THE POTENTIAL OF FIBER MIXTURES TO DELIVER PREDICTABLE AND ROBUST MICROBIOME BENEFITS

Thaisa Cantu-Jungles and Bruce Hamaker
Purdue University

Disclosure: RiteCarbs LLC

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Fibers can be selected to promote specific gut bacteria

- Dietary fibers are the main energy source to beneficial gut bacteria
- Bacterial have specific machineries for fiber degradation
- Dietary fibers can stimulate the growth of specific bacteria from the large intestine

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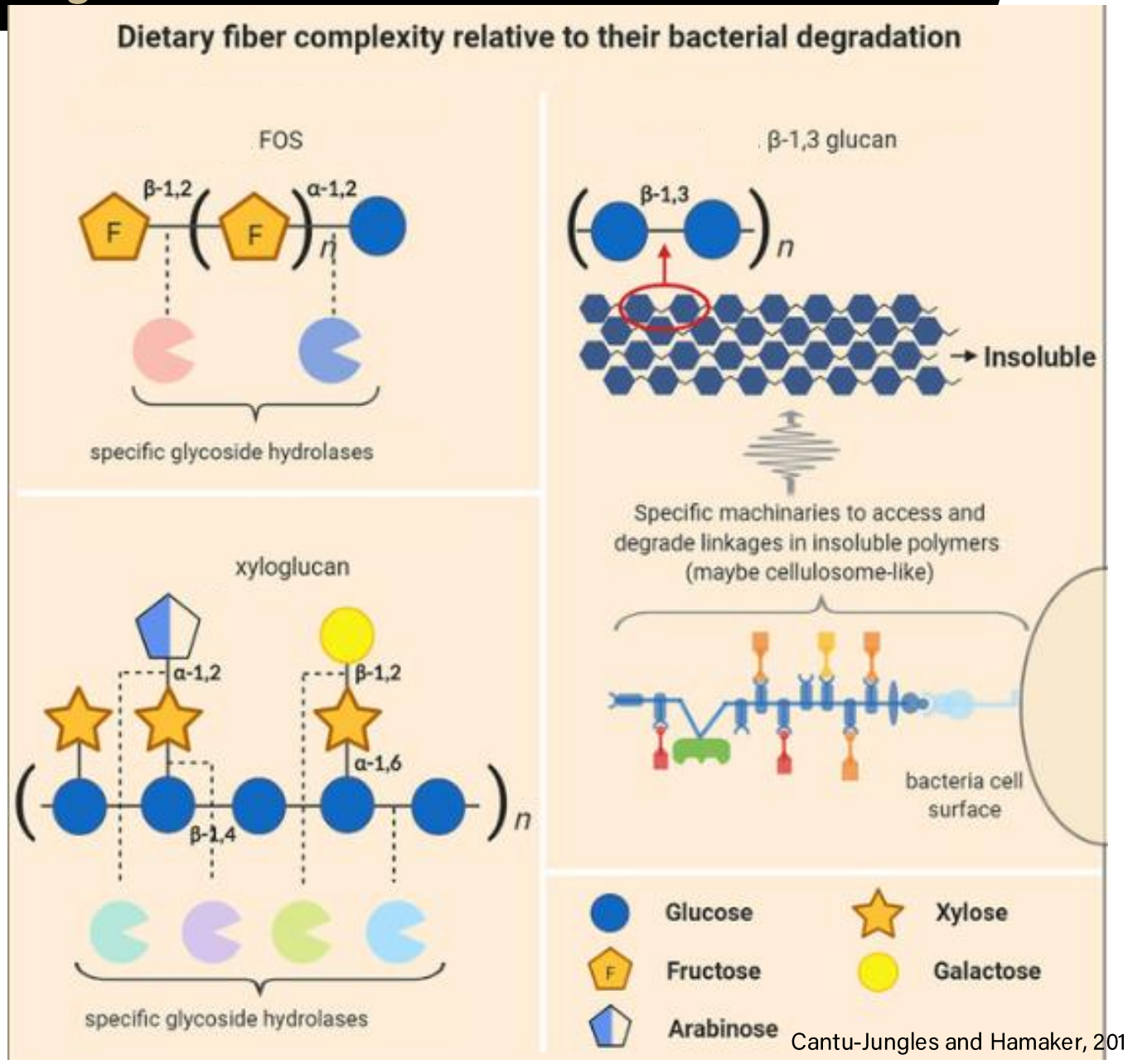
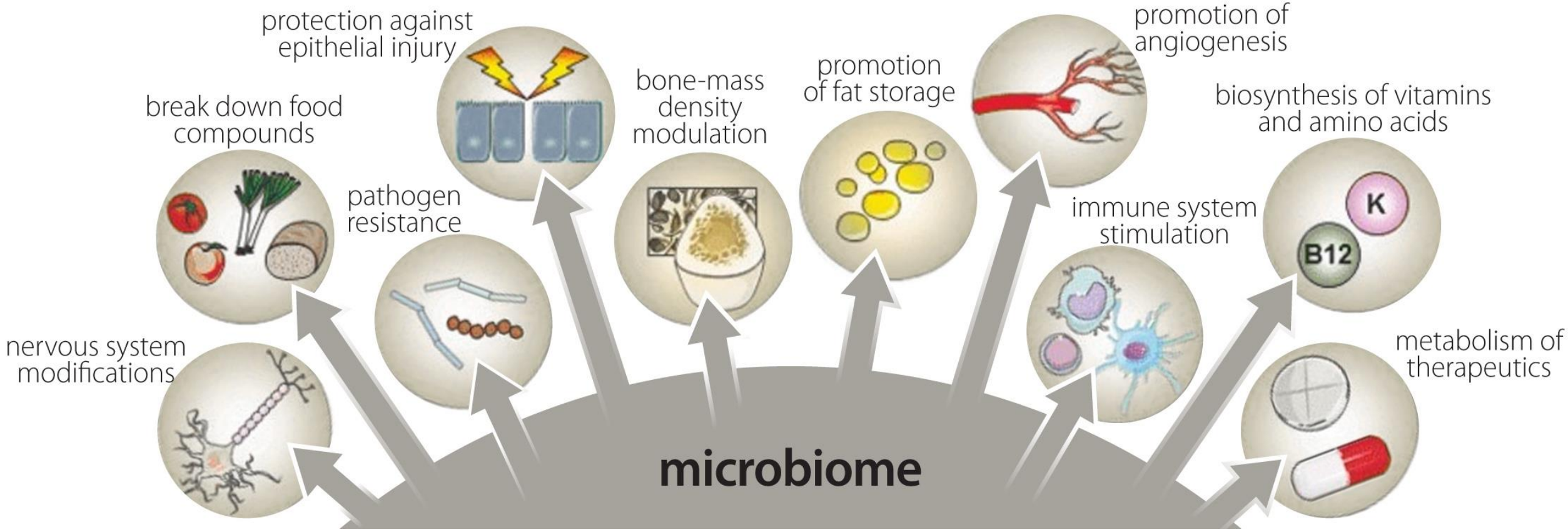


Cantu-Jungles and Hamaker, 2019

Which bacteria to promote?

