Do Gluten-free diets “work” for non-celiac athletes?
by Dana Lis, RD, IOC Diploma Sports Nutrition, PhD(c)

The recent explosion in gluten-free diet (GFD) popularity has far surpassed the low fat and low carb trend and this movement is showing no sign of decelerating. While improved diagnostics may be partially responsible for the increased rates of celiac disease, evidence suggests that this alone does not explain the increased prevalence of reported gluten-related gastrointestinal (GI) disorders and the explosion in GFD popularity. Clinical data estimates that 5% to 10% of the general population requires a GFD for therapeutic purposes (e.g. non-celiac gluten sensitivity [NCGS], wheat allergy). However, market reports indicate that far more Americans are following a GFD that clinically necessary. ¹ More specific to athletes, our recent international survey indicated that in just under 100 non-celiac athletes over 40% adhered to a GFD at least half of the time. ² However, the lack of research on the effects of a GFD in nonclinical populations has challenged the ability for nutrition professionals to provide evidence-based advice on this diet for athletes that do not require gluten-avoidance for therapeutic reasons.

We know that among the general population, gluten avoidance has become prevalent primarily as a result of self-diagnosed gluten-related disorders, the belief that a GFD is “healthier” or can aid in weight loss.³ This gluten-free movement may also be influenced by advertising campaigns including claims for the medical need, health benefits, and athlete testimonials related to the diet.⁴ Interestingly, GFD popularity has also risen among athletes considering dietary strategies to improve performance.² Most sport nutrition professionals have become aware of and experienced the explosion of GFDs, yet do not have any scientific evidence quantifying or qualifying this diet amongst athletic populations. To address this gap in knowledge our group launched an extremely successful international questionnaire to quantify several aspects of GFD uptake in athletes.

Key Findings of an International Survey

With nine hundred and ten respondents, including 17 World/Olympic medalists, our electronic questionnaire quantified the popularity, demographics, beliefs, experiences, sources of information, and prescription basis of GFD among non-celiac athletes. Select key findings:²

- Forty-one percent of non-celiac athletes reported following a GFD at least half of the time.
- Self-prescribed GFDs are more prevalent than medically/scientifically prescribed GFDs.
- Widespread beliefs about GFDs among athletes emphasize that gluten removal is healthier, reduces GI distress, reduces inflammation, and improves athletic performance.
- Other athletes, coaches, and online resources are relied upon more than nutrition professionals for GFD information.
Although the findings from this observational data indicate that many non-celiac athletes have adopted a GFD due to perceived, yet unconfirmed, health and performance benefits there is still no scientific evidence supporting these beliefs. Our lab decided to investigate just this! With the first ever double-blind cross-over trial in athletes the primary aim of this study was to determine the effects of a short-term GFD in non-celiac endurance athletes on exercise performance. We also investigated the effects of a GFD on several parameters that conceivably influence performance, including: (1) GI symptoms, (2) perceived wellbeing, (3) intestinal injury, and, (4) systemic inflammation.

**Methods for Gluten-Free Diet Intervention**

Non-celiac competitive cyclists with a negative history of NCGS, wheat allergy or irritable bowel syndrome were given either a GFD or gluten-containing diet (GCD) for 7-days, with a 10-day washout between. Gluten-free meals were prepared and frozen and the gluten or placebo was hidden in study food bars (2 bars per day with 8g gluten/bar). Participants replicated habitual training and food intake over both trials with a performance test (45-min steady state ride at 70%\(W_{\text{max}}\) followed by a 15-min TT) conducted on day-7 of each trial. Performance was measured by total work (kJ) completed in the TT. We also investigated daily and post-exercise GI symptoms, wellbeing (using the Daily Analysis of Life Demands for Athletes), acute intestinal injury and select inflammatory cytokines.

**Results**

In this tightly controlled study, our data suggests that a 7-day GFD does not have a beneficial or a negative affect on cycling performance, GI health, systemic inflammation or overall wellbeing in non-celiac athletes.

**The Belief Effect**

Although our findings do not support the perceptions that a GFD may have an ergogenic or health benefits in non-celiac athletes, in practice, the ‘belief effect’ should be considered. Our survey results indicate that many non-celiac athletes have adopted a GFD due to perceived, yet unconfirmed, health and performance benefits resultant from gluten removal. These include reduced GI distress, inflammation and improved performance. When athletes consume a GFD as a trial to assess symptom improvement or changes in performance-related parameters, the belief effect must be considered, unless the trial is conducted in a double-blinded manner. Halson and colleagues have shown that the belief in an intervention can improve performance by 1% to 3%, highlighting the importance of considering that belief itself may influence outcomes of this dietary intervention.

**Gluten Blamed for Gastrointestinal Issues**

Endurance-based athletes at the recreationally competitive level are the largest GFD
adherent cohort (and respondent population to our questionnaire). GI distress is a common occurrence (up to 70%) among this group and can be attributed to several possible causes, including exercise-induced gut dysfunction and high carbohydrate intake. Athletes may choose to avoid gluten based on a belief that gluten removal also reduces GI dysfunction.

While the effect of gluten avoidance in non-celiac athletes is unknown, gluten removal in irritable bowel syndrome patients does not seem to have a significant positive effect. In a population of irritable bowel syndrome patients who believed gluten removal had improved symptoms, only 8% reported gluten-specific symptoms when fed gluten in a blinded cross-over trial. Research available on GFD in non-celiac individuals is further limited to blinded cross-over trials in non-athlete, clinical populations, which may not accurately reflect a healthy, athletic population. Our study aimed to addressed this knowledge gap and found no difference in GI symptoms daily (outside of exercise) or during exercise between a GFD and gluten-containing diet.

