

Targeting the Spectrum: Innovations in Autism Pharmacotherapy

Caroline Danaher and Osarhumwense Osariemen
School of Medicine, Trinity College Dublin, Dublin, Ireland

INTRODUCTION

Autism spectrum disorder (ASD) is a heterogeneous neurodevelopmental condition characterised by impairments in social communication, restricted/repetitive behaviours, and altered sensory processing.

No approved pharmacological treatments target core ASD symptoms. Existing medications primarily address associated symptoms (e.g irritability and aggression). Adults also remain critically underrepresented in ASD research.

Objective: To evaluate current and emerging pharmacological interventions targeting core symptoms of ASD in adults by analysing ongoing registered clinical trials, identifying novel therapeutic targets, and informing future directions in ASD pharmacotherapy.

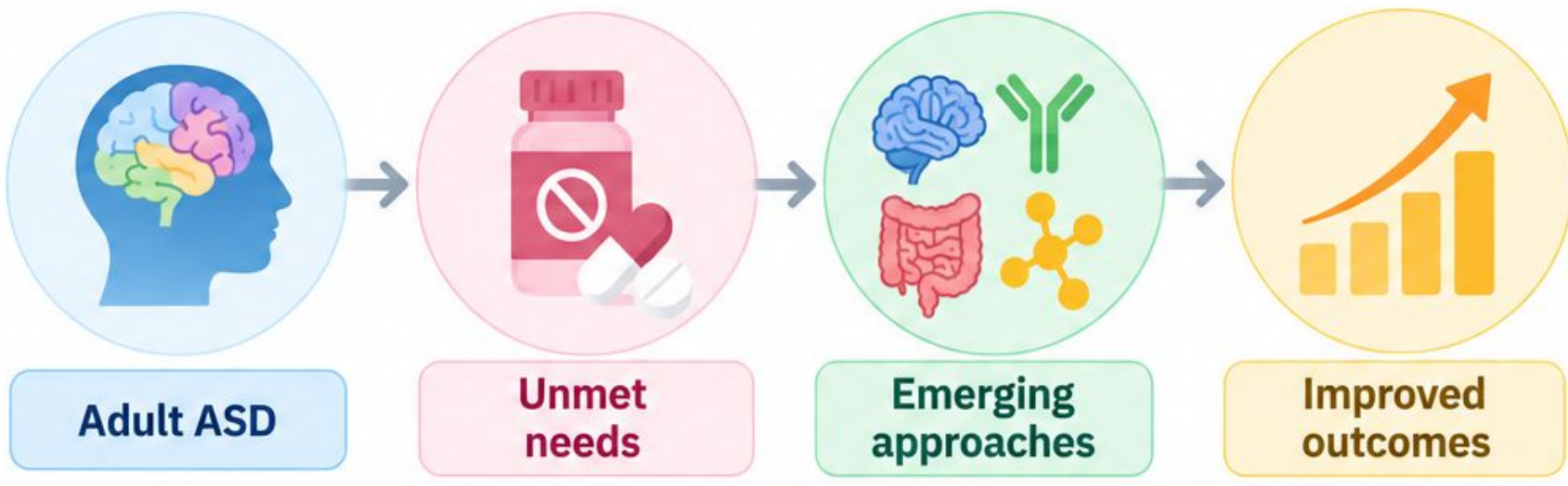


Figure 1. The unmet need and therapeutic opportunity in adult ASD pharmacotherapy.

METHODS

Search Strategy: Systematic search of ClinicalTrials.gov, WHO ICTRP, and EU Clinical Trials Register conducted on 17 February 2026.

Search terms:

Condition: 'autism' OR 'autism spectrum disorder' OR 'ASD'
Intervention: 'pharmacotherapy' OR 'pharm' OR 'drug' OR 'medication*'
Status: recruiting, not yet recruiting, active, not recruiting
Study type: Interventional.