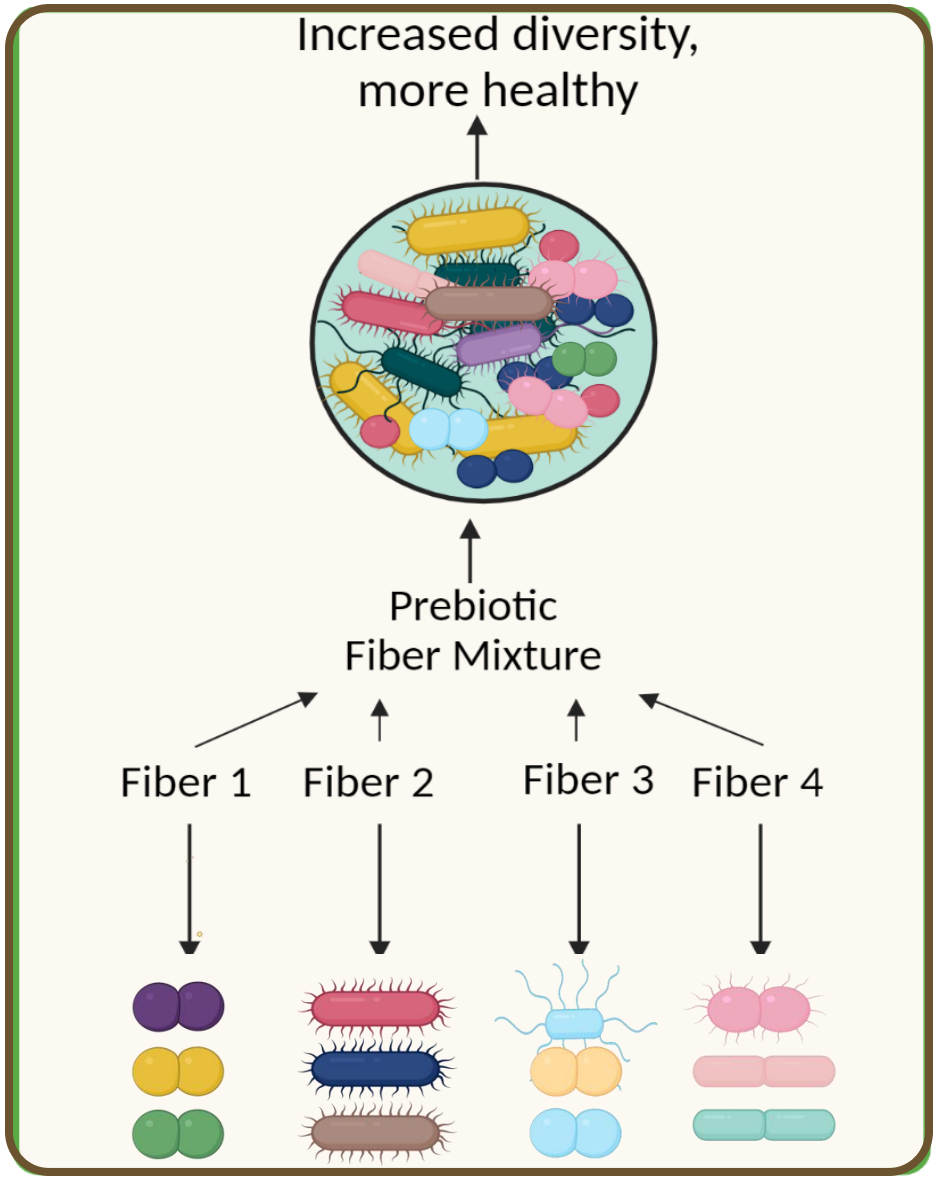
The gut microbiome is a collection of microbes with specific functions



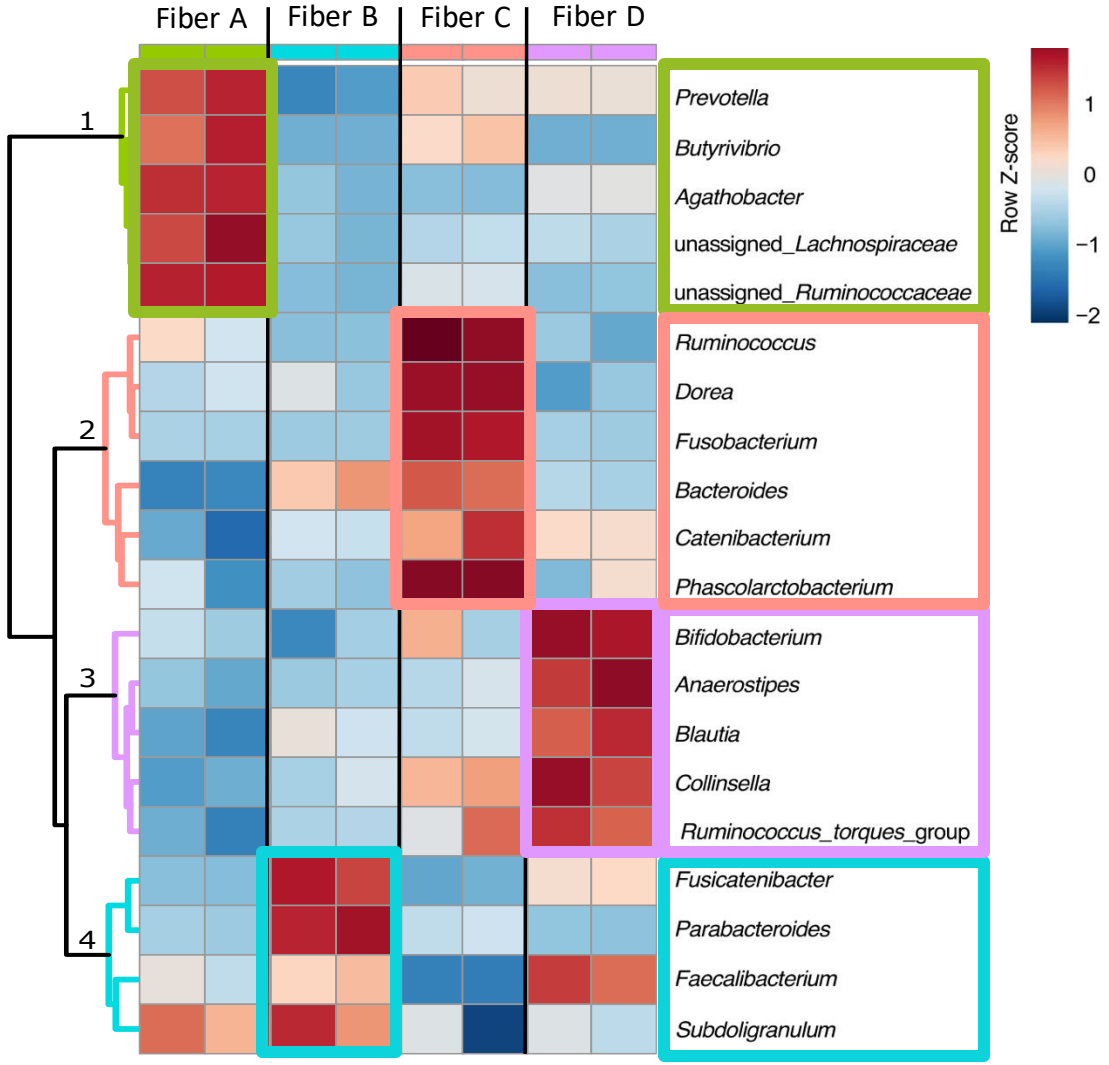
Design of prebiotics for core beneficial gut bacteria

