

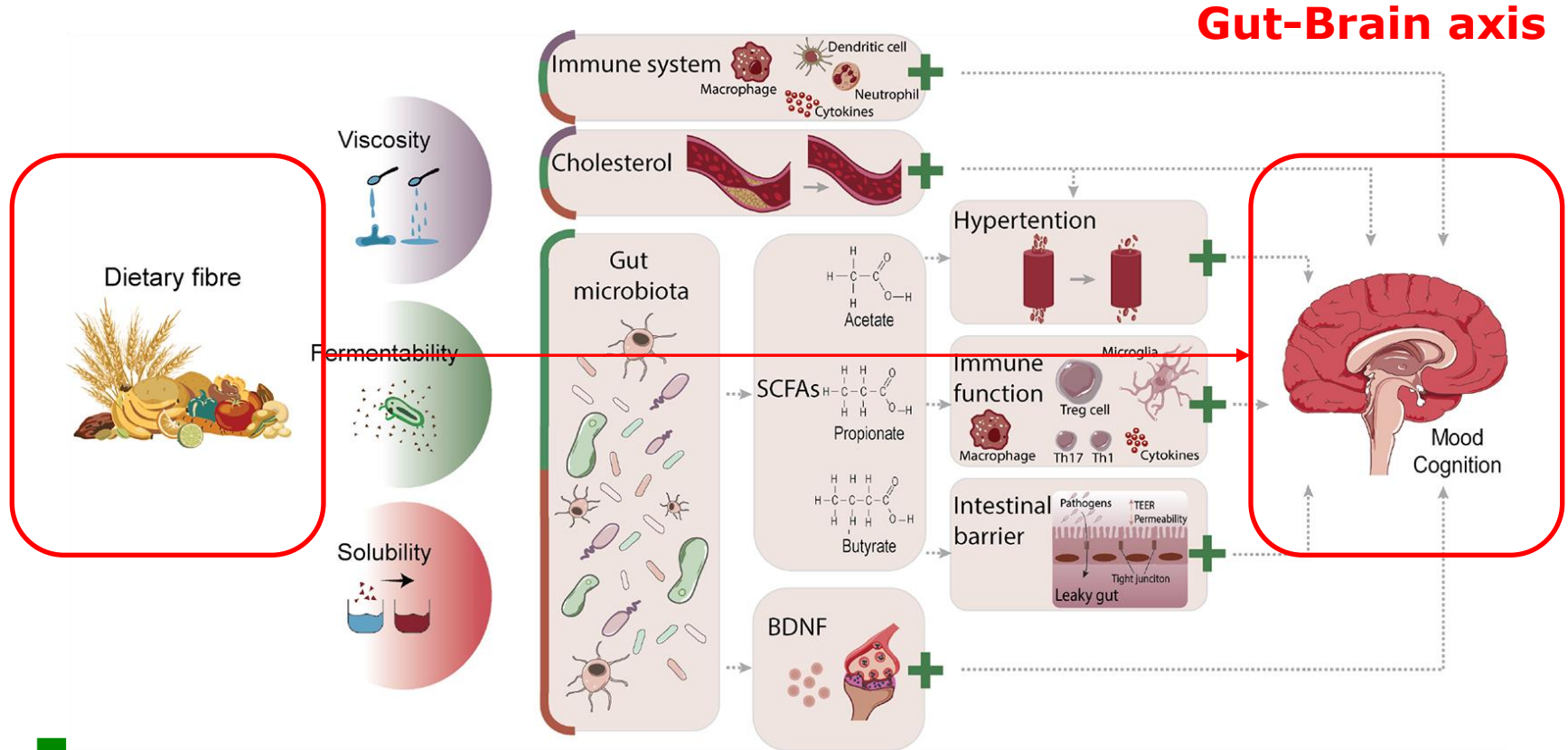
# Gut Feelings: The Impact of Pre-, Pro-, and Postbiotics on Gut- and Mental Health

