

Supplementary Table 5. Restorative Therapy of Microbial Origin

Reference	Fang et al., 2023	Zeng et al., 2023	Song et al., 2024	Liu et al., 2024	Han et al., 2021	Ma et al., 2023	Wen et al., 2022	Ye et al., 2025	Hu et al., 2023	Li et al., 2024b	Yan et al., 2024	Liu et al., 2021	Sun et al., 2023	Ning et al., 2024	
Animal Model	Probiotic						FMT			Prebiotic	Postbiotic			Synbiotic	
Intervention	a	b	c	d	e	f	g	h	i	j	k	l	m	n	
Intervention	Busulfan + Alginate oligosaccharide (AOS)-improved gut microbiota administration	Cyclophosphamide injection + <i>Lactobacillus plantarum</i> administration	Cyclophosphamide injection + <i>Lactococcus lactis</i> OTG 1204 administration	Injection of β -Lg alergen + <i>Lactobacillus rhamnosus</i> LZ260E administration	LPS injection + <i>Lactobacillus rhamnosus</i> HDB1258 administration	Cyclophosphamide injection + <i>B. lactis</i> XLTG11 administration	<i>Pseudomonas aeruginosa</i> injection of the lung + FMT	DSS administration (ulcerative colitis) + FMT	Traumatic brain injury + FMT	EAE pertussis toxin injection + inulin administration (prebiotic)	Cyclophosphamide injection + <i>Bacillus amyloliquefaciens</i> -derived nonapeptide (immunomodulator of microbiota origin)	AOM/DSS injection + injection of Butyrate	R97-116 peptide injection (for Myasthenia Gravis) + Sodium Butyrate administration	Cyclophosphamide injection + Probiotics-Prebiotics-Herbal group	
Gut Metrics	Dysbiosis	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	Restored	
	Structure Alteration ^{1,2}		Restored microscopic alteration	Restored microscopic alteration; Restored gut permeability	Restored microscopic alteration	Restored macroscopic alteration	Restored microscopic alteration		Restored macroscopic and microscopic alteration	Restored microscopic alteration		Restored microscopic alteration; Restored gut permeability	Restored macroscopic alteration		
	Immune Alteration ^{5,6,7,8,9}		Restored innate pro-inflammatory and regulatory immune alteration		Restored innate pro and anti-inflammatory immune response	Restored innate pro and anti-inflammatory immune response			Decreased innate pro-inflammatory immune response; Increased innate anti-inflammatory immune response			Restored adaptive pro-inflammatory immune response	Decreased innate pro-inflammatory immune response		
	Immunoglobulin expression ¹⁰											Restored			
	SCFAs ¹¹										Restored				
Spleen Metrics	Structure Alteration ^{3,4}	Restored splenic cellular arrangement	Restored microscopic alteration	Restored macroscopic alteration; Restored splenic cellular arrangement	Restored macroscopic alteration			Restored microscopic alteration	Restored macroscopic alteration		Restored macroscopic alteration	Restored macroscopic alteration	Restored macroscopic and microscopic alteration	Restored macroscopic alteration	
	Immune Alteration ^{5,6,7,8,9}	Restored innate and adaptive pro-inflammatory response		Restored immune alteration	Decreased innate pro-inflammatory immune response	Increased innate pro-inflammatory immune response; Decreased innate anti-inflammatory immune response; Decreased adaptive pro and regulatory immune response	Restored innate and adaptive pro-inflammatory immune response; Restored adaptive anti-inflammatory immune response	Decreased innate and adaptive pro-inflammatory immune response; Increased regulatory immune response		Restored regulatory immune response	Restored innate pro-inflammatory immune response; Increased adaptive pro-inflammatory immune response; Restored regulatory immune response	Restored innate pro and anti-inflammatory immune response		Restored innate and adaptive pro-inflammatory immune response; Restored innate anti-inflammatory immune response	Restored innate and adaptive pro-inflammatory immune response
	Immunoglobulin expression ¹⁰		Increased		Decreased							Restored		Restored	Decreased
	Oxidative stress ¹²											Restored			

¹ Gut Macroscopic Measurement Alteration (Length, Weight) and Fecal Mass Alteration

² Gut Microscopic Structure Damage: Distrupted villi, Destroyed Mucosal Barrier, Depletion of Goblet cells, Infiltration of Inflammatory cells

³ Spleen Macroscopic Measurement Alteration: Spleen weight, Spleen index (Spleen Weight / Body Weight)

⁴ Spleen Microscopic Measurement: diffuse white pulp, smaller follicles, diffuse white - red pulp border, infiltration of inflammatory cells, vascularization

⁵ Innate Immunity Pro-Inflammatory Cells or Cytokines Expression (Macrophage, Neutrophils, NK Cells, IFN- γ , TNF- α , IL-6)

⁶ Innate Immunity Anti-Inflammatory Immune cells or Cytokine Expression (IL-10)

⁷ Adaptive Immunity Pro-Inflammatory Immune cells (CD3 T Lymphocyte, CD4 T Lymphocyte, CD8 T Lymphocyte; Th1 T Lymphocyte, Th2 T Lymphocyte; IgM B Lymphocyte)

⁸ Adaptive Immunity Anti-Inflammatory Immune cells or Cytokine Expression

⁹ Adaptive Immunity Regulatory Immune cells or Cytokines (Th17 Lymphocyte, IL-17 Cytokines, Foxp3 / Treg Lymphocyte)

¹⁰ Immunoglobulin Expression: sIgA, IgM, IgG, IgA

¹¹ SCFAs: butyrate, acetate, propionate

¹² Oxidative Stress: Increased Free Radical Markers (MDA), Decreased Anti-Oxidant Markers (SOD, CAT, GSH)