

Current Knowledge on the Role of Probiotics in Autism Spectrum Disorder

Symptoms: A Systematic Review

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1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects both behaviour and social communication, alterations that are often combined with other comorbidities, such as gastrointestinal dysfunction. Bearing in mind the role of gut microbiota (GM) in the correct Central Nervous System development and function, it has been postulated that gastrointestinal dysbiosis, which commonly affects ASD patients, is involved in this disorder's aetiology. For this reason, using probiotics to restore the gastrointestinal equilibrium could be a good therapeutic strategy for this disease.

2. AIMS

- To know the characteristic GM profile of ASD patients.
- To give a comprehensive vision of the current state of knowledge about the probiotics' role in ASD from both preclinical and clinical studies.
- To expose an exhaustive perspective of the near future (clinical trials already registered) of this research field.
- To suggest new approaches and future study directions.

3. THEORETICAL BASIS

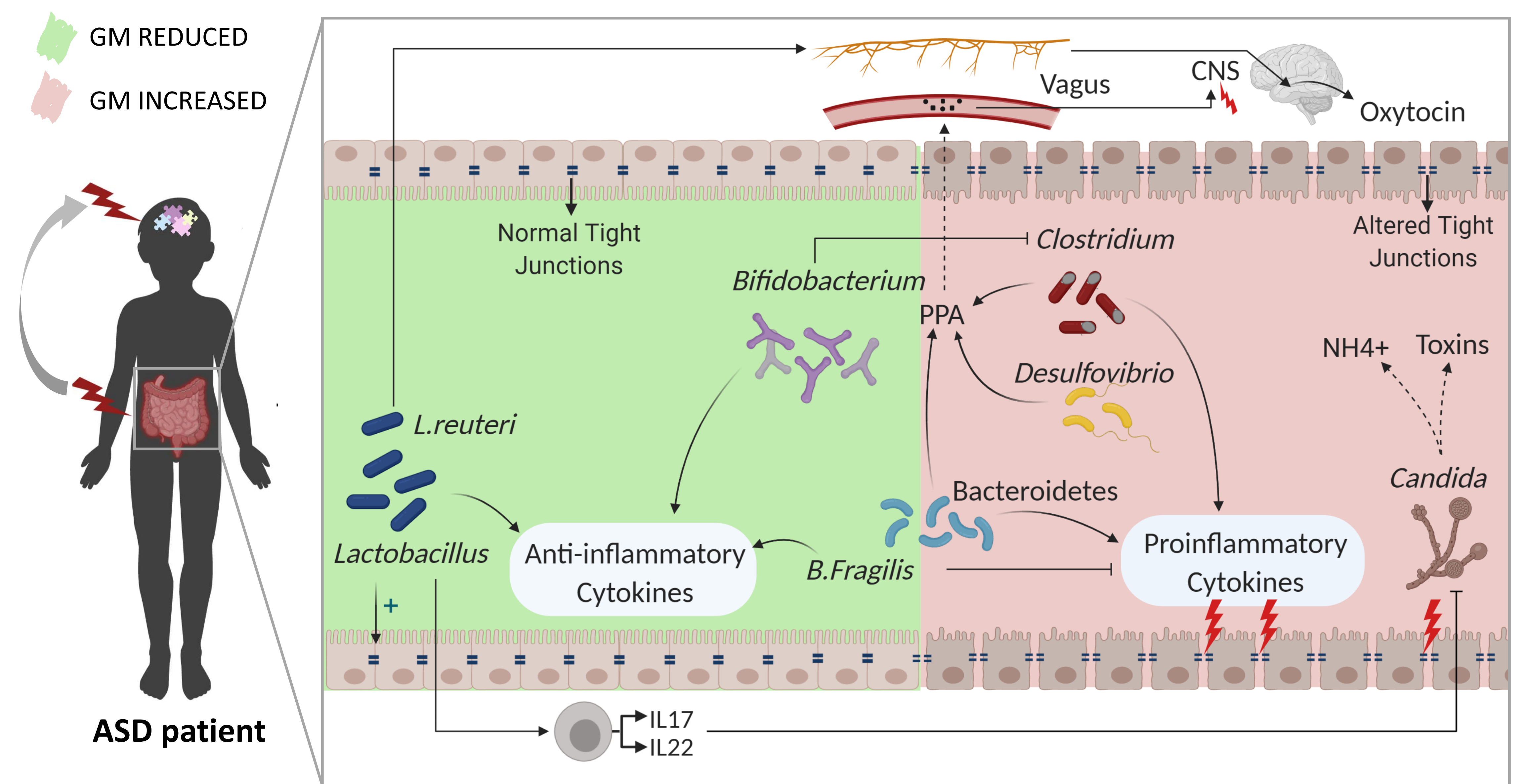


Fig 1: Main ASD-related microorganisms and their role in the disorder. PPA: Propionic Acid; CNS: Central Nervous System. Created with Biorender.