Vitafoods Europe, 20 May 2025

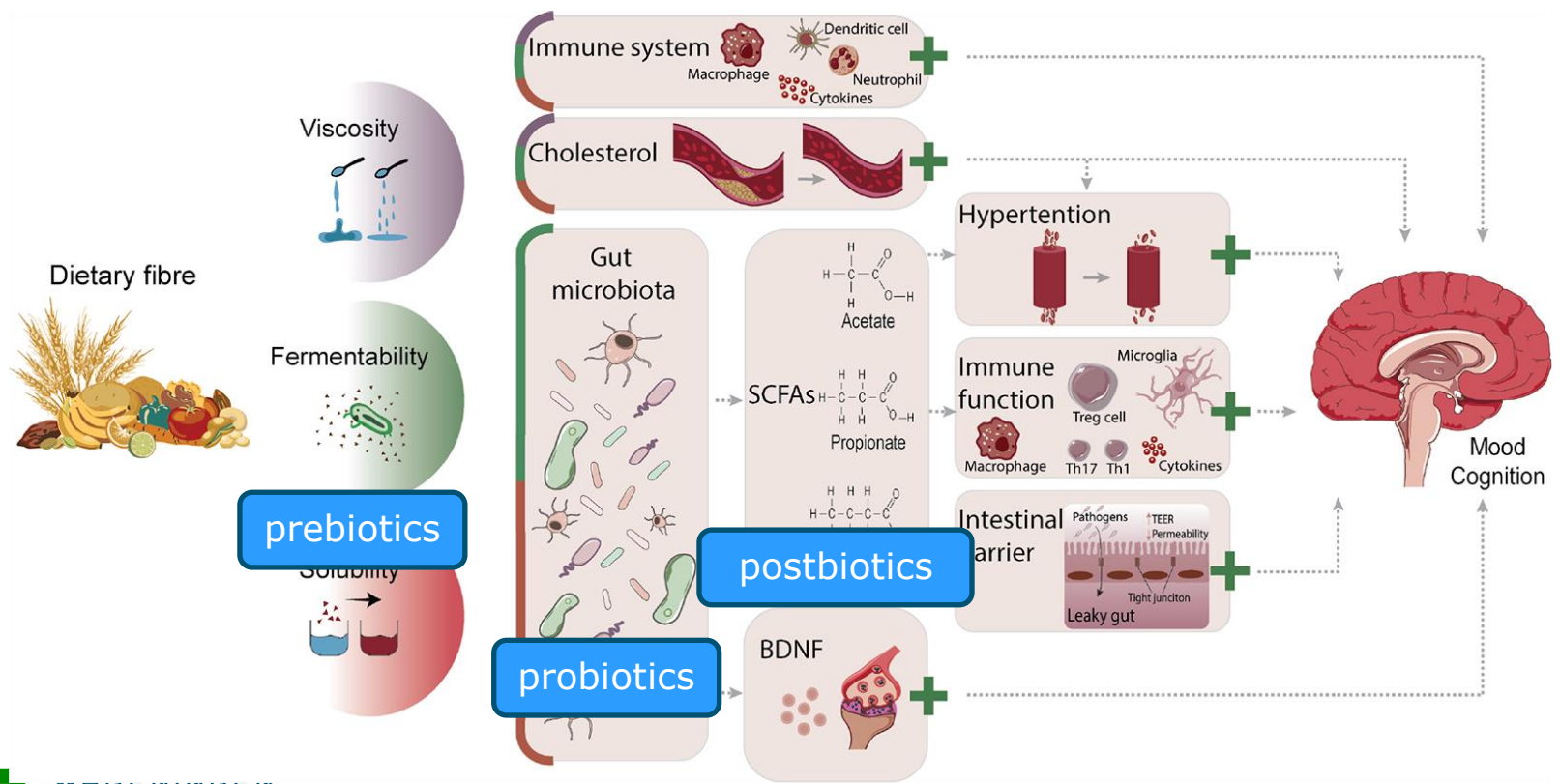
*Nicole de Wit - Wageningen Food & Biobased Research, Wageningen University & Research (WUR), NL*



