

**Table S1.** Literature search strategy and study selection framework.

<b>Section</b>	<b>Category</b>	<b>Details</b>
<b>Article Counts</b>	Records identified (database search)	1,123 (PubMed, Scopus, Web of Science)
	Additional records (hand-searching)	38 (reference lists of key reviews and primary articles)
	Total records screened (title/abstract)	1,161
	Records excluded (title/abstract)	1,014 (not relevant)
	Full-text articles assessed	147 (relevant to $\geq 1$ thematic domain)
	Full-text excluded	81 (lack of mechanistic endpoints)
	Studies included in synthesis	66 (mechanistic studies, high-impact reviews, translational research)
<b>Inclusion Criteria</b>		Mechanistic studies with defined immune or microbiome endpoints
		High-impact peer-reviewed reviews
		Translational studies (germ-free models, FMT, immune pathway modulation)
		Clinical studies with defined pain phenotypes and microbiome/immune measures
		Published between January 2010 and March 2025
<b>Exclusion Criteria</b>		Studies lacking methodological rigor or peer review
		Purely associative microbiome studies without mechanistic endpoints
		Conference abstracts, letters, case reports
		Non-English studies without verified translation