- Group-matched prebiotics : Fibers that precisely align to groups of taxa

- Blends of group-matched prebiotics : Support of core groups of beneficial bacteria in the gut



Designed prebiotic mixtures for core gut microbiota support – Parkinson Disease



*RiteCarbs (patent pending)

Complementary groups of bacteria and metabolites are promoted with the designed prebiotic mixture*

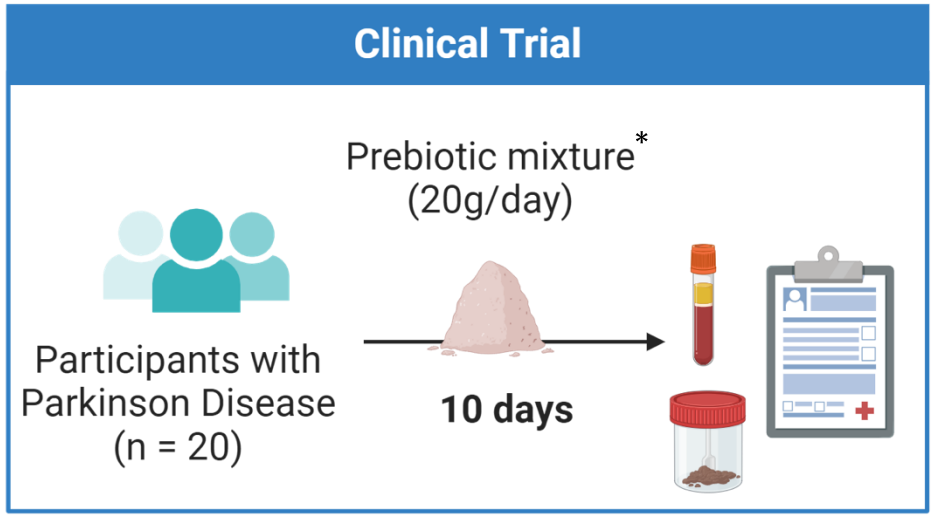
nature COMMUNICATIONS

Nat Commun. 2023; 14: 926.
Published online 2023 Feb 18. doi: 10.1038/s41467-023-36497-x
PMCID: PMC9938693
PMID: 36801916

An open label, non-randomized study assessing a prebiotic fiber intervention in a small cohort of Parkinson's disease participants

Deborah A. Hall,[#1] Robin M. Voigt,[#2,3,4] Thaisa M. Cantu-Jungles,[3,5] Bruce Hamaker,[3,5] Phillip A. Engen,[3] Maliha Shaikh,[3] Shohreh Raeisi,[3] Stefan J. Green,[2,3,6] Ankur Naqib,[3,4] Christopher B. Forsyth,[2,3,4] Tingting Chen,[5,7] Richard Manfready,[2] Bichun Ouyang,[1] Heather E. Rasmussen,[3,8] Shahriar Sedghi,[9] Christopher G. Goetz,[1] and Ali Keshavarzian[2,3,4,10]

Designed prebiotic mixtures for core gut microbiota support - - Parkinson Disease



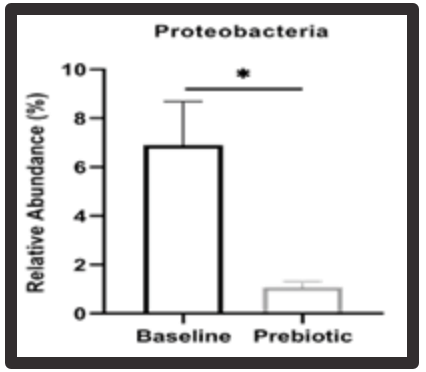
✓ Highly **tolerable**[1]

✓ **Effective**[1] in only 10 days to:

1. Promote a healthier balance of bacteria in the gut
2. Reduce intestinal inflammation
3. Improve gut barrier function
4. Reduce brain injury

**RiteCarbs (patent pending)*

1.



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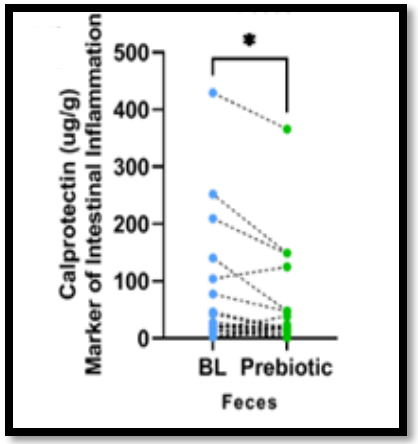

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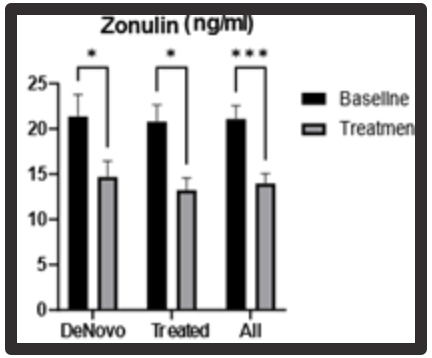