# Food to modulate the gut-brain axis



# Pre-, pro-, postbiotics to modulate the gut-brain axis



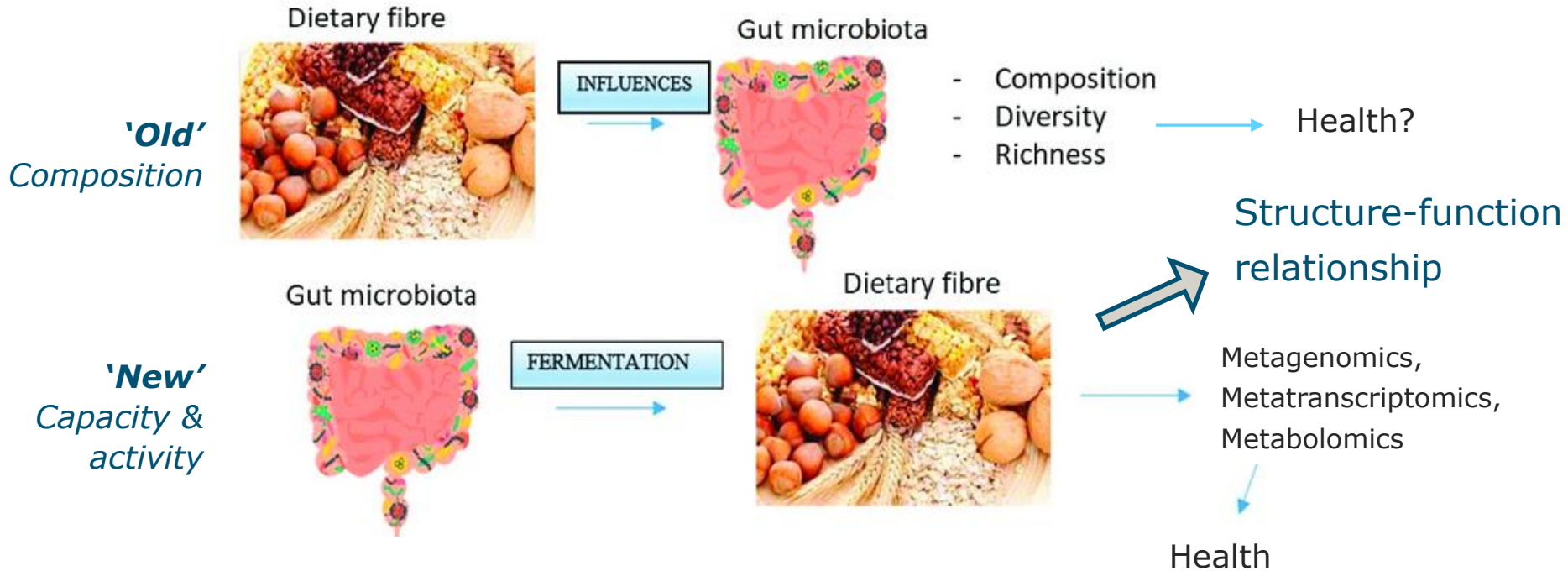
# Prebiotics

*ISSAP:*

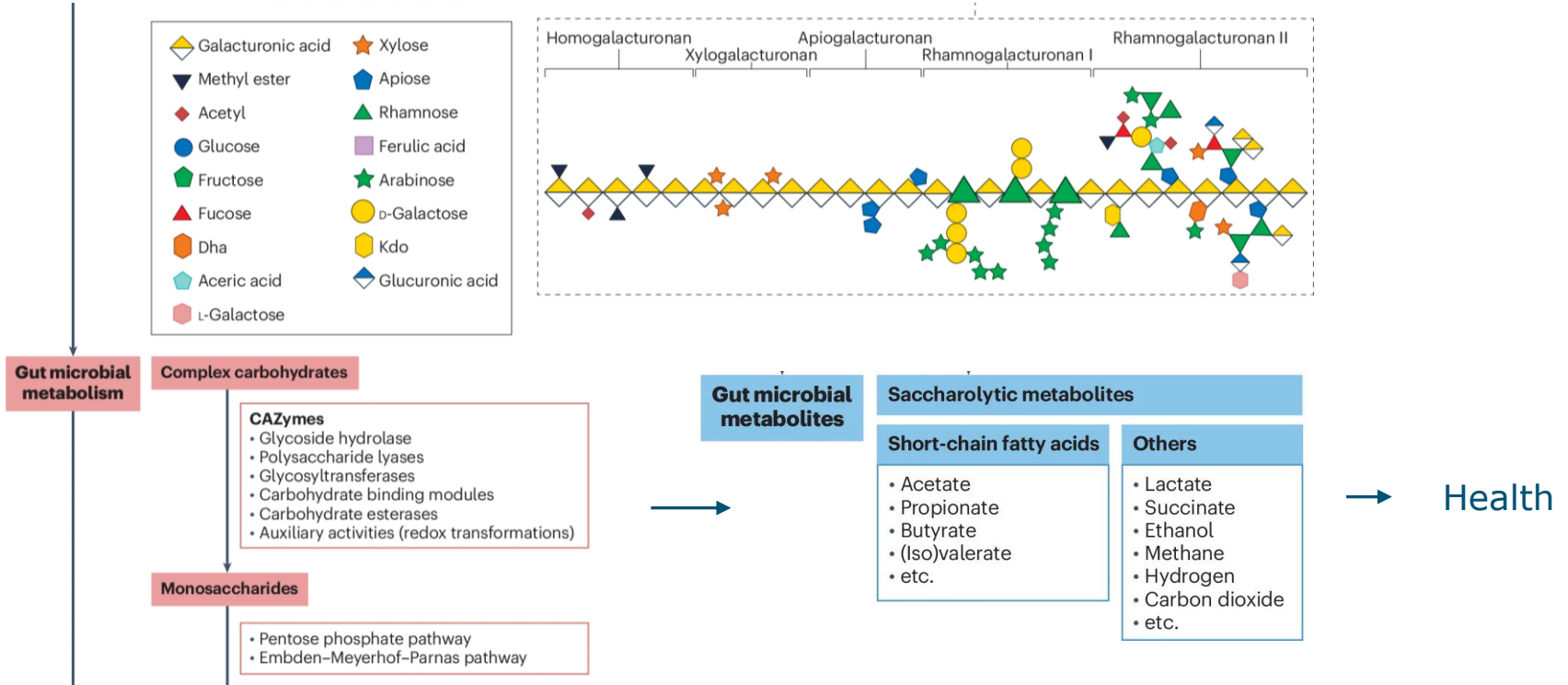
a substrate that is selectively utilized by host microorganisms conferring a health benefit



# Prebiotics & modulation of the gut microbiome



# Structure-function; DF degradation - CAzyme profiles



# Dietary fibre / prebiotics & CAzyme profiling @WFBR

## FiberME project

- *In silico* (metagenomics) + *in vitro* studies → identify link type DF – specific CAzyme profiles
- Predict the optimal type of dietary fibre for a specific (personal) CAzyme profile (via AI modeling & ML) → personalized dietary advice



