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## Metabolomics approaches for unravelling host-gut microbiota changes in different stages of cognitive impairment

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## Stellingen (Propositions)

Behorende bij het proefschrift

### **Metabolomics Approaches for Unravelling Host-Gut Microbiota Changes in Different Stages of Cognitive Impairment**

1. The gut microbiota plays a crucial role in maintaining human health. [this thesis]
2. Metabolomics offers a powerful approach into unraveling how mechanistic biochemistry influences cellular and systemic phenotypes. [this thesis]
3. Standardized protocols for fecal sample handling are crucial, as inconsistent methods can hinder interpretation, underscoring the need for a unified approach to preparation and analysis. [this thesis]
4. Gut microbiota's ability to produce diverse compounds highlights the need for analytical techniques that can cover both polar and nonpolar metabolites. Comprehensive methods are crucial to fully explore the complex interactions between the host and gut microbiota. [this thesis]
5. Rapid modernization is causing progressive loss of diversity of the microbiota, and this may contribute to various diseases prevalent in industrialized societies. [Sonnenburg and Sonnenburg; Nat Rev Microbiol 17, 383–390 (2019)]. This could be addressed using systems biology approaches, including exposomics which aids in linking environmental factors to gut microbiota-host interactions.
6. Zhang et al. [Nutrients 2022, 14(1), 20] proposed targeted probiotics as a novel strategy for treating Alzheimer's disease by restoring intestinal ecology and microbiota balance. While links between gut microbiota and metabolic changes in AD are recognized, the use of probiotics in later stages is controversial due to systemic damage, and the need to overcome colonization resistance in unfavourable gut conditions.
7. Advanced data analysis and machine learning in gut microbiota research will uncover patterns that reveal how microbial compositions affect metabolism, immunity, and disease risk. [Medina et al, ISME Communications 2730-6151 (2022)]. While these studies offer valuable insights, more mechanistic research, such as organ-on-chip models, is necessary to establish causality for effective treatment and prevention strategies.
8. Personalized diet through gut microbiota holds the promise of allowing us to rationally harness nutrition in preventing and treating human disease [Nat Rev Microbiol 17, 742–753 (2019)]. “Personalized” may suggest that interventions are uniquely designed for each person when many recommendations may still be generalized based on broader population studies. This could lead to

the misconception that a single intervention will work effectively for everyone. “Precision” acknowledges the use of scientific data to fine-tune interventions, highlighting that recommendations are derived from specific biological insights rather than purely individual preferences.

9. The greatest discoveries often lie not in finding new things, but in seeing familiar things in new ways. [Alexander Fleming]
10. We cannot solve problems with the same thinking we used to create them. [Albert Einstein]

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