SUPPLEMENTATION TO REDUCE GASTROINTESTINAL DISORDERS IN ULTRA ENDURANCE ATHLETES

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INTRODUCTION

The *amateur* athlete that practices sport to improve the quality of life differs from the professional athlete who is exposed to extreme physiological circumstances.

There is a high correlation between physical and emotional stress and changes in the composition and activity of the gastrointestinal (GI) microbiota. This imbalance directly influences the performance of the athlete and motivated the researchers to determine control strategies and prevention of GI disorders and it born a whole science called ergogenics.

In this sense, probiotics and prebiotics were identified, among others, that could modify the composition of the microbiota and improve the performance of the ultra endurance athletes. The focus was on two specific long-distance sports: ultra-marathon and triathlon.

OBJECTIVE

The aim of this report was to conduct a literature review of nutritional supplements, probiotics and prebiotics that have a proven effect to reduce GI disorders in endurance athletes.

METHODS

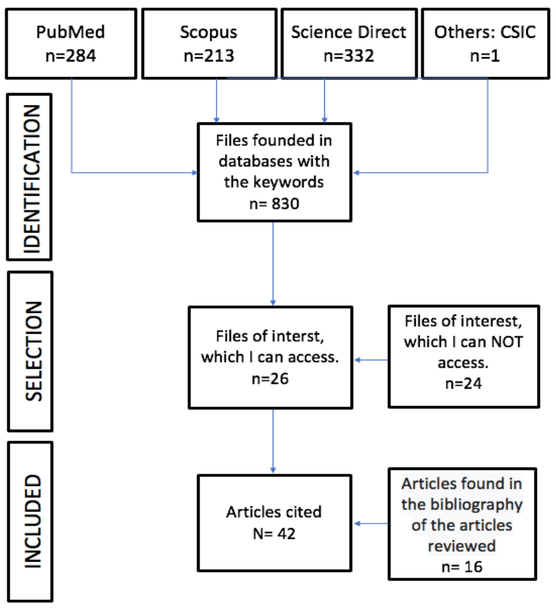


Figure 1. Scheme of the strategy used to collect the information by using searchers, recommended databases and textbooks to identify and select the articles quoted in the report.

RESULTS

MICROBIOTA PROFILE OF BALANCED GI SYSTEM

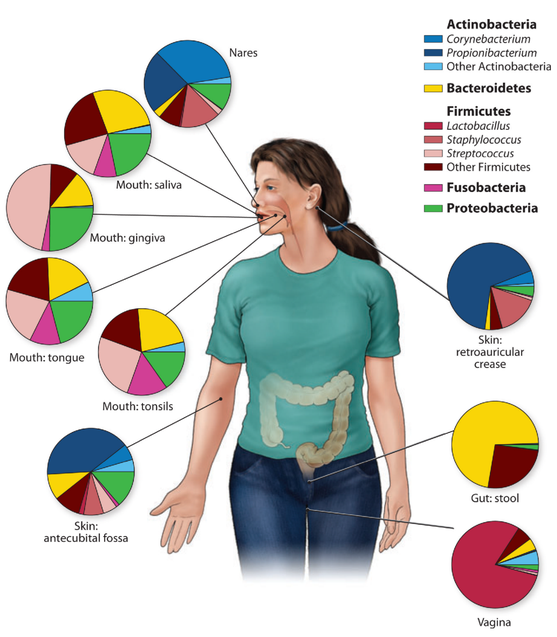


Figure 2. Microbiome diversity depends on the site sampled. (Extracted from Grice, EA., *et al.* 2012, Annu Rev Genom Hum G. 13: 151–170.)

GI DISORDERS IN ULTRA ENDURANCE ATHLETES

Upper GI symptoms	Lower GI symptoms	Related symptoms
Urge to vomit	Endotoxemia	Nausea
Abdominal pain	Malabsorption	Dizziness
Gastric emptying ↓	Intestinal transit ↓	Side ache
Bloating	Systemic inflammation	Leaky gut
Belching	Mucosa erosion	
	Ischemic colitis	
	Diarrhea	

Figure 3: The common GI symptoms in athletes (Extracted from Jeukendrup, A., 2000, Clin Sci Lond. 98, 47-55).