CAzyme  
passport



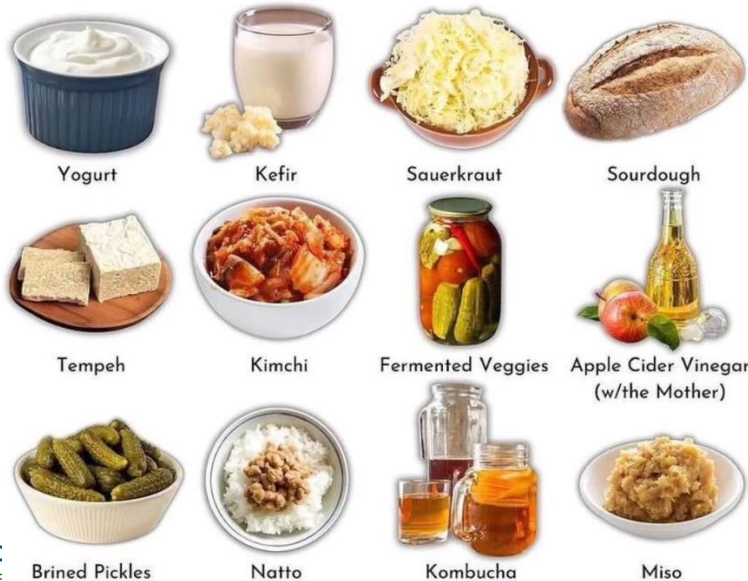
metabolites



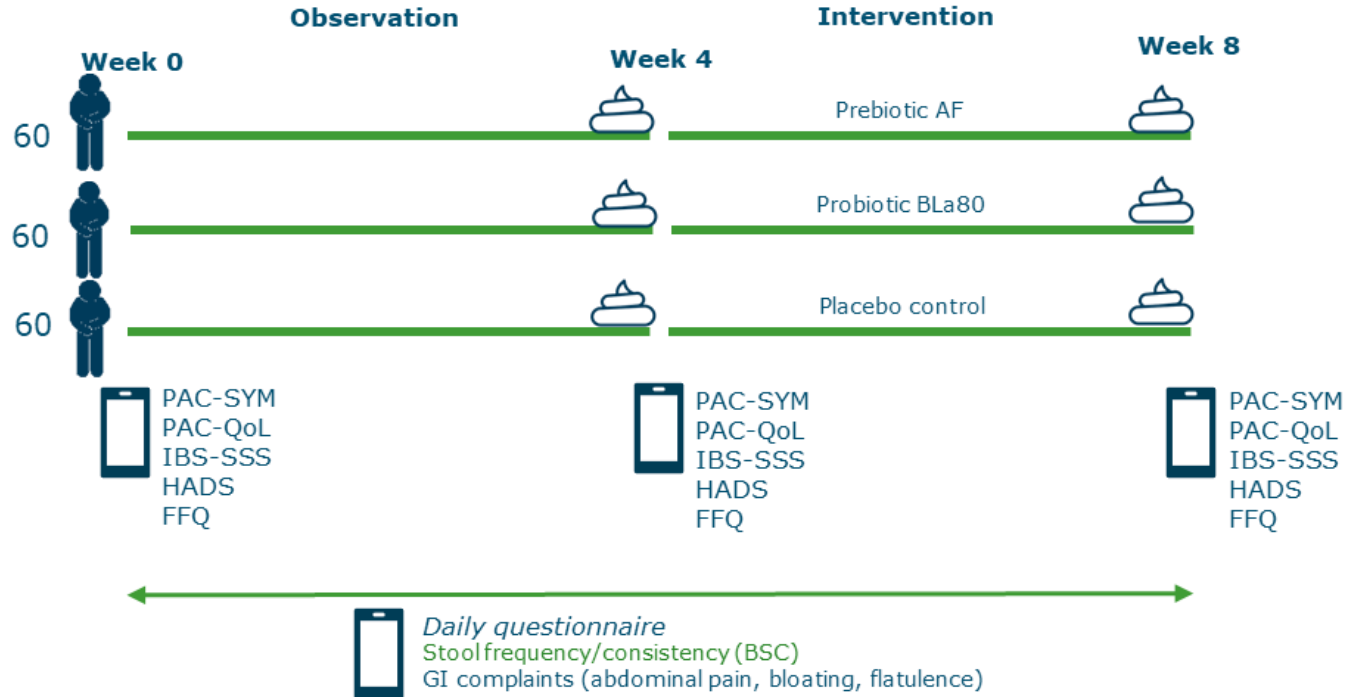
# Probiotics

ISSAP:

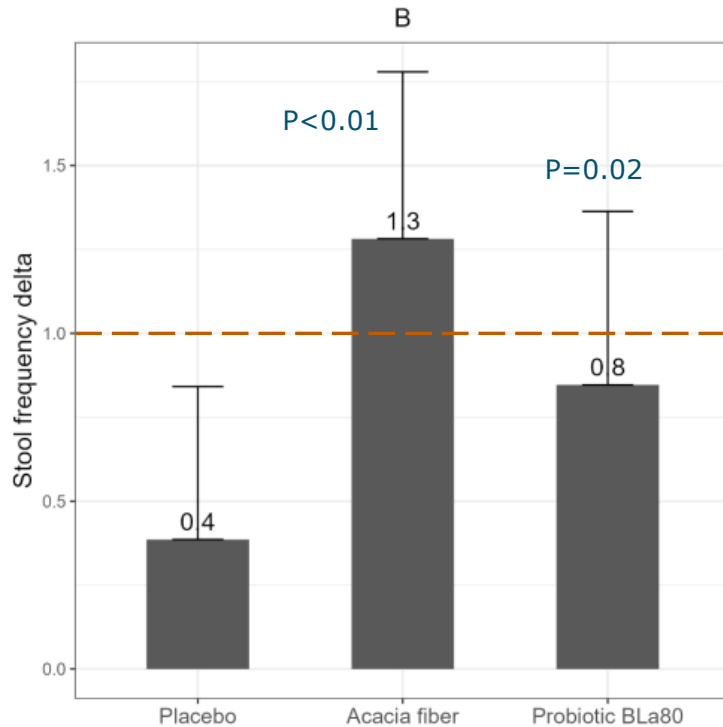
Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host



