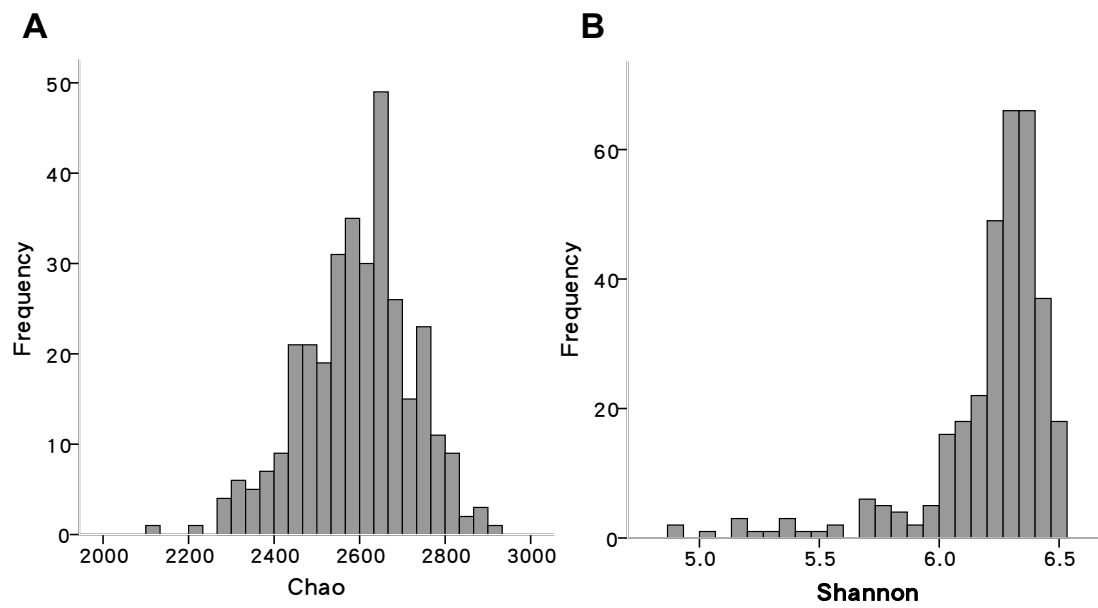
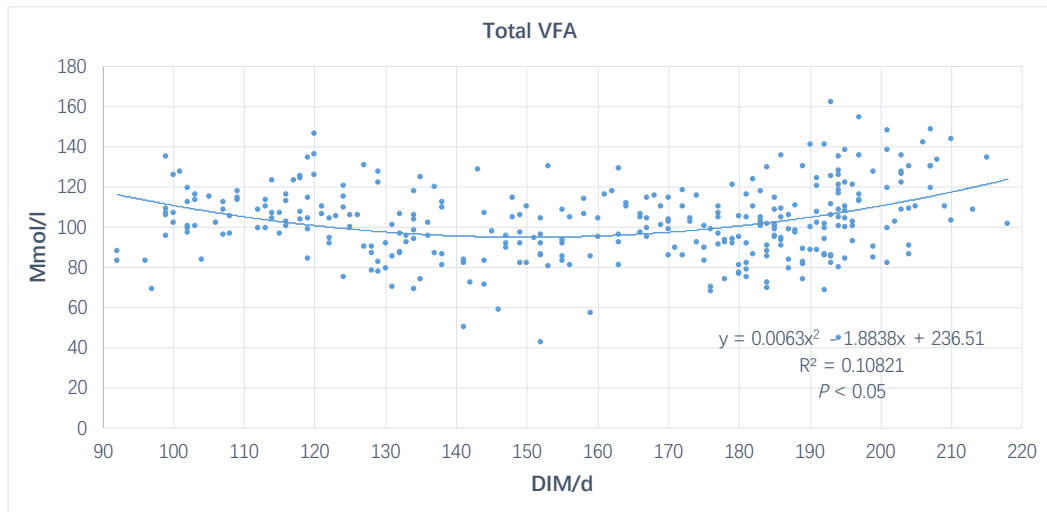
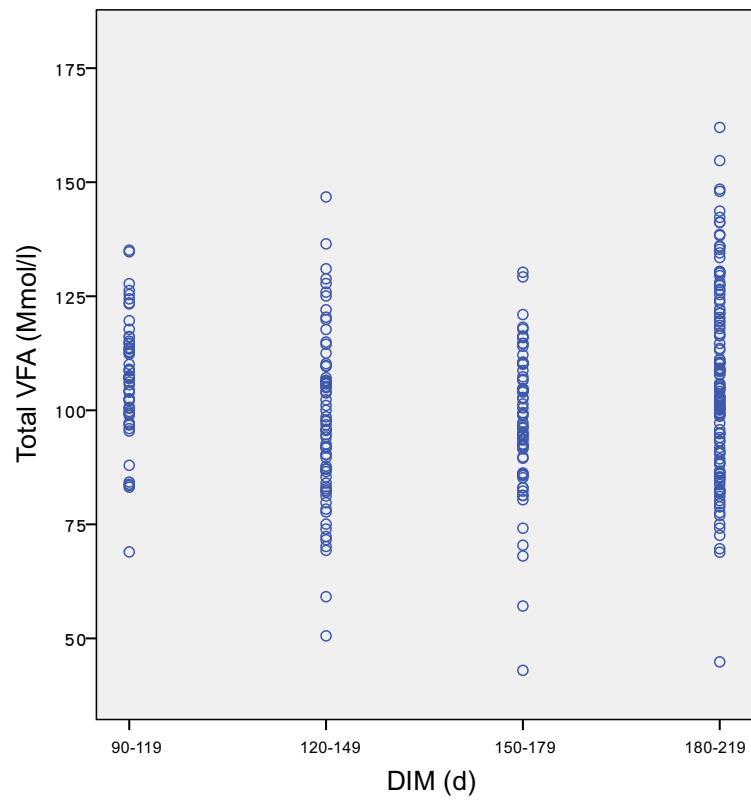


