

**Table S3.** Results from Primer 7e 2-way PERMANOVA analysis at a phylum (A), genus (B) and an OTU level (C)

**Table 3A – Phylum level:** abbreviations Factor 1- NE challenge (Cp) and Factor 2 -probiotic additive (Ad)

**PERMANOVA**  
Permutational MANOVA

*Resemblance worksheet*  
Name: Resem2  
Data type: Similarity  
Selection: All  
Resemblance: S17 Bray-Curtis similarity

Sums of squares type: Type III (partial)  
Fixed effects sum to zero for mixed terms  
Permutation method: Permutation of residuals under a reduced model  
Number of permutations: 99999

*Factors*

Name	Abbrev.	Type	Levels
Cp	Cp	Fixed	2
Aditive	Ad	Fixed	2

*PERMANOVA table of results*

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms	P(MC)
Cp	1	325.9	325.9	4.7139	0.0114	95736	0.0123
Ad	1	61.781	61.781	0.89361	0.4206	95735	0.4188
CpxAd	1	240.56	240.56	3.4795	0.0342	95740	0.0351
Res	48	3318.5	69.136				
Total	51	3951.5					

*Details of the expected mean squares (EMS) for the model*

Source	EMS
Cp	1*v(Res) + 25.923*s(Cp)
Ad	1*v(Res) + 25.923*s(Ad)
CpxAd	1*v(Res) + 12.961*s(CpxAd)
Res	1*v(Res)

*Construction of Pseudo-F ratio(s) from mean squares*

Source	Numerator	Denominator	Num. df	Den. df
Cp	1*Cp	1*Res	1	48
Ad	1*Ad	1*Res	1	48
CpxAd	1*CpxAd	1*Res	1	48

*Estimates of components of variation*

Source	Estimate	Sq. root
S(Cp)	9.905	3.1472
S(Ad)	-0.28375	-0.53269
S(CpxAd)	13.225	3.6367
V(Res)	69.136	8.3148

**Table 3B – Genus level:** abbreviations Factor 1- NE challenge (Cp) and Factor 2 -probiotic additive (Ad)

## PERMANOVA

### Permutational MANOVA

#### *Resemblance worksheet*

Name: Resem1

Data type: Similarity

Selection: All

Resemblance: S17 Bray-Curtis similarity

Sums of squares type: Type III (partial)

Fixed effects sum to zero for mixed terms

Permutation method: Permutation of residuals under a reduced model

Number of permutations: 99999

#### *Factors*

Name	Abbrev.	Type	Levels
Cp	Cp	Fixed	2
Aditive	Ad	Fixed	2

#### *PERMANOVA table of results*

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms	P(MC)
Cp	1	456.67	456.67	1.987	0.064	93875	0.071
Ad	1	404.26	404.26	1.759	0.0981	93880	0.1043
CpxAd	1	316.31	316.31	1.3763	0.1969	93966	0.2008
Res	48	11032	229.83				
Total	51	12202					

#### *Details of the expected mean squares (EMS) for the model*

Source	EMS
Cp	$1 * v(\text{Res}) + 25.923 * S(\text{Cp})$
Ad	$1 * v(\text{Res}) + 25.923 * S(\text{Ad})$
CpxAd	$1 * v(\text{Res}) + 12.961 * S(\text{CpxAd})$
Res	$1 * v(\text{Res})$

#### *Construction of Pseudo-F ratio(s) from mean squares*

Source	Numerator	Denominator	Num. df	Den. df
Cp	1 * Cp	1 * Res	1	48
Ad	1 * Ad	1 * Res	1	48
CpxAd	1 * CpxAd	1 * Res	1	48

#### *Estimates of components of variation*

Source	Estimate	Sq. root
S(Cp)	8.7508	2.9582
S(Ad)	6.729	2.594
S(CpxAd)	6.6719	2.583
V(Res)	229.83	15.16

**Table 3C – an OTU level:** abbreviations Factor 1- NE challenge (Cp) and Factor 2 -probiotic additive (Ad)

**PERMANOVA**  
Permutational MANOVA

*Resemblance worksheet*  
Name: Resem3  
Data type: Similarity  
Selection: All  
Resemblance: S17 Bray-Curtis similarity

Sums of squares type: Type III (partial)  
Fixed effects sum to zero for mixed terms  
Permutation method: Permutation of residuals under a reduced model  
Number of permutations: 99999

*Factors*

Name	Abbrev.	Type	Levels
Cp	Cp	Fixed	2
Aditive	Ad	Fixed	2

*PERMANOVA table of results*

Source	df	SS	MS	Pseudo-F	P(perm)	Unique perms	P(MC)
Cp	1	2562.2	2562.2	1.7576	0.0079	87709	0.023
Ad	1	2012.1	2012.1	1.3802	0.0651	87697	0.1088
CpxAd	1	2181.3	2181.3	1.4963	0.032	87667	0.069
Res	48	69976	1457.8				
Total	51	76725					

*Details of the expected mean squares (EMS) for the model*

Source	EMS
Cp	$1 \cdot V(\text{Res}) + 25.923 \cdot S(\text{Cp})$
Ad	$1 \cdot V(\text{Res}) + 25.923 \cdot S(\text{Ad})$
CpxAd	$1 \cdot V(\text{Res}) + 12.961 \cdot S(\text{CpxAd})$
Res	$1 \cdot V(\text{Res})$

*Construction of Pseudo-F ratio(s) from mean squares*

Source	Numerator	Denominator	Num. df	Den. df
Cp	1*Cp	1*Res	1	48
Ad	1*Ad	1*Res	1	48
CpxAd	1*CpxAd	1*Res	1	48

*Estimates of components of variation*

Source	Estimate	Sq. root
S(Cp)	42.604	6.5271
S(Ad)	21.382	4.624
S(CpxAd)	55.819	7.4712
V(Res)	1457.8	38.182