PHYSIOLOGICAL FACTORS

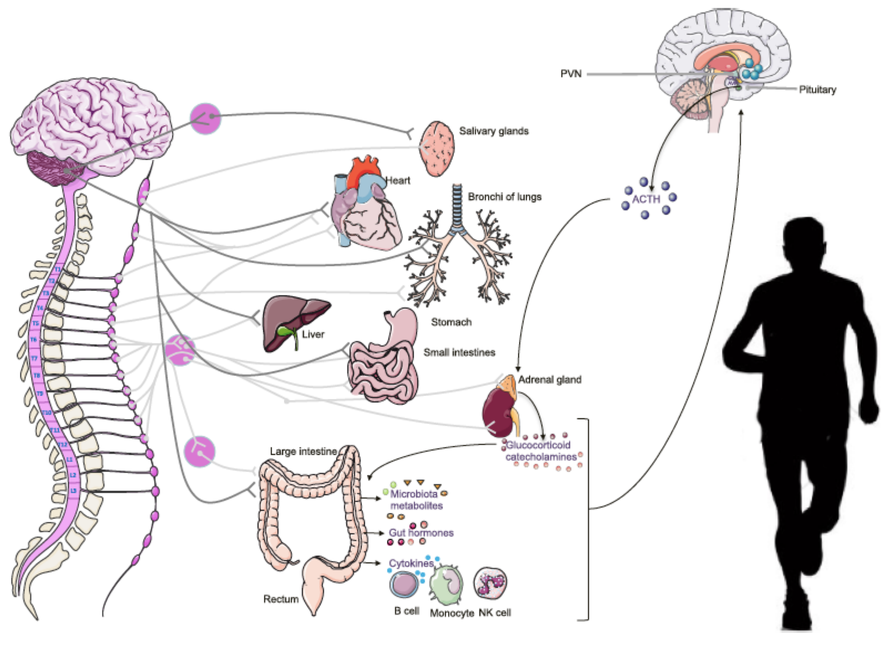


Figure 4. Stress hormones released during high intense exercise (Extracted from Clarck, A., *et al.* 2016, JISSN. 13-43).

