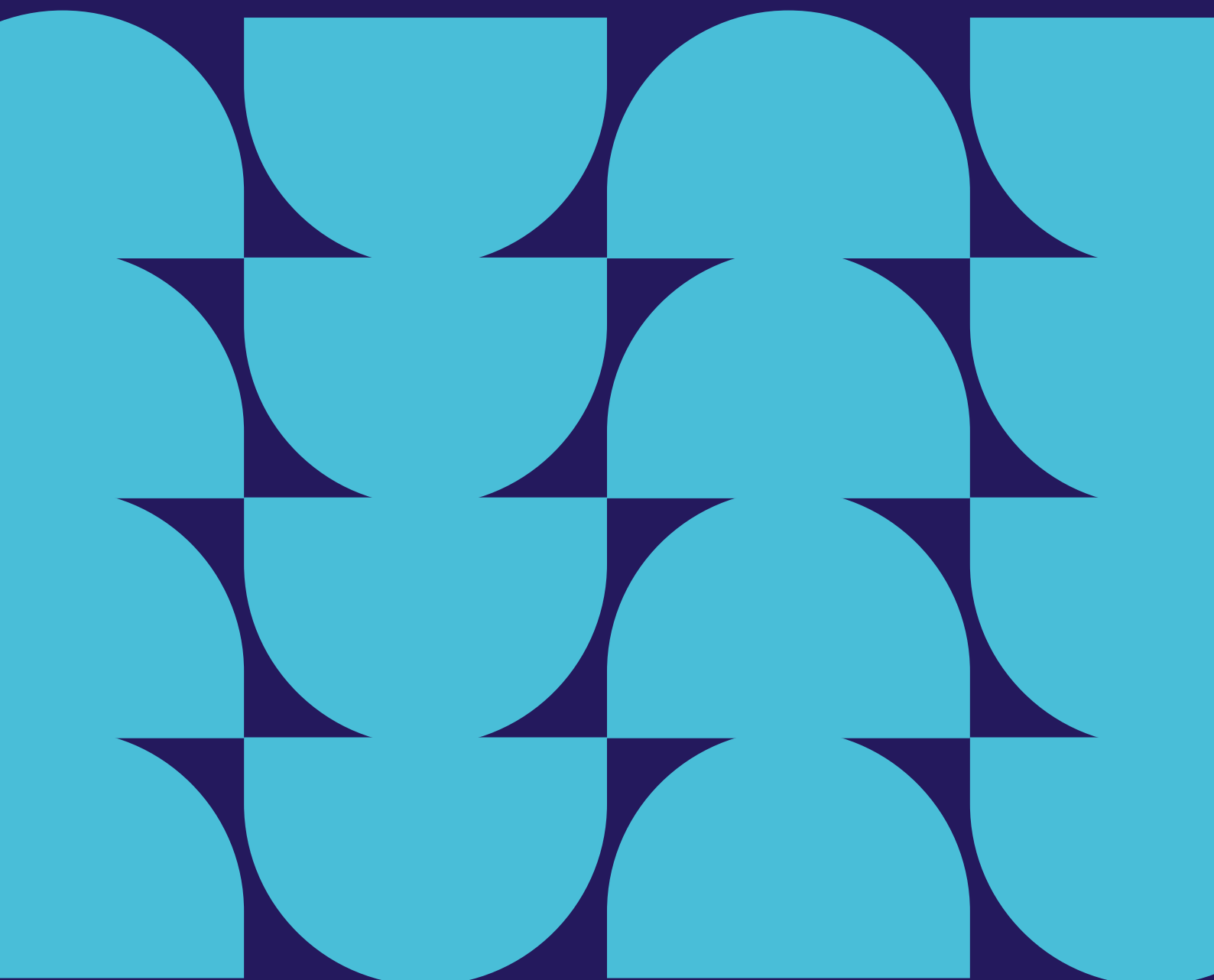




Probiotics+
Athletes' Health



The widest range of benefits



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Athletes' Health and the Gut Microbiome

Emerging evidence highlights the important role of the gut microbiome in athletic performance and health. Regular physical activity is associated with increased gut microbial diversity, which supports digestion, immunity, and metabolic function. Athletes generally exhibit greater microbial diversity than sedentary individuals, suggesting that exercise can positively influence gut health and contribute to improved physical fitness, including cardiovascular and musculoskeletal function, as well as enhanced immune defence and cognitive wellbeing.

