

Targeting the gut
and its resident
microbes to
support athlete
health

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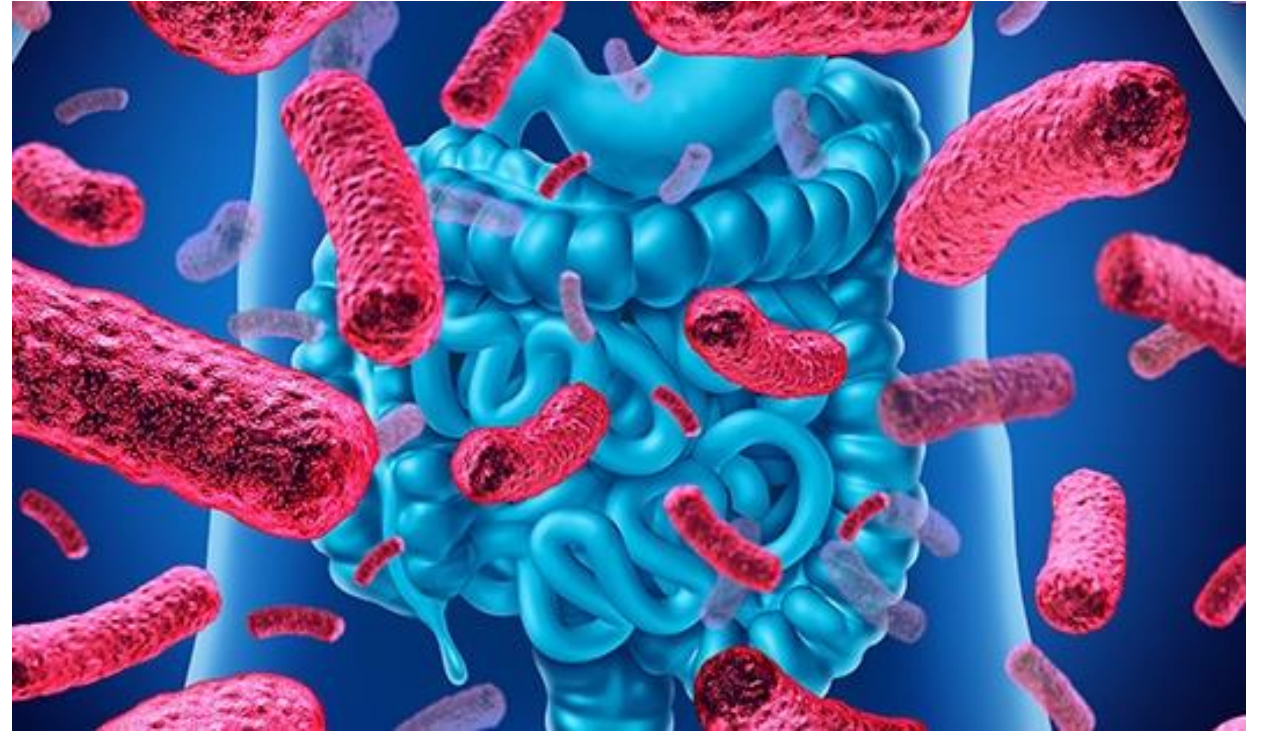
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Overview

- **What...** happens to the gut during exercise?
- **What...** is the gut microbiome?
- **How & why...** Prebiotic interventions may support athlete health

