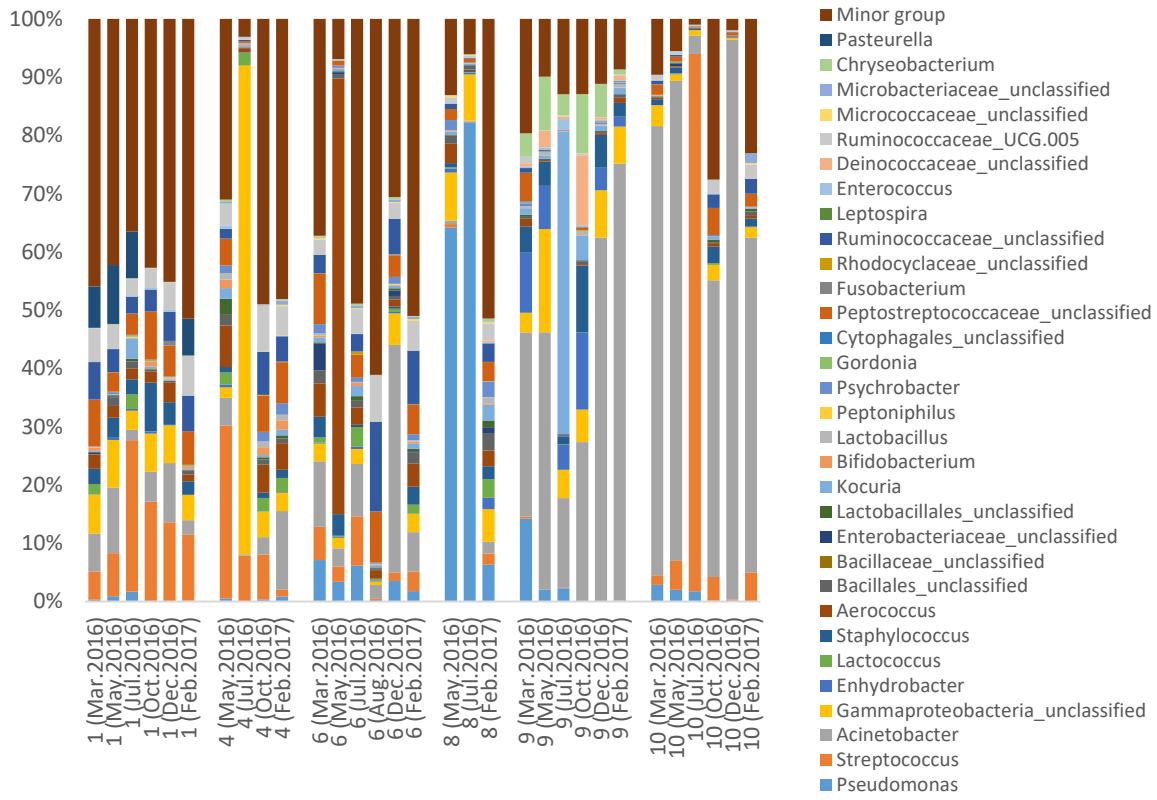
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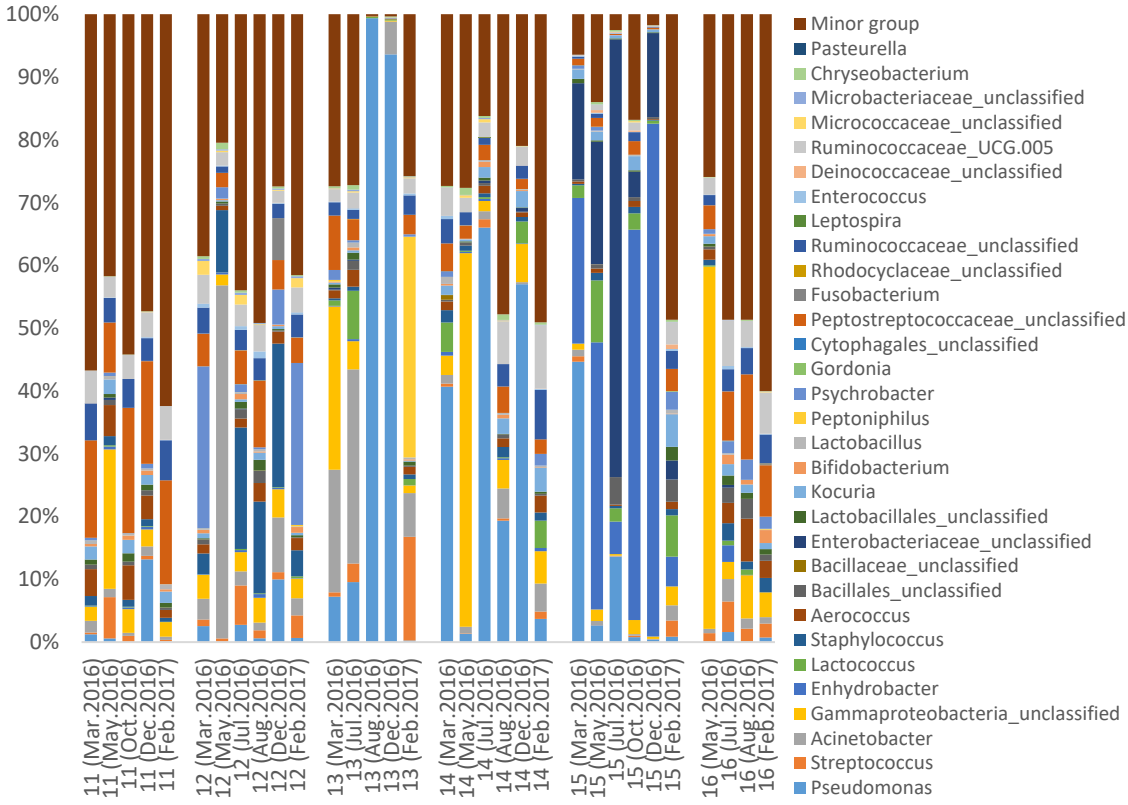
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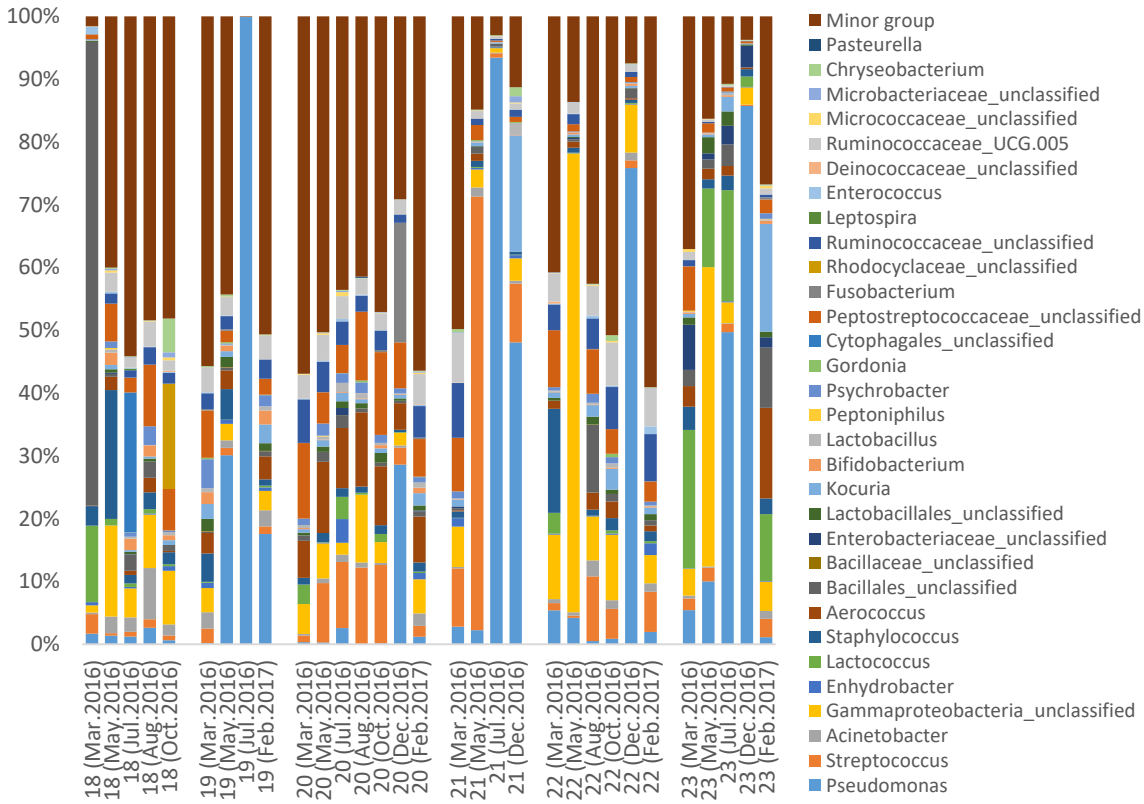
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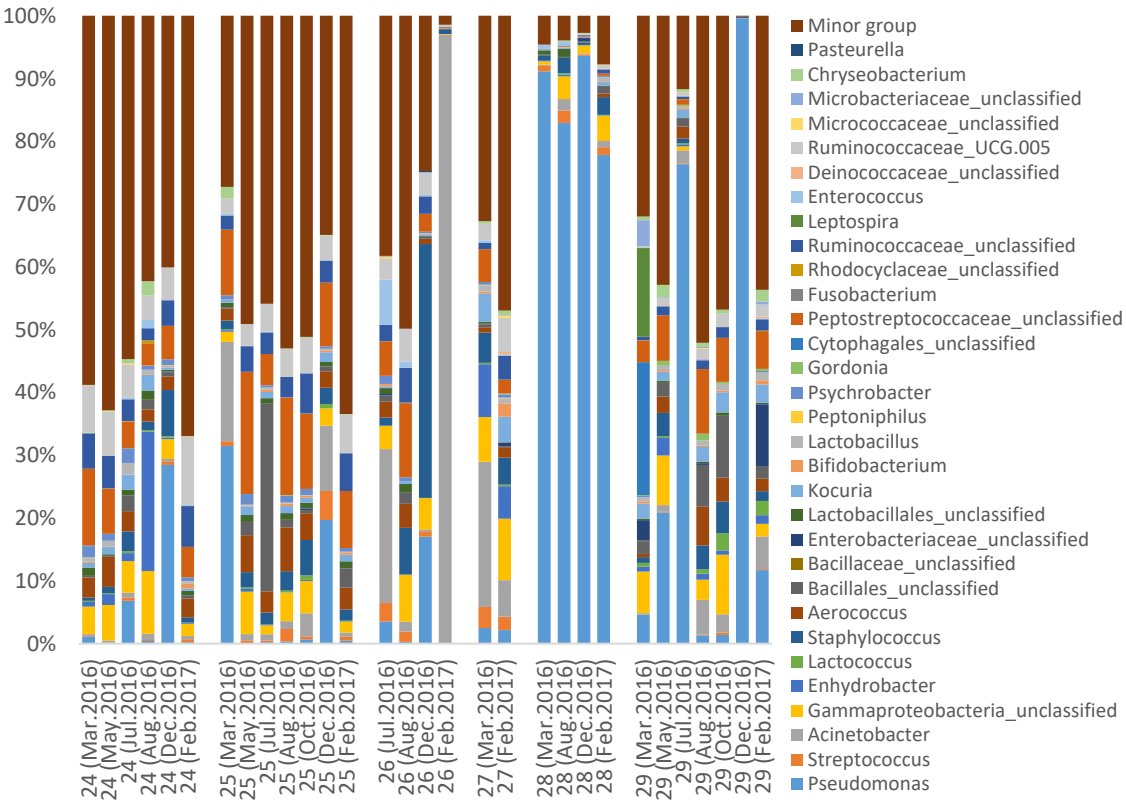
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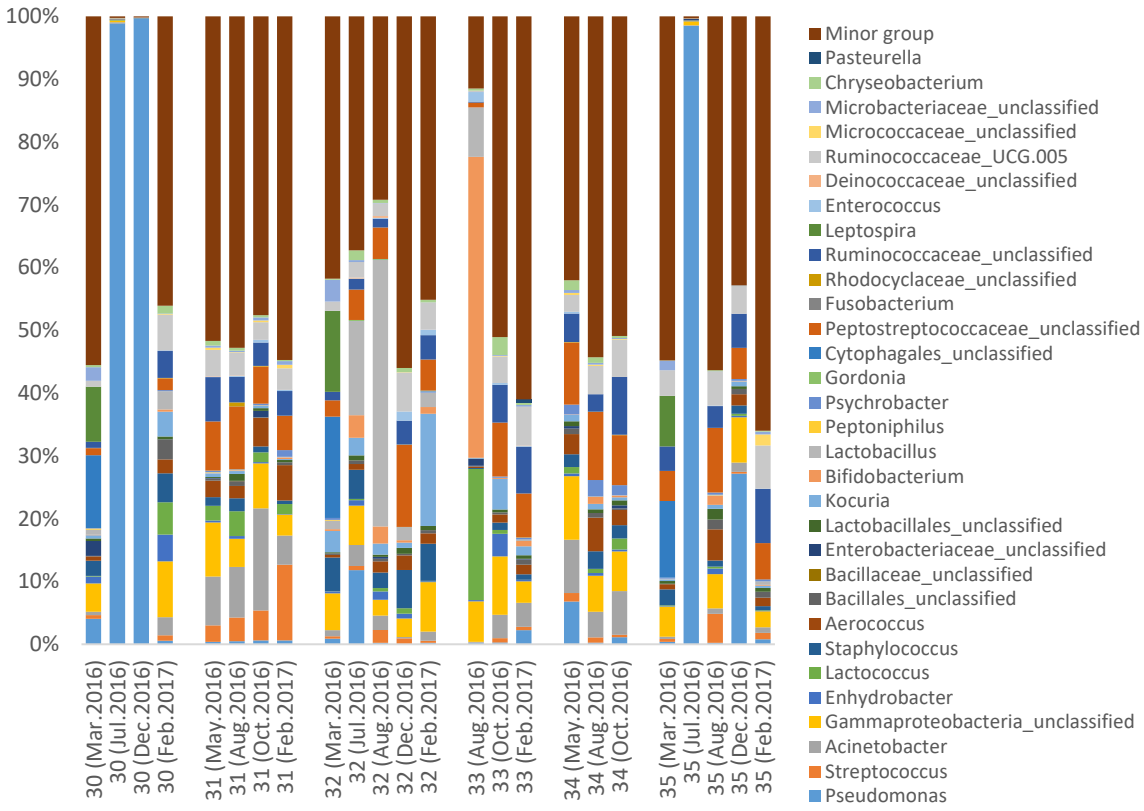