Eligibility (modified PICO)

- **Population:** ASD diagnosis, age ≥ 18 years
- **Intervention:** Pharmacological (biologics, nutraceuticals, investigational drugs)
- **Comparison:** Placebo or standard care
- **Outcomes:** Behavioural, cognitive, neurobiological, or functional
- **Inclusion:** Ongoing at search date; first registered ≥ 1 Jan 2016
- **Exclusion:** Non-pharmacological, observational, paediatric-only (<18), insufficient methodological detail

Quality assessment: Methodological quality assessed via registry information (randomisation, blinding, control groups, sample size, phase, outcome clarity).

RESULTS

Trial Selection:

364 records $\rightarrow$ 57 duplicates removed $\rightarrow$ 307 screened $\rightarrow$ 264 assessed $\rightarrow$ 255 excluded (age criteria $n=250$, pre-2016 $n=2$, non-pharmacological $n=3$) $\rightarrow$ 9 trials $\rightarrow$ 5 excluded (comorbidities/associated symptoms only) $\rightarrow$ **4 trials included.**

All 4 were **Phase 2 studies**. Sample sizes: **20-55 adults (18-60 years)**.

Interventions spanned four mechanistic classes:

- **TB006:** anti-inflammatory/immune-modulating (anti-Galectin-3 mAb)
- **MM402:** monoaminergic/neuromodulatory (R-enantiomer of MDMA)
- **Vitamin B6:** GABAergic/nutraceutical (pyridoxal-5'-phosphate)
- **Microbiota Transfer Therapy (MTT):** gut-brain axis (oral full-spectrum microbiota)

All trials targeted core or closely related ASD symptoms. Substantial heterogeneity in design, sample size, outcome measures, and methodology. Most relied on behavioural and caregiver-reported outcomes, limited incorporation of objective biomarkers.

No trial had published efficacy or safety results at the time of review.

