

## Supplementary materials

**Table S1.** Parasitology results of horses included in the study. Key: FEC = faecal egg count, e.p.g = eggs per gram. Ascarid eggs were also checked for, but all samples were negative.

Horse ID (Control)	FEC (e.p.g)	Horse ID (Tapeworm positive)	<i>A. perfoliata</i> status	FEC (e.p.g)
C1	10	T1	low	90
C2	423	T2	Positive, unrecorded	19
C3	141	T3	low	0
C4	42	T4	low	12
C5	156	T5	low	273
C6	180	T7	med	22
C7	0	T8	low	300
C8	72	T9	Positive, unrecorded	177
C9	234	T10	Positive, unrecorded	105
C10	135	T11	Positive, unrecorded	162
C12	0	T12	high	43
C13	23	T13	high	48
C14	174	T14	med	315
C15	135	T15	high	54
C16	288	T16	high	31
C17	159	T17	med	66
C18	219	T18	high	0
C19	252	T19	med	135
C20	174	T20	low	2
C21	0	T21	low	1
C22	120			
C23	0			
C24	204			
C26	0			
C27	13			
C28	216			
C29	99			
C30	282			

**Table S2.** Barcoded index primers.

Sample	Primer set	Forward	Reverse
	Overhang region on first primer set	ACA CTC TTT CCC TAC ACG ACG CTC TTC CGA TCT	GTG ACT GGA GTT CAG ACG TGT GCT CTT CCG ATC T
Neg	N502_N701	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATTTCGCTTAGTGACTGGAG TTCAGACGTGTGCTC
T5	N502_N702	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCTAGTACGGTGACTGGAG TTCAGACGTGTGCTC
C19	N502_N703	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT TCAGACGTGTGCTC
C14	N502_N704	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATGCTCAGGAGTGACTGGAG TTCAGACGTGTGCTC
C16	N502_N705	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATAGGAGTCCGTGACTGGAG TTCAGACGTGTGCTC
T7	N502_N706	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCATGCCTAGTGACTGGAG TTCAGACGTGTGCTC
T10	N502_N707	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTGACTGGA GTTTTCAGACGTGTGCTC
C20	N502_N708	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTGACTGGAG TTCAGACGTGTGCTC
C2	N502_N709	AATGATACGGCGACCACCGAGATCTACACCTCTCTATACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATAGCGTAGCGTGACTGGAG TTCAGACGTGTGCTC
C6	N503_N702	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCTAGTACGGTGACTGGAG TTCAGACGTGTGCTC
C30	N503_N703	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT TCAGACGTGTGCTC
C15	N503_N705	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATAGGAGTCCGTGACTGGAG TTCAGACGTGTGCTC
T21	N503_N706	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCATGCCTAGTGACTGGAG TTCAGACGTGTGCTC
T11	N503_N707	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTGACTGGA GTTTTCAGACGTGTGCTC
T8	N503_N708	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTGACTGGAG TTCAGACGTGTGCTC
T1	N503_N709	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATAGCGTAGCGTGACTGGAG TTCAGACGTGTGCTC
T20	N503_N710	AATGATACGGCGACCACCGAGATCTACACTATCCTCTACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCAGCCTCGGTGACTGGAG TTCAGACGTGTGCTC
C22	N504_N702	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATCTAGTACGGTGACTGGAG TTCAGACGTGTGCTC
C26	N504_N703	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT TCAGACGTGTGCTC
T13	N504_N704	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CCCTACACGACGCTC	CAAGCAGAAGACGGCATAACGAGATGCTCAGGAGTGACTGGAG TTCAGACGTGTGCTC

