SUPPLEMENTARY MATERIAL

Table S14. The relationships between gut bacteria and inflammation diseases, immune diseases and allergy diseases.

Phylum	Class	Order	Family	Genus	disease	Potential mechanism
Bacillota	Clostridia	Lachnospirales	Lachnospiraceae	**Lachnospiraceae UCG004**	ischemic stroke[21], decreased thyroid function[22]	SCFA metabolism
				Sellimonas	allergic rhinitis[24]; depression[60]	
				Lachnospiraceae UCG010	Cholelithiasis[23]	lack of bile salt hydrolases
		Eubacteriales	Oscillospiraceae	**Ruminococcaceae UCG004**	Vitiligo[25], acne[25], decreased thyroid function[22]	SCFA metabolism
			Peptococcaceae	**Peptococcus**	wheat-dependent exercise-induced anaphylaxis[26]	IgE specific to wheat
			Eubacteriales incertae sedis	Family XIII UCG001	ulcerative colitis[27]	inflammation
Actinomycetota	Coriobacteriia	Coriobacteriales	Coriobacteriaceae	**Collinsella**	rheumatoid arthritis[28], childhood-onset asthma[44]	inflammation
-	Methanobacteria	Methanobacteriales	Methanobacteriaceae	Methanobrevibacter	inflammatory bowel disease[29,30]	Inflammation

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Table S15. The relationships between mediation metabolic pathways or related metabolites and immune diseases.

Metabolic pathway	Metabolism (Immune regulation/ immune disease)	Effect on mast cell
PWY-7400: L-arginine biosynthesis IV (archaebacteria)	L-arginine (Psoriasis)[38], NO synthesized from L-arg (CSU)[39]	Rat mast cells synthesized NO-like factor from L-arginine[40]; Rat mast cells were induced to release histamine by poly-l-arginine[41].
KDO-NAGLIPASYN-PWY: superpathway of (Kdo)2-lipid A biosynthesis	KDO-NAGLIPASYN-PWY (atopic dermatitis)[55], (Kdo)2-lipid A (immune response) [51-54]	(Kdo)2-lipid A could be recognized by mast cells to stimulate host immune responses[51-54]
PWY-7221: guanosine ribonucleotides de novo biosynthesis	Nucleotide (immunological functions of newborns) [49]	-

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