

**Supplementary tables**

**Supplementary table S1.** Particle size and zeta potential of modified SmP and modified SmPNPs.

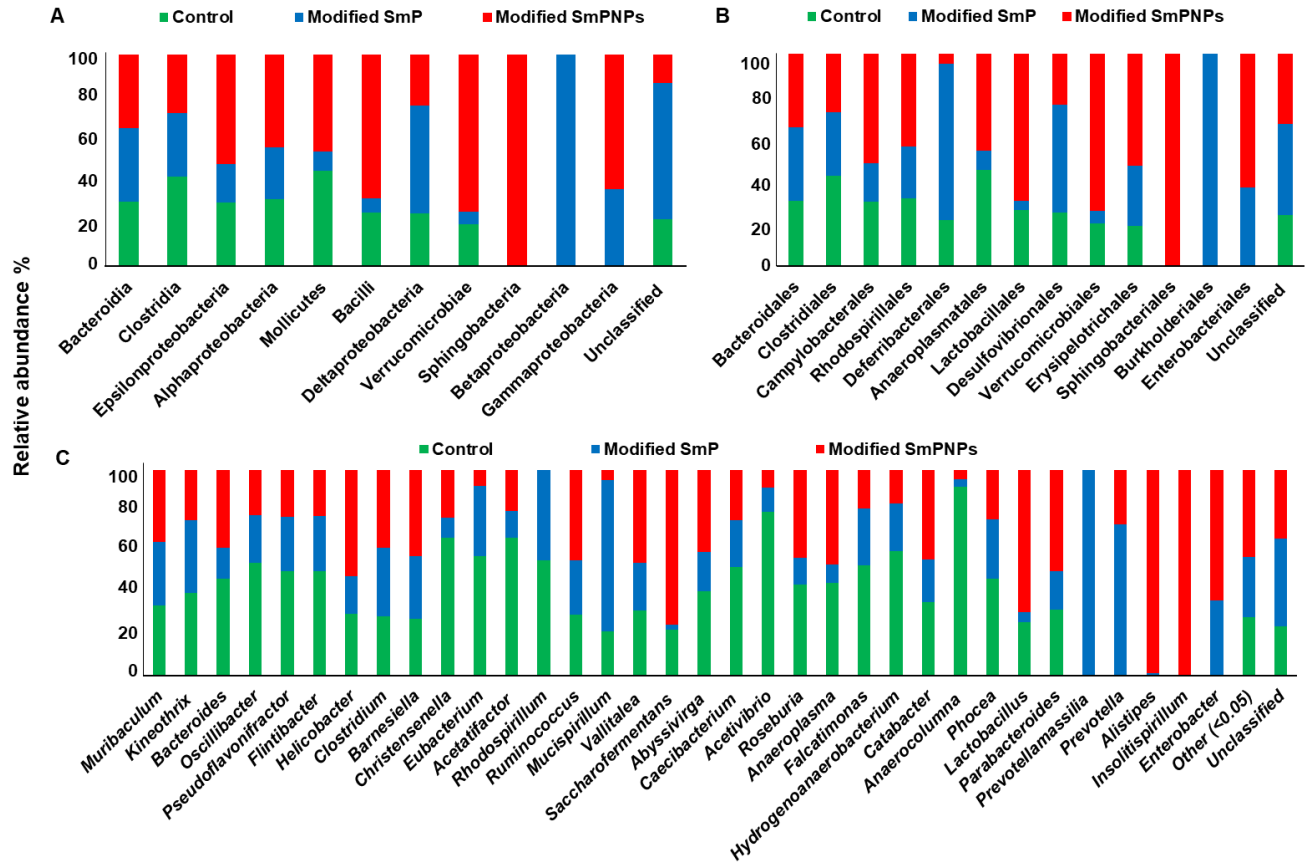
<b>Product</b>	<b>Average particle size (nm)</b>	<b>Zeta potential (mV)</b>
Modified SmP	152.90	-24.4
Modified SmPNPs	64.11	-24.6