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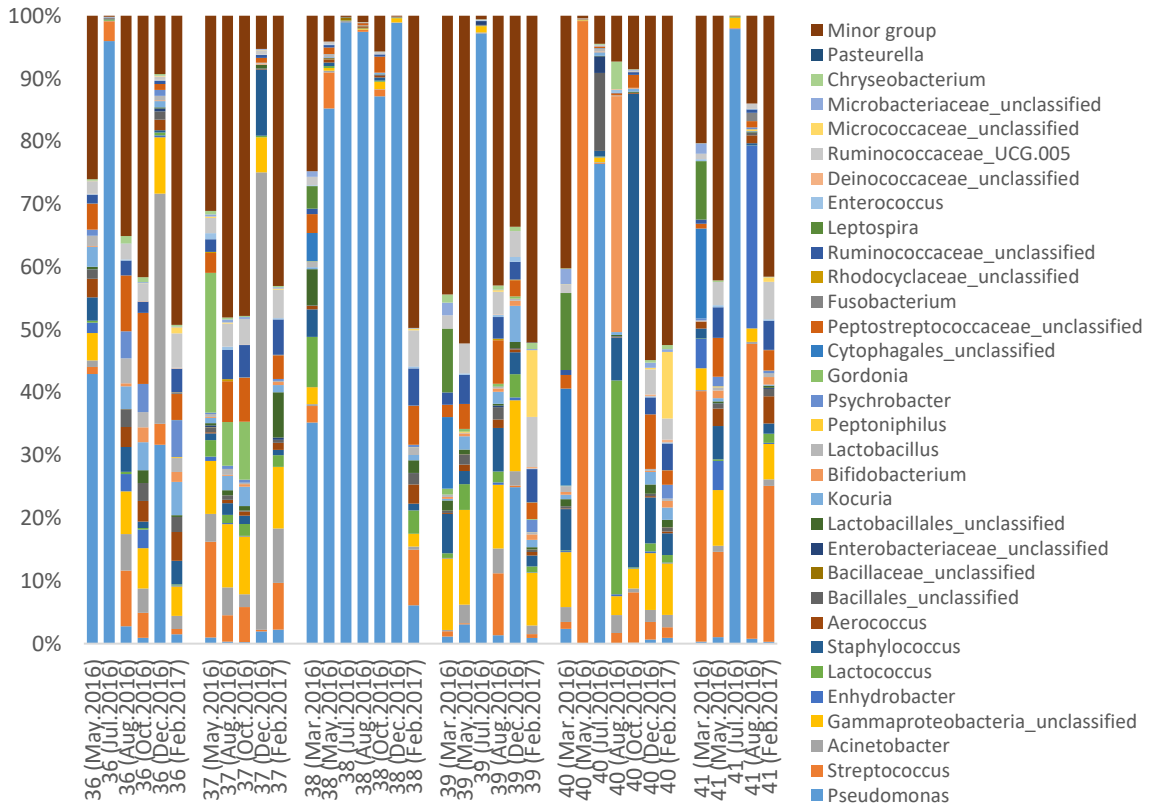
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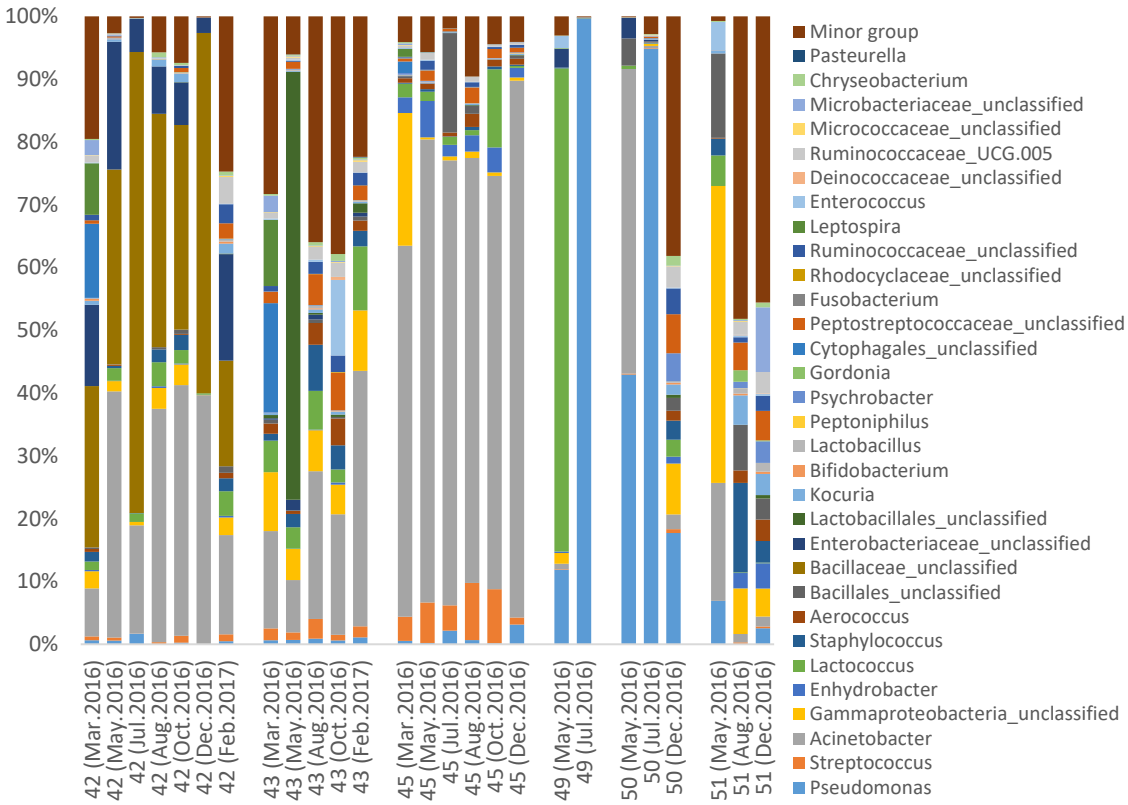
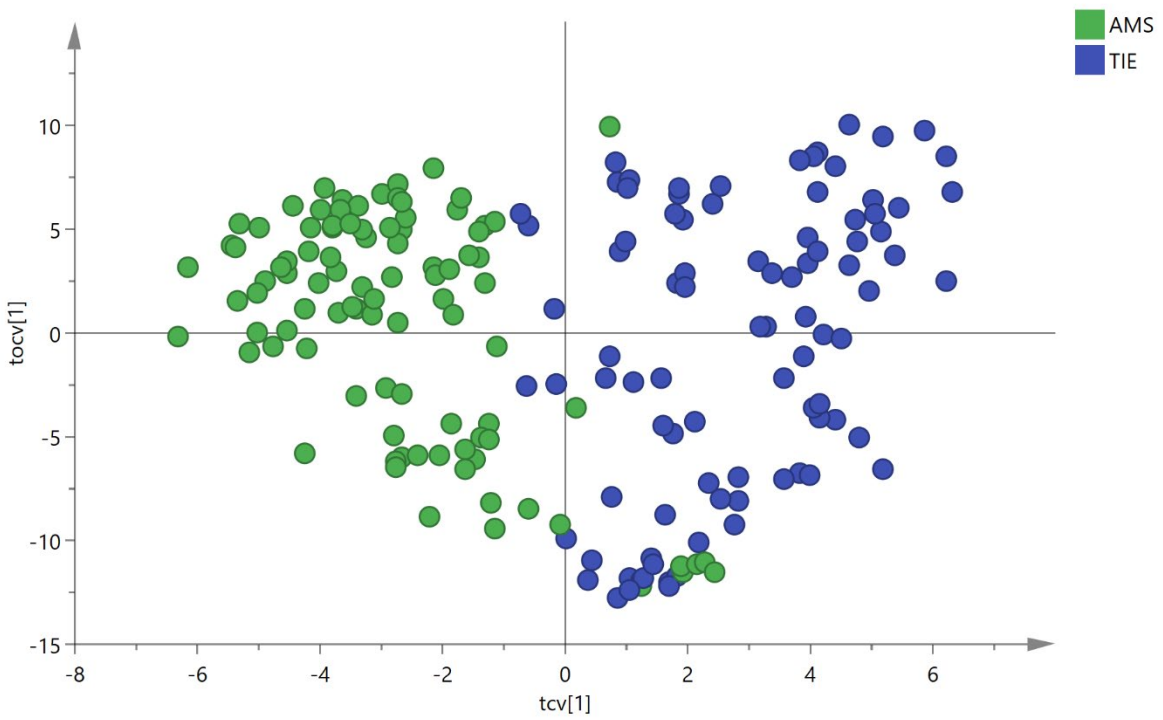
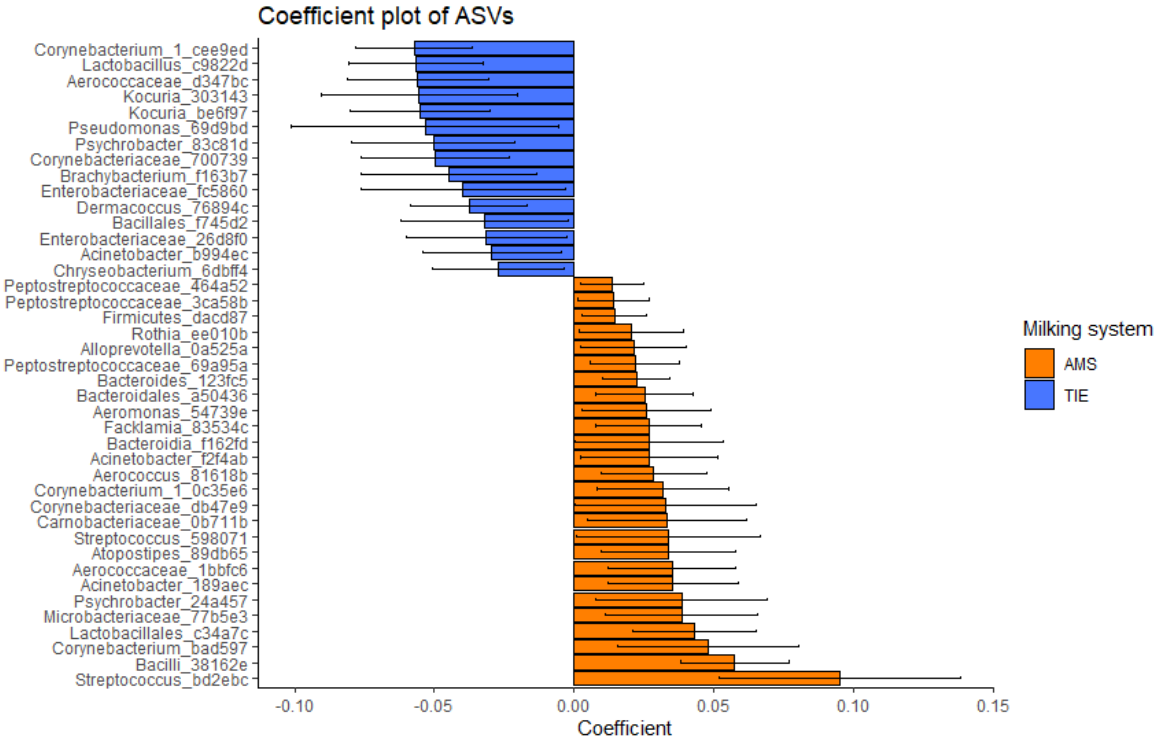


g

Figure S1. The relative abundance (RA, %) of genera of tank milk from 42 