However, the relationship between exercise and gut health is complex. While moderate exercise is beneficial, sustained high-intensity exercise, common among elite athletes, can negatively affect the gut microbiome and intestinal barrier function. Reduced blood flow, heat stress, dehydration, and nutritional challenges during exercise can impair intestinal barrier function, leading to increased intestinal permeability (often referred to as 'leaky gut') and endotoxemia, and potentially reduced carbohydrate absorption. The intestinal barrier regulates the absorption of dietary nutrients from the gut into the bloodstream while preventing potentially harmful microbes and toxins from entering circulation. When this barrier is compromised, increased gut permeability allows bacterial toxins (endotoxins) to enter the bloodstream, triggering inflammatory and immune responses. Anxiety and pre-race stress may further worsen these issues through gut-brain interactions. The prevalence of gut symptoms, such as cramping, nausea, diarrhoea, abdominal pain, and bloating, is particularly high in endurance sports, affecting a substantial proportion of marathon and ultramarathon runners, cyclists, and triathletes. Intense training may also suppress immune function, increasing susceptibility to infections such as upper respiratory tract infections.

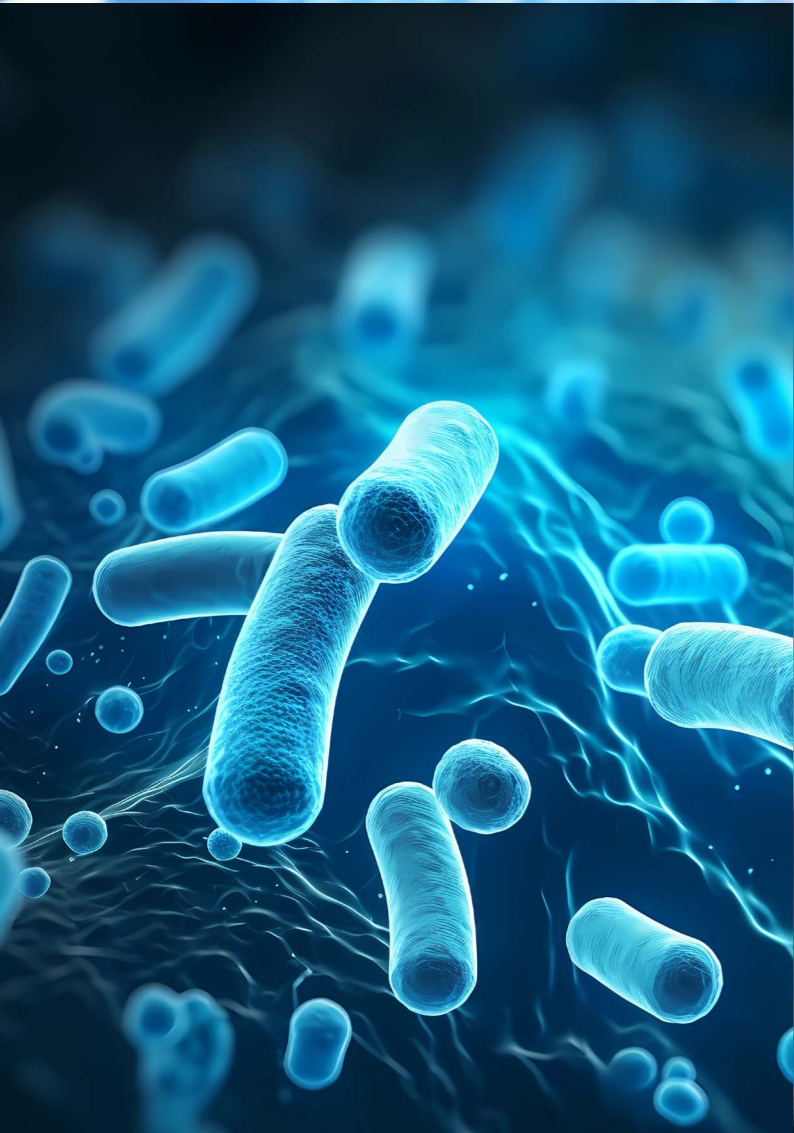
These challenges can negatively impact both health and performance by disrupting training consistency, impairing performance during competition, and, in some cases, leading to withdrawal from events. Maintaining a balanced approach to training intensity, alongside targeted strategies to support gut health, is essential for optimising athletic performance and overall wellbeing.

The Role of Probiotics in Athletes' Health

Probiotics are increasingly recognised as a nutritional strategy to support athletes' gut health and overall performance. Research suggests that probiotics may help reduce the incidence and severity of gut symptoms and respiratory infections linked to endurance exercise. Additionally, probiotics have been associated with improvements in athletic performance.