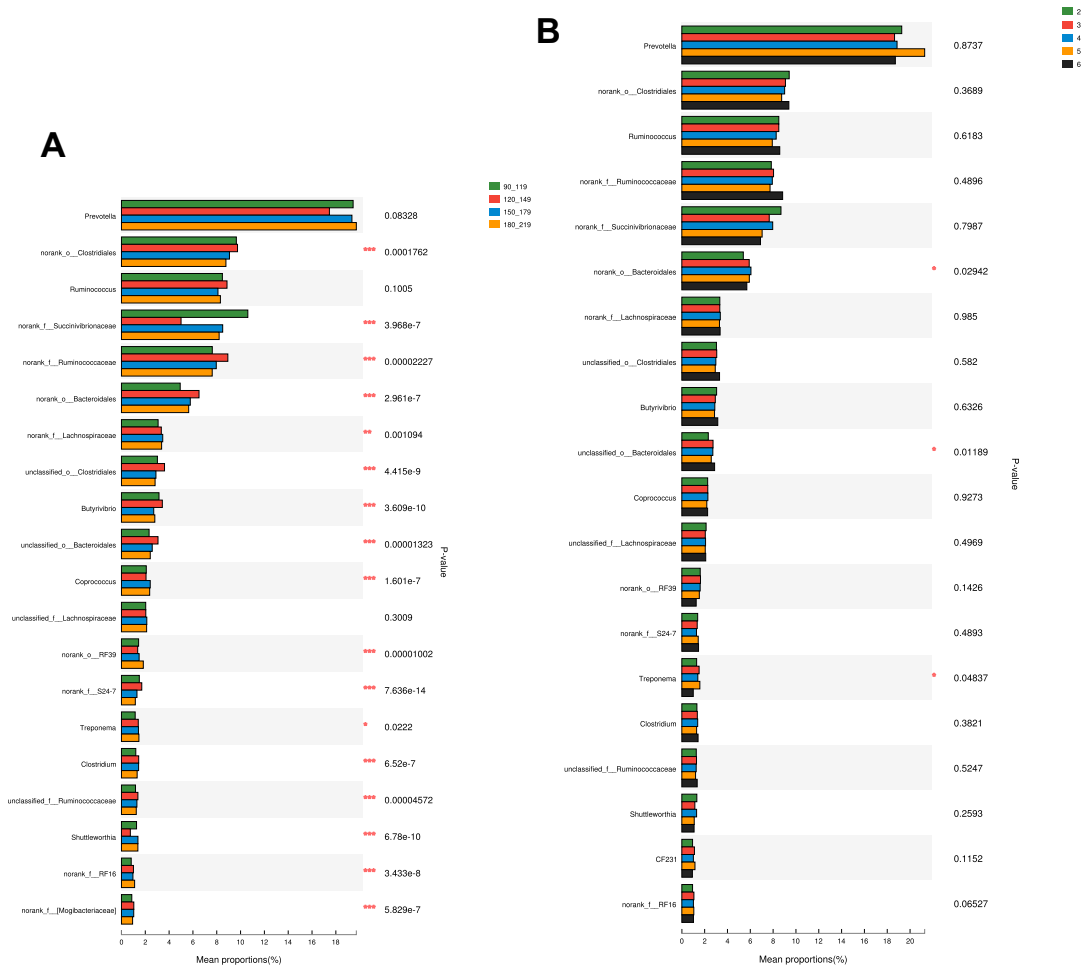
## Supplementary information



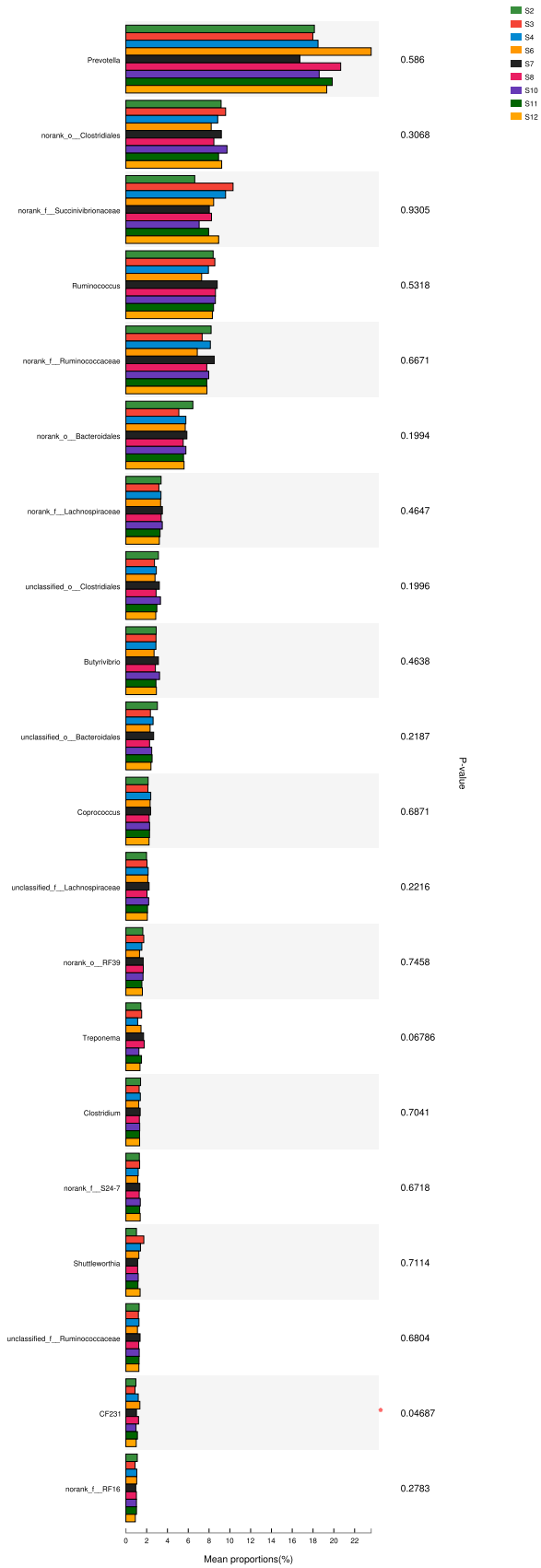
**Fig. S1.** Alpha diversity indexes of rumen bacterial microbiota of all 334 dairy cows. (A) Distribution of Shannon diversity index. (B) Distribution of Chao richness index.