Reported GI symptoms were similar between groups but we also investigated one biomarker indicative of acute intestinal injury (intestinal fatty acid binding protein (IFABP)), known to increase under strenuous exercise conditions. Endurance athletes predictably experience intestinal injury due to GI ischemia, which is proposed as a primary mechanism causing GI distress during exercise. GI ischemia can ultimately give rise to a cascade of responsive events including epithelial injury and both localized and systemic inflammation. Increased epithelial injury also permits translocation of endotoxins across the gut barrier and into circulation, potentially contributing to increased systemic inflammatory responses. Our investigation showed pre-exercise IFABP levels were within expected ranges of healthy controls and increased in accordance with similar exercise studies across both dietary trials during the performance test. Gluten ingestion did not seem to augment this response before, throughout or at the end of a strenuous exercise bought. It is further noteworthy to postulate if recurrent injury, as would occur in endurance training such as in the present study, would facilitate an environment of enhanced susceptibility to dietary triggers or influence markers of systemic inflammation (which we also similar between a GFD and GCD in the present study) in non-celiac athletes.

Avoiding Gluten in the Absence of Medical Need

A simple comparison of a Google search versus a PubMed search using the term “non-celiac gluten-sensitivity” found the “hits” to be 5,000:1 in favor of Google, suggesting that most of the general population is likely relying on non-medical/non-scientific resources for information about gluten-related disorders and a GFD. Similarly, those athletes self-prescribing a GFD also rely on non-peer reviewed or anecdotal GFD information as primary sources of information. Our survey further highlighted that self-diagnosis of a gluten-related disorder based on symptoms or even no symptoms were the more frequent prescription methods for a GFD. Online resources, other athletes, and coaches or trainers are the most popular sources of information, whereas nutritionists and/or registered dietitians are used much less often as sources
of GFD information for athletes. This theme is common in sport nutrition practice, further underscoring the fact that sources of GFD advice may be from non-qualified sources.

One could argue that regardless of the need for a GFD it is not detrimental to avoid gluten, so what’s all the controversy about? One consideration with regards to a GFD are the subsequent nutritional changes that may take place which can either improve or compromise an athlete’s diet\(^2\). Athletes believe that GFD adherence increases conscientiousness of eating a healthy and balanced diet\(^2\). In some cases, the perceived improvements reported with this dietary change may be due to consuming less refined carbohydrates and increasing fruit and vegetable intake rather than to gluten removal itself. To date, it is unknown whether these reported improvements are a function of undiagnosed celiac disease, NCGS or are attributable to the perception by athletes that a GFD benefits performance. However, adopting a GFD without appropriate nutrition counseling may be associated with increased expense (+242\%\(^{13}\)), inadequate intake of B vitamins, fiber and iron, as well as compromised gut health through reduced beneficial gut bacteria populations\(^{13}\). More recently, Shepherd & Gibson\(^{14}\) suggest that the inadequacies found in a GFD may be linked to dietary gluten-free food choices rather than the diet itself. GFD specialty foods in North American food markets are no longer limited to high-sugar, high-fat, low-fiber options. However, for athletes who may travel frequently for training and competition, worldwide gluten-free food availability must be considered when self-selecting food restrictions.

Self-prescription of a GFD can be risky not only because it may restrict food selection but because it could also result in overlooking the underlying causes of GI distress if appropriate medical advice is not sought. Recent studies indicate that gluten may not be the modulating factor in reported symptom improvement with a GFD. Researchers at Monash University (Melbourne, Australia) suggest that fructans are more central to the GI symptoms typically blamed on gluten. Other fermentable oligo-, disaccharides, monosaccharides, and polyls (FODMAPS) should also be considered when deciphering the GI distress puzzle. Amylase trypsin inhibitors in cereals are also under investigation as a potential trigger for immune response and intestinal inflammation.

**Conclusions**

These two studies have been the first to both quantify and qualify GFDs and to investigate the effects of a GFD on performance and related parameters in non-celiac athletes. Although, many athletes adhere to a GFD by choice and hold strong beliefs about the health and ergogenic benefits, our intervention study did not support many of these beliefs. Future research with a longer duration of GFD adherence may help account for differential gut flora habituation, which could be influential on GI health, performance and other parameters. However, such outcomes may be difficult to monitor, as during a longer intervention, training adaptations would be likely to occur that may mask any dietary influenced performance changes. Lengthier interventions are also more intrusive for the athlete, compromise dietary adherence, and challenge
the ability to control and replicate training and food intake. Based on these findings it is recommended that athletes seek evidence-based advice before adopting a GFD for non-clinical reasons to ensure that nutrition intake supports individualised and optimal fueling for sport performance.

Translating Into Practice

- Results from our recent survey investigating the popularity of GFDs in non-celiac athletes offers nutrition practitioners greater understanding of the scope of the GFD movement. Data from the survey emphasizes the importance of considering the psychological aspects of the non-celiac athlete who is following or considering this diet as well as the potential placebo effect.
- An athlete’s diet is a key element to training adaptations and athletic performance, and all elements affecting nutrition intake must be considered when deciding to adopt a GFD for non-medical reasons.
- Given the restrictive nature of this diet and the unknown effects of long-term adherence to a GFD in non-celiac athletes, further research in this area is essential to determine the effects of a GFD on parameters of exercise performance and gut health.

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References