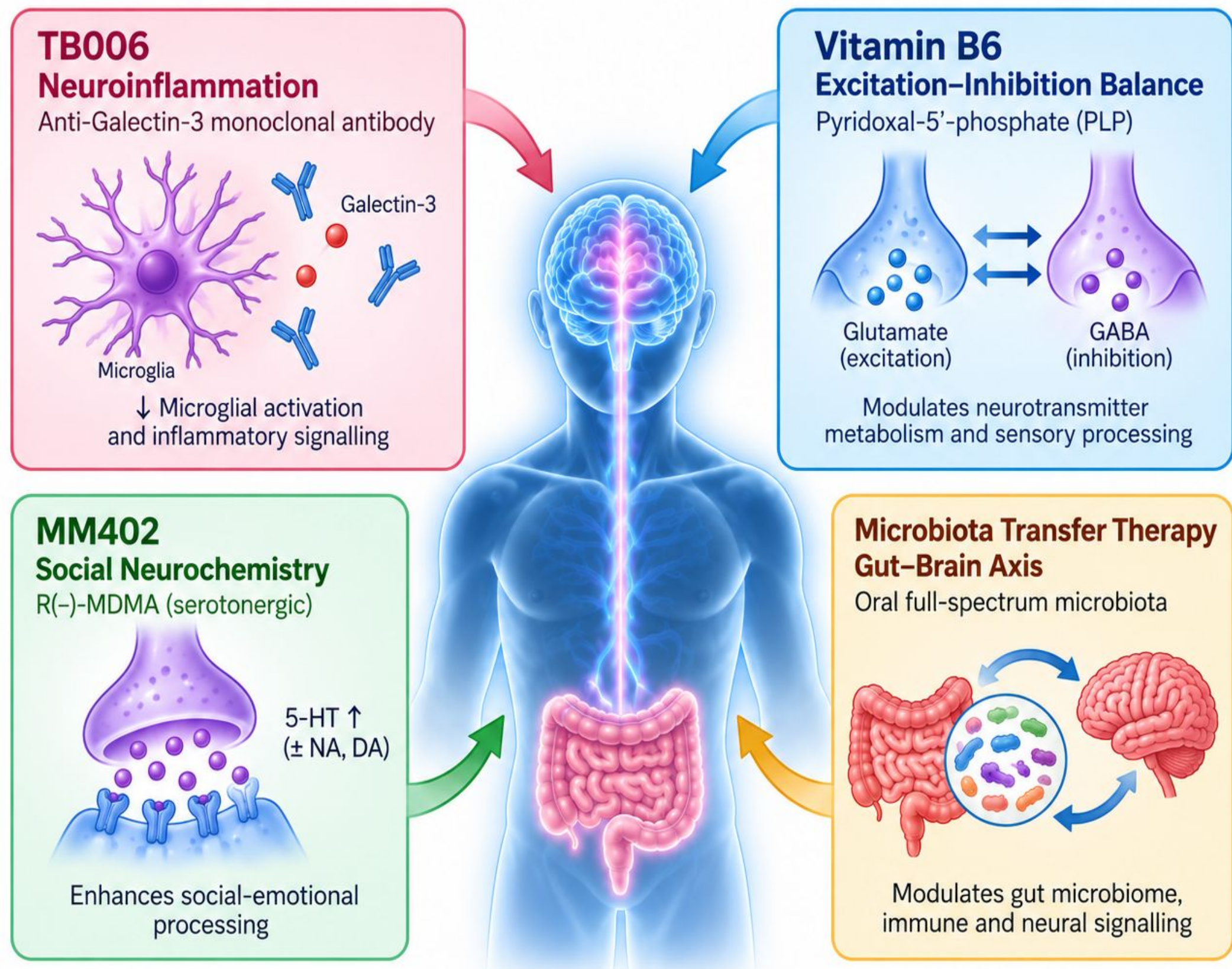


Figure 3. Four emerging mechanistic approaches to pharmacotherapy in adult ASD.