# Pre- and probiotics intervention in IBS-C patients



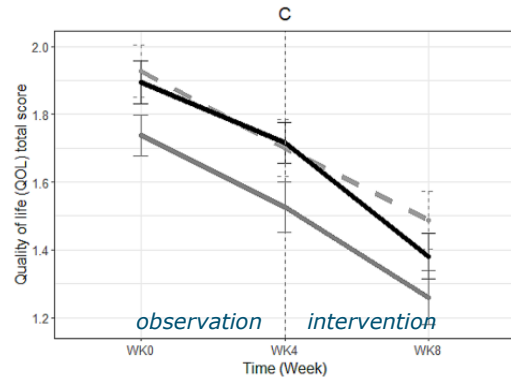
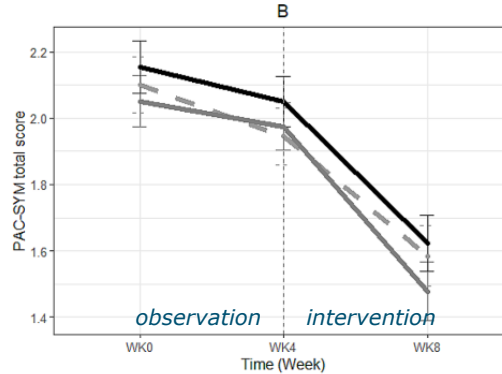
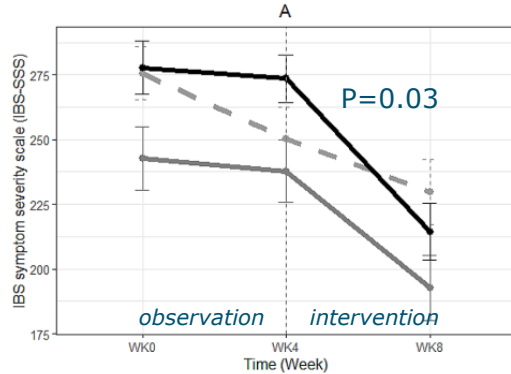
# Pre- and probiotics increase stool frequency in IBS-C



*Delta (= mean intervention - mean observation per week)*

Prebiotic intervention also has a **clinically significant** effect (= delta > 1; FDA guidelines)

# Probiotics reduces IBS-SSS in IBS-C



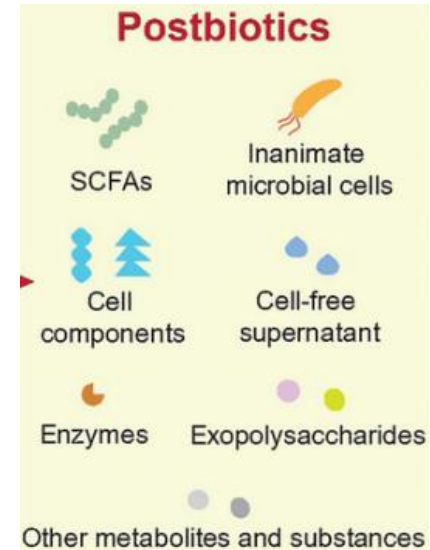
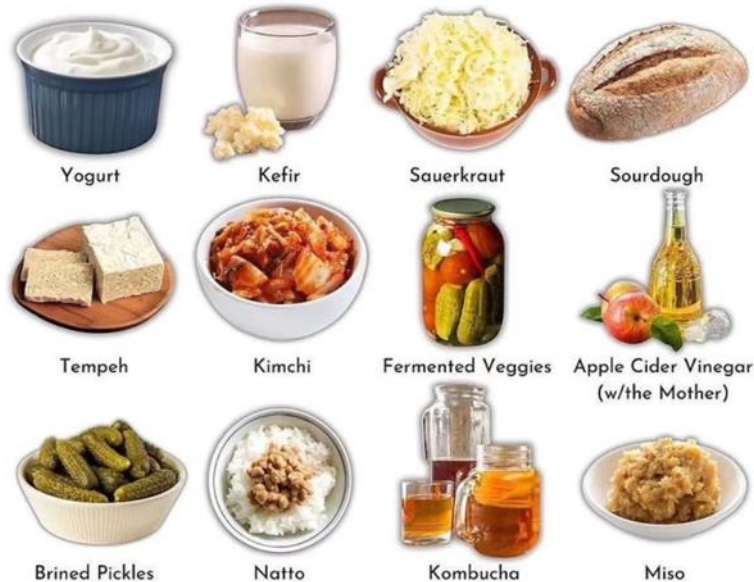
—◆— Placebo —◆— Acacia fiber —◆— Probiotic Bla

*Substantial placebo effect → hampers significance in treatment effects*

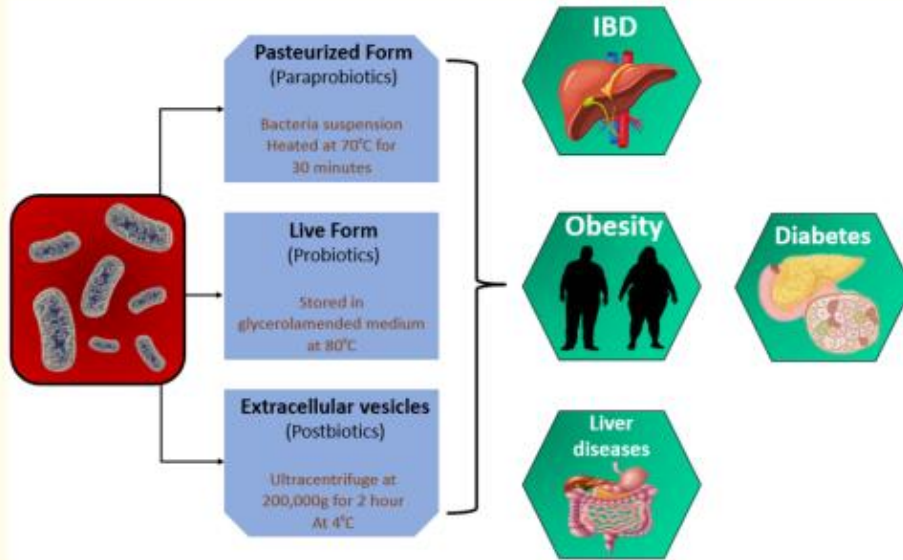
# Postbiotics

*ISSAP:*

a preparation of inanimate microorganisms and/or their components that confers a health benefit on the host



# Probiotics → postbiotics *Akkermansia muciniphila*



**Figure 2:** *A. muciniphila*'s function as a probiotic of the future for a range of metabolic disorders. It has been established that *B. muciniphila* is essential for the control of the immunological and metabolic systems since its identification in 2004. It is currently recognized as a "next-generation probiotic" for the treatment of metabolic disorders such as diabetes, liver disease, obesity, and cancer. Furthermore, the extracellular vesicles pasteurized postbiotics are currently being employed for the same disorders and have shown to be effective in treating them.

