

FOOD ALLERGIES AND FOOD INTOLERANCES IN ATHLETES

A NARRATIVE SCIENTIFIC REVIEW

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GASTROINTESTINAL SYMPTOMS IN ATHLETES

Gastrointestinal (GI) symptoms represent one of the most common medical complaints in competitive sports. During the Olympic Games, across both summer and winter events, around 7% of athletes experience an acute illness, and about one-fifth of these cases are due to gastrointestinal symptoms^{1,2}. This means that GI disturbances are second only to respiratory infections as causes of performance-limiting illness during major competitions. In endurance disciplines such as marathon running, triathlon, cycling, and long-distance swimming, 30–90% of athletes report recurrent GI symptoms³. The wide prevalence range reflects situational triggers (e.g., heat, dehydration, high carbohydrate intake during competition), individual susceptibility, and the varying definitions of GI distress across studies. Team sports are not exempt. Surveys in American football athletes show 50–60% report GI symptoms during training or at rest⁴.

Thus, before one even considers allergies or intolerances, it is evident that the

athlete's gut is a physiologically stressed organ. Reduced splanchnic blood flow during high intensity exercise, thermal stress, mechanical gut jostling, and high intake of concentrated carbohydrates all contribute to digestive vulnerability. This creates fertile ground for misattributed symptoms and underscores the need for careful differential diagnosis for food allergies versus intolerances or other causes of gastrointestinal symptoms.

Food allergies and food intolerances have become increasingly visible topics in sports medicine, partly fueled by rising public awareness, expanding diagnostic options, and a cultural trend toward self-identified dietary sensitivities. For athletes, who rely on optimal gastrointestinal function to support fueling, hydration, and performance, the intersection between food-related symptoms and sport physiology is highly relevant.

While true immunologically mediated food allergies are relatively rare with prevalences between 0.5–1%, gastrointestinal symptoms regardless of cause occur more frequently among athletes, particularly

in endurance, intermittent and high intensity sports (30–90% among athletes). The clinical presentation also differs substantially between the two conditions. Food allergies frequently cause urticaria, pruritus, vomiting, bronchospasm, and hypotension, reflecting systemic immune activation. Food intolerances primarily cause gastrointestinal symptoms, including bloating, abdominal pain, diarrhea, flatulence, and nausea.

A key distinguishing feature is that systemic reactions may occur in food allergy, including anaphylaxis, whereas food intolerances do not cause systemic immune reactions. Consequently, food allergies can be life threatening, while food intolerances are not life threatening, despite potentially causing significant discomfort and reduced quality of life. Distinguishing between these conditions is therefore a central challenge for clinicians working with active populations.

A food allergy is defined as an immunologically mediated adverse reaction to food and are most commonly IgE mediated type I hypersensitivity reactions.

TABLE 1

	<i>Food Allergy</i>	<i>Food Intolerance</i>
<i>Definition</i>	<i>Immunologically mediated adverse reaction to food</i>	<i>Nonimmunological adverse reaction to food or its components</i>
<i>Pathogenesis / Aetiology</i>	<i>Predominantly IgE-mediated (type I hypersensitivity); less commonly nonIgE-mediated mechanisms (e.g. eosinophilic gastrointestinal disorders)</i>	<i>Enzyme deficiencies (e.g. lactase deficiency), malabsorption (e.g. FODMAPs), functional gastrointestinal disorders</i>
<i>Prevalence (General population)</i>	<i>Approximately 0.5–1% confirmed; ~6% self-reported</i>	<i>15–30% self-reported</i>
<i>Prevalence (Athletes)</i>	<i>No robust data available; presumed similar to the general population</i>	<i>10–20% self-reported; gastrointestinal symptoms in 30–90%</i>
<i>Common symptoms</i>	<i>Urticaria, pruritus, vomiting, bronchospasm, hypotension</i>	<i>Bloating, abdominal pain, diarrhoea, flatulence, nausea</i>
<i>Systemic reaction</i>	<i>Yes; possible (e.g. anaphylaxis)</i>	<i>No</i>
<i>Lifethreatening potential</i>	<i>Yes</i>	<i>No</i>
<i>Common triggers</i>	<i>Peanuts, tree nuts, milk, egg, fish, shellfish, wheat, soy</i>	<i>Lactose, fructose, FODMAPs, gluten (noncoeliac), histamine</i>
<i>Diagnosis</i>	<i>Clinical history, skin prick testing, measurement of specific IgE, oral food challenge</i>	<i>Hydrogen breath tests, elimination and provocation diets, symptom-based assessment</i>
<i>Therapy / Management</i>	<i>Strict avoidance, emergency medication (e.g. adrenaline), patient education</i>	<i>Avoidance or dose adjustment of trigger foods, individualised dietary therapy</i>