- 5 randomised, controlled studies with Lab4 or Lab4-based multi-strain probiotics supplementation showing benefits for athletes' health
- 1 study on gut symptoms and running pace in marathon endurance athletes
- 1 study on intestinal health and race performance in triathlon endurance athletes
- 1 study on fuel selection and oxidation in trained cyclists
- 1 study on performance in the heat among endurance runners
- 1 study on race performance in ultra-marathon athletes

Microbiologists Dr. Nigel Plummer and Dr. Sue Plummer established Cultech Ltd in 1994 with the vision for a company with research at its heart.



Studies

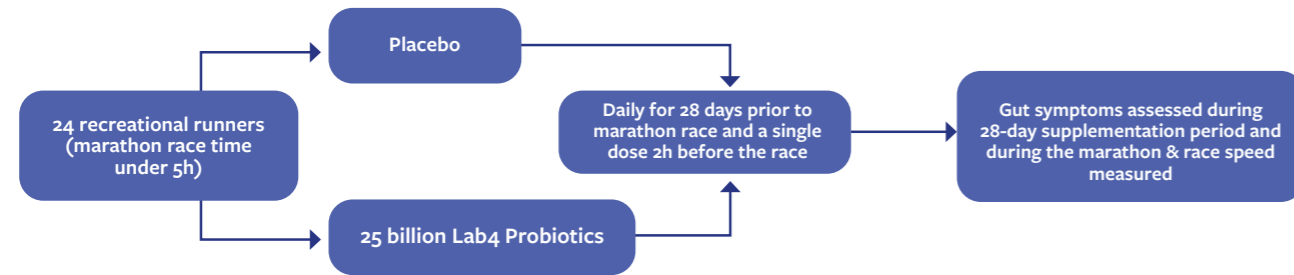
The Evidence for Lab4 Effectiveness for Athletes' Health

Lab4 Probiotics has shown the following benefits:

- In marathon runners, reduced gut symptoms and maintained running pace
- In triathletes, reduced gut symptoms and supported intestinal integrity
- In cyclists, increased carbohydrate utilisation
- In runners, increased time to fatigue in heat
- In ultra-marathon runners, faster completion times

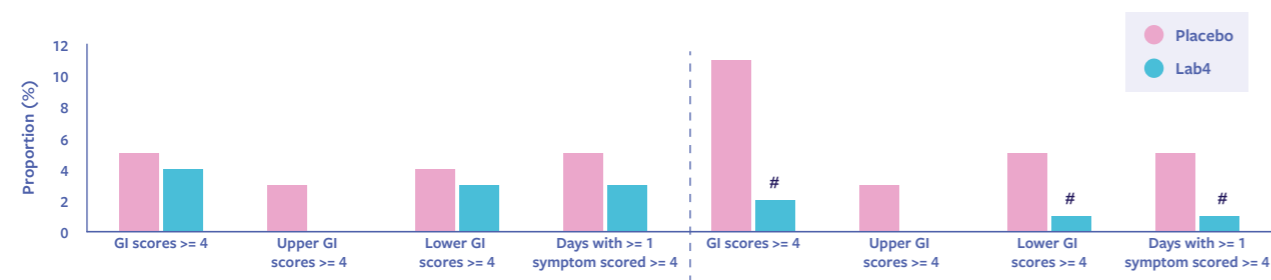
The Marathon Endurance Study

This randomised, double-blind, placebo-controlled study assessed the effect of Lab4 Probiotics supplementation on gut symptoms, race time, intestinal permeability and immunological markers during marathon training and racing.



Results

GI symptoms reported during 28-day supplementation



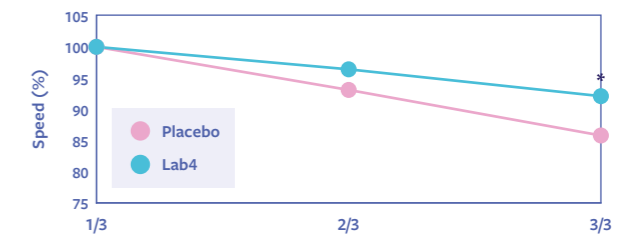
- The number of moderate gut symptoms and number of days with these symptoms were significantly reduced in the last 14 days of Lab4 Probiotics supplementation compared to the first two weeks (# $P < 0.05$).

Gut symptom scores during each third of the race



- A significant reduction in the severity of gut symptoms was seen in the Lab4 Probiotics group compared to the placebo group (* $P = 0.01$) during the final third of the race.
- A significant association was observed between gut symptoms during the race and reductions in running speed, especially towards the later stage of the race.

