

## Low FODMAP Diet and Gastrointestinal Symptoms in Athletes

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Gastrointestinal symptoms (GIS) are considered as the most common health problems experienced by athletes in international sports events, while they are especially more common among athletes of endurance sports such as cyclists, triathletes and marathon runners. Although the incidence rate is 30 - 50% in all athletes, this rate may increase up to 90% in ultra-endurance athletes [1-3]. It is reported that moderate to severe gastrointestinal symptoms of the upper and lower gastrointestinal tract may impair athletic performance, especially during intense endurance exercises [2].

Exercise-induced gastrointestinal symptoms are similar to the clinical signs of Irritable Bowel Syndrome (IBS), the most common functional gastrointestinal disease, which is becoming increasingly prevalent and adversely affecting the quality of life of individuals [4,5]. These symptoms include upper abdominal bloating, belching, nausea, vomiting, epigastric pain, heartburn, abdominal pain, urge to defecate, diarrhea and/or loose, watery stool and blood in stool [2,6].

It is thought that dietary habits and food consumptions of individuals may have an increasing effect, as well as decreasing effect on these symptoms [4]. Many individuals associate their symptoms with their diets, stating that some foods cause worsening of symptoms, and therefore they have removed various nutrients from their diets [7].

The studies on intestinal health discuss different dietary approaches. One of these is a diet in which fermentable oligosaccharides, disaccharides, monosaccharides and polyols from short-chain, poorly absorbed carbohydrates are restricted (FODMAP diet) [7,8]. In the literature, there are studies suggesting that restriction of fermentable carbohydrate sources in daily nutrition (low-FODMAP diet) might have positive effects on gastrointestinal symptoms [4,9]. FODMAPs are poorly absorbed in the small intestine and reach the colon without being digested. They cause an osmotic increase in the intestinal water content and increased gas production due to bacterial fermentation. This occurs both in healthy individuals and in patients with IBS. The low fermentable oligo-di-monosaccharides and polyols diet (FODMAP) is one of the treatment strategies used to reduce irritable bowel symptoms [8]. The studies found that the symptoms reduced in about 70 - 75% of patients with IBS [5,10-13].

A low FODMAP diet for treatment begins with a 4 - 8 week elimination period, which completely removes or restricts foods high in FODMAPs. When the symptoms begin to alleviate, foods high in FODMAPs are introduced into the body by re-adding them to the diet one by one to identify the type and amount of tolerable FODMAPs [7].

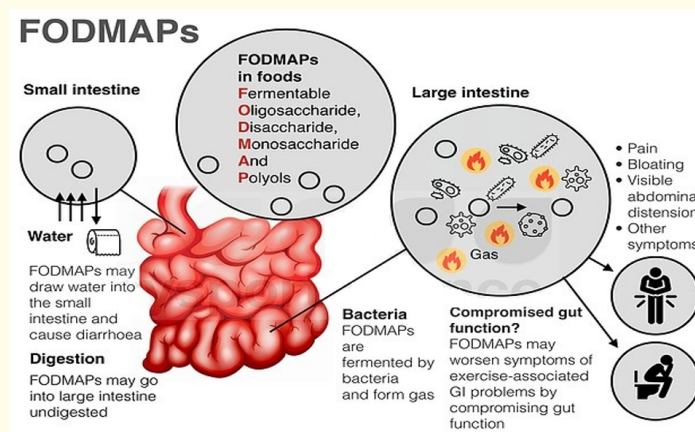


Figure 1: FODMAP and its effect on the body [14].

The resulting theory and evidence show that the use of a low FODMAP diet or restriction of FODMAP may be useful in reducing symptoms of athletes who are constantly struggling with exercise-related gastrointestinal problems [6]. The studies recommending a low FODMAP diet to address gastrointestinal problems in clinically healthy athletes show up as a promising strategy to reduce exercise-related GIS [2]. Numerous studies reveal that about 50% of athletes experience upper GIS during heavy exercise [1,15]. As exercise intensity decreased, this prevalence decreased to 30% [16]. The most common upper GI symptoms experienced by athletes include heartburn, nausea, vomiting and epigastric pain. The three major factors in the pathophysiology of these upper GI symptoms are mechanical forces, altered gastrointestinal (GI) blood flow and exercise-related neuroendocrine changes [1,15].

