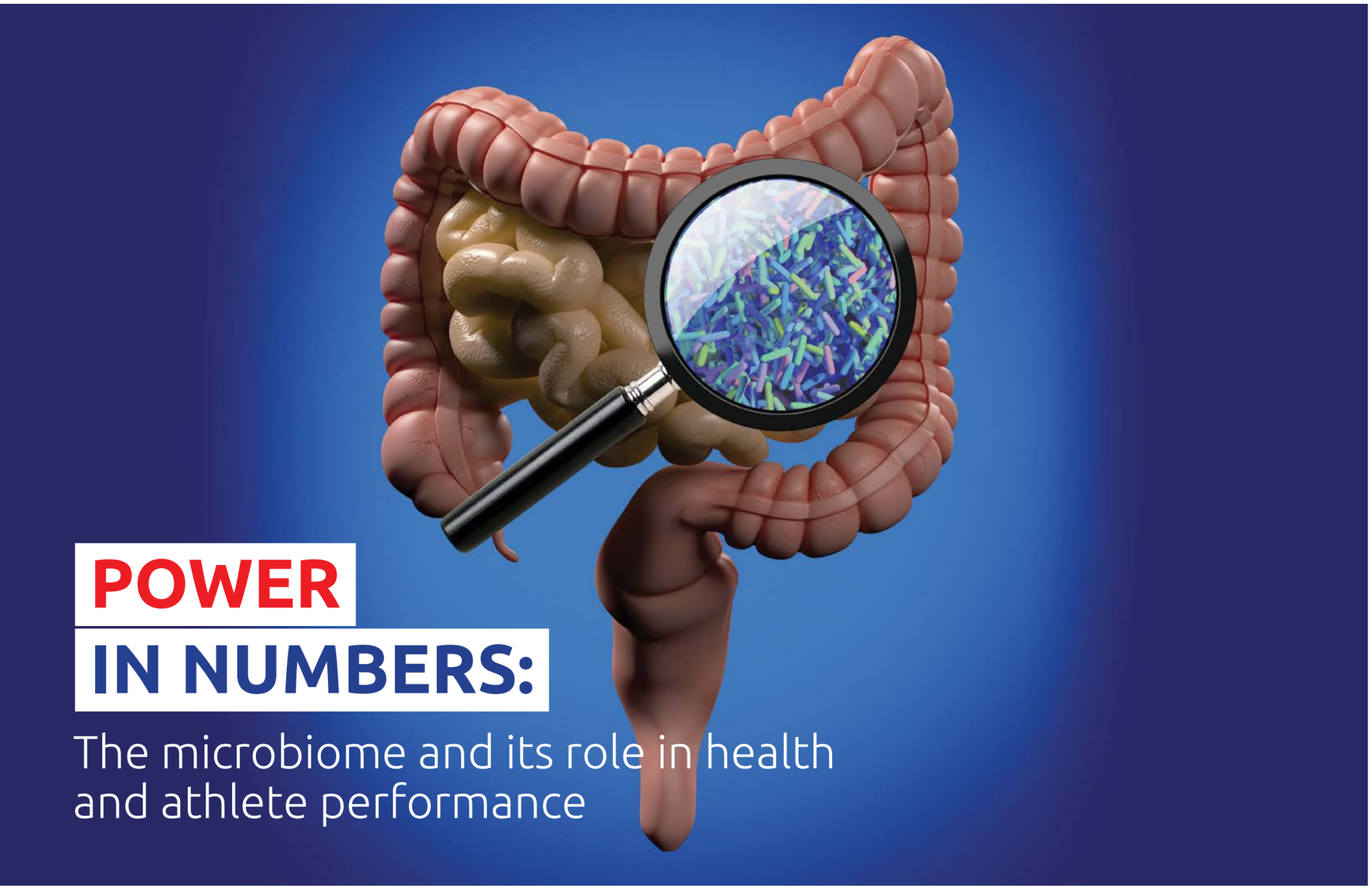

POWER IN NUMBERS:

The microbiome and its role in health and athlete performance

TEXT BY **DR SIMON SOSTARIC** | PHOTOGRAPHY BY **SHUTTERSTOCK.COM**

One hundred trillion is an insurmountable number in anyone's language. That's the approximate number of microbes living within the human body, mostly residing in the digestive tract and colon. Together, these microbes, mostly bacteria, but also archaea, fungi, protozoans and viruses (Rankin et al. 2017; Cerdá et al. 2016) - are collectively known as the human microbiome. Genetic sequencing technology is now so advanced that it is possible to map specific species of bacteria, their genetic material, how they colonise, respond to lifestyle choices, and affect your health and performance.