**Supplementary table S2.** Description of the selected genes, related functions and specific primer in this study.

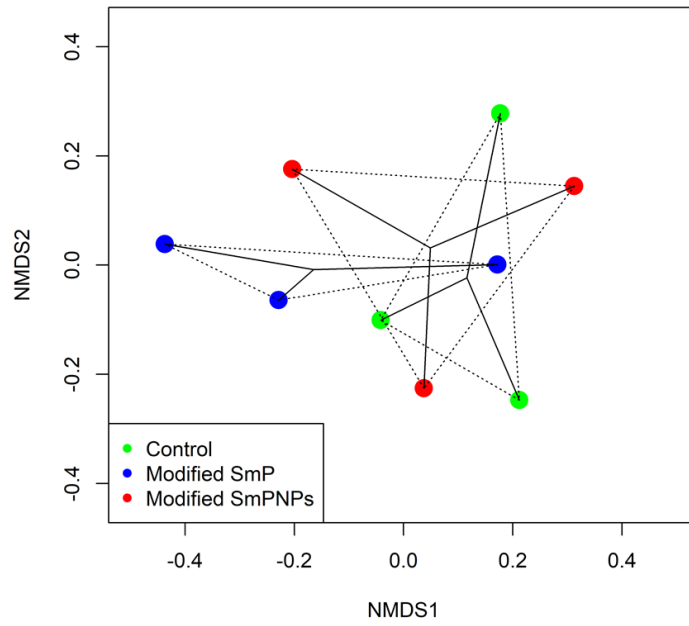
Accession number	Gene nam	Main functions	Primer sequences	
			Forward (5'-3')	Reverse (5'-3')
<b>BC034197.1</b>	Mucin 2 (Muc2)	Antimicrobial activity	ATGCCACCTCCTCAAAGAC	GTAGTTCCGTTGGAACAGTGAAT
NM_023566.3	Mucin 3 (Muc3)	Antimicrobial activity	GTAGTTCCGTTGGAACAGTGAAT	GCCGTGAATTGTATGAACGGA
NP_034974.1	Mucin 5ac (Muc5ac)	Antimicrobial function	GTGGTTTGACACTGACTTCCC	CTCCTCTCGGTGACAGAGTCT
NM_011575.2	Trefoil factor 3 (Tff3)	Intestinal barrier function	CCTGGTTGCTGGGTCCTCTG	GCCACGGTTGTTACTGCTC
NR_003146.1	Defensin $\alpha$ pseudogene 1 (Defa-ps1)	Antimicrobial activity	AGACACTAGTCCTCCTCTCTG	CTGGCTGCTCCTCAGTATTAG
NM_183253.3	Defensin $\alpha$ 21 (Def $\alpha$ 21)	Antimicrobial activity	CCAGGGGAAGATGACCAGGCTG	CCAGGGGAAGATGACCAGGCTG
NM_007844.2	Defensin $\alpha$ 29 (Defa29)	Antimicrobial activity	TCCAGGCTGATCCTATCCAA	GCCTCCAAAGGAGACAGAAA
NM_013590.4	Lysozyme 1 (Lyz1)	Antimicrobial function	GAAGCACCGACTATGGGATATT	GATCCACAGGCATTCTTAGAT
NM_011259.1	Regenerating islet-derived 3 $\alpha$ (Reg3 $\alpha$ )	Bacteriocidic mechanisms	CTCCTGCCTGTTGTTTGTATTTT	CATAGCAGTGGGAGCGATAAG
NM_011036.1	Regenerating islet-derived 3 $\beta$ (Reg3b)	Bacteriocidic mechanisms	TACTGCCTTAGACCGTGCTTCTG	GACATAGGGCAACTTCACCTCACA
NM_010846.1	Myxovirus resistance protein (Mx1)	Antiviral activity	ACAAGCACAGGAAACCGTATCAG	AGGCAGTTTGGACCATCTTAGTG
NM_015783.3	Interferon stimulated gene 15 (Isg15)	Antiviral activity	CAATGGCCTGGGACCTAAA	CTTCTTCAGTTCTGACACCGTCAT
NM_010502.2	Interferon $\alpha$ 1 (Ifn $\alpha$ 1)	Antiviral activity	CTCTCCTGCCTGAAGGACAGGAAG	GGTGGAGGTCATTGCAGAATGAGT
NM_031168.2	Interleukin 6 (Il6)	Antiinflammatory activity	TCCATCCAGTTGCCTTCTTGG-3	CCACGATTTCCAGAGAACATG

NM_010548.2	Interleukin 10 (Il10)	Antiinflammatory activity	TTGAATTCCTGGGTGAGAAG	TCCACTGCCTTGCTCTTATTT
NM_001081082.2	Alkaline phosphatase (Alpi)	Maintain microbiome homeostasis	GGCTACACACTTAGGGGGACCTCCA	AGCTTCGGTGACATTGGGCCGGTT
NM_007432.2	Alkaline phosphatase 3 (Akp3)	Maintain microbiome homeostasis	ACATTGCTACACAACCTCATCTCC	TCCTGCCATCCAATCTGGTTC
NM_011577.2	Transforming growth factor $\beta$ (Tgf- $\beta$ )	Mediator in gut immunogenic responses	CACCGGAGAGCCCTGGATA	TGTACAGCTGCCGCACACA
NM_010851.3	Myeloid differentiation response gene 88 (Myd88)	Adaptor function in immune mechanisms	TCGATGCCTTTATCTGCTACTG	GGTCGGACACACACAACCTTA

## Supplementary figures



**Supplementary figure S1.** Diet-specific changes on taxonomic composition of fecal microbial community of control, modified SmP and SmPNPs treated mice; (A) Comparison of order level; (B) Comparison of class level; (C) Comparison of genus level.



**Supplementary figure S2.** Graphical representation of PERMANOVA analysis of relative abundance of gut microbiota families in control, modified SmP and SmPNPs, computed by Vegan package of R 3.6.1. with 999 permutations for all comparisons. There were no statistically significant ( $p > 0.05$ ) differences among three groups analyzed. The Bray-Curtis distance matrices are visualized using a nonmetric multiple dimensional scaling ((NMDS1) and NMDS2) plot.