Table 1: Food allergies versus food intolerances.

In contrast, a food intolerance refers to a non-immunological reaction to food or to specific components within food. Food intolerances are typically caused by enzyme deficiencies (such as lactase deficiency), malabsorption of certain carbohydrates (e.g. FODMAPs), or functional gastrointestinal disorders, and do not involve the immune system (Table 1).

IGE-MEDIATED FOOD ALLERGIES IN ATHLETES

Contrary to popular belief, elite athletes do not show significantly elevated rates of IgE-mediated food allergies. Current literature suggests prevalence in athletes mirrors that of the general population (Table 2). Yet, although the prevalence is not higher, the clinical impact may be more significant. Performance anxiety, competition stress, rapid fueling needs, and exposure to unfamiliar foods during travel can interact with allergic conditions. Even mild symptoms can have performance implications. In addition, exercise itself can amplify allergic responses (e.g., exercise

TABLE 2

<i>Food Allergen</i>	<i>Self-reported lifetime prevalence (%)</i>	<i>Food challenge–confirmed prevalence (%)</i>
<i>Cow's milk</i>	<i>6,0</i>	<i>0,6</i>
<i>Wheat</i>	<i>3,6</i>	<i>0,1</i>
<i>Egg</i>	<i>2,5</i>	<i>0,2</i>
<i>Tree nuts</i>	<i>2,2</i>	<i>0,5</i>
<i>Fish</i>	<i>1,3</i>	<i>0,1</i>
<i>Peanut</i>	<i>1,3</i>	<i>0,2</i>
<i>Soy</i>	<i>0,4</i>	<i>0,3</i>

Table 2: Most common food allergies in Europe, adapted⁵.

induced anaphylaxis, food exercise dependent reactions).

FOOD INTOLERANCES AS A MAJOR CAUSE OF GI PROBLEMS IN ATHLETES

In contrast to allergies food intolerances are non immunological reactions and by far more common, especially among athletes. These include lactose intolerance (due to lactase deficiency), FODMAP sensitivities, fructose malabsorption, histamine intolerance and intolerances triggered by diet timing or training stress.

Population based data indicate that up to 65% of the global population has reduced lactase activity. GI complaints related to FODMAP intake affect around 20% of the general population, yet 30–50% of athletes experience FODMAP related symptoms during exercise.

THE ROLE OF FODMAPS IN ATHLETIC GI DISTRESS

FODMAPs (Fermentable Oligo-, Di-, Monosaccharides, and Polyols) are poorly absorbed carbohydrates that draw water into the intestine and undergo fermentation, leading to gas production. In athletes, particularly under stress conditions, these physiological effects may become amplified. Symptoms frequently include bloating, abdominal pain, nausea, diarrhea or urgency and cramping. Common sports related sources of FODMAPs include:

- fructose-containing gels
- milk based drinks (lactose)
- sorbitol or mannitol in “sugar free” sports snacks
- wheat-based products
- certain fruits like apples, pears, or overly ripe bananas.

Given the heavy reliance on carbohydrate-rich fueling in endurance sports, athletes often consume substantial quantities of these triggers. FODMAP-induced symptoms may affect sport performance more often than immunological food allergies, yet are frequently confused with the latter.

LACTOSE INTOLERANCE IN ATHLETES

Many athletes suspect milk or dairy as a symptom trigger, but without confirmed diagnosis.