WHY SHOULD YOU TAKE NOTICE, AND BE AWARE OF YOUR GASTROINTESTINAL FRIENDS?

Microbes are the gatekeepers to your health, fitness and vitality, and should not be ignored. They are responsible for synthesising an array of vitamins that are essential for physiological function; digesting fibre; and amongst other things, interacting with immune function. Your genes, lifestyle choices and various medications are the primary determinants of your microbiome. Subsequently, if colonies of the most "important" microbes are diminished, or absent, and the colonies of "bad" microbes are over populated, health can be significantly impacted. For example, the microbiome is strongly related to mood, metabolism, weight gain, gastrointestinal disturbances, fatigue, depression and auto-immune conditions. Naturally, any one or combination of even minor disturbances linked to an altered microbiome can also derail athletic performance.

WHAT'S INVOLVED IN ANALYSING YOUR MICROBIOME?

Given that microbiome analysis is relatively new to the Australian healthcare system, finding an accredited healthcare professional to facilitate microbiome analysis can be tricky. Some of the genomic laboratories, such as smartDNA, provide a "locate practitioner" search option on their website. The accredited practitioner is typically a health professional with a background in lifestyle and intervention effects on genetics – including general practitioners, molecular scientists, dietitians, exercise physiologists and others. The practitioner will collate an extensive history from the recipient (health, physical activity, dietary patterns), and provide them with a faecal smear collection kit. The sample is sent to a genomic laboratory for analysis, which takes six to eight weeks. DNA sequencing targets variable regions within the bacterial genome. The healthcare professional then interprets microbiome results, and an action plan is devised in order to target requisite changes in microbial form and function.

HOW DIET AFFECTS THE MICROBIOME?

Nutrition is perhaps the most intriguing and misunderstood of the fundamental sciences that are essential for humans to thrive. We live in an age that is, at best, confusing to the average person when it comes to applying food and beverage "best practice". The truth of the matter is, there is no, 'one size that fits all' when it comes to ideal nutritional guidelines, as everyone responds differently to the consumption and metabolic handling of foods and beverages. Indeed, a landmark study by Professor David Zeevi and colleagues (2015) from the Weizmann Institute of Science in Israel, identified that even when people eat the exact same types of meals, there is a remarkably high level of variability in blood glucose responses (post-prandial glucose response, or PPGR). The primary concern for those individuals who exhibit poor glucose handling following meals is their inherent risk of developing metabolic diseases, including type 2 diabetes. The Israeli research group also made significant inroads into finding solutions to the complex nature of varied PPGR, which included personalising diets based on their microbiome, dietary and physical activity habits. This integrated approach proved to be instrumental in accurately predicting individual PPGR. Furthermore, microbial diversity is sensitive to dietary changes after only several days. Studies during the past decade (quoted in Zeevi, 2015) have provided strong links between the type of diet, microbial subpopulations and their subsequent link with common health conditions. For example, low levels of *Bifidobacterium adolescentis* are associated with greater weight loss when adhering to a diet that improves glucose handling, whereas the opposite is true for maintaining a diet that diminishes glucose handling. Low levels of *Bacteroidetes phylum* is characterised in those affected by obesity and high fasting glucose. However, switching to a diet that improves glucose handling will increase the diversity of these microbes. With regard to a more sinister chronic disease, such as type 2 diabetes, low levels of *Roseburia inulinivorans* is typically observed.

© Getty Images

> *"Microbes are the gatekeepers to your health, fitness and vitality, and should not be ignored."*
> — Dr Simon Sostaric

Generally speaking, your gut microbiome will thrive with a diverse diet that includes: high fibre foods (vegetables, fruits, legumes et al), fermented foods (natural yoghurt; kimchi; sauerkraut; et al), prebiotic foods (mostly fibre from complex carbohydrate, fruit and vegetables that cannot be digested by human cells) and, amongst other things, minimising sugars and artificial sweeteners. The benefit of analysing your unique microbiome allows for a higher level of precision in dietary intervention.