4. METHODOLOGY

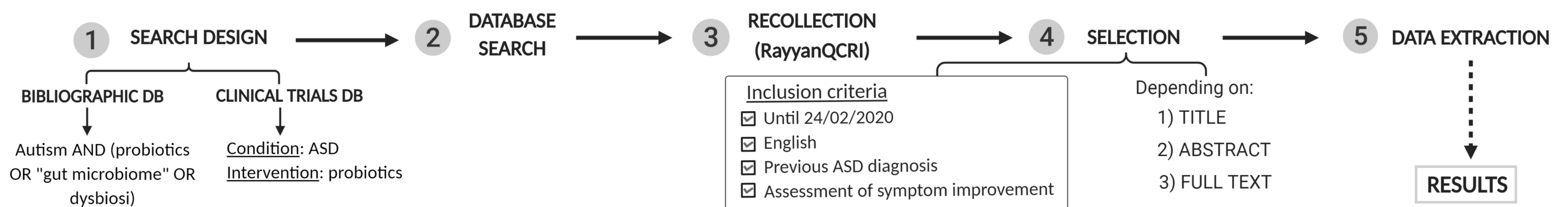


Fig 2: Methodology design of the systematic review, based on PRISMA protocol; DB: Databases; Created with Biorender.

5. RESULTS

Evidence from Animal Studies (n=7)