Key considerations for athletes with self-reported or confirmed lactose intolerance include:

- Symptoms (bloating, diarrhea, cramping) may be dose dependent

- Milk-based protein shakes are common triggers, especially when consumed rapidly post exercise or under dehydration
- Lactose-free or low lactose alternatives (e.g., whey isolate, hydrolysates) are often well tolerated.

HISTAMINE-RELATED INTOLERANCE

Athletes may also exhibit reactivity to high histamine foods (e.g., fermented products, certain fish, processed meats). Strenuous exercise itself releases histamine, potentially making some athletes more sensitive post training. Foods that should be avoided in histamine-intolerant athletes include fermented dairy (e.g. kefir, yoghurt), aged cheeses such as parmesan or cheddar, smoked or canned fish (e.g. mackarel, tuna) alcoholic beergaes or energy drinks.

GLUTEN AND WHEAT SENSITIVITY IN ATHLETES

Few nutritional topics in sports elicit as much debate as gluten. Many athletes self identify as “gluten sensitive,” yet only a minority meet diagnostic criteria for celiac disease or wheat allergy (s.a.: < 1% prevalence of true wheat allergy, strict avoidance required).

Celiac disease is an autoimmune condition triggered by gluten in genetically predisposed individuals. Prevalence is around 1% worldwide. For athletes, untreated CD can significantly impair performance through mechanisms such as iron deficiency, fatigue, weight loss, malabsorption. Diagnosis requires

both positive serology (e.g., tTG-IgA) and confirmatory biopsy.

However, there is also a Non-celiac gluten/wheat sensitivity (NCGS/NCWS). Estimated (self-reported) prevalence is about 5–8%, with absence of celiac pathology and IgE response. Varying symptoms include vague, inconsistent GI symptoms and improvement when gluten is removed. Critically, there are no validated biomarkers, rendering diagnosis purely clinical and subject to placebo and nocebo effects. In athletes, additional confounders include high FODMAP intake (wheat is rich in fructans), intense training increasing gut permeability and possibly psychological expectation effects.

However, there is no consistent performance benefit of gluten-free diets in non celiac athletes, as many athletes incorrectly attribute GI symptoms to gluten when FODMAPs are the real trigger. Gluten-free products can be nutritionally inferior (lower fiber, fewer micronutrients, higher cost). Poorly designed GFDs risk insufficient carbohydrate availability, undermining training adaptations⁶. The recommendation from a sports nutrition standpoint is therefore clear: After excluding CD and wheat allergy, consider FODMAP reduction, not strict gluten elimination.

PROTEIN SUPPLEMENTS AND GI SYMPTOMS IN ATHLETES

Protein powders are ubiquitous in sport environments, but they can contribute to digestive symptoms. Wardenaar (2019)

TABLE 3

<i>Food category</i>	<i>Recommended lowerFODMAP options</i>
<i>Cereals & grains</i>	<i>Rice and ricebased products</i>
<i>Starchy foods</i>	<i>Potatoes</i>
<i>Grains</i>	<i>Oats (usually well tolerated)</i>
<i>Fruit</i>	<i>Ripe (but not overripe) bananas</i>
<i>Sports nutrition</i>	<i>Glucosebased gels or drinks</i>
<i>Dairy alternatives</i>	<i>Lactosefree dairy products or plantbased alternatives</i>

Table 3: Food choices low in FODMAPs for pre-and post-exercise fueling.

demonstrated that lactose-containing whey concentrates, sugar alcohols added to flavored supplements or high osmolality of certain protein shakes and its rapid ingestion after exercise can promote bloating, diarrhea, or cramping⁷. Athletes who report “protein intolerance” may, in reality, be reacting to formulation properties rather than protein per se. Nutritionist or physicians should evaluate

- protein type (concentrate vs. isolate)
- sweeteners used
- timing relative to training
- fluid intake
- dose per serving

to allow for targeted modifications in food intake and reduction in supplemental protein.