participating farms. The genera that have maximum RA less than 10% were grouped into minor group, which resulted 31 genera in the figure. **(a)** farm 1, 4, 6, 8, 9 and 10; **(b)** farm 11, 12, 13, 14, 15 and 16; **(c)** farm 18, 19, 20, 21, 22 and 23; **(d)** farm 24, 25, 26, 27, 28 and 29; **(e)** farm 30, 31, 32, 33, 34 and 35; **(f)** farm 36, 37, 38, 39, 40 and 41; **(g)** farm 42, 43, 45, 49, 50 and 51.



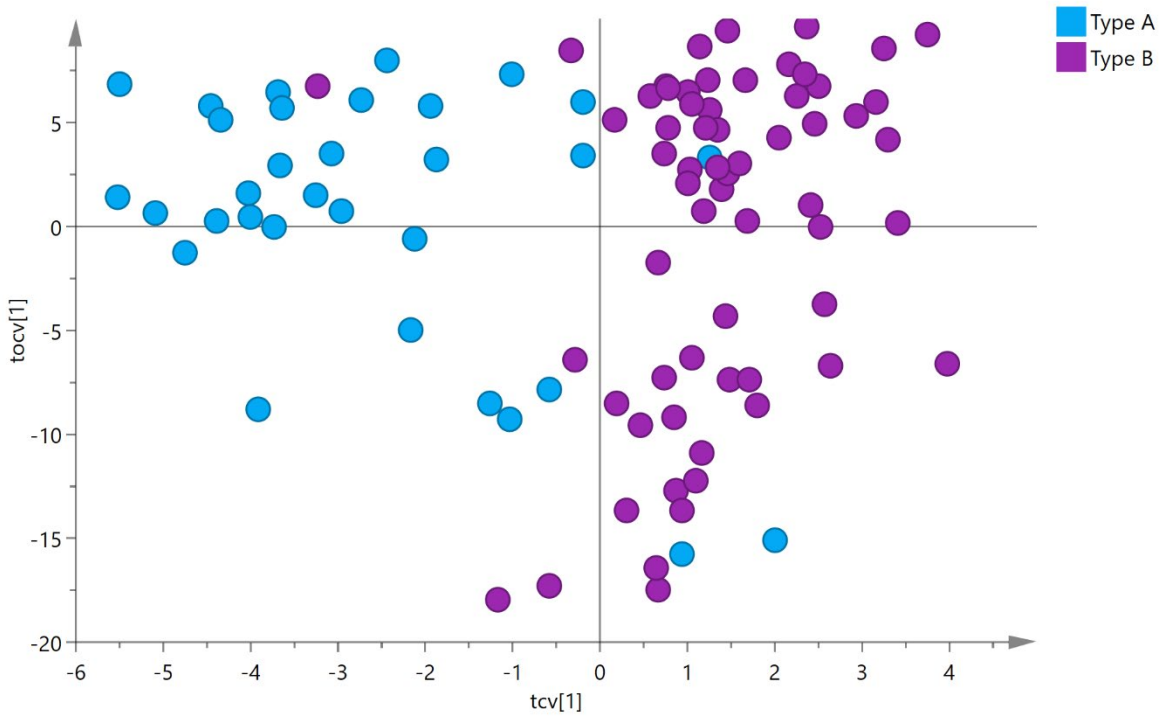


b

Figure S2. (a) Cross-validation score (CV score) plot of the microbial data from milk samples collected on the farms using automatic milking system (AMS) and the tie-stall milking system (TIE). Each dot represents a milk sample from an individual farm, colors indicating type of milking system. There are 95 and 90 