Sample	Primer set	Forward	Reverse
T4	N504_N705	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTTCAAGCAGAAGACGGCATAACGAGATAGGAGTCCGTGACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C9	N504_N706	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CAAGCAGAAGACGGCATAACGAGATCATGCCTAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C18	N504_N707	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTGACTGGA CCCTACACGACGCTC	GTTACAGACGTGTGCTC
T3	N504_N708	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C17	N504_N709	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTTCAAGCAGAAGACGGCATAACGAGATAGCGTAGCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C1	N504_N710	AATGATACGGCGACCACCGAGATCTACACAGAGTAGAACACTCTTT CAAGCAGAAGACGGCATAACGAGATAGCCTCGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C13	N505_N702	AATGATACGGCGACCACCGAGATCTACAGTAAGGAGACTCTTT CAAGCAGAAGACGGCATAACGAGATCTAGTACGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T12	N505_N703	AATGATACGGCGACCACCGAGATCTACACGTAAGGAGACTCTTTCAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT CCCTACACGACGCTC	TCAGACGTGTGCTC
C10	N505_N704	AATGATACGGCGACCACCGAGATCTACACGTAAGGAGACTCTTTCAAGCAGAAGACGGCATAACGAGATGCTCAGGAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T15	N505_N705	AATGATACGGCGACCACCGAGATCTACAGTAAGGAGACTCTTT CAAGCAGAAGACGGCATAACGAGATAGGAGTCCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T19	N505_N706	AATGATACGGCGACCACCGAGATCTACACGTAAGGAGACTCTTT CAAGCAGAAGACGGCATAACGAGATCATGCCTAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T14	N505_N707	AATGATACGGCGACCACCGAGATCTACACGTAAGGAGACTCTTT CAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTACTGGA CCCTACACGACGCTC	GTTACAGACGTGTGCTC
C23	N505_N708	AATGATACGGCGACCACCGAGATCTACAGTAAGGAGACTCTTT CAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C3	N505_N709	AATGATACGGCGACCACCGAGATCTACACGTAAGGAGACTCTTTCAAGCAGAAGACGGCATAACGAGATAGCGTAGCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T9	N506_N702	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATCTAGTACGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T17	N506_N703	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT CCCTACACGACGCTC	TCAGACGTGTGCTC
C28	N506_N704	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATGCTCAGGAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C21	N506_N705	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATAGGAGTCCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C4	N506_N706	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATCATGCCTAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T2	N506_N707	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTACTGGA CCCTACACGACGCTC	GTTACAGACGTGTGCTC
C27	N506_N708	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C12	N506_N709	AATGATACGGCGACCACCGAGATCTACACTGCATAAACACTCTTT CAAGCAGAAGACGGCATAACGAGATAGCGTAGCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC

C5	N507_N702	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATCTAGTACGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C24	N507_N703	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATTTCTGCCTGTGACTGGAGT CCCTACACGACGCTC	TCAGACGTGTGCTC
T16	N507_N704	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATGCTCAGGAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
T18	N507_N706	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATCATGCCTAGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C7	N507_N707	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATGTAGAGAGGTACTGGA CCCTACACGACGCTC	GTTACAGACGTGTGCTC
C29	N507_N708	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATCCTCTCTGGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC
C8	N507_N709	AATGATACGGCGACCACCGAGATCTACACAAGGAGTAACACTCTTTCAAGCAGAAGACGGCATAACGAGATACCGTAGCGTACTGGAG CCCTACACGACGCTC	TTCAGACGTGTGCTC