Main idea: Findings from animal research are promising

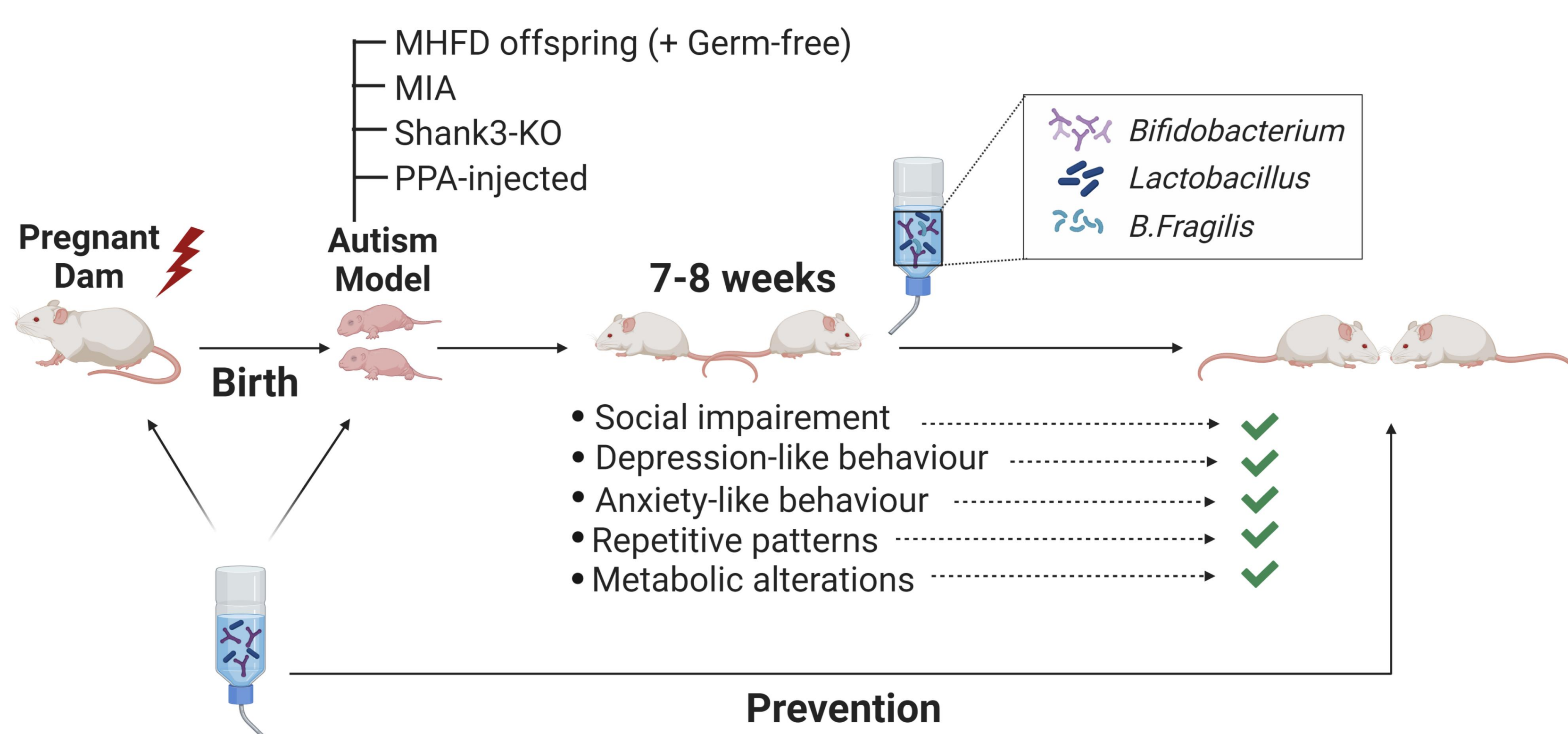


Fig 3: Major characteristics of probiotics use in ASD-rodent model: composition, moment of administration and principal outcomes. MHFD: maternal high fat diet; MIA: Maternal Immune Activation; Created with Biorender.

Evidence from Human Studies (n=11)

Main idea: Evidence from human research is limited

- Prospective studies : n=9
- Retrospective studies: n=2

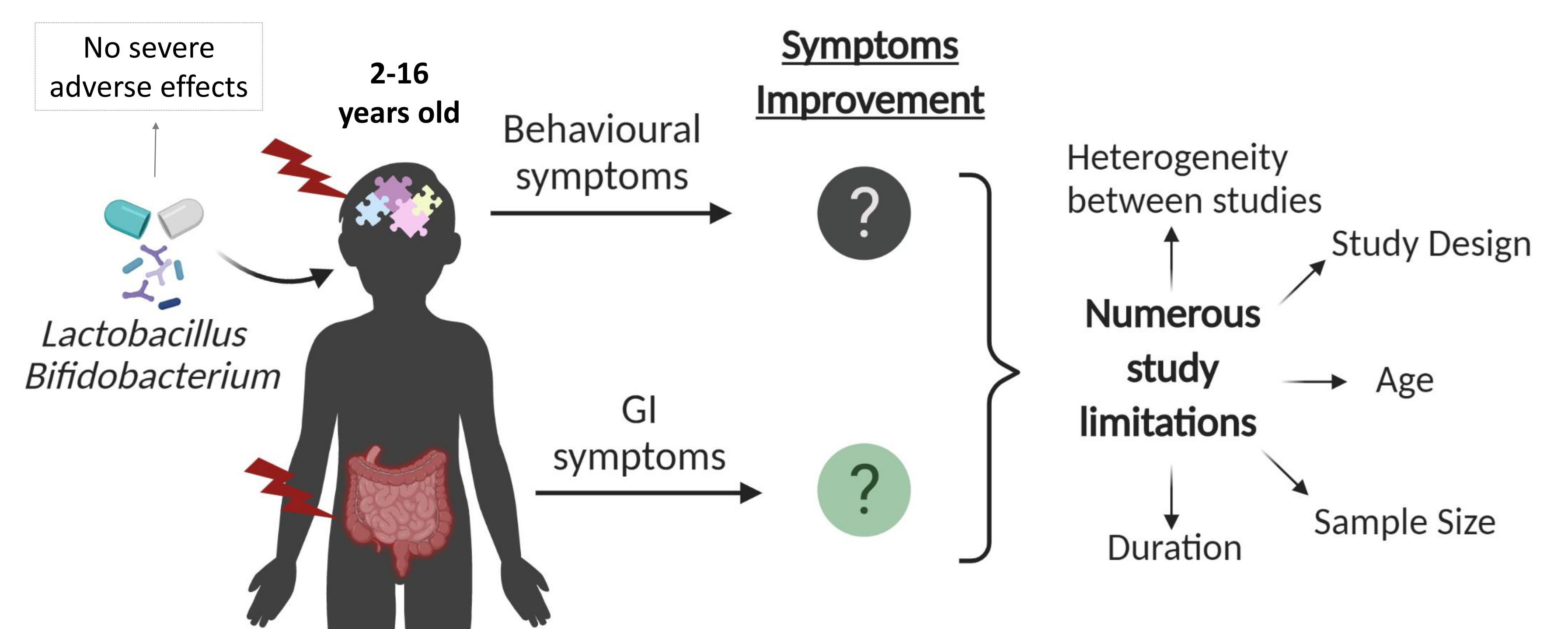


Fig 4: Major characteristics of probiotics use in humans: composition, moment of administration, principal outcomes and foremost limitations. GI: Gastrointestinal. Created with Biorender.

