthy individuals (18-22) is also supported by the fact that these patients may respond to the manipulation of the flora, as showed by some studies involving probiotics (especially *Lactobacillus* strain) and IBS. The evidence of a beneficial effect of the use of probiotic bacteria in IBS so far has been inconclusive; some trials have obtained

a symptomatic reduction or recovery while others have produced different results (23-25).

In this study, we aimed at evaluating the efficacy of rifaximine (a broad-spectrum, poorly absorbable antibiotic) on its own or in association with the probiotic strain of *Bifidobacterium longum* W11 in reducing symptoms in patients with IBS.

## Materials and methods

This study was a monocentric, prospective open trial. The patients, fulfilling Rome criteria and with normal blood tests, were recruited and included in the study after a gastroenterological clinical evaluation. All patients had a normal colonic examination before beginning the study (colonoscopy or barium enema).

Thereafter, seventy patients with diagnosed IBS were randomized into two groups: Group A and Group B. In Group A 41 patients received rifaximin 400 mg for the first ten days of every month and then a formulation of the probiotic strain of *Bifidobacterium longum* W11 (one granulated suspension for 6 days at alternate weeks) for the following 6 days.

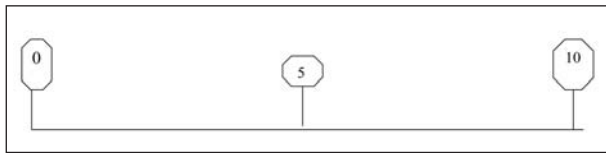
Group B included 29 patients receiving only rifaximin 400 mg (for the first ten days of the month).

Exclusion criteria were: age under 18 yrs, pregnancy and breast-feeding, previous abdominal surgery or diverticulitis, a concomitant organic intestinal disease or other severe systemic diseases, immunodeficiency, a documented intolerance to rifaximin or to probiotics and a low compliance to the therapy. Patients were also excluded if they had started or ended a treatment with antibiotics, antidiarrhoea agents, laxatives, or spasmolytics during the period of the study.

All criteria were assessed by means of a complete history, physical examination, endoscopy/double contrast X-ray and analysis of biochemical blood samples.

At admission, the patients were classified on the basis of stool frequency: 25 patients had an alternate bowel habit, 18 had a diarrhoic bowel habit and 27 had a constipated one.

A clinical evaluation was performed at admission and after 2 months, taking into account the visual analogous method, which expressed the overall clinical



**Figure 1.** Visual analogous: the method used to evaluate symptomatology score

condition and general well-being of the patient, according to both the gastroenterologist’s and the patients’ point of view. Visual analogous is a visual score (from 0 to 10) that evaluates the efficacy of the administered therapy on the overall severity of symptoms, especially bowel habit and the overall clinical conditions of the patients during the follow-up (Figure 1).

Patients who developed complications or side effects, recorded by means of a structured clinical interview during each clinical evaluation or whenever necessary, were withdrawn from the study. Patients who voluntarily stopped the treatment or who did not attend the follow-ups were considered drop outs. Non compliance was defined as an interruption of drug intake for more than 4 weeks, or if less than 80% of the appropriate dose was taken. All patients included in the study had given informed oral consent before entering the study.

**Statistical methods**

Demographic and clinical characteristics were shown as mean ± standard deviation and range.

We used the Wilcoxon test to compare a single group at baseline and after two months and the Monn Whitney U test for the comparison of the two groups at baseline and after two months.

**Results**

Group A was composed as follows: 58.5% were male patients with a mean age of 53 ± 14 years.

Group B was composed as follows: 44.8% were male patients with a mean age of 53 ± 13 years. No statistically significant demographic difference was observed between the 2 groups (Table 1).

**Table 1.** Demographic and clinical characteristics of the patients at baseline (all differences are non significant)

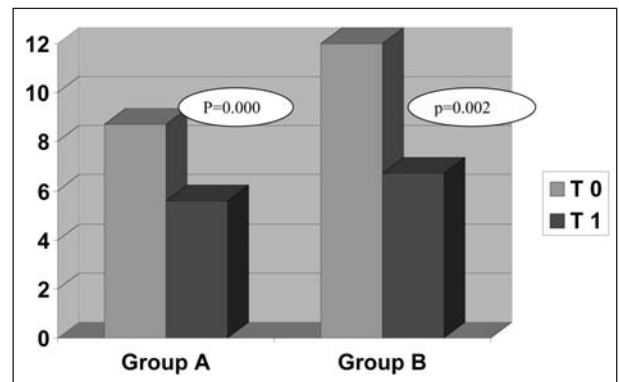
|                   | Group A     | Group B     |
|-------------------|-------------|-------------|
| Patients          | 41          | 29          |
| Males             | 24 (58.54%) | 13 (44.82%) |
| Females           | 17 (41.46%) | 16 (55.18%) |
| Age (mean ± S.D.) | 53 ± 14     | 53 ± 13     |
| Range             | (25-76)     | (29-81)     |

At baseline, no significant difference was shown between the visual analogous of the two Groups both from the physician’s point of view (p = ns) and from the patient’s point of view (p = ns).