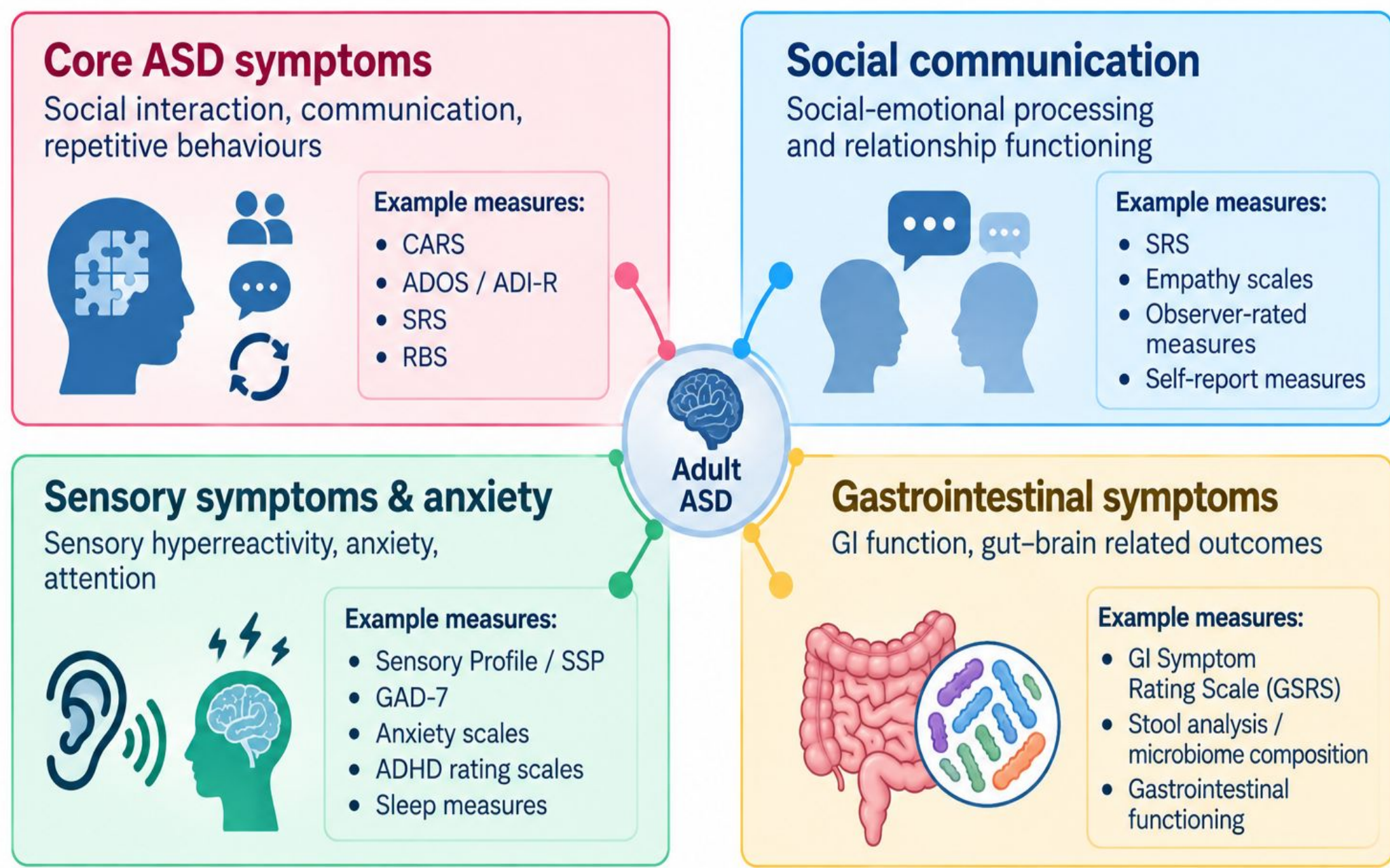


Figure 4. Heterogeneity of clinical outcomes across included trials.