# Dietary fiber & fermented food intervention + pre- and postbiotic supplements

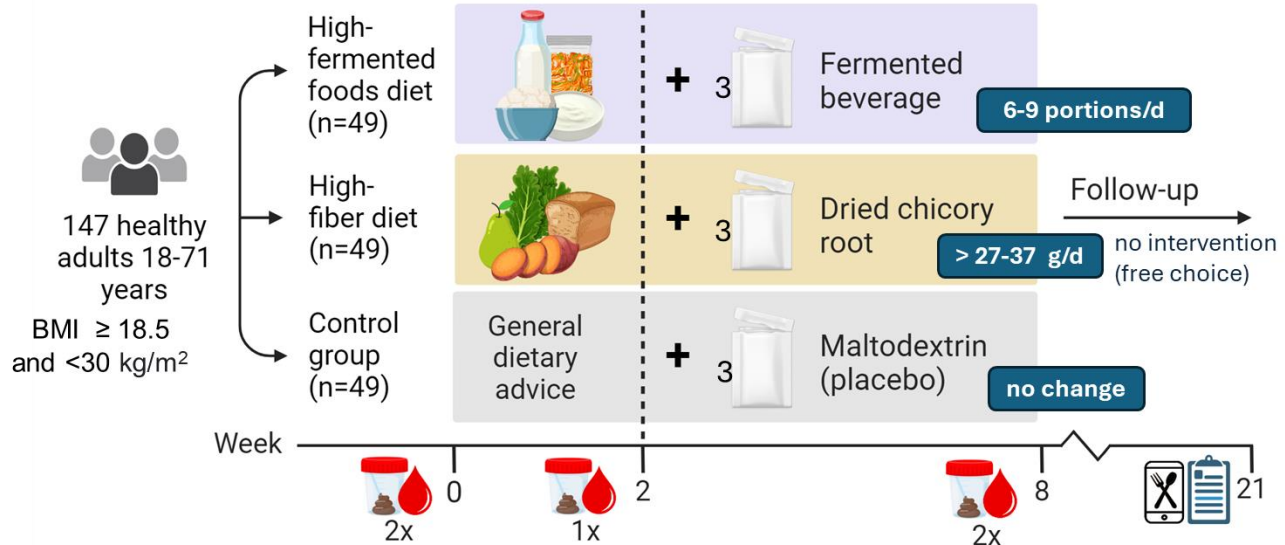


Citizen science elements



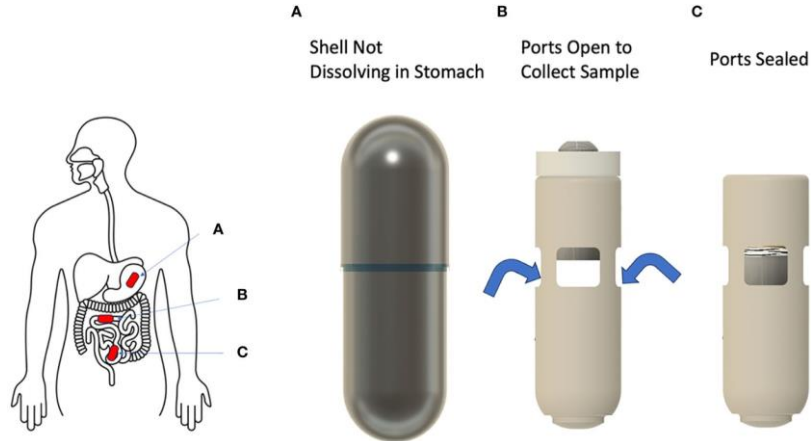
Main exclusion criteria:

- Disease/medical condition interfering with study outcomes
- Dietary fiber intake of  $\geq 18$  gram (women) or  $\geq 22$  gram (men)
- $>3$  daily portions of fermented foods
- Antibiotic or 'biotics' supplement use



# Postbiotics & gut microbiota modulation

- Less pronounced effects on fecal gut microbiome
- Maybe bigger effect in small intestine?? Optionally studied by using ingestible sampling pills:



Wang et al. *Front. Microbiomes* 3:1321624

# Prebiotics & decrease in gut microbiota alpha diversity

The Journal of Nutrition 153 (2023) 3156–3163



## JN THE JOURNAL OF NUTRITION

journal homepage: <https://jn.nutrition.org/>

Perspectives

### Tuning Expectations to Reality: Don't Expect Increased Gut Microbiota Diversity with Dietary Fiber

Thaisa M. Cantu-Jungles\*, Bruce R. Hamaker

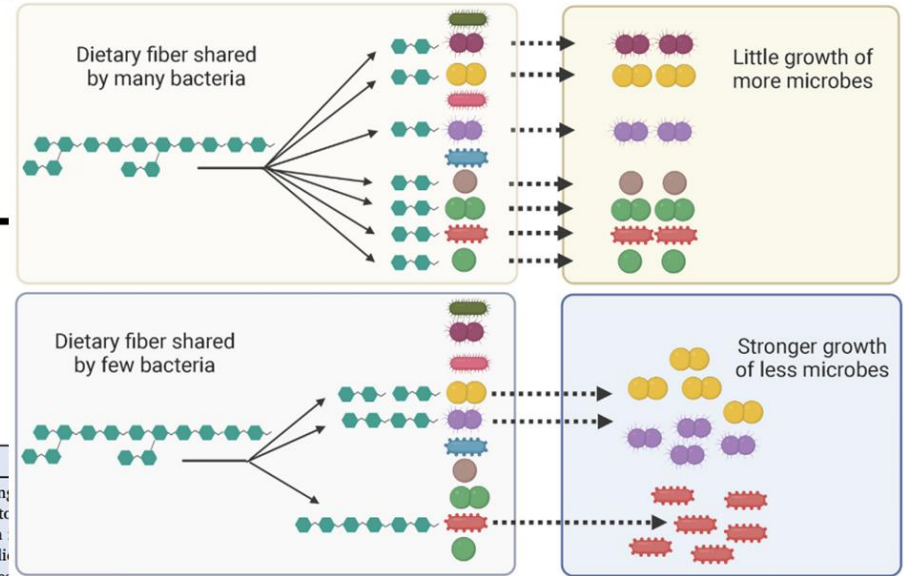
Department of Food Science, Whistler Center for Carbohydrate Research, Purdue University, West Lafayette, IN, United States

#### ABSTRACT

Dietary approaches, particularly those including fiber supplementation, can be used to promote health benefits by shaping communities. Whereas community diversity measures, such as richness and evenness, are often used in microbial ecology to describe these complex and vast microbial ecosystems, it is less clear how these concepts apply when dietary fiber supplementation is used. From a microbial ecology perspective, we summarize and demonstrate how factors including experimental approach, number of bacteria sharing a dietary fiber, and initial relative abundances of bacteria that use a fiber can significantly affect diversity outcomes in fiber fermentation studies.

that a reduction in alpha diversity is possible, and perhaps expected, for most approaches that use fermentable fibers to beneficially shape the gut microbial community while still achieving health-related improvements.

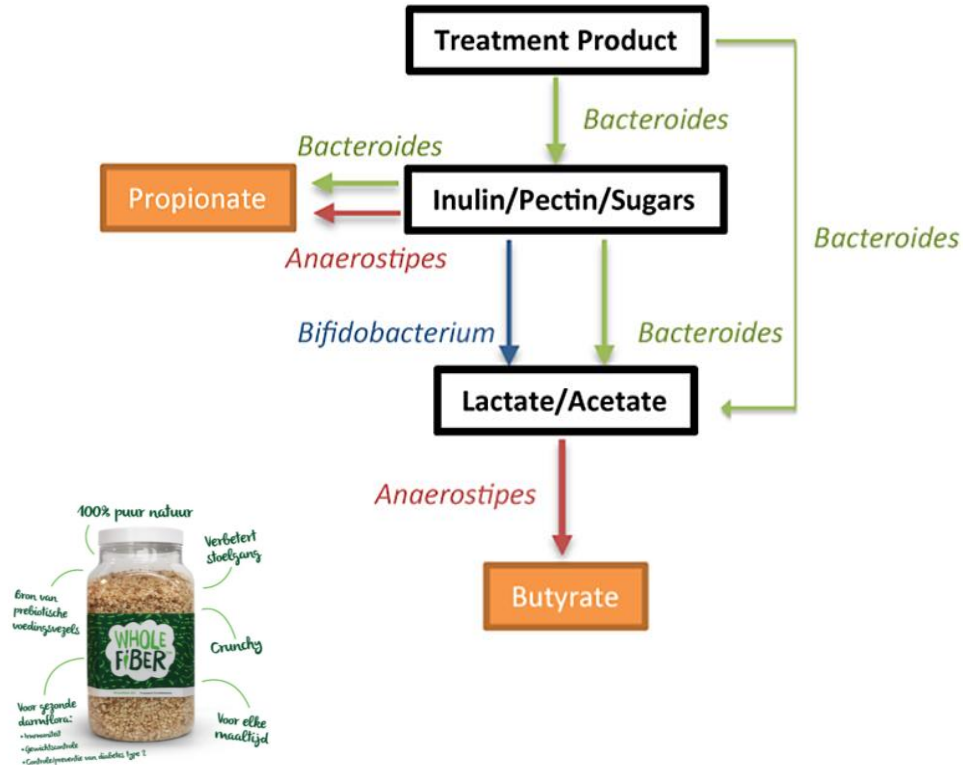
**Keywords:** alpha diversity, dietary fiber, gut microbiota, prebiotics