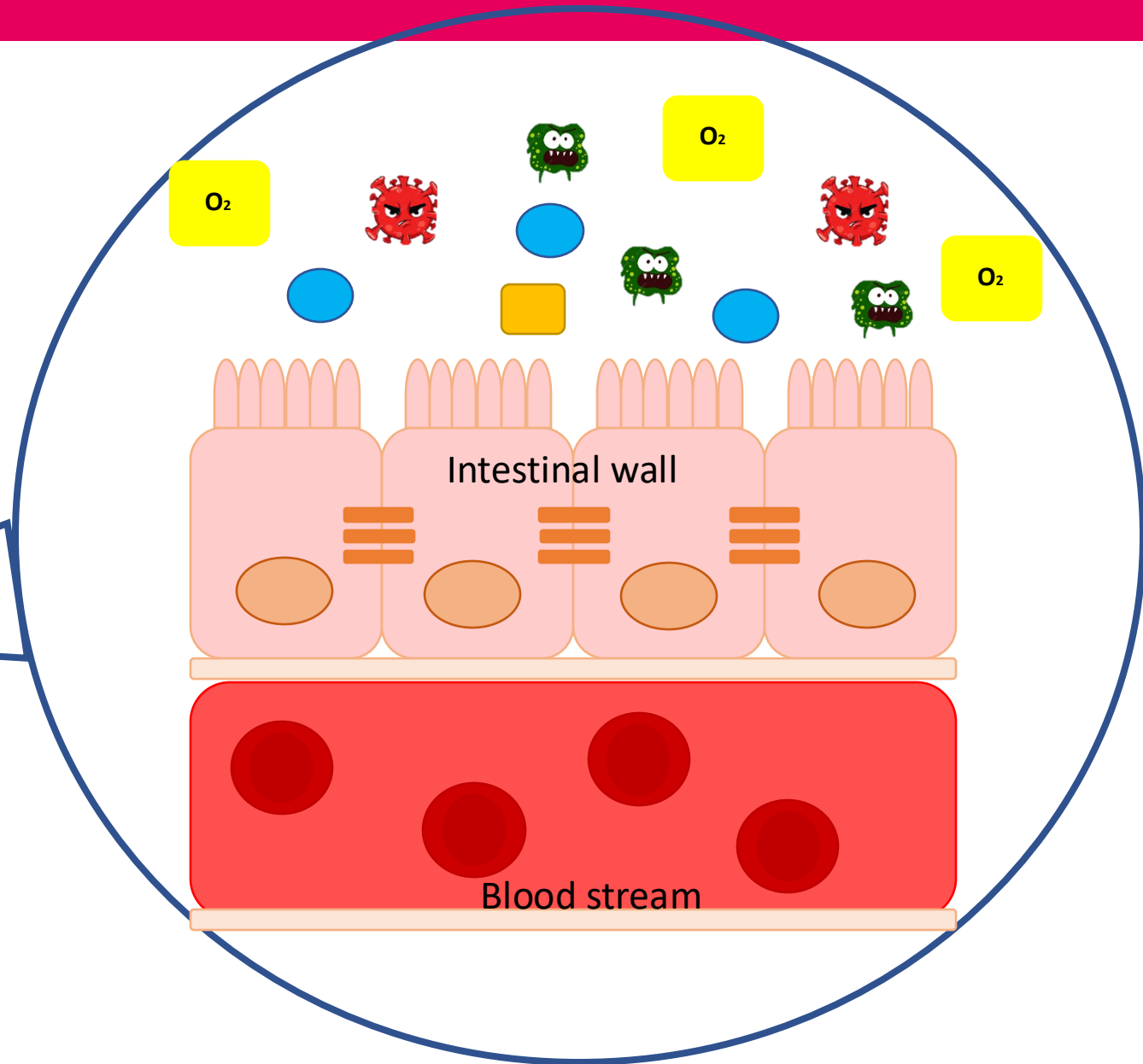
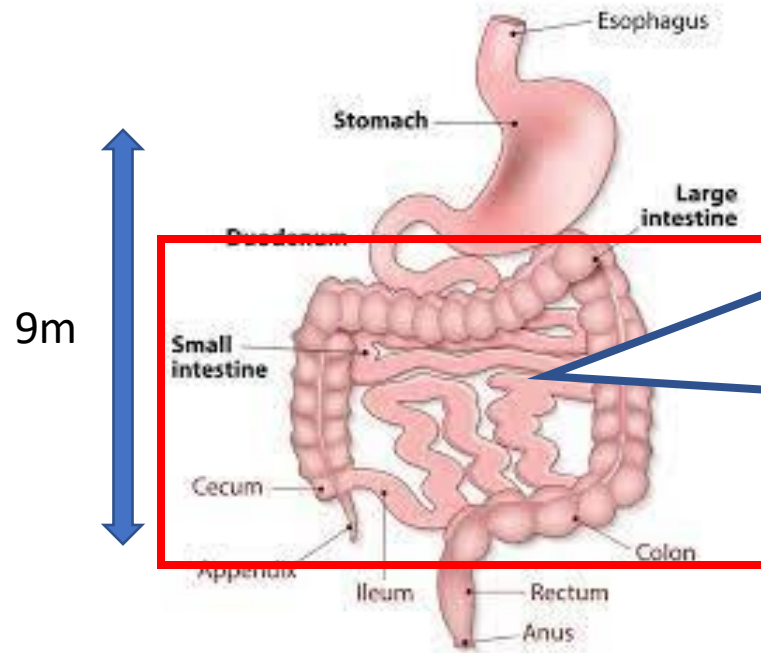