A possible cause of gastrointestinal symptoms arising during a marathon run is food intake before and/or during training/competition. Carbohydrate (CHO) intake has been shown to be beneficial for performance both in the previous days and during endurance exercise days; however, it has been seen that there is an association between carbohydrate intake during endurance exercise and GIS. The mechanisms by which this may occur include potential malabsorption causing lumen distention, delayed gastric emptying and gas production. However, to date, the number of studies on the usual eating habits of recreational marathon runners and association of these with GIS during a race is very limited [3].

The study included 910 athletes to assess avoidance behaviours towards self-selected food/drink to minimize gastrointestinal distress. It was reported that 55% of athletes removed at least one nutrient containing high fermentable oligosaccharide, disaccharide, monosaccharide and polyols (FODMAP) from their diets, and that there was an improvement in the symptoms by 82.6%. In athletes indicating that high FODMAP foods trigger gastrointestinal symptoms, the nutrients from the most effective to the least effective include lactose (86.5%), galacto-oligosaccharides (23.9%), fructose (23.0%), fructans (6.2%) and polyols (5.4%), respectively. Athletes most frequently avoid lactose and, less frequently other high FODMAP foods to reduce gastrointestinal discomfort [17,18].

The following table gives foods containing high FODMAP and low FODMAP foods (Table 1).

FODMAP categories	High FODMAP foods <sup>a</sup>	Low FODMAP food exchanges <sup>b</sup>
High lactose	Yogurt, cow’s milk	Lactose-free milk, soy milk (from soy protein)
Excess fructose	Apples, figs, watermelon, cherries, agave, honey, many fruit juices (e.g. apple), beetroot juice with apple juice included/whole beetroot	Oranges, berries, bananas, grapes, kiwifruit, cantaloupe, strawberries, blueberries, raspberries, blended vegetable juice (tomato-based) canned or pickled beets
High fructans/ galacto-oligosaccharides	Dates, cashews/pistachio nuts, breads/bagels, onions, wheat-based energy bars	Gluten-free, spelt, special sourdough spelt breads, rice cakes, corn tortillas, wheat and/or gluten-free energy bars
High polyols	Dried apricots, protein bars and powders, some electrolyte tablets, sugar-free gum/candies	Protein bars with alternative sweeteners, limit intake of sugar-free gum/candies or choose sugar-containing brands

**Table 1:** High FODMAP foods and low fodmap alternatives commonly consumed in an athlete’s diet [2,4,10].

*FODMAP fermentable oligo-, di-, monosaccharides and polyols*

<sup>a</sup>: Check cereals, bars, sports foods, and mixed meals for high FODMAP ingredients

<sup>b</sup>: Low FODMAP diets should be guided by a sports dietitian. Sports dietitians advising on low FODMAP diets should be guided by the Monash Low FODMAP Diet course®

It suggests that short-term (1 week) FODMAP reduction may be a useful intervention to minimize daily GI symptoms in endurance athletes with exercise-related GI distress [6,20]. However, it is important to provide nutrition training to the athletes following low FODMAP diets. In these individuals, it is necessary to know the ingredients of the products consumed and to acquire the habit of reading food labels. Diets to be followed for a long time may cause nutritional deficiencies (malnutrition). Therefore, it is thought that the evaluation of the studies to be conducted in terms of nutritional element will be favourable for the health of individuals [4]. Since low FODMAP diets require to be followed without causing nutritional deficiencies and negatively affecting performance in athletes, assistance should be sought from experienced dietitians who are experts in nutrition [21].

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