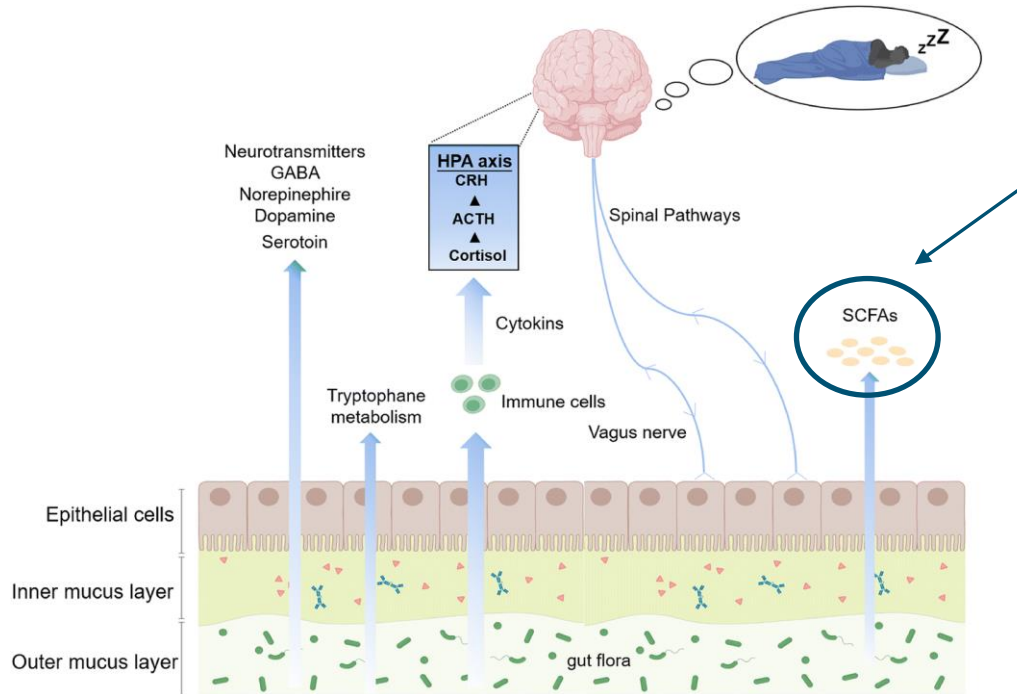
Cantu-Jungles et al., *J of Nutr* 153 (2023) 3156–3163

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# Prebiotic supplement effects still detectable on HF background diet



# Pre-, pro- and postbiotics & sleep quality



Pre-, pro- and postbiotics can enhance sleep quality → **SCFA** might play a pivotal role in this

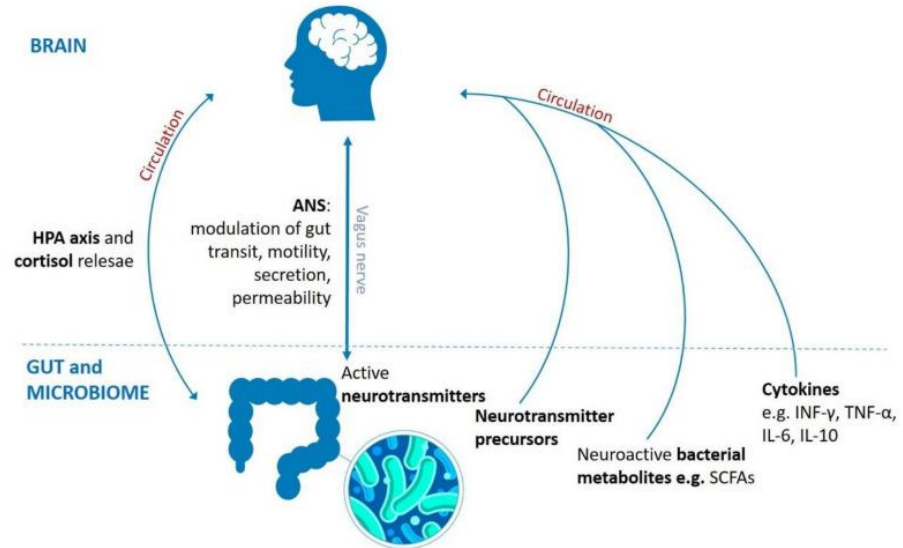
↓  
*BUT*, evidence from intervention studies is largely lacking

*Lin et al. Open Life Sci. 2024 Jul 18;19(1):20220910*

**Fig 2.** Sleep disturbances related to the brain-gut axis are mainly conveyed by the following four factors: 1. immune way; 2. neural way, 3. endocrine way, and 4. gut flora.

# Pre-, pro- and postbiotics & mental health

- Results animal studies promising (depression / anxiety), but human intervention studies are limited
- Variable results:
  - reduced symptoms
  - no effects



# Biotics & human mental health; variable results?

- Small sample size
- Varying inclusion and exclusion criteria (e.g. various degrees of depression, type of basic treatment)
- Varying duration of treatment (longer not always more effective)
- Varying outcomes and subjective measures (mainly questionnaires)
- Interactions of treatments with the native microbiota and its variability is largely missing
- Follow-up (long-term effects?)

More clinical trial are needed!!

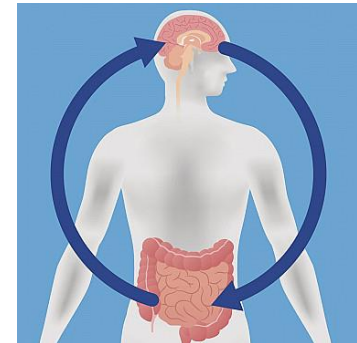
# Clinical intervention trials & mental health @WFBR

- **Oh my Gut! project:**

- 6-weeks intervention (o.a. multiple biotics) → effect on stress (25-40 yrs)
- started April 2024, duration 3 years

- **Food4Mood project:**

- 8-weeks dietary intervention (plant-based HF diet + 4 biotic supplements)  
→ effect on mood/mental wellbeing (students)
- starting May 2025, duration 3 years



# Interested in clinical food intervention trials @WFBR



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**Happy to meet you at Vitafoods Europe 2025!**

Thanks!



To explore  
the potential  
of nature to  
improve the  
quality of life