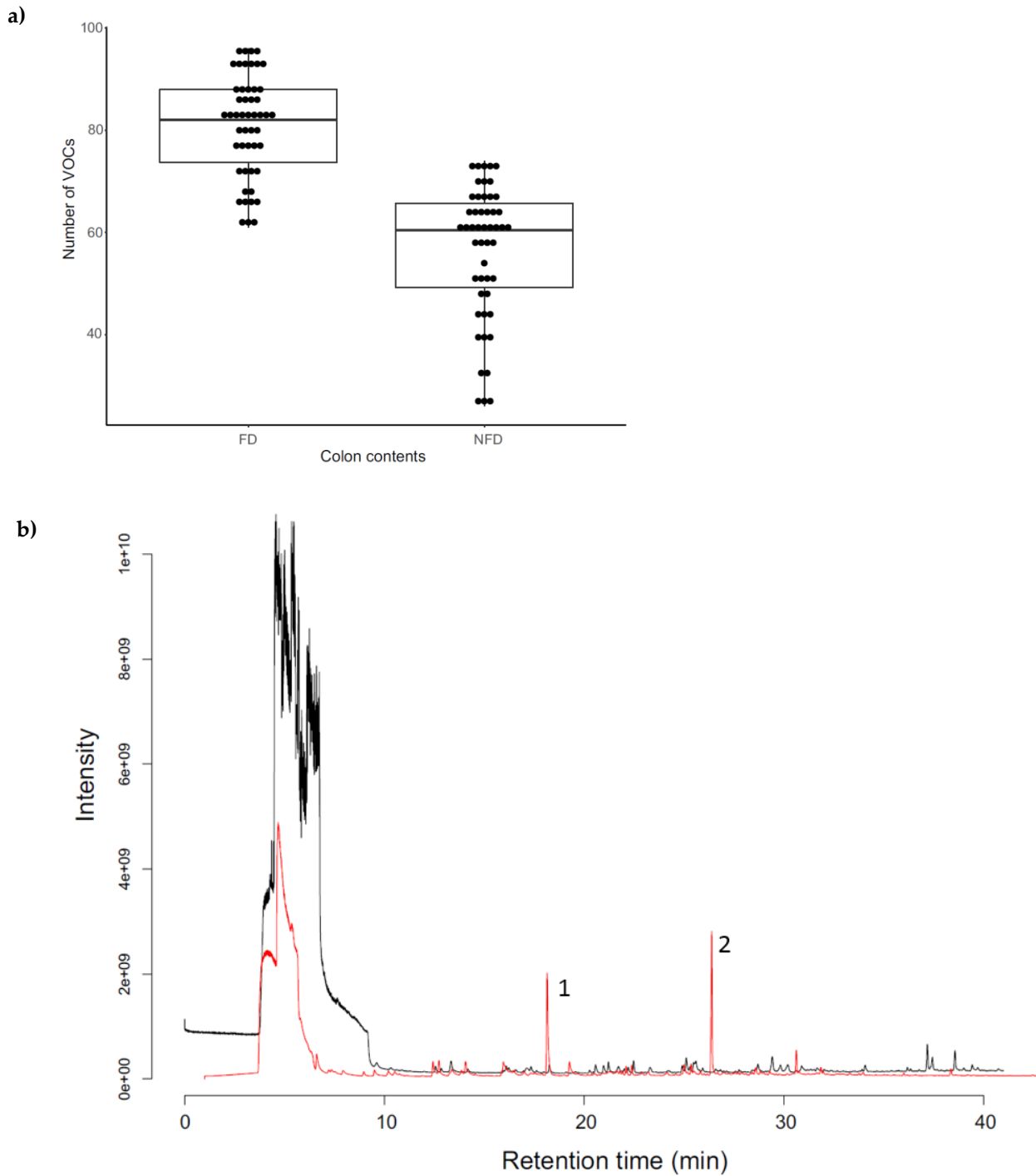
**Table S3.** A list of VOCs identified and frequencies of occurrence in TP and CO samples.