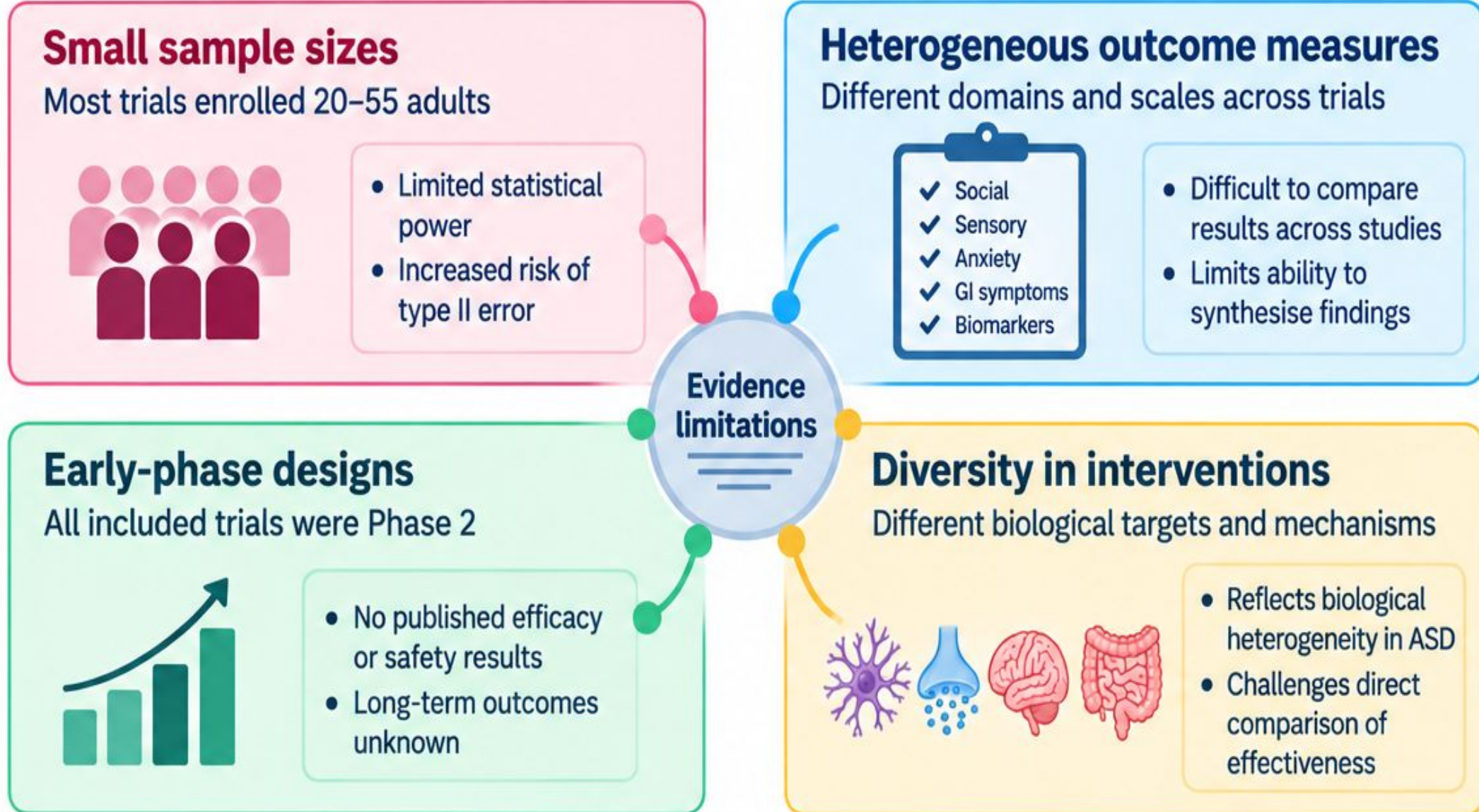


Figure 5. Key limitations of the current evidence base.

DISCUSSION

A field in transition. ASD pharmacotherapy is moving from symptom-based prescribing toward *mechanism-targeted interventions*. The four included trials reflect this shift, targeting neuroinflammation, monoaminergic signalling, E/I balance, and the gut-brain axis.

Diversity without comparability. Different mechanisms, outcomes, and designs reflect genuine biological heterogeneity in ASD but *prevent cross-trial comparison*. We cannot yet say which mechanism is most promising.

The translational gap. Emerging approaches differ substantially in complexity, delivery and potential scalability. However, the absence of published efficacy and safety results prevents conclusions about their comparative clinical utility.

Intervention	Primary Outcome	Strength	Weakness
TB006	Autism severity	Targeted neuroimmune mechanism	IV administration
Vitamin B6	Sensory hyperreactivity + anxiety	Accessible intervention	Preliminary evidence
MM402	Social communication	Mechanistically targeted	Open-label; small sample
MTT	Autism severity + GI symptoms	Gut-brain approach	Complex protocol

Table 1. Primary outcomes, strengths and weaknesses of each clinical trial.

CONCLUSIONS

• **No intervention is yet established** for core ASD symptoms in adults.

• Emerging therapies target **four distinct pathways:** neuroinflammation, E/I balance, social neurochemistry, gut-brain axis

• Evidence remains limited by **small samples, early-phase designs and heterogeneous outcomes**.

What's Needed Next?

- **Phase 3** trials with **larger** adult samples.
- **Standardised** outcome measures (CARS + biomarkers)
- **Long-term** follow-ups (12+ months)
- Interventions that are **both** novel and scalable.

REFERENCES

- [ClinicalTrials.gov](#). TB006 for Autism Spectrum Disorder. NCT06500637.
[ClinicalTrials.gov](#). Vitamin B6 for Sensory Reactivity in Autism. NCT06234501.
[ClinicalTrials.gov](#). MM402 in Adults with Autism Spectrum Disorder. NCT07303907.
Tweedie-Cullen RY, et al. Gut Bugs in Autism Trial: faecal microbiome transfer in autistic adolescents and adults. *BMJ Open*. 2024;14:e074625.
Kang DW, et al. Microbiota Transfer Therapy alters gut ecosystem and improves gastrointestinal and autism symptoms. *Microbiome*. 2017;5:10.
Kang DW, et al. Long-term benefit of Microbiota Transfer Therapy on autism symptoms and gut microbiota. *Sci Rep*. 2019;9:5821.

ACKNOWLEDGEMENTS

This review was conducted independently by the authors as part of a research project at the School of Medicine, Trinity College Dublin. No external funding was received. The authors declare no conflicts of interest.



Sincere thanks to Dr. Lukasz Kowalewski for his guidance, feedback, and support throughout this project.

Figure 2. PRISMA-style flow diagram.