MICROBA

As we face a global metabolic disease epidemic, the investigation of more detailed and personalised interventions is becoming increasingly important. Extensive research has revealed a strong understanding of the role of the microbiome in metabolic diseases, such as:

- **Cardiovascular disease**
- **Type 2 diabetes**
- **Non-alcoholic fatty liver disease (NAFLD)**
- **Obesity.**

The webinar, Managing Metabolic Health through the Gut Microbiome reviewed scientific literature with a focus on evidence-based strategies to modify clinical interventions centred around the following microbial risk factors for metabolic disease:

- **Trimethylamine (TMA)**
- **Branched Chain Amino Acids (BCAA)**
- **Hexa lipopolysaccharides (Hexa LPS).**

Summarised below are key evidence-based interventions for each microbial risk factor.

Red meat intake drives microbial trimethylamine production

Test	The *Insight™* test identifies individuals whose microbiomes have a **high potential to produce trimethylamine (TMA)** which the liver then converts into trimethylamine oxide (TMAO).
Evidence	Meta-analyses have shown that high blood levels of TMAO are associated with significant increased risk of metabolic disease, including: ▪ 47% increased risk of all cause mortality (Farhangi, 2020), ▪ 62% increased risk of cardiovascular events (Heianza *et al*, 2017), ▪ 89% increased risk of diabetes (Zhuang *et al*, 2019), and ▪ 12% increased risk of hypertension (Ge *et al*, 2020). Dietary carnitine drives microbial TMA production but response is highly individual (Wang *et al*, 2019). Red meat is the richest dietary source of carnitine (Knuttel-Gustavsen and Harmeyer 2007). Cruciferous vegetables contain indoles known as I3C and DIM which have been shown to inhibit the conversion of TMA to TMAO (Cashman *et al*, 1999).
Intervention	Personalised interventions to target a high microbial potential to produce TMA include limiting red meat consumption and increasing intake of cruciferous vegetables.

High microbial BCAA production is predictive of insulin resistance

Test	The *Insight™* test identifies individuals whose microbiomes have a **high potential to produce branched chain amino acids (BCAAs)**.
Evidence	Increased microbial production of BCAAs have been associated with the development of insulin resistance and type 2 Diabetes Mellitus (Wu *et al*, 2020; Pederson *et al,* 2016). If the blood levels of BCAAs exceed the capacity of the muscle to utilise them it results in the accumulation of toxic compounds which ultimately leads to insulin resistance (Shou *et al,* 2019). Physical activity increases the muscles capacity to utilise BCAAs and reduces the risk of insulin resistance (Shou *et al,* 2019). Low fibre western style diets are associated with increased plasma BCAAs levels (Merz *et al*, 2018; Dhakan *et al,* 2019; DeFillipis *et al*, 2019).
Intervention	Personalised interventions to target high microbial potential to produce BCAA include increasing fibre intake to prevent microbial BCAA production and increasing physical activity to increase muscle capacity to utilise BCAAs.

High hexa LPS indicates a pro-inflammatory microbiome

Test	The *Insight™* test identifies individuals whose microbiomes have a **high potential to produce hexa lipopolysaccharides (Hexa LPS).**
Evidence	Hexa LPS are pro-inflammatory compounds produced by some species of bacteria within the Proteobacteria phylum (Di Lorenzo *et al,* 2019). Blood LPS levels have been shown to be elevated in obesity, type 2 diabetes and non-alcoholic fatty liver disease and Alzheimer's disease (Cani *et al,* 2008). Saturated fat increases postprandial blood LPS levels while omega 3 fatty acids decrease postprandial blood LPS levels (Lyte *et al,* 2016). Increasing fibre intake protects the gut barrier which prevents LPS crossing the gut barrier and reduces inflammation. (Kopf *et al,* 2018).
Intervention	Personalised interventions to target high microbial potential to produce hexa LPS include limiting saturated fat intake and maximising omega 3 fatty acid and fibre intake.

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