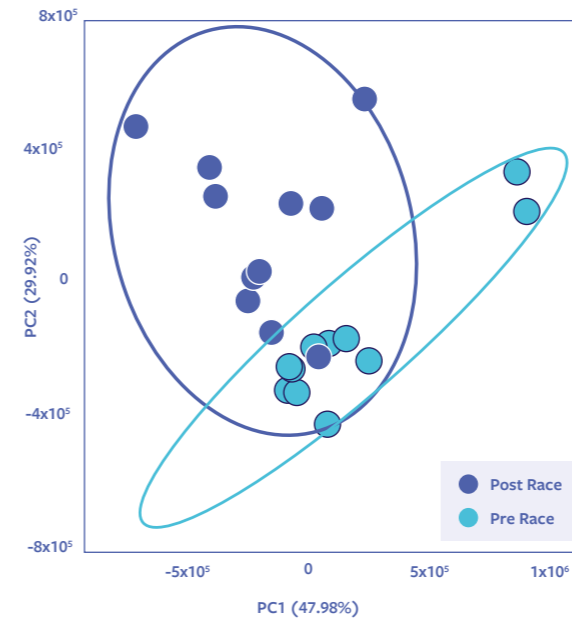
Running speed during each third of the race



- The reduction in average running speed from the first to the last third of the race was significantly greater in the placebo group (14.2% reduction) compared to the group taking Lab4 Probiotics (8% reduction, * $P = 0.03$).

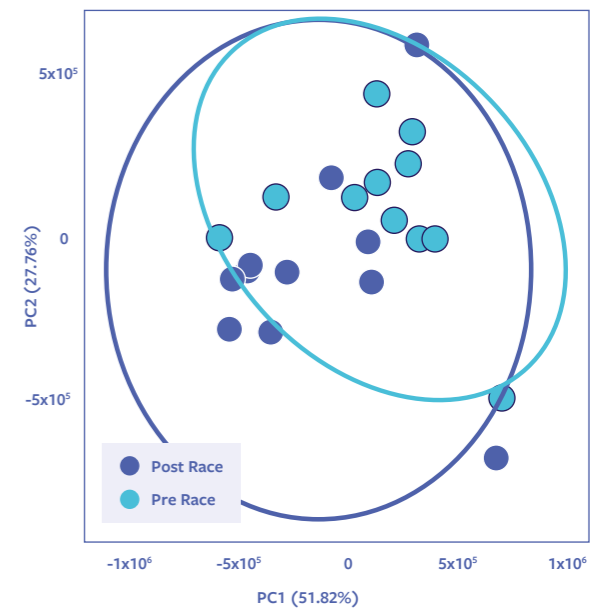
Metabolic Perturbation

Placebo



- Greater post-marathon metabolic disruption was observed in the placebo group, characterised by a shift towards lipid metabolism (over carbohydrate metabolism) and a reduction in anti-inflammatory metabolites.

Lab4



- Lab4 Probiotics supplementation attenuated these perturbations.

Conclusion

Lab4 Probiotics supplementation was associated with reduced gut symptoms in endurance runners, supported the maintenance of running pace during a marathon, and lessened marathon-induced metabolic disturbances, suggesting a protective effect on metabolic homeostasis.



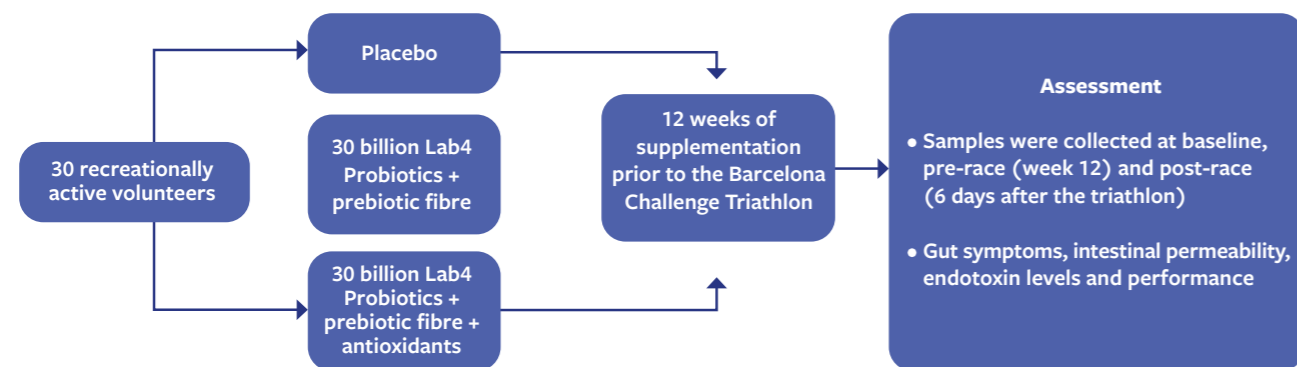
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The Hertfordshire Study >

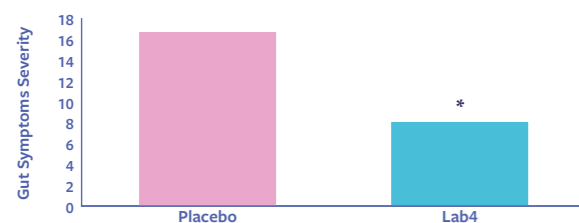
This randomised, double-blind, placebo-controlled study aimed to assess the effects of a 12-week Lab4 probiotic/prebiotic intervention, with or without antioxidants, on gut symptoms, endotoxin levels, intestinal permeability, and race time in recreational athletes.