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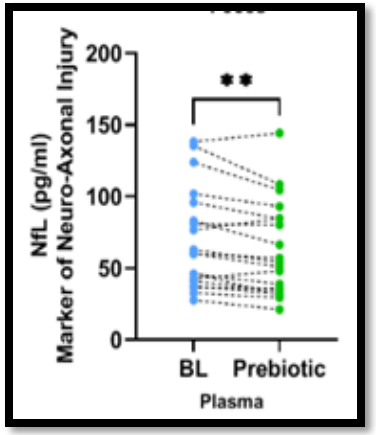
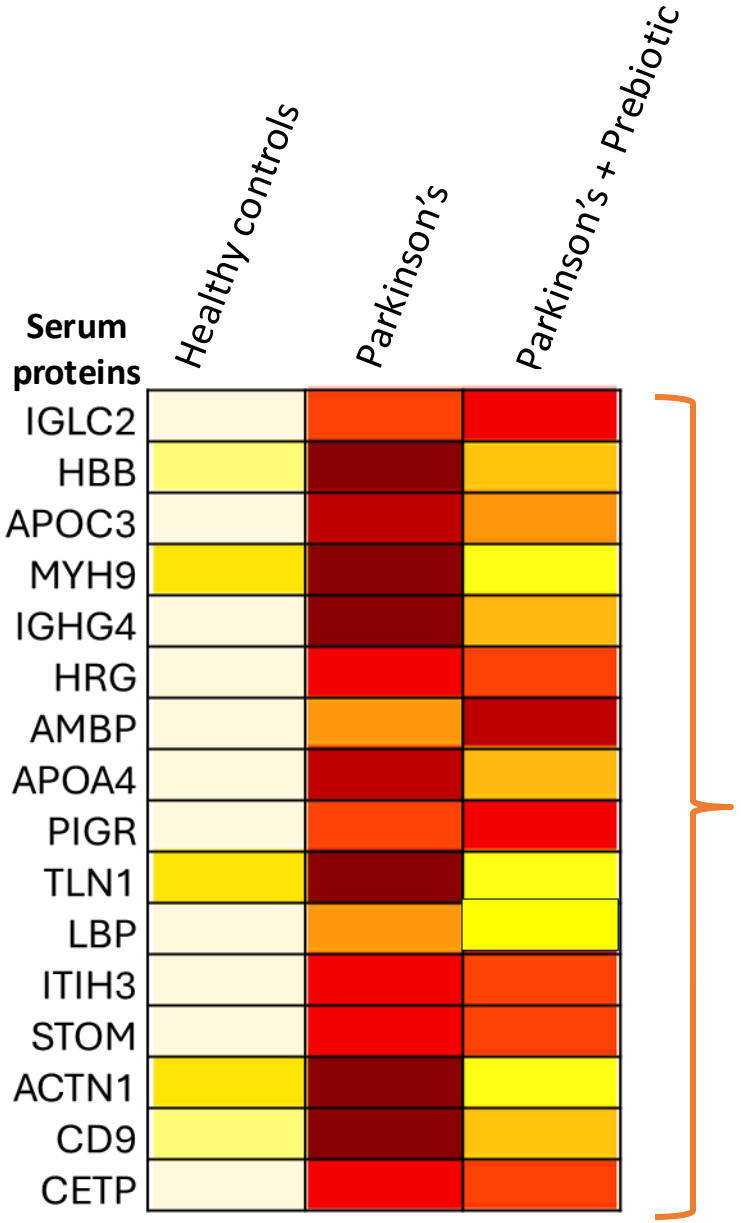


(Hall et al, *Nat. Commun.* 2023)

Designed prebiotic mixtures for core gut microbiota support – Parkinson Disease

- **Food as medicine**
- Activation of pharma-targeted biochemical pathways



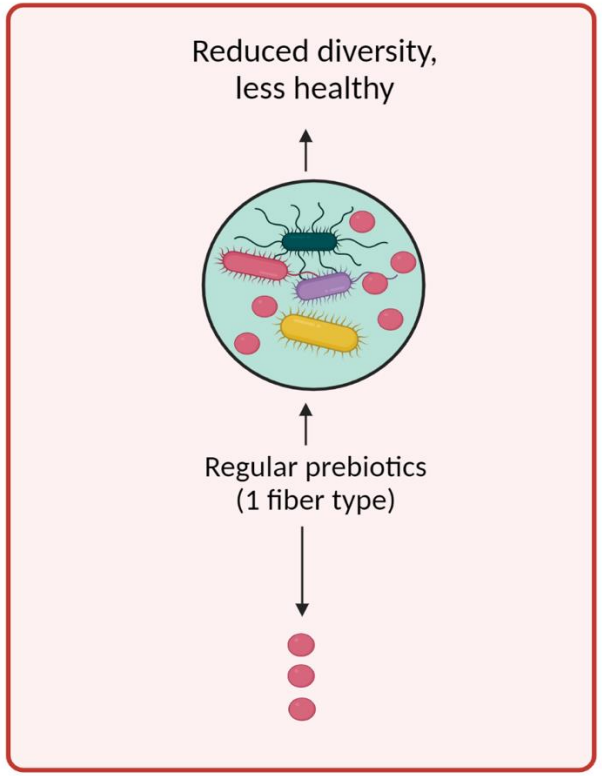
Prebiotic* treatment improved

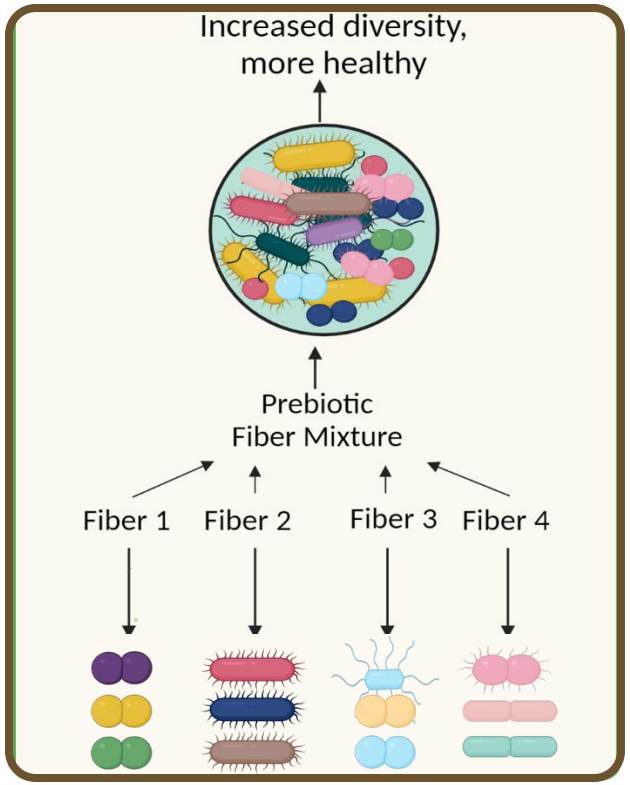
- **Inflammation**
- **Immune response**
- **Neural development and repair**
- **Dopaminergic neuron functions**
- **Blood-brain barrier**
- **Neurotransmission**
- **Lipid metabolism**