<b>Retention time_VOC</b>	<b>Present Control</b>	<b>Present Tape</b>
10.22_2,3-Butanedione	28	20
10.50_2-Butanone	21	20
10.60_Ethyl acetate	23	13
10.80_2-Butanol	24	17
11.93_1-Propanol, 2-methyl-	27	17
12.45_Butanal, 3-methyl-	28	20
12.55_Acetic acid	11	14
12.79_Butanal, 2-methyl-	28	20
13.43_Furan, 2-ethyl-	20	16
13.80_1-Penten-3-one	5	10
13.88_2-Pentanone	21	16
13.94_1-Penten-3-ol	28	18
14.21_Pentanal	28	20
14.30_n-Propyl acetate	16	15
14.63_Butanoic acid, methyl ester	25	17
15.21_Heptane, 2-methyl-	12	15
16.07_Propanoic acid	19	17
16.19_3-Pentanone, 2-methyl-	11	13
16.50_Toluene	25	19
16.66-Octane	27	19
16.92_2-Octene, (E)-	4	10
16.93_1-Propanone, 1-cyclopropyl-	26	17
17.27_1-Pentanol	26	19
17.61_Butanoic acid, ethyl ester	24	16
18.01_2-Hexanone	23	17
18.25_Hexanal	28	20
18.64_Methyl valerate	13	11
19.40_Butanoic acid	25	19
20.30_Ethylbenzene	27	20
20.49_Nonane	28	20
20.60_Benzene, 1,3-dimethyl-	28	20
21.00_2-Hexenal	23	17
21.32_1-Hexanol	14	11
21.71_Styrene	28	19
21.73_Butanoic acid, 2-methyl-	6	9
21.94_2-Heptanone	28	20
22.05_1,7-Octadiene, 2,7-dimethyl-	25	16
22.26_Heptanal	28	20
22.52_1,6-Octadiene, 3,7-dimethyl-, (S)-	27	20
22.85_Nonane, 2-methyl-	22	17
24.21_Decane	28	20
24.37_2-Heptanone, 6-methyl-	28	20
24.68_2-Heptanone, 5-methyl-	21	16
24.74_Furan, 2-pentyl-	28	19
24.90_1-Heptanol	5	11
25.23_1-Octen-3-ol	25	19
25.36_3-Octanone	27	20
25.44_Benzene, 1,2,4-trimethyl-	18	13
25.441_Benzaldehyde	15	10
25.55_5-Hepten-2-one, 6-methyl-	28	20
25.66_2-Octanone	12	14
25.68_3-Octanol	26	17
26.01-Octanal	28	20
26.20_D-Limonene	28	20
26.53_Dimethyl sulfone	28	20
27.66_Cyclohexanone, 2,2,6-trimethyl-	27	20
27.70_Undecane	15	9

28.00_Phenol	25	19
29.16_2-Nonanone	16	15
29.51_Nonanal	25	17
30.37_2(3H)-Furanone, 5-ethylidihydro-	20	14
30.75_Dodecane	27	20
30.91_p-Cresol	17	14
31.43_Undecane, 2,6-dimethyl-	27	20
31.50_Benzyl methyl ketone	9	9
32.41_2-Decanone	27	20
34.03_Tridecane	27	20
34.15_1-Cyclohexene-1-carboxaldehyde, 2,6,6-trimethyl-	28	20
35.46_2-Undecanone	22	18
35.73_1H-Pyrrole-2,5-dione, 3-ethyl-4-methyl-	9	11
36.01_Tridecane, 3-methyl-	21	16
36.30_Dodecane, 2,6,10-trimethyl-	28	20
36.89_Tetradecane	28	20
38.70_Heptadecane, 2,6,10,14-tetramethyl-	28	20
40.72_2-Butanone, 4-(2,6,6-trimethyl-1-cyclohexen-1-yl)-	8	10
6.62_Ethanol	28	20
7.19_Propanal	28	20
7.35_Acetone	28	20
7.48_Dimethyl sulfide	21	12
7.55_Isopropyl Alcohol	19	11
7.92_Acetic acid, methyl ester	28	20
8.98_Propanal, 2-methyl-	28	20
9.35_Methacrolein	6	10
9.54_1-Propanol	27	20
9.89_Furan, 2-methyl-	12	14

**Table S4.** Taxonomic identification of OTUs in Fig 6.

OTU	Kingdom	Phylum	Class	Order	Family
OTU1359	Bacteria	Firmicutes	Clostridia	Clostridiales	Ruminococcaceae
OTU2243	Bacteria	Firmicutes	Clostridia	Clostridiales	Christensenellaceae
OTU1127	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU2331	Bacteria	Bacteroidetes	Bacteroidia	Bacteroidales	Prevotellaceae
OTU43	Bacteria	Firmicutes	Clostridia	Clostridiales	Christensenellaceae
OTU743	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU3249	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU298	Bacteria	Firmicutes	Clostridia	Clostridiales	Ruminococcaceae
OTU147	Bacteria	Bacteroidetes	Bacteroidia	Bacteroidales	Prevotellaceae
OTU2051	Bacteria	Bacteroidetes	Bacteroidia	Bacteroidales	Rikenellaceae
OTU980	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU768	Bacteria	Spirochaetae	Spirochaetes	Spirochaetales	Spirochaetaceae
OTU2081	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU776	Bacteria	Firmicutes	Clostridia	Clostridiales	Christensenellaceae
OTU720	Bacteria	Firmicutes	Erysipelotrichia	Erysipelotrichales	Erysipelotrichaceae
OTU1446	Bacteria	Firmicutes	Clostridia	Clostridiales	Lachnospiraceae
OTU526	Bacteria	Bacteroidetes	Bacteroidia	Bacteroidales	Prevotellaceae