milk samples originated from the 18 and the 19 farms that using AMS and TIE

respectively. **(b)** Coefficient plots of Amplicon Sequence Variants (ASVs, bacterial taxa followed by ASV numbers) in tank milk samples from farms using AMS and TIE, respectively. The whiskers indicate the confidence intervals of the coefficients.

a


Type A
Type B
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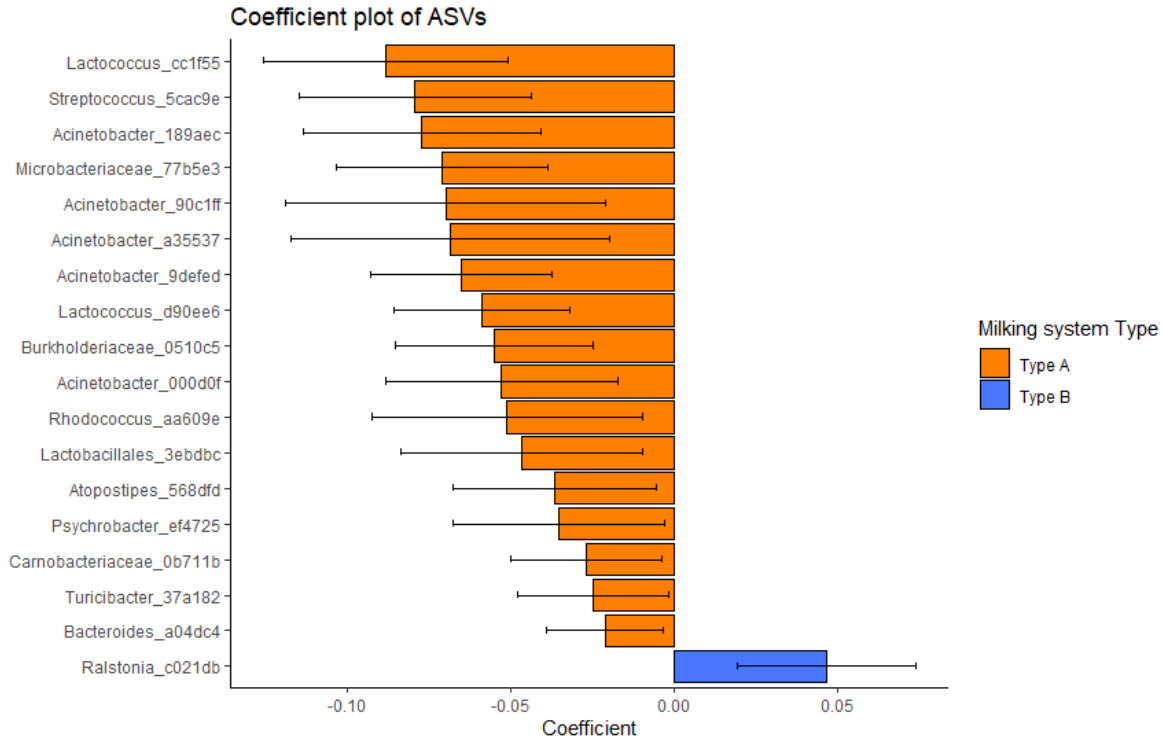
Coefficient plot of ASVs
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0.05
Coefficient
Milking system Type
Type A
Type B

Figure S3. (a) Cross-validation score (CV score) plot of microbial data from milk samples collected on farms using different types of AMS. Each dot represents a milk sample from an individual farm, colors indicating the brand of AMS. There are 32 and 63 milk samples originated from7 and 11 farms using type A and B of AMS respectively. **(b)** Coefficient plots of Amplicon Sequence Variants (ASVs, bacterial taxa followed by ASV numbers) in tank milk samples from farms using type A and B automatic milking robots. The whiskers indicate the confidence intervals of the coefficients.