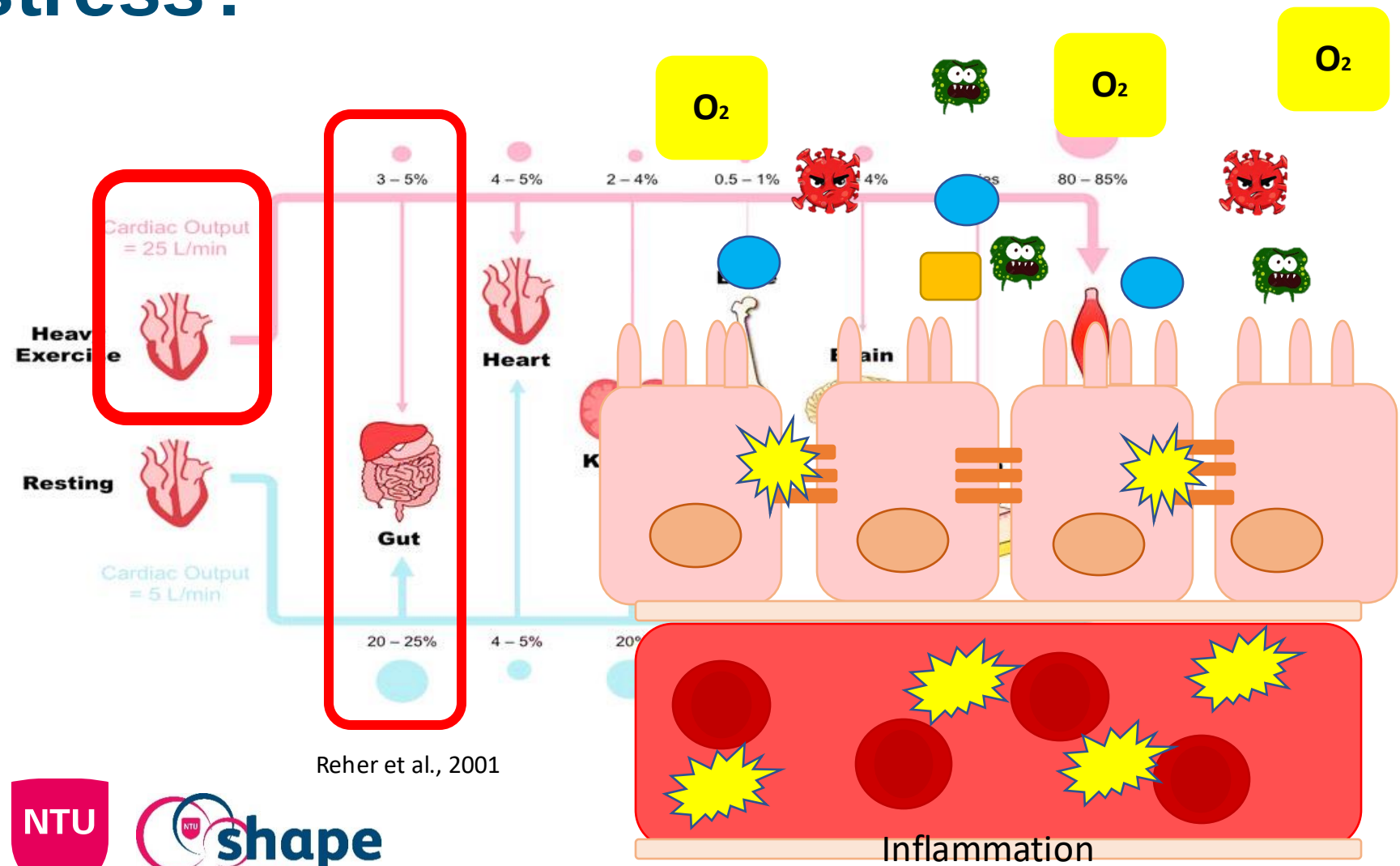
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What... happens to the gut
during exercise and physical
activity?

What is the gut?



What happens during exercise & environmental stress?



Reher et al., 2001



What impact does this have?

86% athletes experience bloating, nausea, flatulence, vomiting (Pugh et al 2017)

Travellers' diarrhoea remains prevalent in athlete settings (Nikolic et al 2021)

Compromised exercise recovery and nutrient absorption (Costa et al 2017)





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What... is the gut microbiome?

The human microbiome



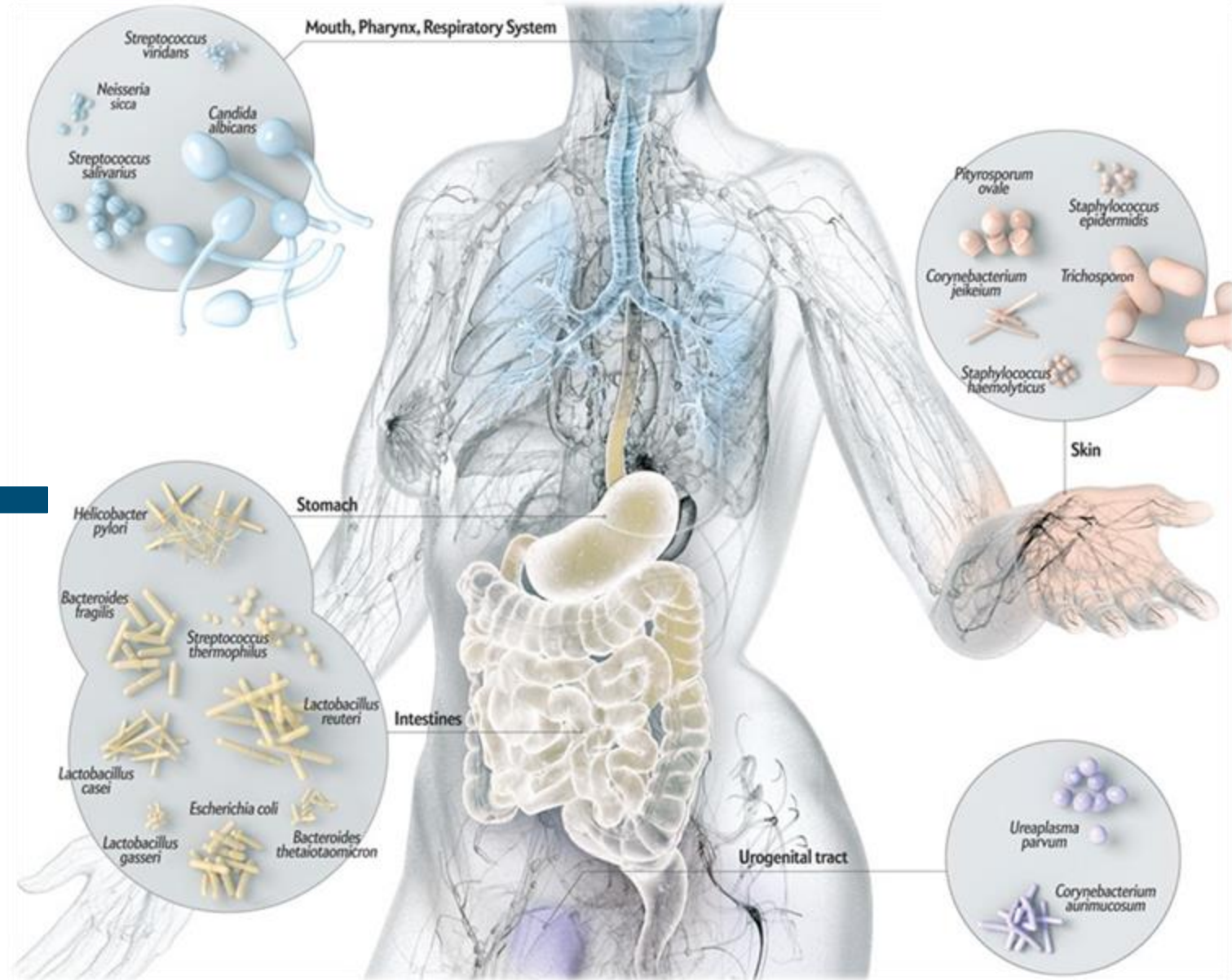
We are home to
100 trillion microbes!
“Our microbiota”

