



**Figure S1. Alpha diversity analysis of the gut microbiota in NC, MCI, and AD.**

Alpha diversity analysis of the gut microbiota among NC, MCI, and AD, illustrated by A. Rarefaction curves; B. Shannon-Wiener curves; C. Species accumulation curves. NC, cognitively normal controls; MCI, mild cognitive impairment; AD, Alzheimer's disease; OTUs, Operational taxonomic units.

**Table S1. The correlation (Corr) coefficients and P value of the five specific gut microbiota**

<b>taxa with clinical characteristics</b>					
	Erysipelatoclostridiaceae	Erysipelotrichales	Saccharimonadales	Patescibacteria	Saccharimonadia
Age	0.066024202	0.048186319	0.162941006	0.162941006	0.162941006
	P>0.05	P>0.05	P=0.0045	P=0.0045	P=0.0045
Education	-0.04574294	-0.035431348	-0.101498002	-0.101498002	-0.101498002
	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05
MMSE	-0.079646069	-0.092068593	-0.285270844	-0.285270844	-0.285270844
	P>0.05	P>0.05	P=4.61e-07	P=4.61e-07	P=4.61e-07
MoCA	-0.105802869	-0.113735467	-0.228162636	-0.228162636	-0.228162636
	P>0.05	P>0.05	P=5.31e-04	P=5.31e-04	P=5.31e-04
Z_memory	-0.160678551	-0.18852155	-0.174634342	-0.174634342	-0.174634342
	P=0.0087	P=0.002	P=0.0043	P=0.0043	P=0.0043
Z_attention	-0.089689796	-0.115544157	-0.057319084	-0.057319084	-0.057319084
	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05
Z_visuospatial	-0.12996039	-0.116307259	-0.105414672	-0.105414672	-0.105414672
	P=0.0341	P>0.05	P>0.05	P>0.05	P>0.05
Z_executive	-0.082433706	-0.075605569	-0.209663066	-0.209663066	-0.209663066
	P>0.05	P>0.05	P=5.78e-04	P=5.78e-04	P=5.78e-04
Z_language	-0.094812701	-0.112472813	-0.189420894	-0.189420894	-0.189420894
	P>0.05	P>0.05	P=0.0019	P=0.0019	P=0.0019
CDR	0.113356807	0.127017794	0.314628499	0.314628499	0.314628499
	P=0.0494	P=0.0276	P=2.43e-08	P=2.43e-08	P=2.43e-08
ADL	-0.023100965	-0.008717582	0.231340891	0.231340891	0.231340891
	P>0.05	P>0.05	P=5.87e-05	P=5.87e-05	P=5.87e-05

MMSE, Mini-mental State Examination; MoCA, Montreal Cognitive Assessment; ADL, Activities of Daily Living; CDR, Clinical Dementia Rating. The composite Z scores were computed for specific cognitive domains including memory, attention, visuospatial ability, Language, and Executive function.

**Table S2. The P value of abundance comparisons of five specific taxa among different clinical subgroups**

Subgroup comparison	Erysipelatoclostridiaceae	Erysipelotrichales	Saccharimonadales	Patescibacteria	Saccharimonadia
NC vs. MCI	0.005645	0.02662	0.007575	0.007575	0.007575
NC vs. AD	6.32E-06	8.28E-06	8.37E-05	8.37E-05	8.37E-05
MCI vs. AD	0.0299	0.008745	0.04777	0.04777	0.04777
Comparison among NC, MCI and AD	3.03E-05	4.54E-05	0.000211	0.000211	0.000211
CDR 0 vs. 0.5	3.10E-05	0.0003111	0.004855	0.004855	0.004855
CDR 0 vs. 1	7.57E-05	2.47E-05	0.00652	0.00652	0.00652
CDR 0 vs. 2	6.13E-06	4.59E-05	0.000779	0.000779	0.000779
CDR 0 vs. 3	0.0286	0.07643	0.01093	0.01093	0.01093
CDR 0.5 vs. 1	0.3456	0.05666	0.4117	0.4117	0.4117
CDR 0.5 vs. 2	0.0408	0.06467	0.07114	0.07114	0.07114
CDR 0.5 vs. 3	0.5797	0.4941	0.03867	0.03867	0.03867
CDR 1 vs. 2	0.3037	0.8813	0.4025	0.4025	0.4025
CDR 1 vs. 3	0.921	0.9125	0.1355	0.1355	0.1355
CDR 2 vs. 3	0.7158	0.8555	0.2676	0.2676	0.2676
Comparison among CDR 0, 0.5, 1, 2 and 3	2.52E-06	1.19E-05	0.0005255	0.0005255	0.0005255
<i>APOE</i> 4- vs. <i>APOE</i> 4+	0.01978	0.004703	0.01303	0.01303	0.01303

NC, cognitively normal controls; MCI, mild cognitive impairment; AD, Alzheimer's disease. AD, Alzheimer's disease; CDR, Clinical Dementia Rating. APOE, apolipoprotein E.

**Table S3. The P value of abundance comparisons of five specific taxa among different clinical subgroups in participants aged  $\geq 60$  yrs.**

Subgroup comparison	Erysipelatoclostridiaceae	Erysipelotrichales	Saccharimonadales	Patescibacteria	Saccharimonadia
NC vs. MCI	0.006	0.035	0.031	0.031	0.031
NC vs. AD	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MCI vs. AD	0.202	0.064	0.195	0.195	0.195
Comparison among NC, MCI and AD	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
CDR 0 vs. 0.5	0.001	0.008	0.077	0.077	0.077
CDR 0 vs. 1	0.001	< 0.001	0.092	0.092	0.092
CDR 0 vs. 2	0	< 0.001	0.003	0.003	0.003
CDR 0 vs. 3	1	1	0.095	0.095	0.095
CDR 0.5 vs. 1	1	0.713	1	1	1
CDR 0.5 vs. 2	0.427	0.622	0.565	0.565	0.565
CDR 0.5 vs. 3	1	1	0.725	0.725	0.725
CDR 1 vs. 2	1	1	1	1	1
CDR 1 vs. 3	1	1	1	1	1
CDR 2 vs. 3	1	1	1	1	1
Comparison among CDR 0, 0.5, 1, 2 and 3	< 0.001	< 0.001	0.001	< 0.001	< 0.001
APOE 4- vs. APOE 4+	< 0.001	< 0.001	0.012	0.012	0.012

NC, cognitively normal controls; MCI, mild cognitive impairment; AD, Alzheimer's disease. AD, Alzheimer's disease; CDR, Clinical Dementia Rating. APOE, apolipoprotein E.