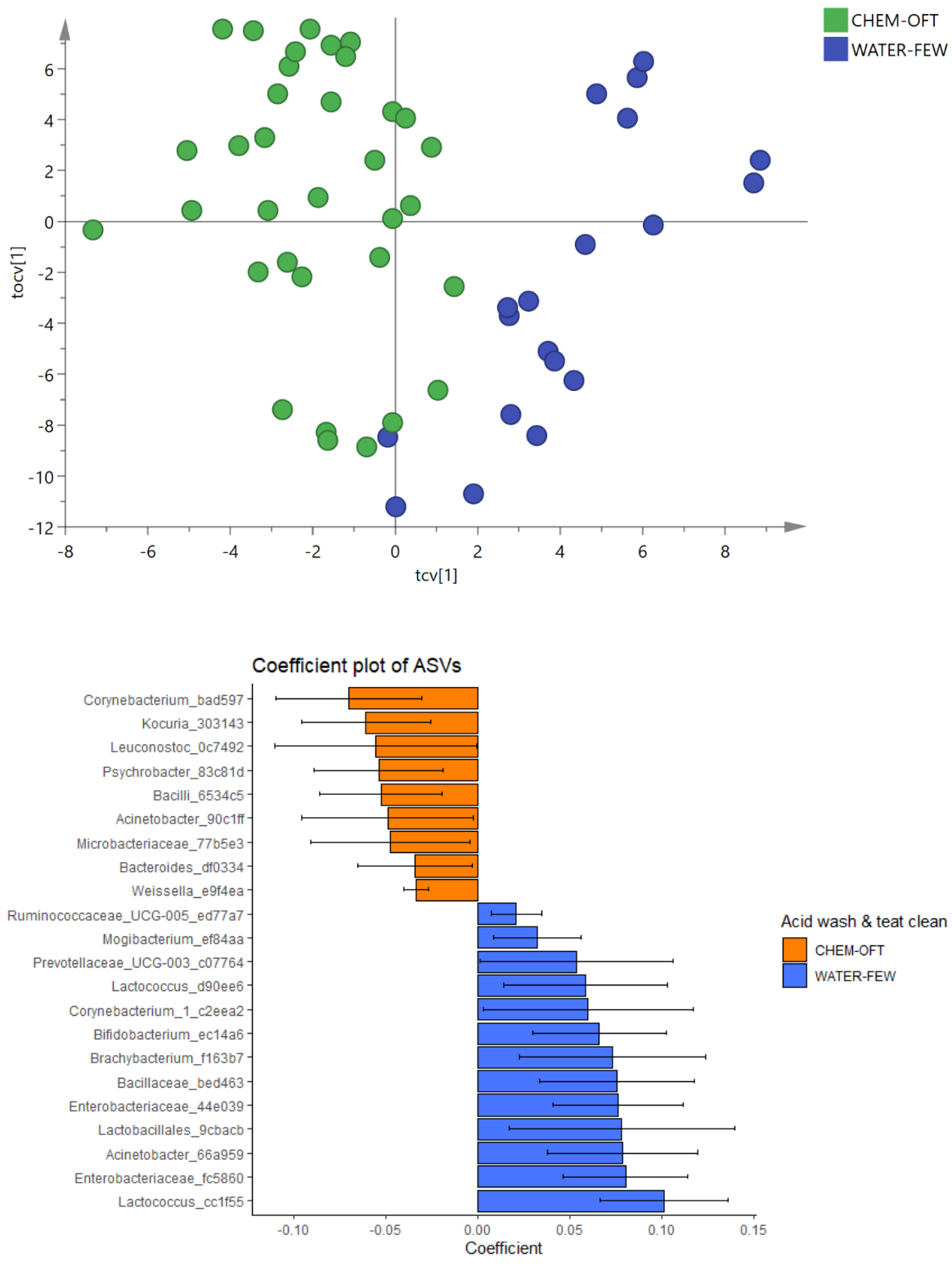

Figure S4. (a) Cross-validation score (CV score) plot of microbial data from milk samples from tie-stall farms using different methods for teat cleaning before milking and frequency of using acid to clean the milking equipment (confounded factors). CHEM-OFT: use of chemical agent in connection to teat cleaning and frequent use of acid to clean the milking equipment (represented by 34 milk

samples originated from 8 farms). WATER-FEW: use of water only to clean teats before milking and less frequent use of acid wash to clean the milking equipment (represented by 19 milk samples originated from 3 farms). **(b)** Coefficient plots of Amplicon Sequence Variants (ASVs, bacterial taxa followed by ASV numbers) in tank milk samples from tie-stall farms using different routines to prepare teats before milking and frequency of acid wash to clean the milking equipment (confounded factors).