- That outnumber our 37 trillion human cells
- Microbes contribute an extra 2 million genes to each person
- We are a superorganism!

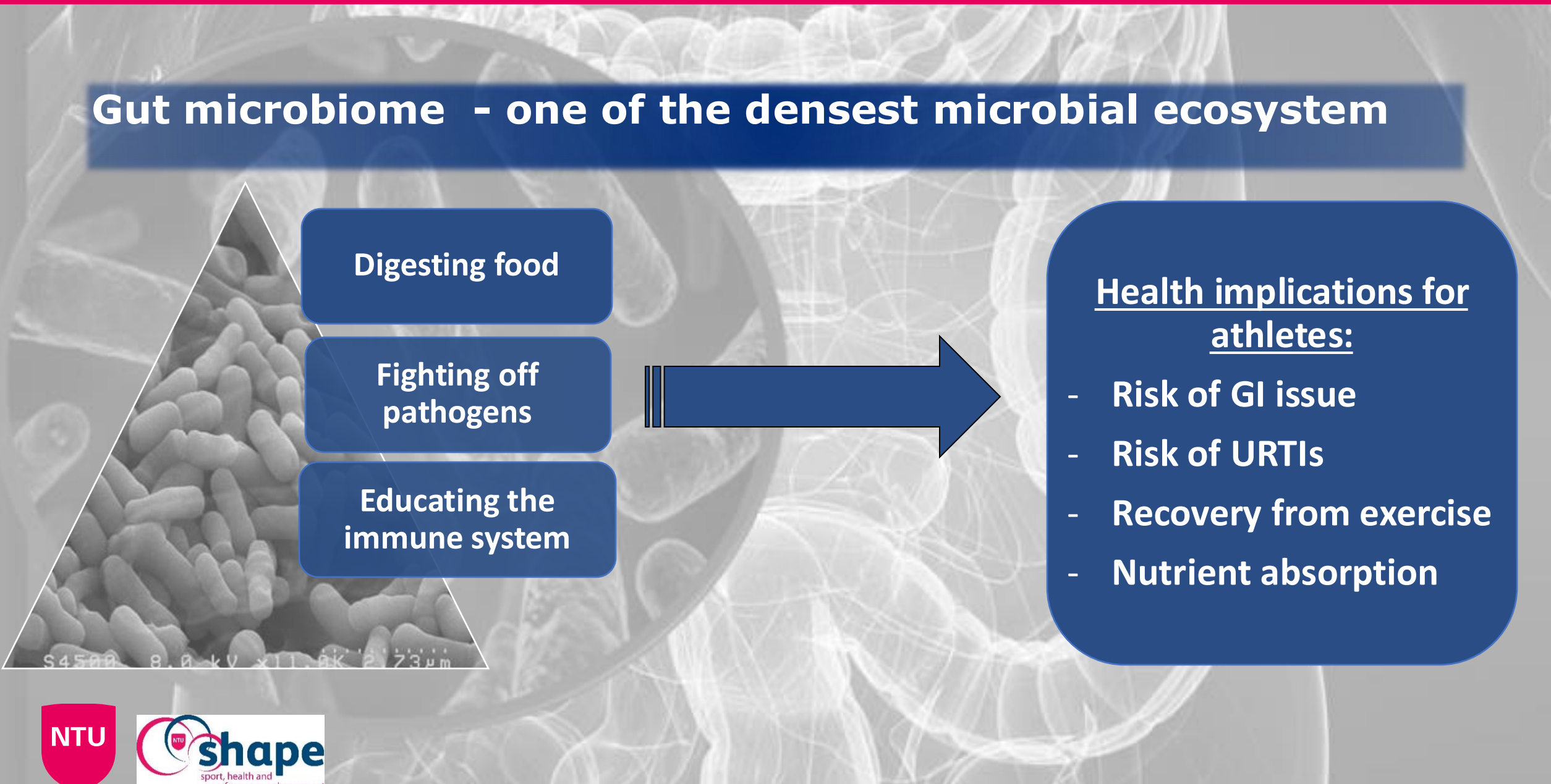
The gut microbiome

Up to 1.5 kg or
3 pints in volume

The gut microbiota is
one of the densest
microbial ecosystems
ever observed



Gut microbiome - one of the densest microbial ecosystem



The diagram features a background image of a human torso with the digestive system highlighted. On the left, a triangular inset shows a microscopic view of bacteria. Three blue rounded rectangular boxes