At the 2 month follow-up, patients reported an improvement in the visual analogous both in Group A (p = 0.000) and in Group B (p = 0.002) (Figure 2; Table 2).

The remission of symptoms was also confirmed by a physician both in Group A (p = 0.000) and in Group B (p = 0.000) (Figure 3; Table 2).

However, after 2 months, there was a statistically significant difference between Group A and B in the decrease in the visual analogous according to the pa-



**Figure 2.** Evolution of patients’ visual analogous in the two groups

**Table 2.** Evolution of visual analogous at the 2 month follow-up in the two groups

|               | Patient visive analogous |     |       | Gastroenterologist visive analogue |      |       |
|---------------|--------------------------|-----|-------|------------------------------------|------|-------|
|               | T 0                      | T 1 | P     | T 0                                | T 1  | p     |
| Score Group A | 8.7                      | 5.6 | 0.002 | 6.5                                | 4.32 | 0.000 |
| Score Group B | 8.5                      | 6.7 | 0.000 | 6.1                                | 5.1  | 0.000 |

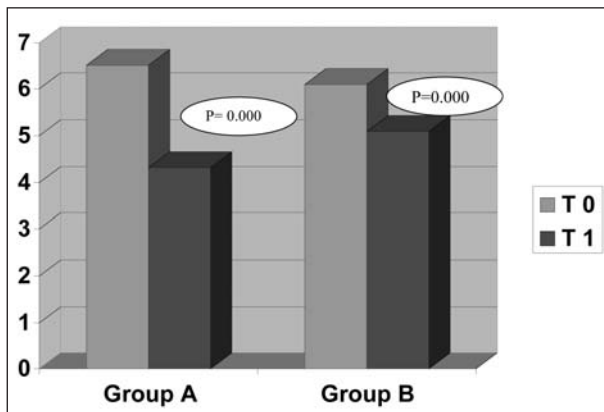


Figure 3. Evolution of gastroenterologist' visual analogous in two groups

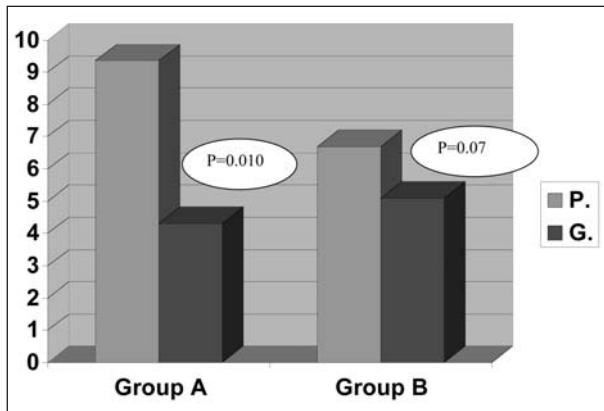


Figure 4. Evaluation at the 2 month follow-up of symptoms score in the 2 groups according to the patients and physicians opinion

tient's opinion ( $p = 0.010$ ): in fact, at T1 patients in Group A thought their symptoms had improved more than patients in Group B. The physician's opinion at T1 did not confirm these results ( $p = 0.07$ ). (Figure 4).

## Discussion

The results of this study indicate that the administration of *Bifidobacterium longum* W11 in association with rifaximin decreases symptoms in patients with IBS.

Probiotics are living micro-organisms that, if ingested in a certain quantity, exert health benefits that

go beyond basic inherent nutrition (26). According to this definition, probiotics do not necessarily colonise the human intestine. The crucial point regards showing a distinct health benefit that is achieved by the consumption of specific strains. The effect of a bacterium is strain specific and cannot be associated to other strains of the same species.

The range of specific symptoms associated with IBS may indicate a variety of etiological influences and some of them may advocate a multicomponent therapy (27).

We performed this study to test the hypothesis that an increased intestinal colonisation of *Bifidobacterium longum* W11, after the cyclic administration of rifaximin (a broad-spectrum, poorly absorbable antibiotic), which eradicates the bacterial overgrowth of the small intestine, may reduce symptoms, especially those related to bowel habit and stool frequency.

At the 2-month follow-up, a continuous improvement in the visual analogue in both patients who received rifaximin and bifidobacterium and in patients who received only antibiotic therapy (without the probiotic formulation) was demonstrated, but symptoms benefited most from the combined therapy.

Currently, no organism can be recommended to patients as being likely to help their symptoms. However, the abnormalities observed in the colonic flora of IBS suggest that a probiotic approach will ultimately be justified. In the future, probiotics may be used in the prevention of intestinal microflora damage following antibiotic administration or gastroenteritis, which in turn may prevent the onset of symptoms associated with IBS (28).

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