**RiteCarbs (patent pending)*

Designed Fiber Mixtures vs Individual Fibers

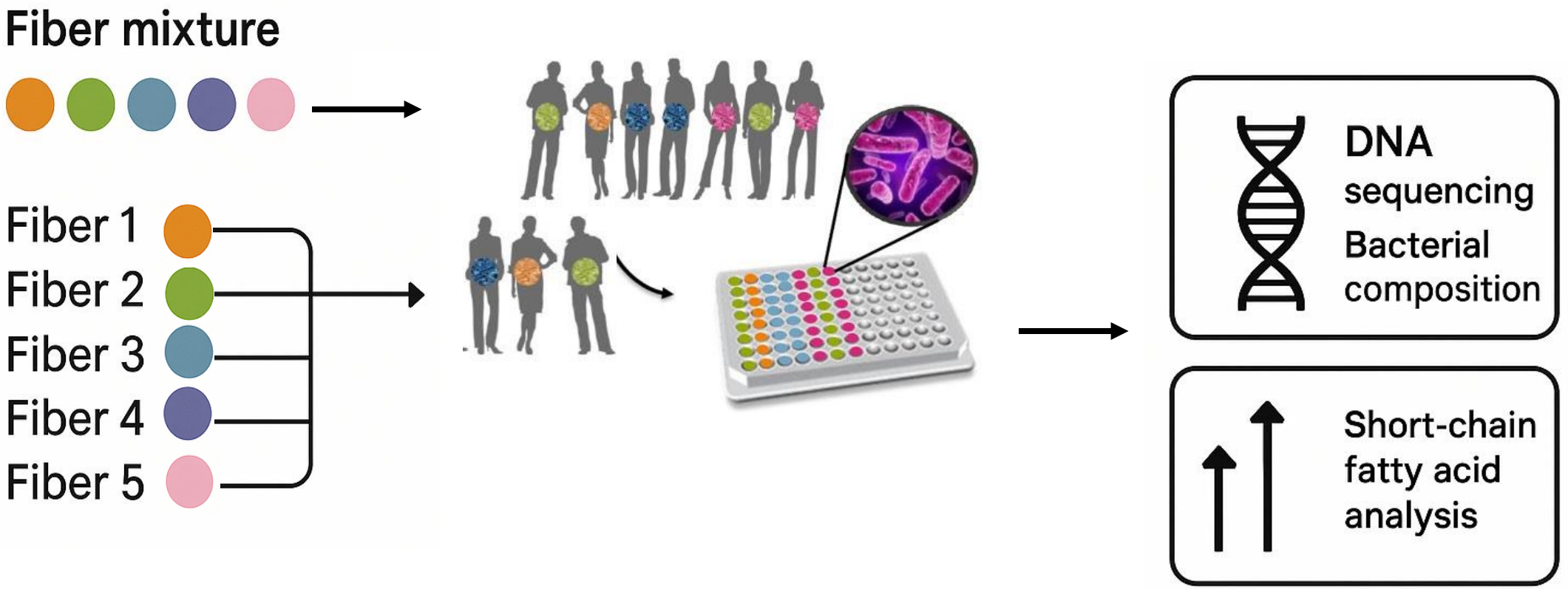
1) Provide support to a larger number of beneficial bacteria
2) Have more consistent responses in different individuals





Designed Fiber Mixtures vs Individual Fibers

Collaboration: Frank Schuren (TNO)



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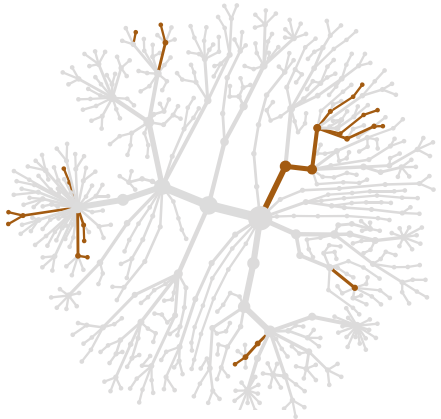
(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

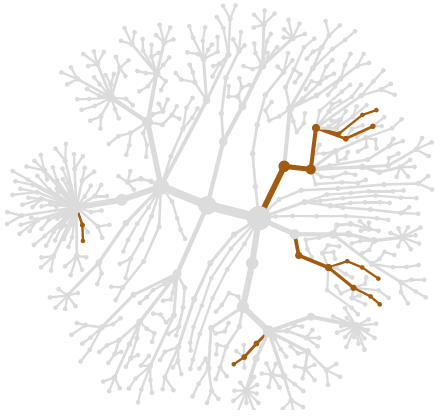
Designed Fiber Mixtures vs Individual Fibers