Results >

Gut Symptoms

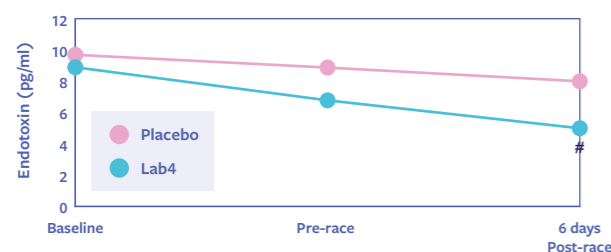
Gut Disturbance



- Gut symptom severity scores during training were significantly lower in the Lab4 Probiotics group compared to placebo (* $P < 0.001$).
- Gut disturbance symptoms include:
 - Bloating
 - Nausea
 - Stomach/intestinal pain or discomfort
 - Cramping
 - Headaches
 - Dizziness
 - Constipation
 - Diarrhoea
 - Belching
 - Urge to urinate and defecate

Endotoxigenicity

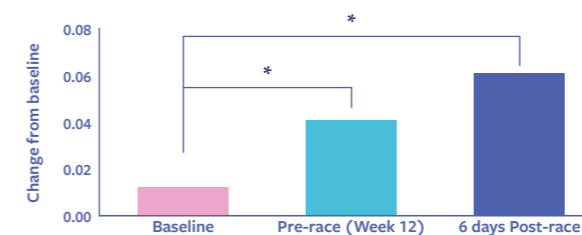
Plasma Endotoxin



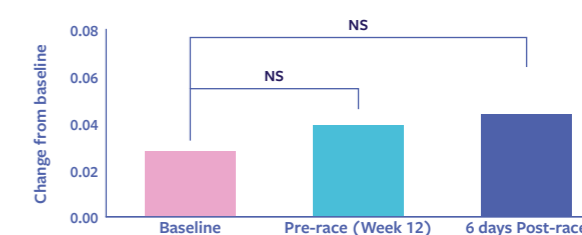
- Endotoxin levels were significantly reduced in the Lab4 Probiotics group, six days post-race compared to the start levels (# $P < 0.05$).
- This represented an overall 43.9% reduction in endotoxin levels.
- No changes in endotoxin levels were observed in the placebo group.

Intestinal Permeability

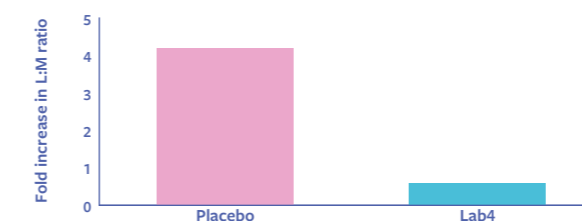
Placebo Group L:M Ratio



Lab4 Group L:M Ratio

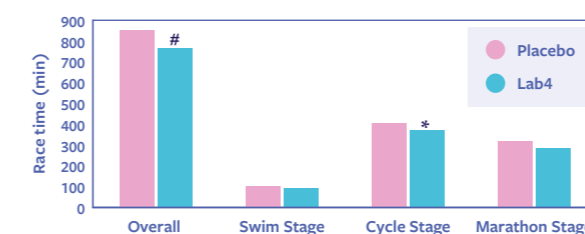


Lactulose:Mannitol Ratio



- A standard Lactulose:Mannitol (L:M) test was used to assess intestinal permeability.
- Altered intestinal permeability was only observed in the placebo group, where the L:M ratio significantly increased from baseline to pre-race and six days post-race (* $P < 0.05$).
- This represents a 4.2 fold increase compared to a 0.6 fold increase in the Lab4 Probiotics group.

Performance



- The Barcelona Challenge Triathlon consisted of a 3.8 km sea swim, a 180 km road cycle, and a 42.2 km marathon run.
- The Lab4 group was significantly faster than the placebo group during the cycling stage (* $P = 0.046$).
- A strong trend toward faster overall finishing times was observed in the Lab4 group compared to the placebo group (10% faster, # $P = 0.058$).

