Growing *Akkermansia muciniphila* for therapeutic applications

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The mucus degrading gut microbe *Akkermansia muciniphila* is commonly associated with a healthy gut. Its relative abundance was found to be negatively correlated with metabolic disorders, obesity and chronic gut inflammations in humans. Preclinical trials in mice have proven its efficacy in reducing body weight increase on a high fat diet and this has been repeated in multiple studies. To exploit the full potential of *A. muciniphila* and demonstrate its causal effect, human trials need to be designed. A major bottleneck is the fact that so far *A. muciniphila* only has been grown on medium containing undefined animal components, such as mucin. Hence, it could not be tested in humans. For this purpose, the organism needs to be grown in an animal component-free culture medium, meaning replacing the mucin currently used in the medium for *A. muciniphila.*

To support the design of a minimal medium we used predictions based on the genome-scale metabolic model (GEM). This revealed that *A. muciniphila* may not have complete amino acid synthesis pathways and suggested a gap in the peptidoglycan synthesis pathway. By using an experimental approach using anaerobic growth conditions and compounds of non-animal origin, we were able to design a new synthetic medium that supported efficient growth of *A. muciniphila* to high biomass levels. To confirm the functionality of *A. muciniphila* grown in the newly developed medium, the bacterium was tested in a preclinical trial in mice. The results will be discussed and a further outlook of the use of *A. muciniphila* as a new therapeutic will be provided.