MECHANICAL FACTORS

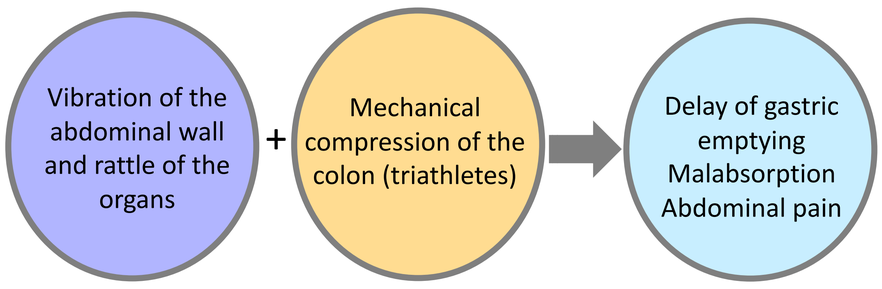


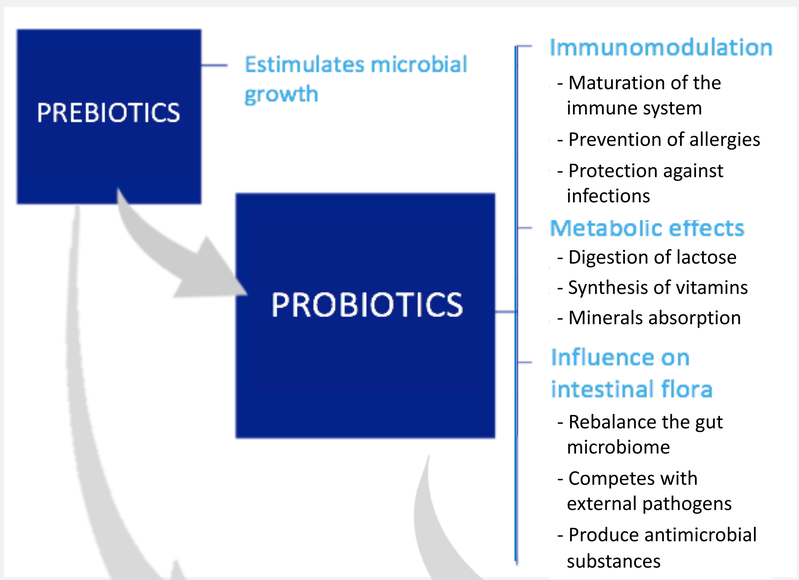
Figure 5: Mechanical factors involved in the delay of gastric emptying, malabsorption, abdominal pain and other GI problems in athletes during extreme performance.

NUTRICIONAL FACTORS

General recommendations regarding the contribution of macronutrients	
Component	**Amount**
Carbohidrates	8 a 12 g/kg of body weight/day
Protein	≥20 g in intervals of 3 to 4 h
Fat	20 to 35% of energy intake
Fiber	It is recommended to eat little fiber to provide a quick source of energy and avoid possible digestive problems associated with high fiber diets.

Table 1: General recommendations for macronutrients components in diet. The ultra-resistance performance leads to an average daily energy deficit of ~8.000 to 14.000 kcal (Extracted from Knechtle, B., 2013. Nutrition and enhanced sports performance. Muscle Building, Endurance and Strenght, pp 161-167).

DIETARY SUPPLEMENTS



Fructooligosaccharides (FOS)

Inulin

Others:

Complex carbohydrates
Amino acids
Short chain fatty acids (SCFA)
Medium chain fatty acids
Omega-3 polyunsaturates

***Lactobacillus* spp.**
Lb. acidophilus
Lb. casei
Lb. fermentum
Lb. delbrueckii bulgaricus

***Bifidobacterium* spp.**
B. lactis
B. bifidum

Others:
Streptococcus thermofilus
Saccharomyces boulardii
Lc. lactis and *Lc. cremoris*

Additional dietary supplements

Vitamins C, A, D, E, B6 and B12.

EUROPEAN REGULATIONS

- **Royal Decree 130/2018** of 16 March, new annex on **"Other substances with a nutritional or physiological effect other than vitamins and minerals that can be used in the manufacture of food supplements"**
- **Regulation (EC) 1170/2009** on **lists of vitamins and minerals and their forms that can be added to food, including food supplements**.
- **Regulation (EU) 2015/2283** of the European Parliament and of the Council of 25 November 2015 on new foods, by which Regulation (EU) No 1169/2011 is amended, defines as **"new food"** all food that has not been used in an important measure for human consumption.
- Food supplements composed of substances other than vitamins and minerals could only be marketed in our country under the principle of mutual recognition.

CONCLUSIONS

➢ The performance in ultra distance athletes with GI disorders can be improved by reestablishing the balance of the intestinal flora.

➢ Microbiota generates beneficial metabolites such as butyrate and propionate that can: (1) increase transepithelial resistance; (2) promote the integrity of the intestinal barrier and (3) stimulate the immune system.

➢ There are dietary strategies to modulate the gut microbiota by supplementation essentially with probiotics and prebiotics.

➢ Among the bacteria with probiotic activity, stand out the genera *Lactobacillus* spp. and *Bifidobacterium* spp. with an effective dose in the range of 10^9-10^{10} CFU/day. In regard to prebiotics, the use of inulin and FOS is highlighted.

➢ They are usually combined in the formulations and become symbiotics.

➢ There is no harmonization related to the use of these supplements at European level. In Spain, a list of substances that can be used as food supplements has been prepared to ensure consumer protection and the competitiveness of the food industry.