SUPPORTING PERFORMANCE WHILE REDUCING SYMPTOMS

The gut is highly trainable, and with appropriate nutrition strategies, symptoms often improve dramatically. But mislabelling symptoms as “food allergies” can lead athletes into needlessly restrictive diets that compromise performance and well being. Therefore, clear medical guidance is essential, not only for accuracy but also for performance optimization. The overarching clinical objectives for athletes are:

1. Preserve nutritional adequacy, especially carbohydrate availability.
2. Avoid unnecessary dietary restriction, which may lead to energy deficits.
3. Reduce symptom burden, especially around training and competition.

For practical management of GI symptoms, the following strategies may be used by athletes:

- Avoid large, high-fat, high-fiber meals within 2–3 hours of training.
- Minimize high-FODMAP foods immediately pre-exercise (Table 3).
- Maintain consistent meal patterns.
- Ensure adequate pre-session hydration.
- Avoid hyperosmolar beverages (>8% carbohydrate concentration) during exercise.

References

1. Pugh JN, Fearn R, Morton JP, Close GL. Gastrointestinal symptoms in elite athletes: Time to recognise the problem? *Br J Sports Med.* 2018;52(8):487–488. doi:10.1136/bjsports-2017-098376

SUMMARY: 10 PRACTICAL TIPS FOR PHYSICIANS WORKING WITH ATHLETES WITH GI SYMPTOMS

1. Always distinguish between allergy and intolerance first. Misclassification is common and leads to unnecessary dietary restriction.
2. Never start a gluten-free diet before testing for celiac disease. Diagnostic accuracy depends on gluten exposure.
3. Ask detailed questions about fueling during training. Many symptoms are temporally related to exercise-induced gut stress rather than food itself.
4. Assess carbohydrate source and concentration. Hyperosmolar drinks, fructose-rich gels, and sugar alcohols are frequent triggers.
5. Use FODMAP reduction strategically, not indefinitely. Short-term trials can reveal triggers without long-term overrestriction.
6. Evaluate supplement labels meticulously. Protein powders and sports snacks often hide lactose or polyols.
7. Encourage “gut training” for endurance athletes: practice race-day nutrition during hard sessions.
8. Educate athletes on hygiene, especially when traveling or in team cafeterias: foodborne illness mimics intolerance.
9. Be cautious with elimination diets in young athletes. Growth, bone health, and performance require adequate energy and micronutrient intake.
10. Collaborate closely with sports dietitians. Interdisciplinary management yields the best outcomes for complex digestive issues.

2. Ribichini E, Scalese G, Cesarini A, Mocchi C, Pallotta N, Severi C, Corazziari ES. Exercise-induced gastrointestinal symptoms in endurance sports: A review of pathophysiology, symptoms, and nutritional management. *Dietetics.* 2023;2(3):289–307. doi:10.3390/dietetics2030021
3. Montero-Carrasco K, Arias-Tellez MJ, Soto-Sánchez J. Use of carbohydrate (CHO), gluten-free, and FODMAP-free diets to prevent gastrointestinal symptoms in endurance athletes: A systematic review. *Nutrients.* 2024;16(22):3852. doi:10.3390/nu16223852
4. Wardenaar FC, Schott KD, Mohr AE, Ortega-Santos CP, Connolly JE. An exploratory study investigating the prevalence of gastrointestinal symptoms in collegiate Division I American football athletes. *Int J Environ Res Public Health.* 2023;20(15):6453. doi:10.3390/ijerph20156453
5. Nwaru BI, Hickstein I, Panesar SS, Roberts G, Muraro A, Sheikh A. Prevalence of common food allergies in Europe: A systematic review and meta-analysis. *Allergy.* 2014;69(8):992–1007. doi:10.1111/all.12423
6. Lis DM. Exit gluten-free and enter low FODMAPs: A novel dietary strategy to reduce gastrointestinal symptoms in athletes. *Sports Med.* 2019;49:87–97. doi:10.1007/s40279-018-01034-0
7. Wardenaar FC, Mohr AE, Ortega-Santos CP, Nyakayiru J, Kersch-Counet C, Chan Y, Clear AM, Kurka J, Schott KD, Seltzer RGN. Effects of protein supplement characteristics on gastrointestinal complaints in athletes. *Nutrients.* 2019;11(9):2093. doi:10.3390/nu11092093

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