Conclusion >

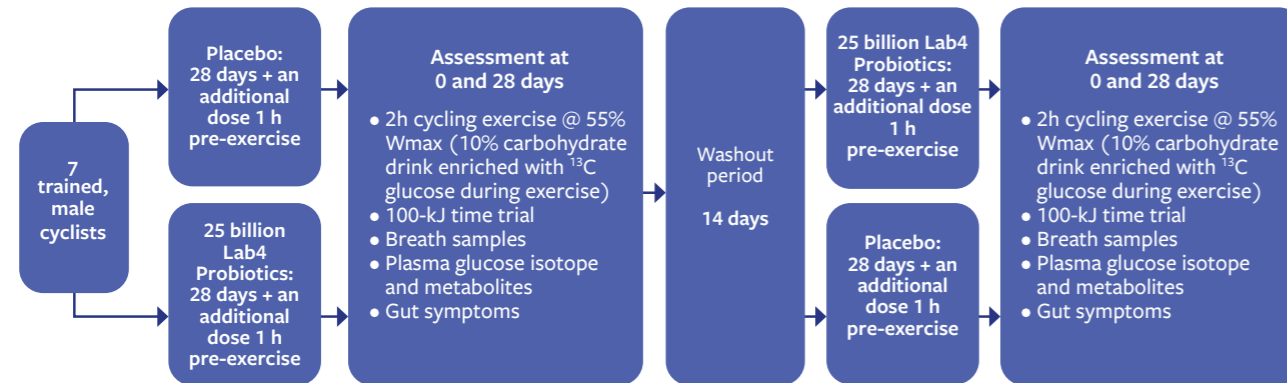
Lab4 Probiotics supplementation supported gut health in triathlon athletes by reducing gut symptoms, preserving intestinal integrity during training and competition, and contributing to improved race performance.



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The Cycling Endurance Study

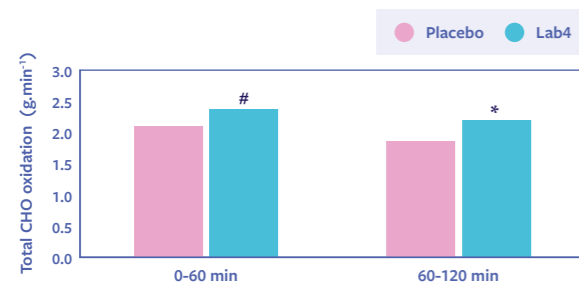
This randomised, double-blind, placebo-controlled crossover study investigated whether Lab4 Probiotics supplementation increases the oxidation of orally ingested maltodextrin and total carbohydrate oxidation during 2 hours of endurance cycling.



Results

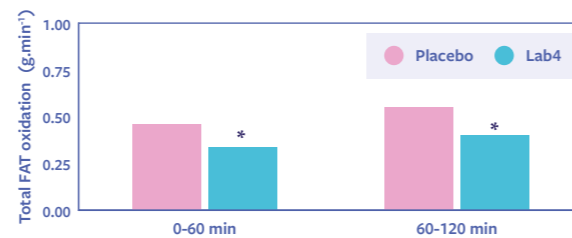
Substrate Oxidation

Carbohydrate Oxidation



- Carbohydrate (CHO) oxidation increased in the Lab4 group during the first hour of exercise compared to placebo ($\#P=0.087$), with a significant difference between groups during the 60-120 min period ($*P=0.038$).

Fat Oxidation



- Fat oxidation was significantly reduced in the Lab4 group compared to placebo during both the 0-60 min and 60-120 min periods ($*P=0.041$, $*P=0.021$, respectively).

Gut Symptoms

- The incidence of gut symptoms during cycling exercise was low in both groups, suggesting that the exercise intensity and duration did not induce significant gastrointestinal disturbance.

