

NMR-BASED METABOLOMICS CHALLENGES IN GUT MICROBIOTA ANALYSIS

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Background:

The metabolic activity of gut microbiota (GM) influences the human health. Metabolomics represents a powerful tool to evaluate the effects of lifestyle, environment, nutrition, therapies on gut microbiota, generating insights in the interactions between the gut microbiota and host metabolism.

Methods and Results:

NMR spectroscopy is one of the more effective omic technique, providing a comprehensive analysis of metabolite composition of biological samples. The multivariate statistical analysis applied on NMR data can detect possible sample differentiations/homologies elicited by specific metabolites, suggesting markers of diseases/treatments/status. The literature reports NMR-metabolomic studies, *in vivo* and/or *in vitro*, on gut microbiota. Human faeces were mainly analysed monitoring gastrointestinal diseases observing differentiation in the GM metabolome between healthy people and CRC or IBD or IBS patients; in other studies, the influence of drug administration, diet, and functional foods (including prebiotics and probiotics) on microbiota metabolome was investigated.

Conclusions and Significance:

NMR metabolomics allows the analysis of metabolic patterns of GM, and microbiota-host interactions. The integration with metagenomics, metatranscriptomics, and metaproteomics, will lead to a deeper understanding of complex biosynthetic pathways of GM. The findings could help in non-invasive prevention and diagnosis, personalized medicine, and improve the efficacy of food supplements.

Keywords:

NMR, Metabolomics, Chemometrics, Prebiotics, Postbiotics

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Thematic Area:

- ~~○ Frontiers in Microbiome Research~~
- Microbiome: from Research to Clinics

Infrastructures:

SCITEC-CNR is equipped with three high field NMR spectrometers, specifically: Bruker Avance II 500 MHz, Bruker 600 DRX, and Bruker Avance Neo 600 spectrometer, this last equipped with 5 mm reverse Z gradient cryoprobe PRODIGY and thermostated autosampler. Dedicated software for NMR data analysis completed the instrumental facility, including SIMCA-P 13.03 (Sartorius Data Analytics, Umeå Sweden) software package for multivariate statistical analysis.