AX

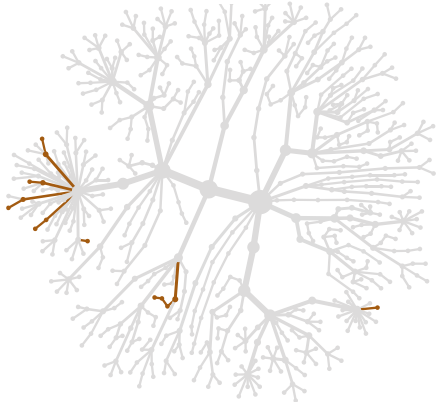
PEC



CRS

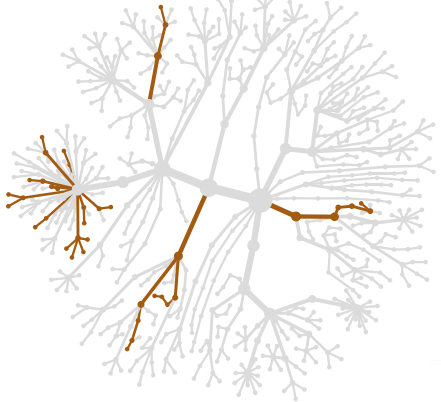


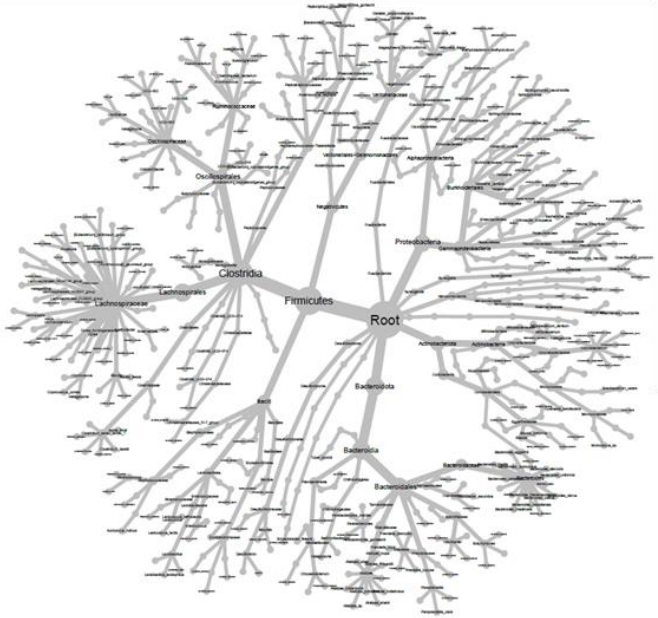
KG

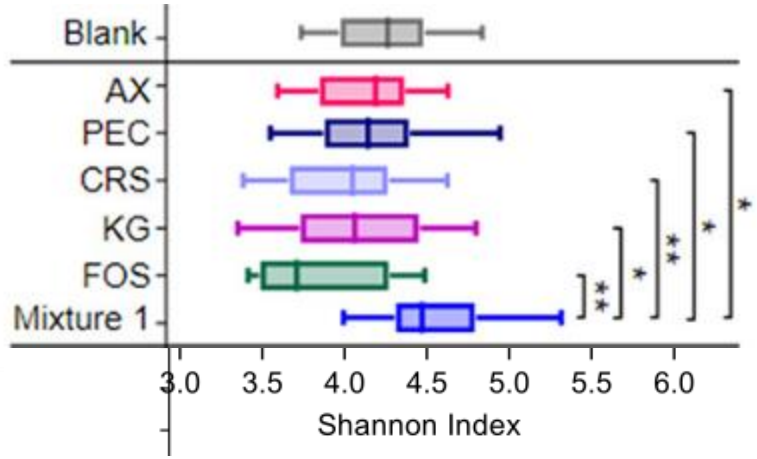


FOS

Mixture 1*







Bacteria higher in fiber treatment

Significant when FDR-adjusted wilcoxon p_value <0.05

**RiteCarbs (patent pending)*

(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

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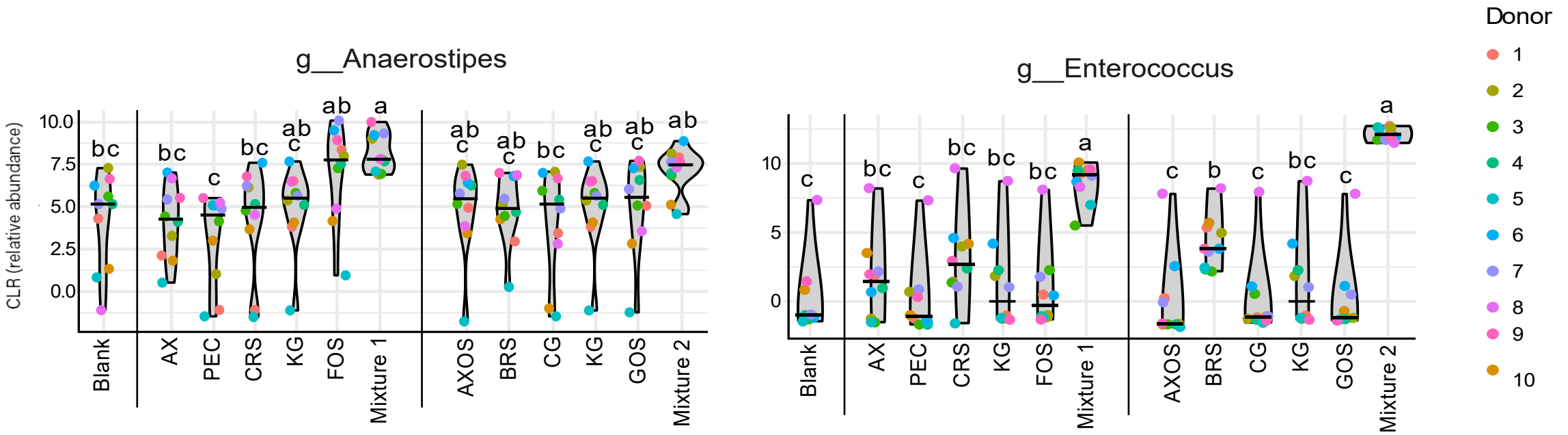

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➢ Unexpected findings - **synergistic interactions** that:

✓ 1) Boost short chain fatty acid production above expected

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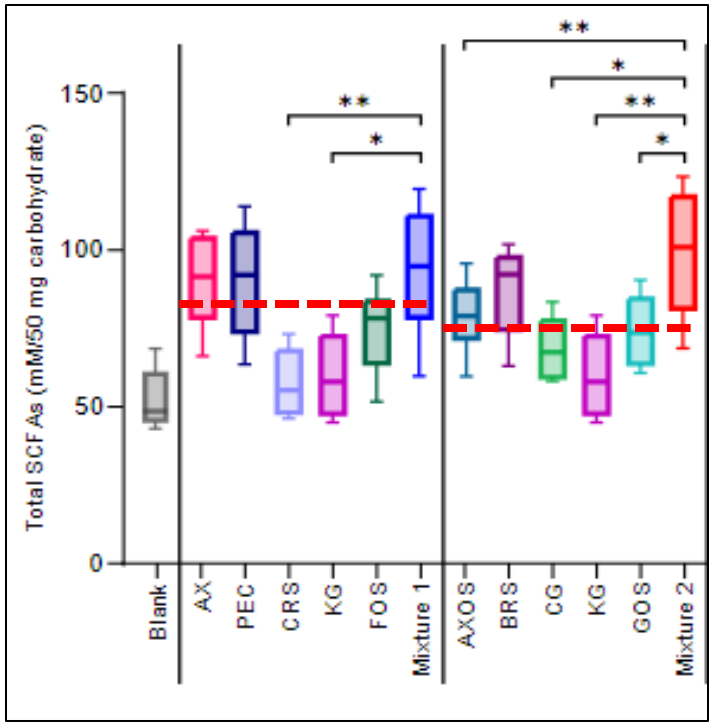
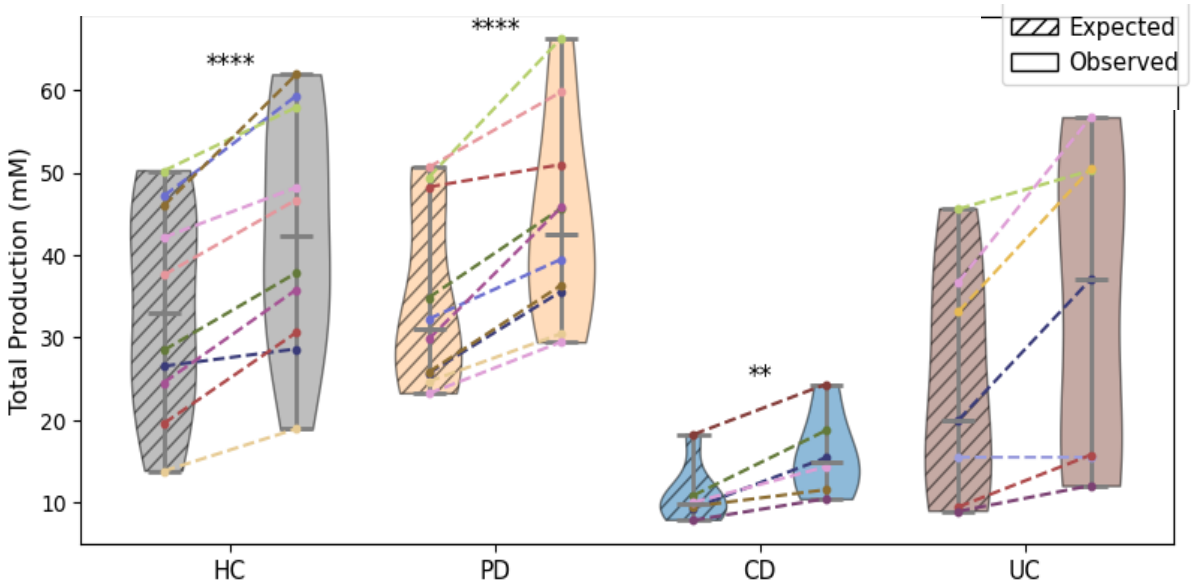


Average production of individual fibers

(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

- Expected SCFAs production with the mixture:
  - Calculated from single *in vitro* fermentation data
  - Assuming additive effects
    - Each of 4 components contributes 25% SCFA produced individually



(*unpublished data*)

