Exercise-associated GIS

- Acute or delayed onset
- Transient nature
- Difficult to ascertain precise causal mechanism(s)

Causes

- Appear to vary in origin
- Multifactorial in nature
- Circulatory Gastrointestinal-Pathway & Neuroendocrine-Gastrointestinal Pathway

Therefore it is challenging to identify effective preventative or management strategies

FODMAPs & Exercise

Low FODMAP diet has shown efficacy in:

- Reducing exercise-associated GIS in endurance runners in two case studies
- To reduce GIS in runners at rest NOT during exercise in two RCTs (Gaskell et al. 2018, Lis et al. 2018, 2019, Wiffin et al. 2019)
- Ingestion of FODMAPs before, during or after exercise risks malabsorption due to exercise-associated compromise of digestive and absorptive functions
- Consequently lower GIS may be triggered & upper GIS via ileal brake mechanism (Gaskell et al. 2018)

Aim

- To determine the impact of pre- and post-exercise FODMAP intake on gastrointestinal integrity, function and symptoms in response to exertional-heat stress.

Hypothesis

- A 24-h high FODMAP diet before exertional heat stress and a high FODMAP recovery beverage will exacerbate exercise-associated gastrointestinal function and integrity markers, and result in greater GIS compared to a low FODMAP dietary intervention.

*Typical diet of endurance athletes
Participants

Endurance trained runners
- 10 male
- 8 female

Age (years) 35 ± 8
Weight (kg) 68 ± 12
Height (m) 1.74 ± 0.08
Body fat mass (%) 18 ± 5

\[ \text{VO}_{2\text{max}} \text{ (ml kg}^{-1} \text{ min}^{-1}) \] 62 ± 9

Weekly training load (h) 10.2 ± 3.8

Study Design – Double Blind RCT

- Dietary intervention:
  - 24h prior to exercise: High (HFOD) or low (LFOD) FODMAP diet
  - Pre-exercise HFOD or LFOD b/fast, 2h prior to exercise
  - During exercise: Water consumed ad libitum
  - Post-exercise: HFOD or LFOD recovery beverage

- Exercise:
  - 2h treadmill running (60% \[ \text{VO}_{2\text{max}} \], 35° C, 23% RH, airflow ~10.5km h \(^{-1}\))

- Measures:
  - Change in nude body mass pre/post exercise
  - GIS & Breath H\(_2\) before, every 15min during & 4h post-exercise
  - RPE, TC, Rectal temperature, HR, every 15min during exercise
  - Cortisol, I-FABP, LBP, sCD4 pre-post exercise

Table 1. Nutrient Composition of 24-h high and low FODMAP diet

<table>
<thead>
<tr>
<th></th>
<th>High (HFOD)</th>
<th>Low (LFOD)</th>
<th>( P \text{-value} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>2730 ± 767</td>
<td>2502 ± 581</td>
<td>0.071</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>103 ± 29</td>
<td>91 ± 23</td>
<td>0.014*</td>
</tr>
<tr>
<td>Fat (g)</td>
<td>68 ± 18</td>
<td>66 ± 15</td>
<td>0.448</td>
</tr>
<tr>
<td>Total Carbohydrate (g)</td>
<td>405 ± 124</td>
<td>355 ± 89</td>
<td>0.016*</td>
</tr>
<tr>
<td>Total Dietary Fibre (g)</td>
<td>53 ± 9</td>
<td>50 ± 9</td>
<td>0.248</td>
</tr>
<tr>
<td>Total FODMAP (g)</td>
<td>46.7 ± 26.2</td>
<td>2.0 ± 0.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Oligosaccharides (g)</td>
<td>10.8 ± 3.7</td>
<td>1.8 ± 0.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Polyols (g)</td>
<td>6.2 ± 2.2</td>
<td>0.2 ± 0.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lactose (g)</td>
<td>21.2 ± 15.1</td>
<td>0.0 ± 0.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Excess of Fructose (g)</td>
<td>8.7 ± 7.2</td>
<td>Nil</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Gastrointestinal Integrity Markers

Gastrointestinal Symptoms
Conclusions & Implications

- A single day low FODMAP diet prior to exertional heat stress, and a low FODMAP recovery beverage immediately after exercise, reduces gastrointestinal symptoms and maintains function compared to a high FODMAP diet.
- A low FODMAP diet results in substantially greater intestinal epithelial injury compared to a high FODMAP diet.

Recommendations

- To reduce the risk of carbohydrate malabsorption and GIS during and post-exercise, a 24h low FODMAP diet prior to and immediately after exertional heat stress may be helpful.
- Consuming carbohydrate during exertional heat stress has been shown to ameliorate epithelial injury.

References

- Kitic C, et al. Relationship between gastrointestinal complaints and exertional heat stress heat stress has heat stress may be helpful.
- A, et al. Relationship between gastrointestinal complaints and exertional heat stress heat stress has heat stress may be helpful.
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