are stacked vertically, containing the text 'Digesting food', 'Fighting off pathogens', and 'Educating the immune system'. A large blue arrow points from these boxes to a larger blue rounded rectangular box on the right. This box contains the heading 'Health implications for athletes:' followed by a bulleted list of four items: 'Risk of GI issue', 'Risk of URTIs', 'Recovery from exercise', and 'Nutrient absorption'.

Digesting food

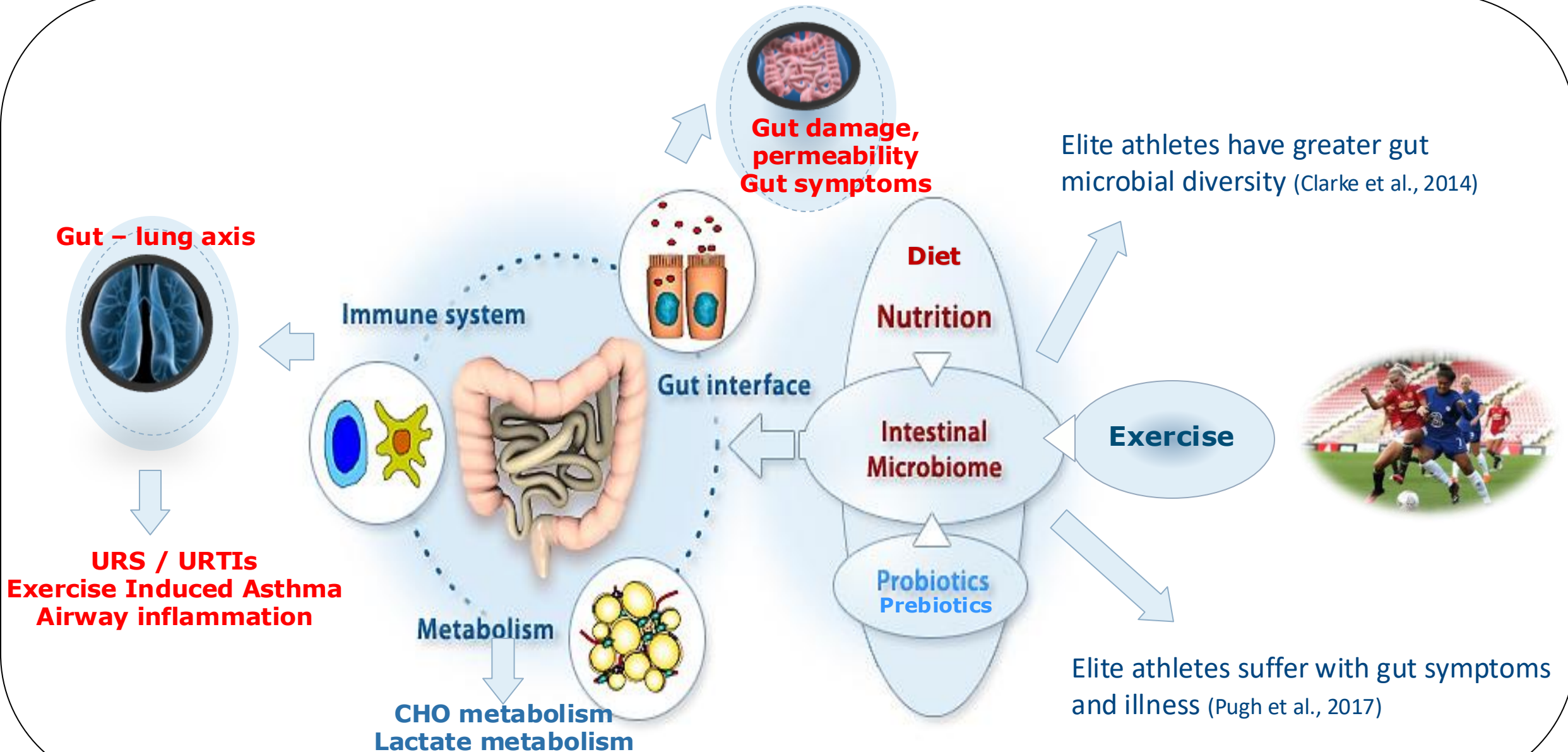
Fighting off
pathogens

Educating the
immune system

Health implications for athletes:

- Risk of GI issue
- Risk of URTIs
- Recovery from exercise
- Nutrient absorption

Gut microbiota – a target in physical activity

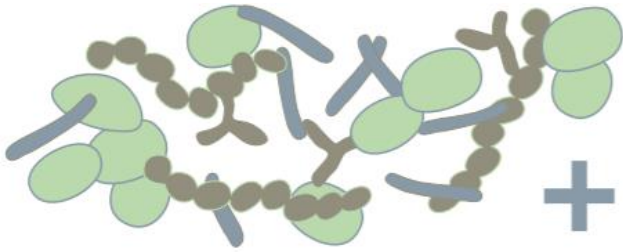




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How...Prebiotic interventions may
support athlete health

Manipulation of the gut microbiota



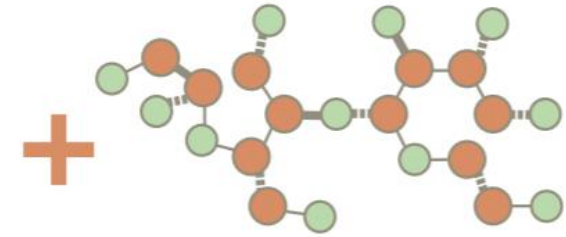
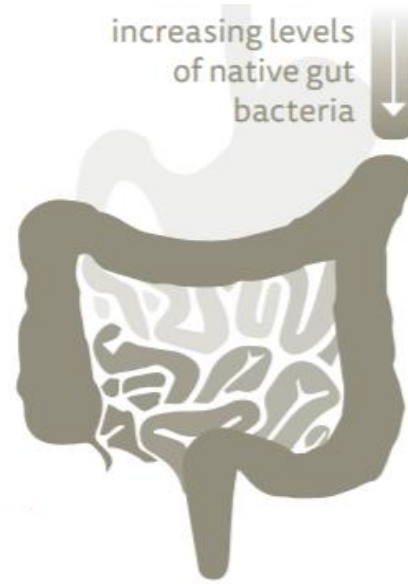
Probiotics

Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host

Yoghurt, kefir, sauerkraut etc.

Can influence the microbes that colonize our body

Can grow, metabolize and interact, but rarely permanently colonize



Prebiotics

Non-digestible food ingredient metabolised by beneficial gut microbiota

A compound or ingredient that is utilised by the microbiota producing a health or performance benefit

Onion, garlic, Jerusalem artichoke, chicory etc.

Positive impact on the composition and/or activity of resident microbiota
Increase microbe-derived metabolites important for health

Probiotics use in athletes



Cox et al (2007)
in runners

50% reduction
in URTI
incidence



Gleeson et al
(2011) in runners

Reduced the
incidence of
URTJ and
enhanced sIgA



Haywood et al
(2014) in rugby

Lower incidence
of URTI and GI
episodes
Shorter duration
of URTI



Prebiotics in elite athletes

- Aim: to assess the effects of a 24-week prebiotic (B-GOS) supplement on the severity, duration and incidence of URS and GIS, markers of immunity and inflammation in elite rugby union players



2.8 g/day B-GOS

Vs



2.8 g/day
Maltodextrin



Prebiotics in elite athletes

Upper respiratory symptoms

Episode duration (days)

Prebiotic 7.4 (2.8) vs Placebo 9.8 (4.0); ($P < 0.05$)