**A****B**

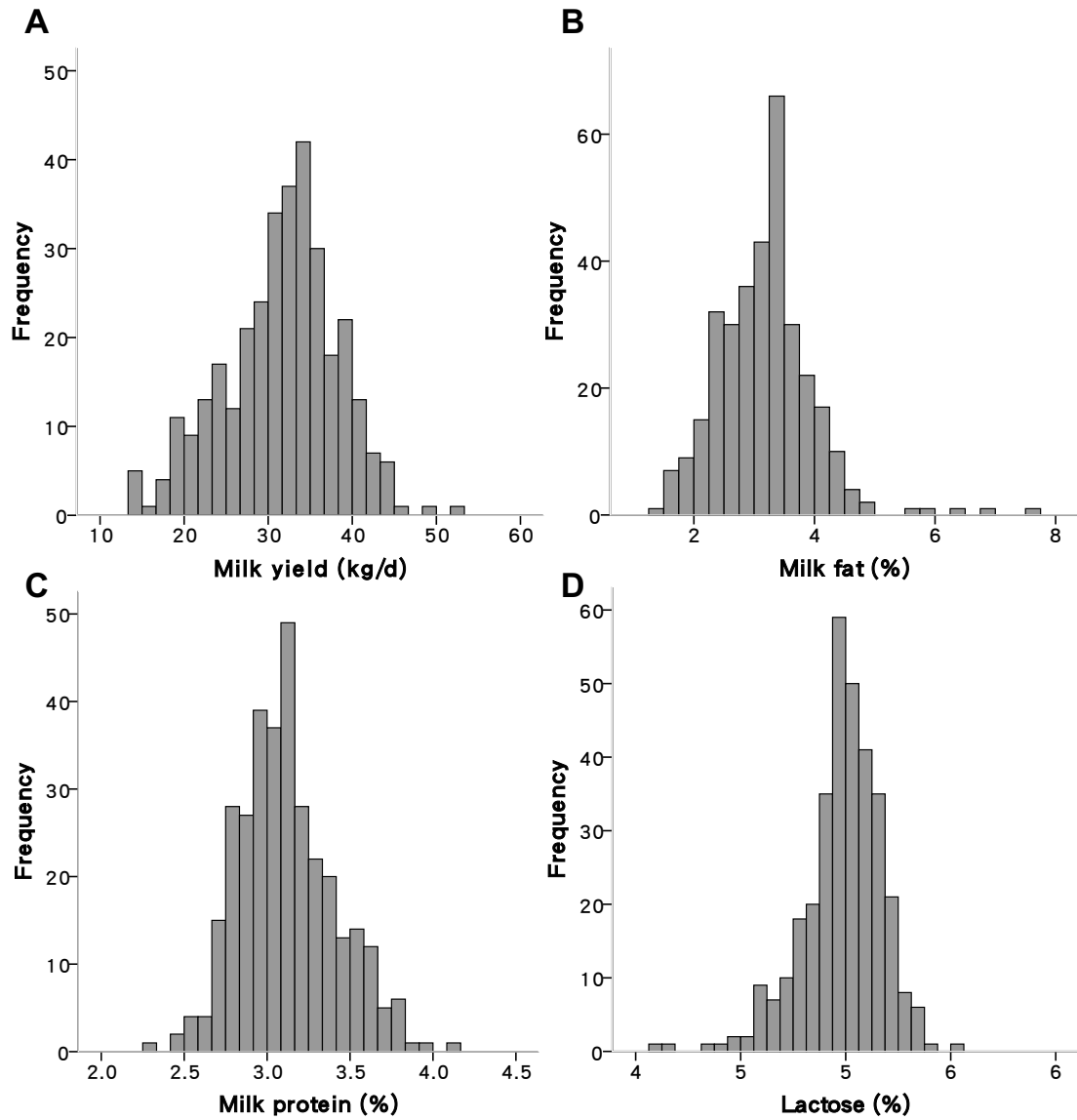
**Fig. S2.** Relationships between total VFA and lactation stage. (A) Scatter plot of total VFA related to different days in milk (DIM). (B) Distribution of total VFA concentrations in DIM groups.