6. CONCLUSIONS

Main conclusion: The current knowledge is promising but not enough to conclude that probiotics are effective on improving behavioural/GI ASD-related symptoms

- The exact GM profile in ASD is unclear
 - Little is known about how to treat with probiotics
- TOO MANY STUDY LIMITATIONS
- IMPROVEMENTS
- Partially solved in ongoing clinical trials
- Lactobacillus and Bifidobacterium → "Gold Standard" genus

- Probiotics in ASD is a booming domain of research.
- Other approaches are needed.



NEW DIRECTIONS

7. FUTURE DIRECTIONS

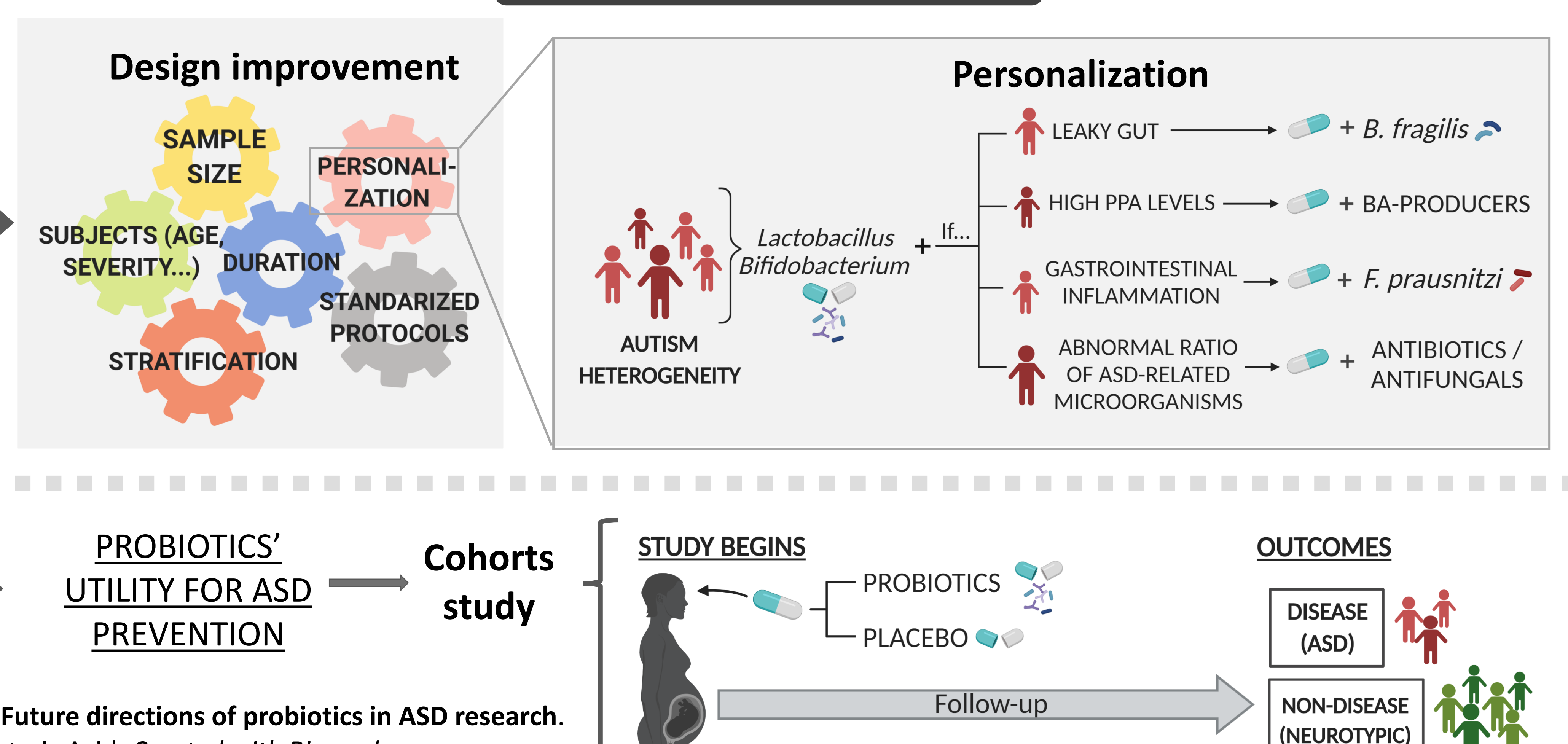


Fig 5: Future directions of probiotics in ASD research. BA: Butyric Acid. Created with Biorender.