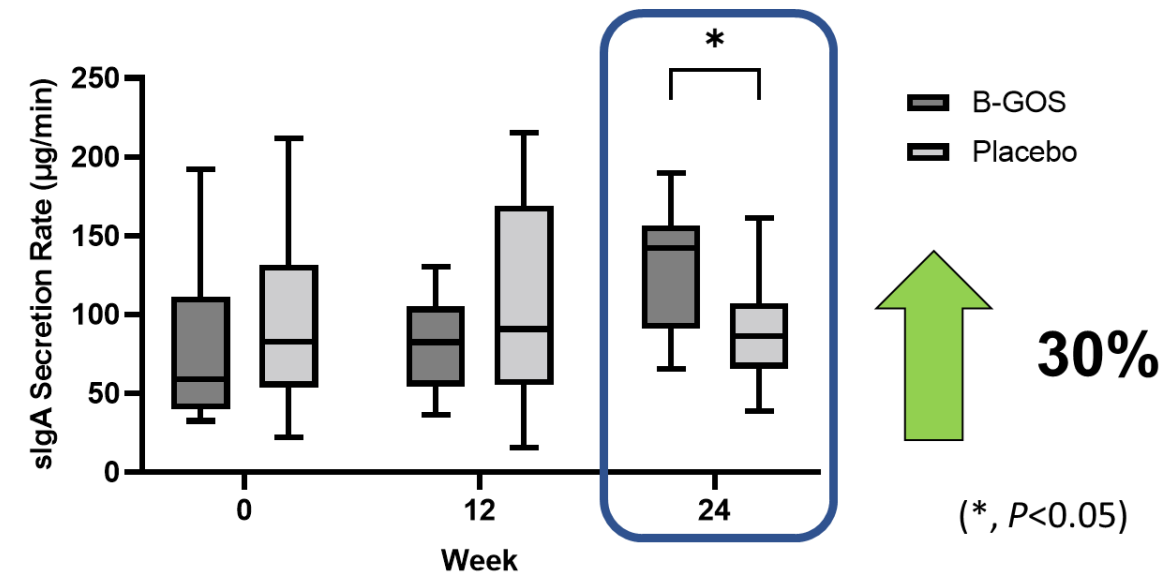
Gastrointestinal symptoms

Total symptom free weeks

Prebiotic 11 (5.2) vs Placebo 7 (4.9); ($P < 0.05$)



Secretory IgA



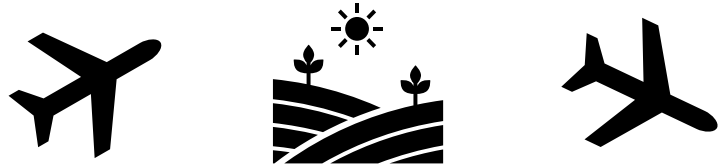
Prebiotics and traveller's diarrhoea

2.7g/day B-GOS (PRE)

Or

2.7g/day placebo (PLA)

5 days preceding travel



Continued for 7-15 days during travel period

Up to 15-day log of TD symptoms

Definition of TD: 3 or more loose stools per day

Compliance group	Prebiotic (%)	Placebo (%)	Odds ratio	P-value
Full compliance	32 (19)	48 (29)	0.56	0.03
Conditionally compliant	41 (23)	54 (31)	0.65	0.08
<5days compliant	52 (25)	60 (30)	0.79	0.29

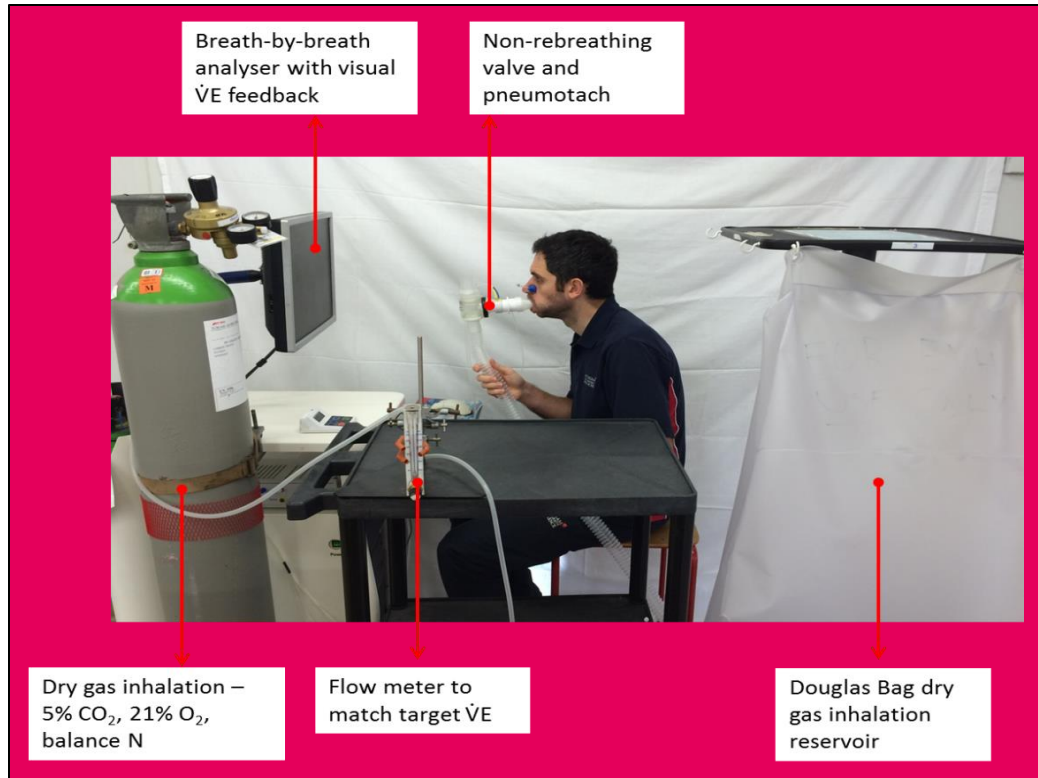
↓ TD incidence in full compliant group who received PRE compared to PLA

Greater protective effect from 8-days onwards

Most effective on acute 1-day TD episodes (6 vs 20; 1-day incidents in PRE and PLA respectively; $P = 0.004$).