HOW THE MICROBIOME INTERACTS WITH PHYSICAL ACTIVITY AND ATHLETIC PERFORMANCE?

The interaction between gut microbiota and immune function, in particular, is central to an athlete's ability to train and recover with consistency and efficacy. For example, a dysfunctional microbiome has been linked with inflammatory induced changes in gut wall permeability, which may facilitate leakage of bacterial material, and subsequently promote immune and metabolic disturbances throughout the body (Rankin et al., 2017).

Altered microbiome is characterised following extended periods of physical or psychological stress. Endurance athletes, in particular, are often susceptible to overtraining syndrome. Therefore, investigating individual microbiome characteristics in endurance athletes who are in good health, and in those affected by a myriad of fatigue disorders, has the capacity to better understand the mechanisms of systemic fatigue and inflammation.

Bacteria DNA originating in the gut (and of the utmost functional value remaining in the gut) have also been found in the circulation and joints of individuals affected by inflammatory disorders. Therefore, the microbiome also appears to play an important regulatory role in tendon, bone and joint function.

While research investigating the microbiome in athletes versus non-athletes is in its infancy, a recent study by Clarke and colleagues (2014) observed a significantly more diverse microbiome in elite professional rugby players compared to controls. Furthermore, the rugby players demonstrated lower levels of inflammation and improved metabolic function compared to controls. The diverse health promoting benefits of exercise is very well established and continues to gain momentum. Recent research has certainly shed light on the likelihood that these health benefits also include exercise-induced modulation of gut microbiota.

CONSIDERATIONS & TAKE HOME MESSAGE FOR TRIATHLETES

The implications of altered gut microbes on body composition, energy availability, metabolic function, local and systemic inflammation and immune function are significant not only in maintaining good health, but also transferring to an athlete's ability to effectively respond and adapt to training stimuli, and minimise the risk of injury and illness. The sensitivity of the microbiome to changes in diet, exercise, stress, medication and the like, is perhaps the ultimate case in point for athletes to consider individualising their dietary and training composition and methods, in order to capitalise on the best opportunity to thrive. AT

References:

Rankin, A., et al. (*Br J Sports Med*, 2017). Microbes in sport – The potential role of the gut microbiota in athlete health and performance.

Cerdá, B., et al. (*Frontiers in Physiol*, 2016). Gut microbiota modification: Another piece in the puzzle of the benefits of physical exercise in health?

Zeevi, D., et al. (*Cell*, 2015). Personalized nutrition by prediction of glycemic responses.

Clarke, S.F., et al. (*Gut*, 2014). Exercise and associated dietary extremes impact on gut microbial diversity.

DR SIMON SOSTARIC
PhD.,BAppSc.,AEP.,AES
Exercise Physiologist / Sport Scientist

Dr Simon Sostaric is a distinguished exercise physiologist, sports scientist, researcher and author. Simon holds a physiology doctorate (Victoria University, Melbourne, Australia), in electrolyte regulation and skeletal muscle fatigue.
He is the founder and director of Melbourne Sports & Allied Health Clinic (www.msahc.com.au), with 25 years' experience in professional sport, clinical practice and academia.
For more information,
Twitter: @DrSimonSostaric
Facebook: @melbournesports andalliedhealthclinic

INTERACTIVE HOMETRAINER
WITH INTEGRATED POWER METER
±2,5% ACCURACY
SIMULATES 14% SLOPE
IDEAL FOR USE WITH A WIDE RANGE
OF SOFTWARE PLATFORMS
TO TRAIN AS YOU WISH

TRAIN TO PERFECTION WITH THE ULTIMATE POWER TOOL

ELITE
DESIGN & PERFORMANCE

DIRETO
INTERACTIVE
POWER
METER
TRAINER

Distributed By: Cassons Pty Ltd - AUSTRALIA
P: +61(0)2 8882 1900 F: +61(0)2 8882 1999
E: enquiries@cassons.com.au - W: www.cassons.com.au
Like us on Facebook
Cassons Australia Bicycle
Follow us on Instagram
@cassonsaustraliabicycle
elite-it.com