

# The Volatile Metabolites of the Microbiome

BREATH BIOPSY®

Using Breath to Understand Microbiome Function in Human Health

The microbiome is responsible for a plethora of biological functions important to human health. Volatile metabolites are produced by the microbiome and are quantifiable using Breath Biopsy®. Measuring these metabolites in exhaled breath is a non-invasive method for investigating and monitoring dysbiosis in real-time and is compatible with high-frequency serial sampling to understand dynamic longitudinal changes in the microbiome.



## WEBINAR - Non-invasive Functional Assessment of the Microbiome from Exhaled Breath:

Watch now to explore non-invasive volatile metabolites originating from the microbiome and how these can be measured using Breath Biopsy.



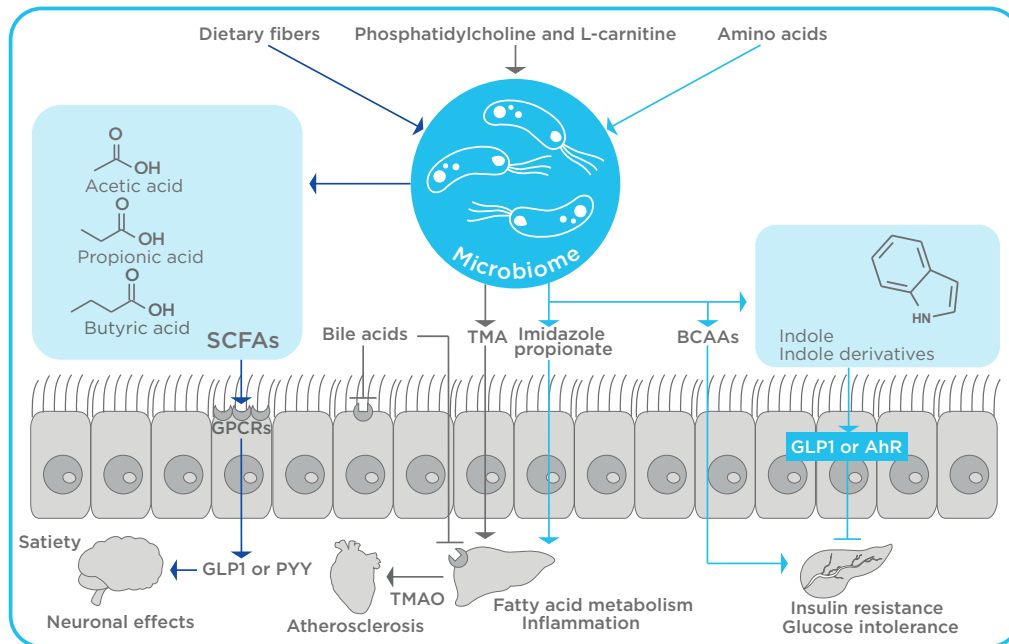
The microbiome is known to produce volatile primary metabolites e.g. SCFAs



Breath testing measures metabolic changes in real time



Metabolites are concentrated from large volumes of breath providing higher sensitivity



Potential to enable home-based sample collection



Breath testing is fully non-invasive and patient-friendly



Could be used to determine approximate location of microbes in the gut

## Examples of Volatile Metabolites Relevant to the Microbiome

- Short-chain fatty acids (SCFAs) are produced from the anaerobic fermentation of indigestible polysaccharides. SCFAs have roles in multiple signaling contexts, including in the central nervous system and the gut, as well as in immunity and inflammation.
- Branched-chain fatty acids (BCFAs) are products of branched-chain amino acid metabolism associated with *Bacteroides* and *Clostridium* bacteria.
- Aromatic amino acid metabolism products such as indoles, phenols, and cresols are associated with different species. Indole performs roles in regulation, for example of biofilms.
- Trimethylamine (TMA) and triethylamine are produced by the fermentation of dietary nutrients such as choline, betaine and carnitine. TMA is associated with multiple diseases including atherosclerosis, CKD, NASH, obesity, type 2 diabetes and colorectal cancer.
- Alcohols such as propanol and propan-2-ol are associated with the general fermentation of sugars.
- Aldehydes, alkanes and ketones may be produced via the metabolic conversion of alcohols by the microbiome, but are also associated with lipid peroxidation. Lipid peroxidation is caused by oxidative stress, which is linked to inflammation and host response.