**Figure S1.** Comparison of VOC numbers and chromatogram of colon contents freeze-dried (FD) (n=50) and not freeze-dried (NFD) (n=50). One horse (C25) was excluded from the freeze-dry analysis as the sample failed to freeze-dry adequately. a) shows a boxplot of VOC numbers found in FD and NFD, a significantly greater number of VOCs were detected in FD rather than NFD (Wilcoxon signed-rank test with continuity correction,  $p < 0.001$ ). In b) a GCMS chromatogram overlay of the VOC profile of NFD (black trace) and FD (red trace) colon contents from one horse. Peak 1 = hexanal, peak 2 = dimethyl sulfone.

(A)





(B)

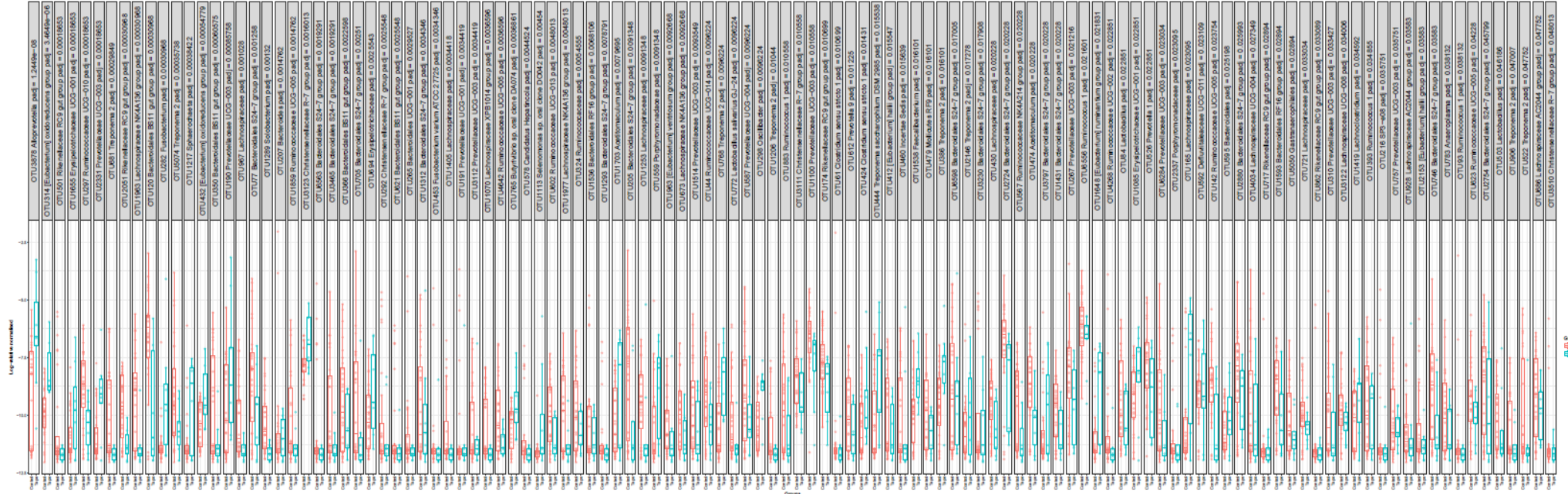


Figure S2. (A) Significant OTUs comparing TP and CO. (B) Significant OTUs comparing TP\_21 and CO.