Conclusion

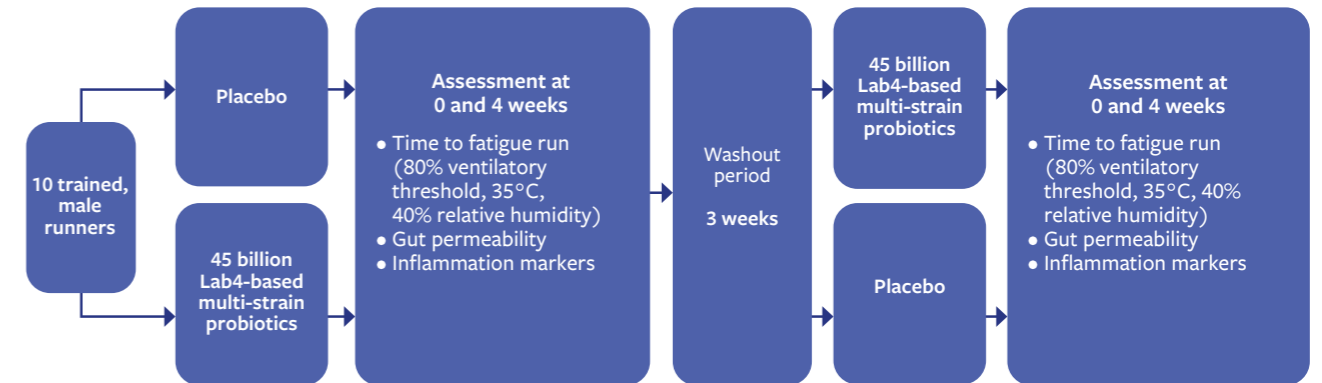
Lab4 Probiotics modestly increased total carbohydrate oxidation and reduced fat oxidation during endurance cycling, with effects most evident during the second hour of exercise. These findings suggest a potential enhancement in exogenous carbohydrate utilisation.



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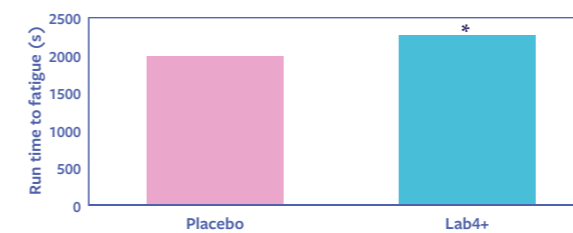
The Running to Exhaustion Study

This randomised, double-blind, placebo-controlled crossover study investigated the effect of Lab4-based multi-strain probiotic supplementation on gut permeability, inflammation, and running performance during exercise in hot conditions.



Results

Performance



- A significant increase in running time to fatigue in the heat was observed in the probiotic group compared to placebo ($*P=0.03$).
- Runners supplemented with probiotics exercised for a longer duration (37min 44s \pm 2min 42s) compared to those receiving a placebo (33min 0s \pm 2min 27s).

Intestinal permeability

- Intestinal permeability was assessed using the urinary lactulose:rhamnose test.
- The lactulose:rhamnose ratio was approximately 8% lower following probiotic supplementation compared to placebo; however, this difference did not reach statistical significance.
- This was associated with reduced circulating lipopolysaccharide (LPS) concentrations at both pre- and post-exercise time points.

Conclusion

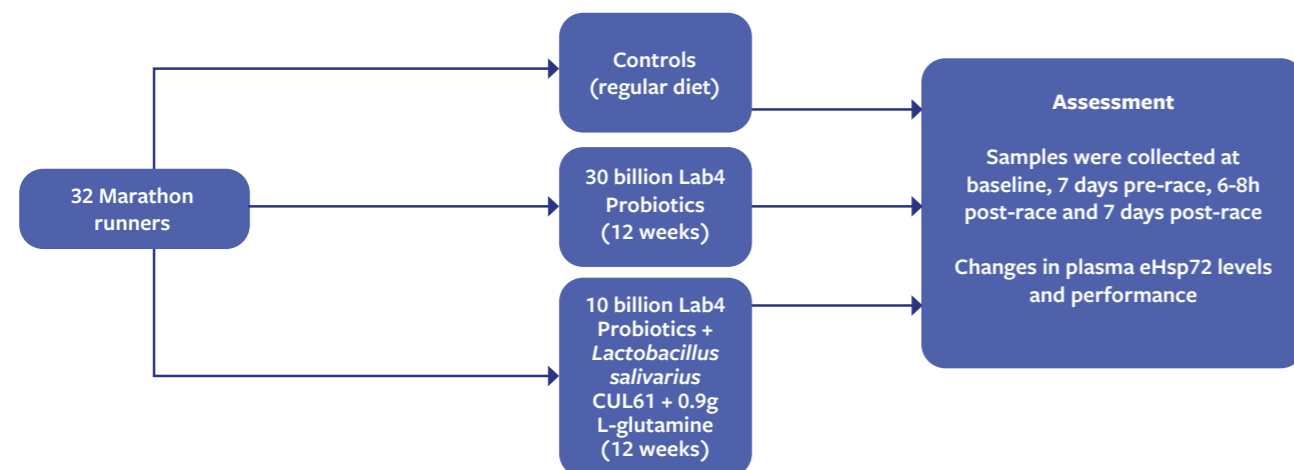
Lab4-based multi-strain probiotic supplementation significantly increased running time to exhaustion in hot environmental conditions. However, the exact mechanisms underlying this performance benefit remain unclear. Probiotics may exert small to large effects on gut barrier integrity and endotoxin translocation, which could collectively contribute to enhanced exercise performance.



