Gut Health and Exercise

Information brought to you by Symprove

Gut Health and Exercise

There is now significant focus on identifying ways to modify the gut microbiome for optimisation of health and in the prevention and management of disease. While there are many factors known to impact the gut microbiome, the influence of exercise and its implications in health is a relatively new area of research. This article aims to summarise the latest evidence to date.

Despite the well-known beneficial effects of moderately-intense exercise on human health, periods of prolonged, strenuous exercise stress are known to exacerbate gastrointestinal integrity and function, most recently termed 'exercise-induced gastrointestinal syndrome' (Costa et al 2017).

This syndrome relates to responses driven by:

1) A re-distribution of blood flow and reductions in total splanchnic perfusion

2) An increase in sympathetic activation and reductions in gastrointestinal functional capacity (e.g. alterations in motility and transit)

These exercise-induced responses are associated with intestinal injury, increases in permeability, promotion of endotoxemia and changes in motility and absorption capacity. Collectively, this can lead to the manifestation of gastrointestinal symptoms. Notably, research to date shows that athletes partaking in endurance-based sports (e.g. ultra-marathons, triathlons) commonly report a high prevalence of gut-related symptoms (e.g. cramping, diarrhoea).

The good news is that there are several prevention strategies that are recommended to help attenuate or prevent manifestation of gastrointestinal symptoms during exercise. These include maintaining euhydration, consideration of dietary supplementation (e.g. probiotics), avoidance of NSAIDs, consumption of adequate carbohydrate and partaking in a gut-training protocol.

Where does the gut microbiome come in

To date, several animal studies have shown that exercise training can independently modify microbial composition and functionality. For example, increases in butyrate-producing bacteria and increases in the phyla ratio of Firmicutes to Bacteroidetes.

In humans, modification of the gut microbiota with exercise training has only been observed in recent years. For example, a study by Clarke et al (2014) reported higher bacterial diversity (α diversity) in rugby players training on a regular basis compared to controls, while a more recent study by Bressa et al (2017) observed a higher abundance of butyrate-producing bacteria (Faecalibacterium prausnit ii, Roseburia hominis, and Akkermansia muciniphila) in active women (at least 3 hours of exercise per week) compared to sedentary controls. However, due to their cross-sectional nature, it wasn't possible to control for confounders such as dietary intake. The first longitudinal study by Allen et al (2018) explored the impact of 6 weeks of endurance exercise (30-60 minutes, 3 x week) on gut microbial composition and functionality in sedentary lean and obese adults, without changes to dietary patterns.

Interestingly, results showed that while exercise training improved body composition and VO2max in both groups, baseline gut microbiomes were different between the two groups, resulting in different responses to exercise training. For example, compositional changes in SCFA-producing bacteria (Faecalibacterium spp Lachnospira spp) and expression of the butyrate-regulating gene (BCoAT) were more pronounced in lean vs obese participants. Exercise-induced changes to the gut microbiome were also largely reversed upon cessation of exercise training, suggesting that, like other factors (e.g. dietary changes, probiotic use, limiting alcohol, minimising stress), changes are transient and require continued adherence in order for the observed positive effects to be maintained. A further study by Munukka et al (2018) investigated microbial responses to 6 weeks of light-moderate cycling in sedentary overweight women. Results showed an increased relative abundance of Akkermansia muciniphila and a decrease in Proteobacteria. Notably, only around half of the subjects' microbiomes responded considerably to exercise suggesting some participants had 'exercise responsive' microbes and others had 'non-responsive' microbes. It is well known that an individual's gut microbiome is highly personalised and there is significant inter-individual variation. Thus, responses to an exercise intervention will differ from person to person. This has also been previously observed in dietary interventions (Healey et al 2016).

Collectively, studies to date suggest that exercise training alone can modify the gut microbiome, paving the way for potential therapeutic use in the management of health and disease in the future. It is plausible that by altering the gut microbial composition to a more favourable profile; for example, a higher abundance of SCFA-producing communities (e.g. Bifidobacterium, Lactobacillus) which are known to enhance stability and function of the intestinal epithelium and tight-junction integrity may potentially offer some level of protection against exercise-induced disturbances to gut integrity and function, as well as gut-related symptoms after exercise training, though further investigation is required.

Take Homes

- Undertaking regular physical activity in line with international recommendations (150 mins/week of moderate intensity exercise or 75 minutes/week of vigorous aerobic activity) is considered beneficial for host and gut health

- Build up gradually and choose something you enjoy - walking, exercise classes, self-defence class, dancing, swimming. It doesn't have to be the gym!

- Keep in mind the other factors known to influence our gut health. For example, opting for a plant-based diet with focus on diversity and variety

References

Costa et al 2017 https://www.ncbi.nlm.nih.gov/pubmed/28589631

Bressa et al 2017 https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0171352&type=printable

Allen et al 2018 https://www.drperlmutter.com/wp-content/uploads/2017/12/exercise-microbiome-humans.pdf

Clarke SF, Murphy EF, O'Sullivan O, et al. Exercise and associated dietary extremes impact on gut microbial diversity. Gut 2014; 63(12):1913-1920.

Munukka et al 2018 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6178902/pdf/fmicb-09-02323.pdf

Healey et al (2016) https://bmjopen.bmj.com/content/bmjopen/6/9/e012504.full.pdf