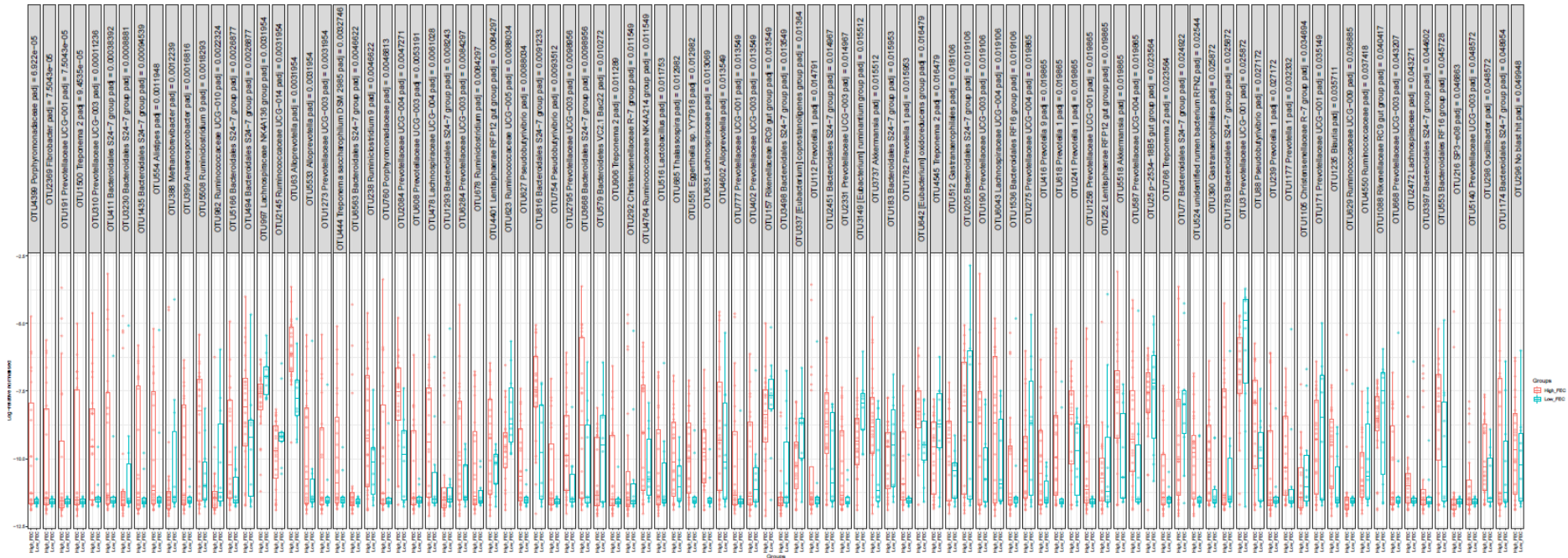
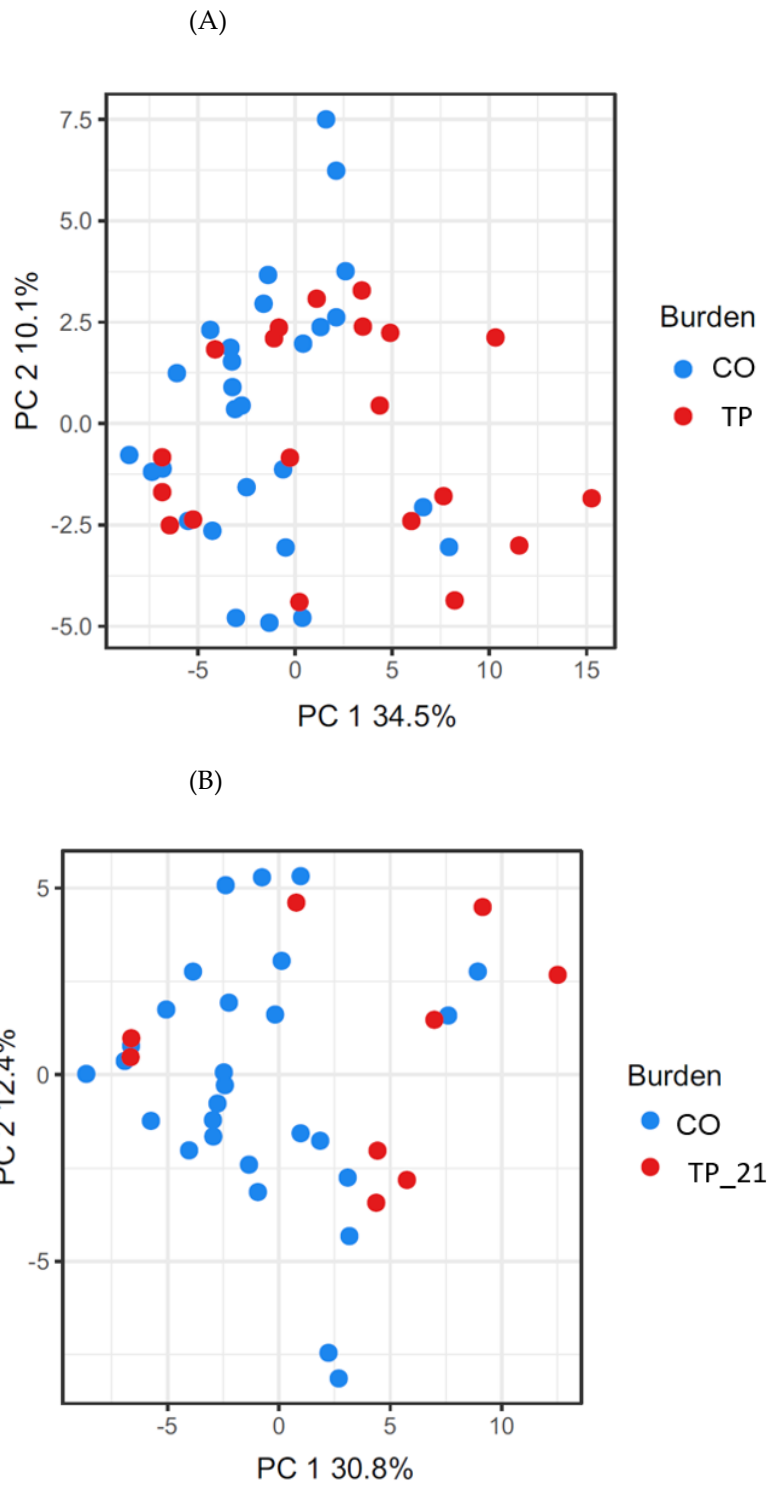
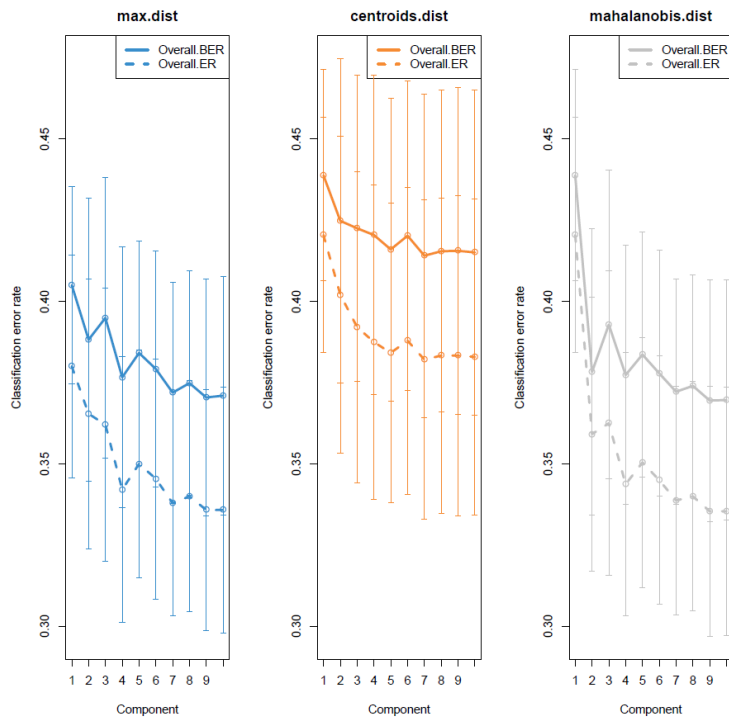


Figure S3. Significant OTUs between Low\_FEC and High\_FEC groups.



**Figure S4.** (A) PCA of VOC profile (tapeworm positive = TP and tapeworm negative = CO). (B) PCA of VOC profile ( $\geq 21$  tapeworms = TP<sub>21</sub> and tapeworm negative = CO).



**Figure S5.** Balanced error rate for mixOmics model.