Prebiotics to combat asthma / EIA

- Asthma and EIA prevalent in elite athletes
- Altered gut microbiota in asthma
- 3-week Prebiotic (B-GOS) ($5.5\text{g}\cdot\text{d}^{-1}$) vs Placebo (maltodextrin)



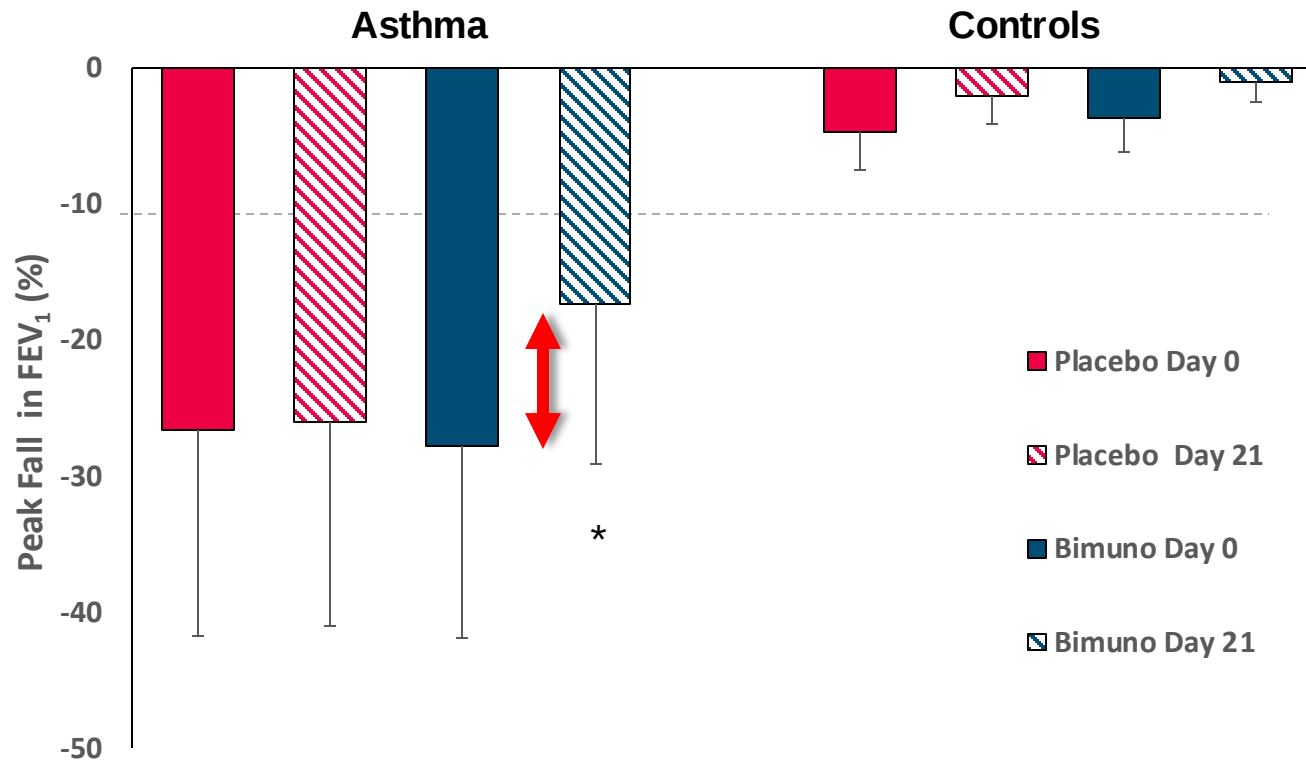
Eucypnic voluntary hyperpnoea

Mimics breathing rates associated with exercise.

Causes airway drying and in susceptible individuals EIA, and airway inflammation

Williams et al (2016) *Br J Nutr.*

Prebiotics to combat asthma / EIA



*Bimuno Day 0 vs. Bimuno Day 21 ($P = 0.004$)

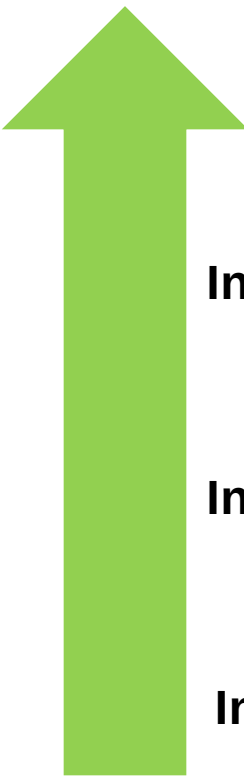
- 40% reduction in severity of EIA
- Patient perceivable difference

Summary

- URTIs and gastrointestinal (GI) symptoms are a burden for athletes.
- The gut microbiome significantly influences immune and GI function; therefore, this makes it a suitable treatment target.
- Emerging evidence now suggests that dietary prebiotics may reduce the burden of URTIs and EIA, and attenuate GI symptoms associated with training and exercise

But so what???

So what???



Increase athlete availability

Increase likelihood to perform optimally

Increase success?



Future directions for prebiotic research in athletes

Athlete directions?

- Female athlete health
- Gut-brain, gut-lung, gut-muscle axis
- Metabolic responses
- Different athletic settings

Support in occupational settings

- Physically demanding occupations
- High performance occupations

Formulations and combinations

- Synbiotic formulations
- Combinations with other sports supplements (e.g. protein, collagen)
- Product type – ease of use for adherence in athletes



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Thank you for listening