HC: healthy controls; PD: Parkinson disease;
CD: Chron's disease and UC: ulcerative colitis

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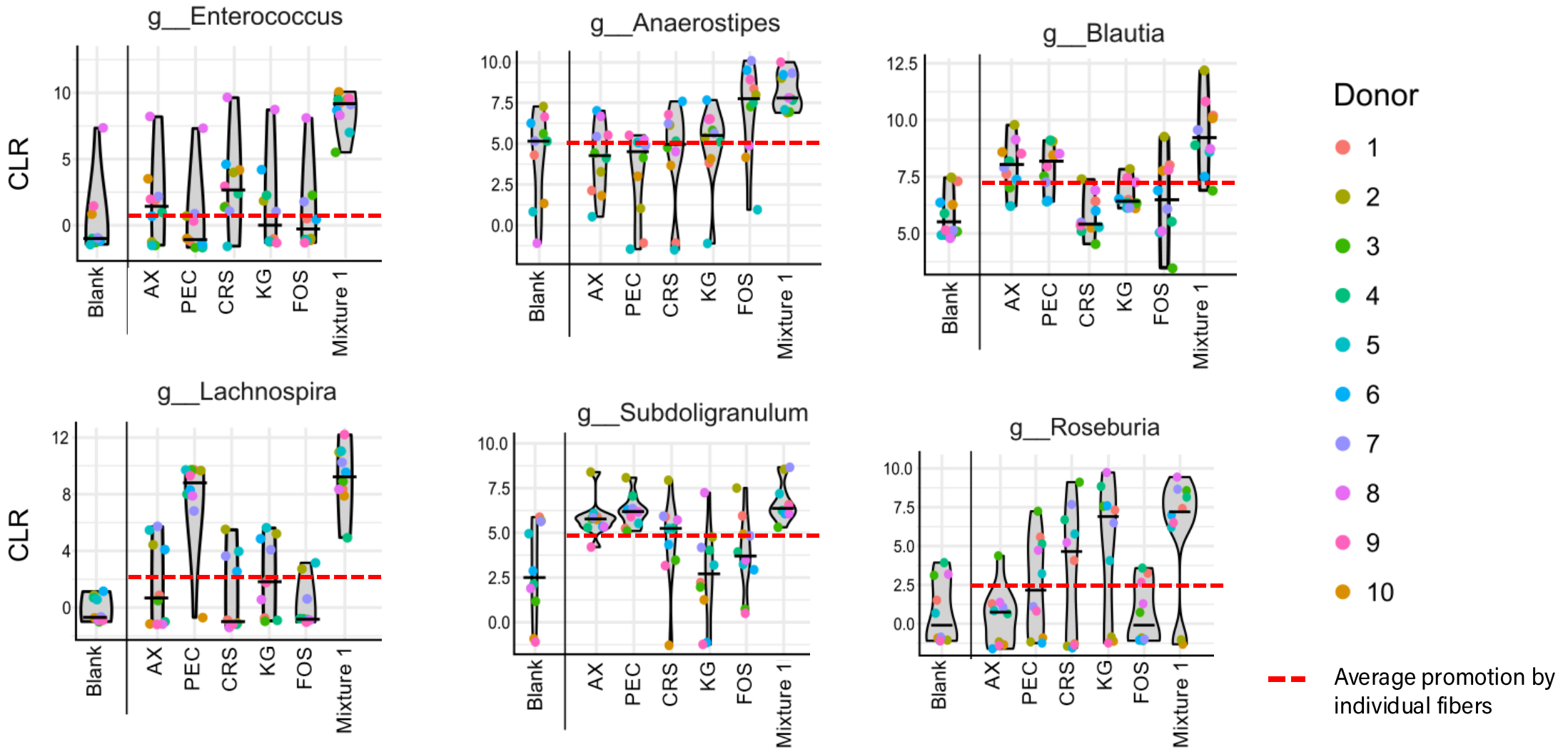

Genus differentially promoted across one or more treatments compared to the blank – identified through ANCOM

(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

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➢ Unexpected finding - **synergistic interactions** that:

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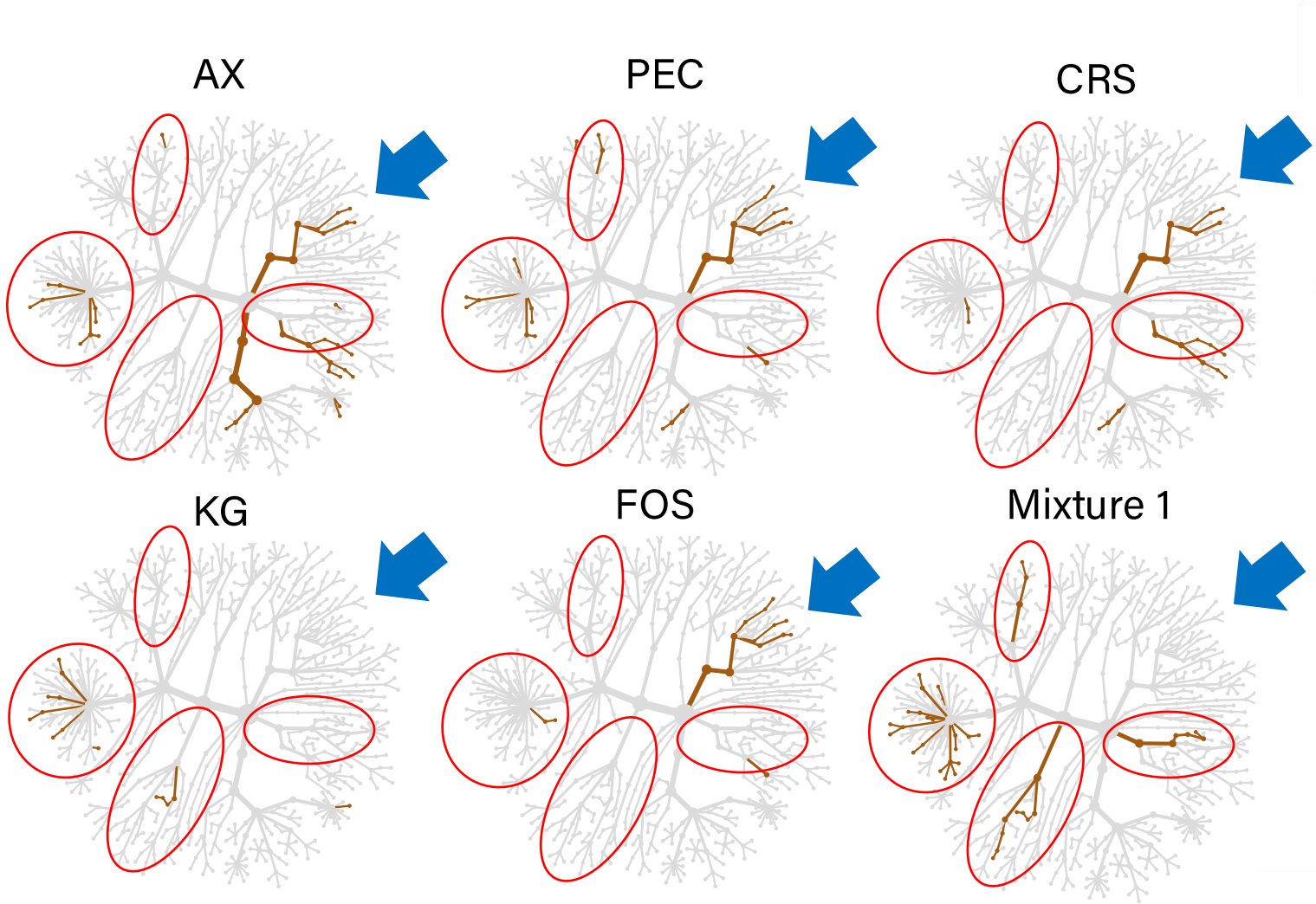
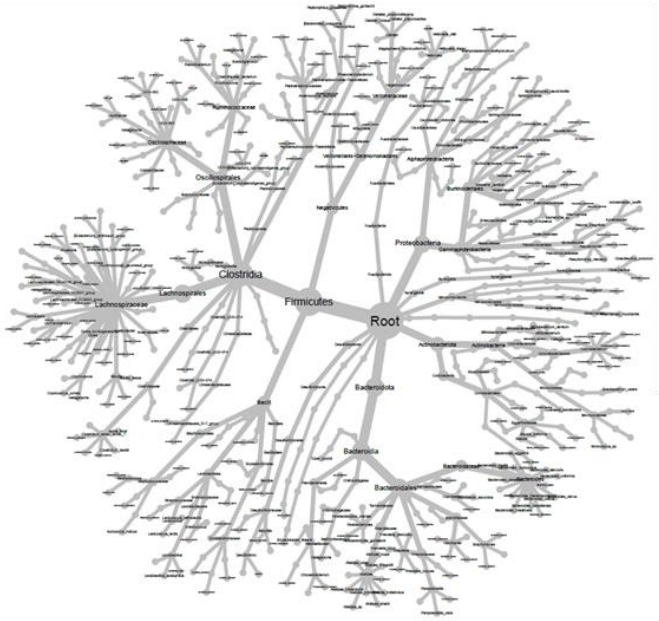
✓ 2) Promote taxa at higher levels than any of its individual components