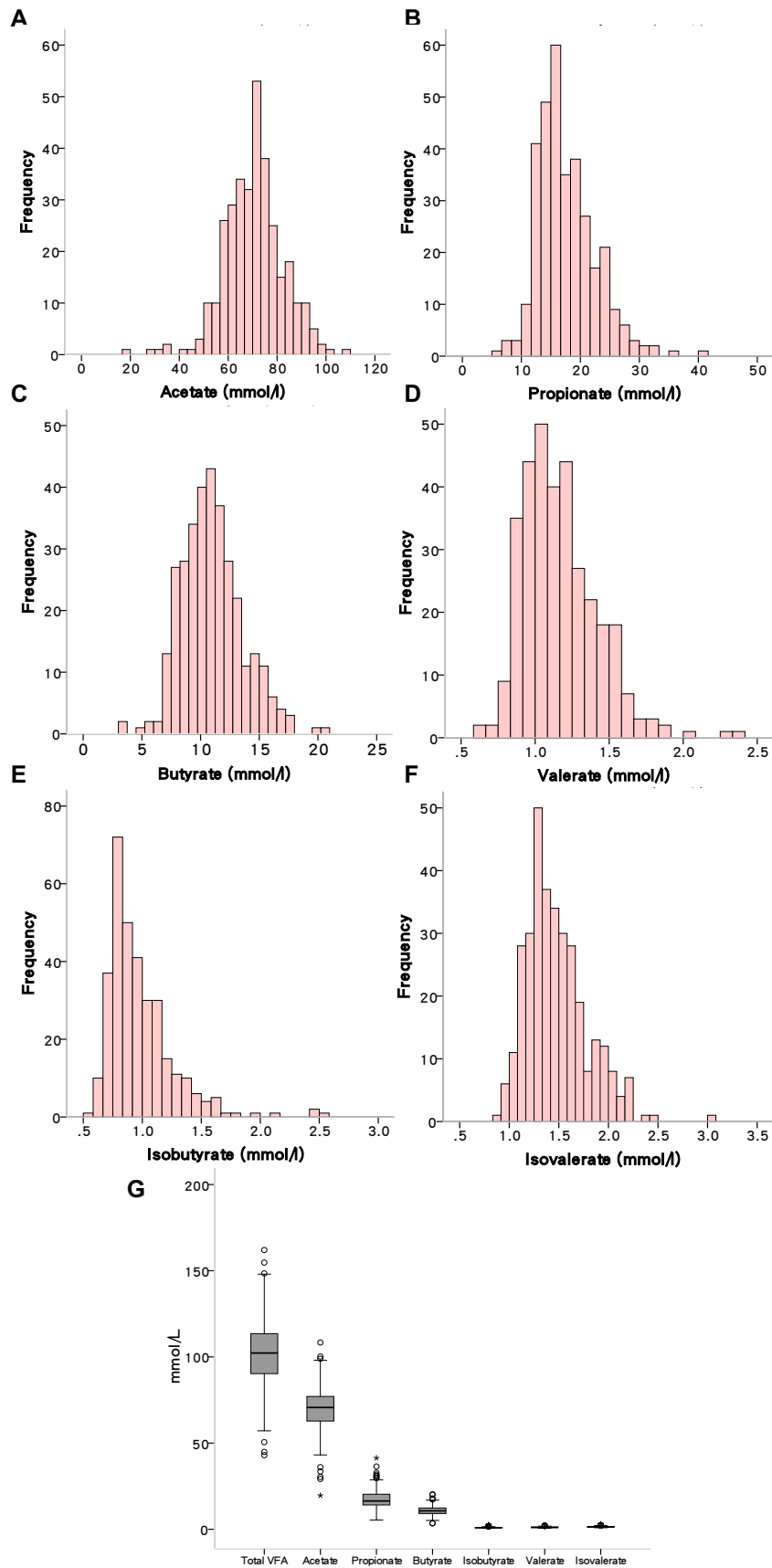
**Fig. S3.** Relative abundances of predominant genera between cows from different DIM groups (A) and parity groups (B). \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .



**Fig. S4.** Relative abundances of predominant genera between cows from different sire groups.

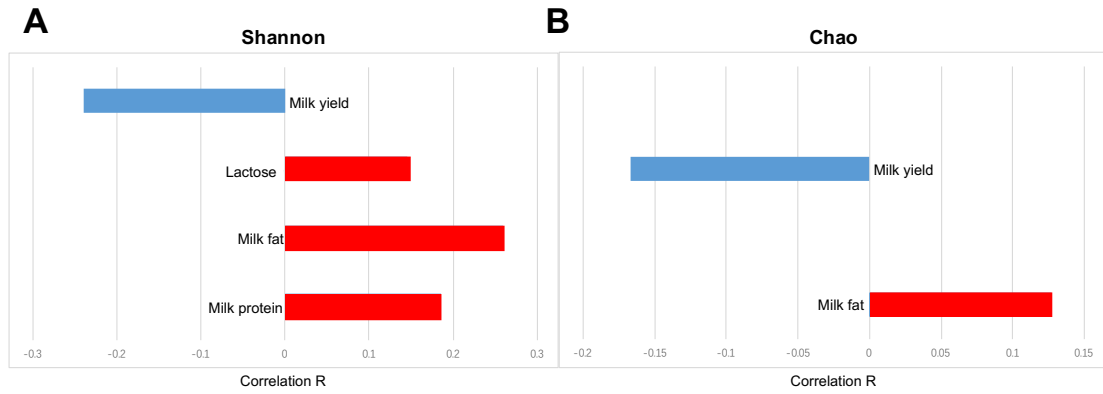


**Fig. S5.** Distributions of milk yield (A), milk fat (B), milk protein (C) and lactose (D).



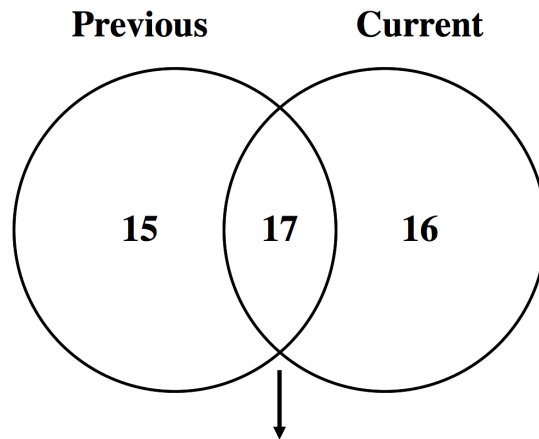
**Fig. S6.** Distributions of Acetate (A), Propionate (B), Butyrate (C), Valerate(D), Isobutyrate (E) and Isovalerate (F). Boxplot shows concentrations of total VFA, acetate,

propionate, butyrate, isobutyrate, valerate and isovalerate (G).



**Fig. S7.** Milking performance associated with Alpha diversity indexes. (A) Spearman correlation coefficients of milking performance correlated with Shannon index. (B) Spearman correlation coefficients of milking performance correlated with Chao index. Only significant correlations ( $P < 0.05$ ) were presented.





15 taxa included exclusively in previous study	16 taxa included exclusively in current study	17 taxa included in two studies
Atopobium	Treponema	p-75-a5
Adlercreutzia	CF231	Bulleidia
*Coriobacteriaceae	Fibrobacter	Desulfovibrio
*Coriobacteriales	YRC22	Selenomonas
*F16	Anaerostipes	Succinielasticum
*YS2	Anaeroplasma	Ruminococcus
*Aeromonadales	RFN20	Oscillospira
Mitsuokella	Succinivibrio	Shuttleworthia
*Ruminococcaceae	Ruminobacter	Roseburia
Lachnobacterium	L7A_E11	Pseudobutyrvibrio
Eubacterium	Anaerovibrio	Moryella
*Lachnospiraceae	*Lachnospiraceae	Lachnospira
*Clostridiales Family XIII	Schwartzia	Coprococcus
*Clostridiales	BF311	Clostridium
*Bacteroidales	Mogibacterium	Butyrvibrio
	Oribacterium	Blautia
		Prevotella

\*Taxa not identified at the genus level were shown at their highest taxonomic identified level.

**Fig. S8.** Shared and specific core bacteriome between study by Jami and Mizrahi (E. Jami, and I. Mizrahi, PLoS ONE 7(3): e33306, 2012, doi:10.1371/journal.pone.0033306) and the current study.