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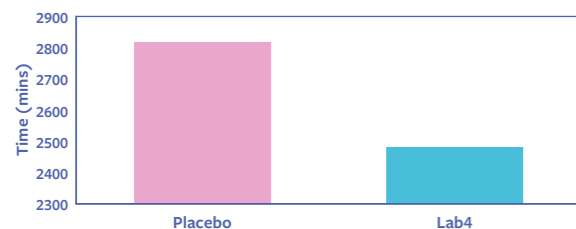
The Ultra Marathon Endurance Study >

This study used a randomised, controlled, non-blinded design to investigate the effects of Lab4 Probiotics supplementation on levels of a stress-related protein (extracellular heat shock protein 72; eHsp72) and performance during a multi-day ultra-endurance event, the Marathon des Sables.



Results >

Performance



- The Marathon des Sables is a 294.4 km, 7-day ultra-marathon held in the Sahara Desert (20–50°C).
- The Lab4 group completed the race 5 hours and 38 minutes faster than the control group, but this difference did not reach statistical significance.
- This represents an approximate 12% reduction in completion time (2481 ± 846 min vs. 2819 ± 525 min).

Extracellular Heat Shock Protein (eHsp72)

- eHsp72 concentrations increased following the race, indicating physiological stress; however, no significant differences were observed between groups during the study period.

Conclusion >

Lab4 Probiotics supplementation was associated with a meaningful (~12%) reduction in completion time during the ultra-marathon. Future studies with larger sample sizes are required to determine statistical significance.



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A multitude of benefits

- Lab4 Probiotics has shown simultaneous benefits on digestive health, immune function, athletic performance, gut-brain axis, and alongside antibiotic use
- The Lab4 consortia are adapted to the human gut with demonstrable ability to survive stomach acidity and bile acids and to colonise epithelial tissue and mucous
- Lab4 has a shelf-life up to 24 months in ambient conditions*

Why Lab4 Probiotics Work

One body system

The gut and hence the microbiome are extensively connected to almost all of the other physiological systems of the body, this includes the immune system, endocrine system, brain and central nervous system, and metabolic physiology.

Proxies for microbes

Consequently, as proxies for our microbiome, effective probiotics could also impact beneficially on these distant physiologies – and these benefits may be manifest simultaneously as the intestinal health benefits outlined above.

Bacterial colonisation

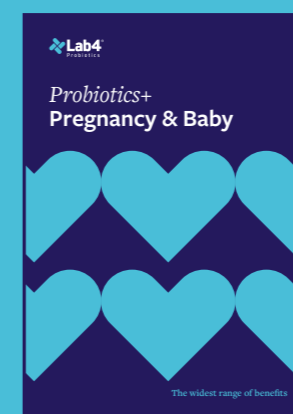
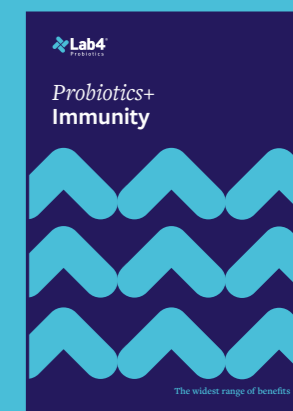
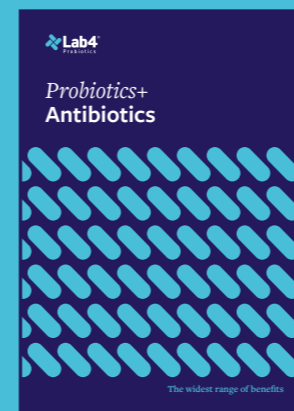
Lab4 contains *Lactobacillus acidophilus* (two strains) as well as *Bifidobacterium animalis* subsp. *lactis* and *Bifidobacterium bifidum*. The Lactobacilli are dominant colonisers of the sparsely populated small intestine and the Bifidobacteria constitute a significant population in the distal small intestine and are also present throughout the large intestine.

High dose

Over the past 30 years it has become evident that higher doses of effective probiotic strains produce faster, greater and more consistent effects and benefits. In all clinical studies on adults performed to date, Lab4 has been supplemented at 25 billion a day. This is why we have seen a broad range of consistent health benefits across a wide range of conditions and particularly with intestinal health.

*In powder, capsule and chewable tablet products produced and packed appropriately

See our other Guides



Lab4 Specification

Lab4 Probiotics blends are available as freeze-dried concentrated powders at various concentrations. For more details, please contact Josh Kerry-Smith at info@lab4probiotics.co.uk or on +44(0)1639 825100 www.lab4probiotics.co.uk

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