✓ 3) Taxa that are not supported by any of the mixture components are supported by the mixture

Designed Fiber Mixtures vs Individual Fibers





Bacteria higher in fiber treatment

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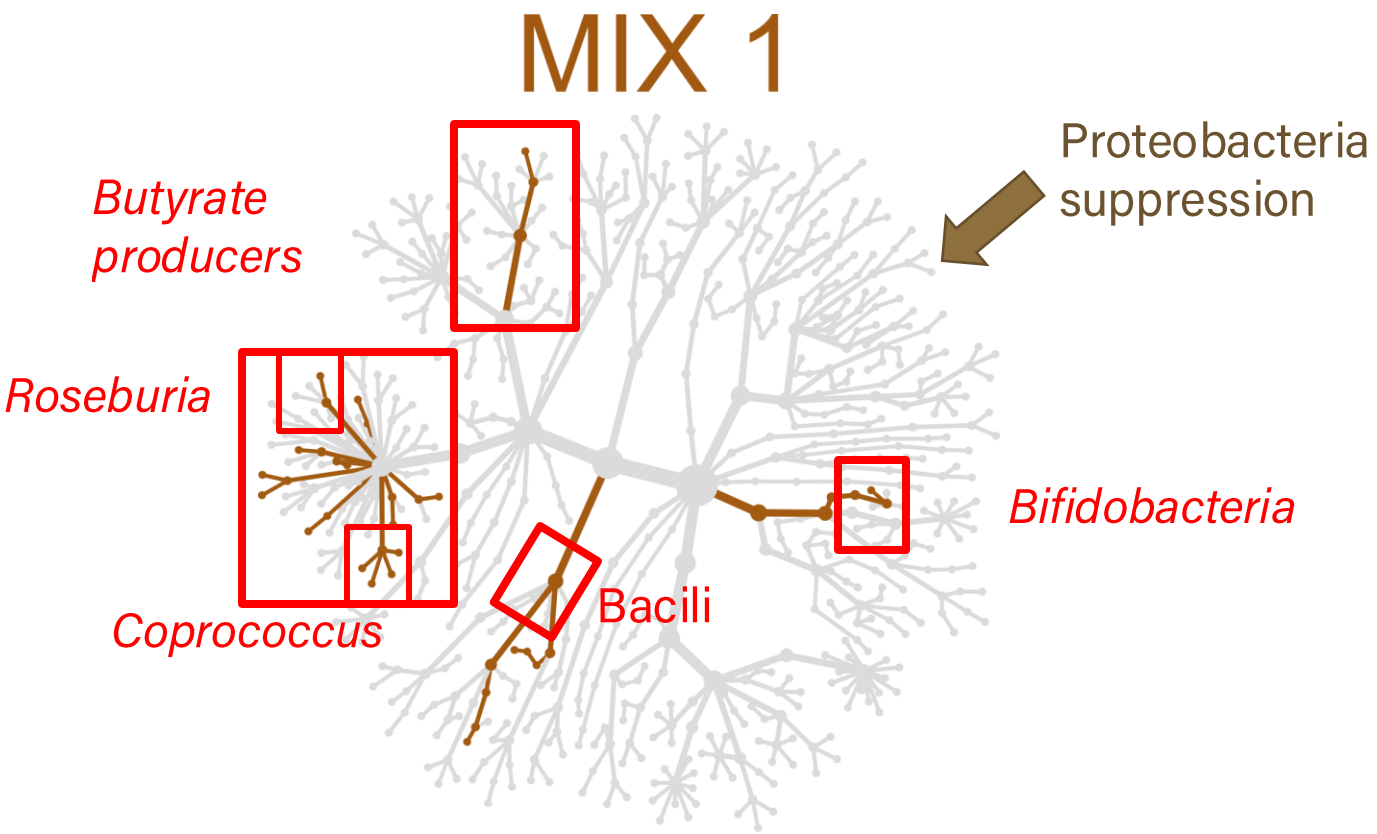
(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

Mixture 1 - Targets



(Cantu-Jungles, T. M., et al. *Gut Microbes* 2025)

Conlcusions

Designed fiber mixtures have potential to lead to:

- **Provide support to a larger number of beneficial bacteria**
  - Promote unique bacterial taxa that might not be promoted with individual fibers
  - Prevention of pathogenic bacteria growth

- **Consistent responses across people**

- **Intense responses in the gut microbiota (more effective, act faster?)**

Perspectives

1) **Design fibers mixtures to support specific groups of beneficial bacteria**
2) **Improve synergistic interaction of fibers to promote specific targets**

- Total or specific SCFAs
- Specific or multiple bacterial groups

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Mathematical approaches, machine learning

Knowledge based hypothesis generation

Q&A

tcantuju@purdue.edu

Thaisa Jungles

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