**Table S3 Milking performance and rumen fermentation in different lactation stage groups.**

Items	Mean				SEM	<i>P</i>
	90-119	120-149	150-179	180-219		
ECM (Kg)	32.72	32.93	29.17	29.27	0.33	***
Milk yield (Kg)	34.52	32.67	29.93	30.18	0.37	***
Milk protein (%)	2.95	3.13	3.13	3.19	0.02	***
Milk fat (%)	3.06	3.39	3.18	3.17	0.05	NS
Total VFA (mmol/l)	106.97	97.62	97.75	106.15	1.01	***
Acetate (mmol/l)	71.72	68.22	67.51	72.72	0.66	**
Propionate (mmol/l)	19.56	15.46	17.00	18.19	0.27	***
Butyrate (mmol/l)	12.01	10.49	9.81	11.44	0.14	***

\*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$ . By One-way ANOVA.

**Table S4 Numbers of cows which were in the same parity, days in milk (DIM), sire and dam subgroups.**

Parity	Numbers	DIM	Numbers	Sire	Numbers
2	124	90-119	56	S1	5
3	107	120-149	73	S2	26
4	62	150-179	72	S3	14
5	24	180-219	132	S4	17
6	15			S5	6
7	2			S6	11
				S7	21
				S8	18
				S9	9
				S10	34
				S11	28
				S12	73
				S13	9
				S14	3

**Table S6 Spearman correlation coefficients between milking performance and rumen fermentation products.**

	Milk yield	Milk fat	Milk protein	Lactose	Milk protein yield
VFAs					
Acetate	-0.316	0.264			-0.291
Propionate	0.314	-0.312	-0.153		0.267
Butyrate			0.161		
Isobutyrate	-0.214	0.149			-0.207
Valerate	0.225	-0.205	-0.129		0.187
Isovalerate				-0.113	

Only significant ( $P < 0.05$ ) correlations were shown in the table.

**Table S7 Spearman correlation coefficients between rumen fermentation products and bacterial genera.**

Taxa	Acetate	Propionate	Butyrate	Isobutyrate	Valerate	Isovalerate
Prevotella	0.218		0.221			
Shuttleworthia	0.244	0.554	0.299		0.530	0.395
Lachnospira	0.208	0.498	0.296		0.487	0.329
Succinivibrio	0.219					
Selenomonas	0.216		0.223			
f__Succinivibrionaceae	0.428				0.334	0.216
f__Ruminococcaceae		-0.256			-0.228	
Butyrivibrio		-0.253				
o__Bacteroidales		-0.477			-0.428	-0.286
o__Clostridiales		-0.224	0.203			
Clostridium		-0.241			-0.246	
p__SR1		-0.209	-0.229		-0.225	-0.213
Fibrobacter		-0.241	-0.227		-0.304	
f__Mogibacteriaceae		-0.263		0.208	-0.227	
YRC22		-0.220				
Moryella		-0.210				
CF231				0.260		0.267
f__Christensenellaceae		-0.458			-0.414	
Anaerostipes			0.222			

Only significant ( $P < 0.05$ ) correlations with R value  $> 0.2$  were shown in the table.

**Table S8 Spearman correlation coefficients between milking performance and bacterial genera.**

Taxa	Milk yield	Milk fat	Milk protein	Lactose
f__Christensenellaceae	-0.186	0.237		0.123
o__Bacteroidales	-0.229	0.226		
Moryella	-0.142	0.211		
f__Mogibacteriaceae	-0.225	0.169		
f__Ruminococcaceae	-0.185	0.190		
Clostridium	-0.149	0.153		
f__Succinivibrionaceae	0.172	-0.258		
Lachnospira	0.161	-0.219	-0.110	
CF231	-0.207		0.212	
Succinivibrio	-0.218			
YRC22	-0.145			
f__RF16	-0.120			
f__Lachnospiraceae	-0.131			
Fibrobacter	-0.120			
Selenomonas	-0.150			-0.108
Shuttleworthia		-0.201		-0.163
o__Clostridiales		0.181		0.115
Butyrivibrio		0.163		0.125
Treponema		-0.149		
Pseudobutyrvibrio		0.121		
f__S24-7		0.131		
p-75-a5			0.110	
f__Prevotellaceae			0.144	

Only significant ( $P < 0.05$ ) correlations with R value  $> 0.2$  were shown in the table.