# Hydrogen and Methane Breath Testing for SIBO and Carbohydrate Malabsorption

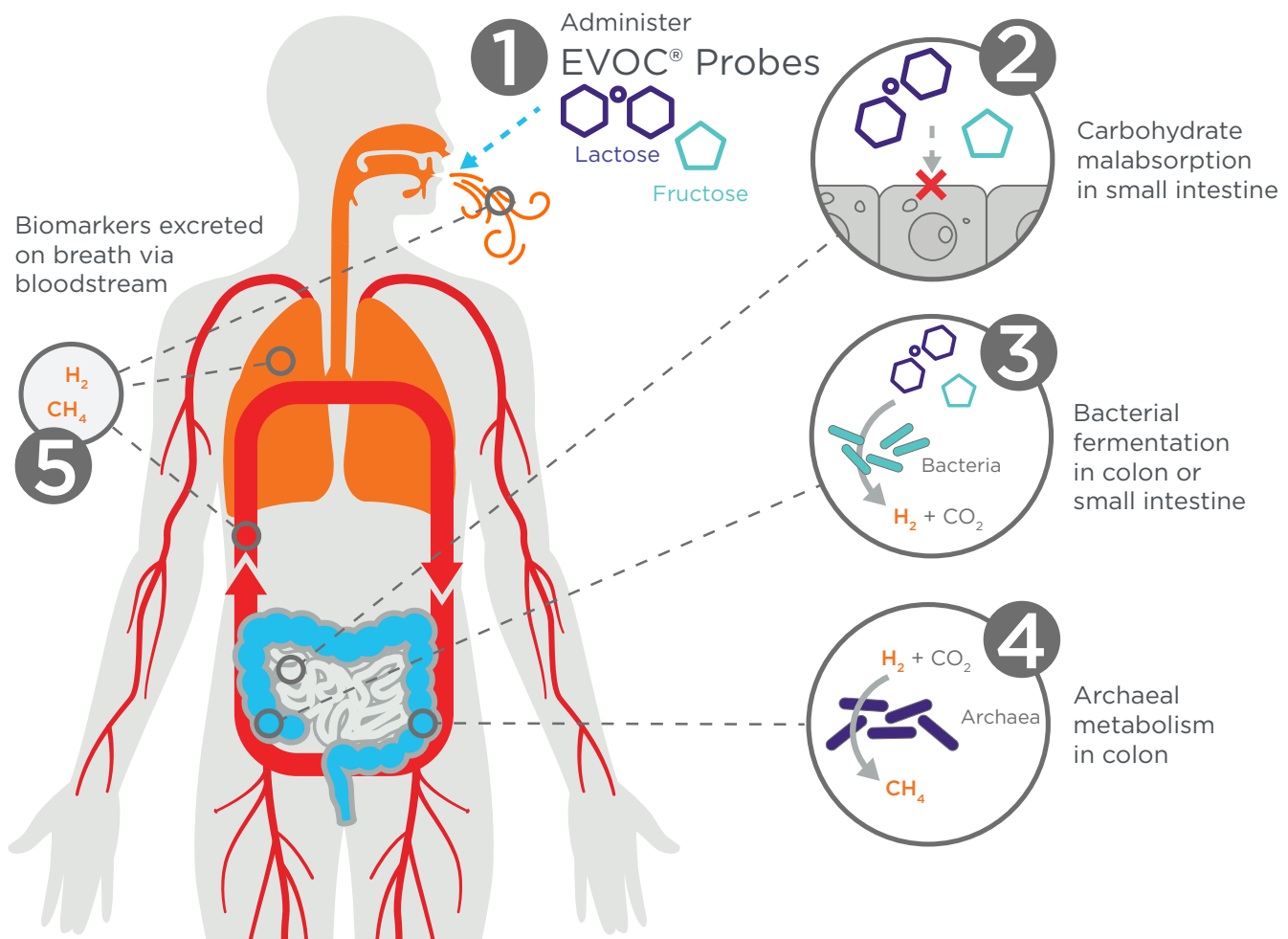
While volatile metabolite profiling can be informative in a preclinical or clinical research setting, the ultimate goal for much of this research is the translation of volatile markers into clinical tests for disease or debilitating conditions.

The Hydrogen and Methane Breath Test (or HMBT) is widely used in clinical investigations to help inform on the cause of digestive problems which are a common source of persistent discomfort for millions of people.

HMBT is based on the observation that hydrogen and methane gases expelled in human breath are derived from intestinal bacteria, as products of the fermentation of undigested substrates.

The pattern of these excreted compounds can give an indication of the underlying cause of persistent GI issues, such as small intestinal bacterial overgrowth, intestinal methanogen overgrowth, or other forms of dysbiosis. This, in turn, can help direct appropriate treatments and increase the effectiveness of those treatments.

In the UK, HMBT test kits are offered by Owlstone Medical. Using HMBT is simple – the subject ingests a carbohydrate substrate specific to the test of interest and then provides a breath sample at specific times after ingestion by blowing through the straw provided into the collection tube. Once finished, the test is posted back to Owlstone Medical for analysis, where a trained clinical scientist will compile the test results into a report that is sent to the patient and their doctor.



Contact us to find out more about collaborating with Owlstone Medical and to discuss incorporating Breath Biopsy in your microbiome research.

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