

## Supplementary Tables

Table S1. Clusters and representative sequences of *mmuM* genes in phylogenetic analysis

Genus	<i>mmuM</i> number	Cluster number	Representative sequence accession number
<i>Streptococcus</i>	134	11	1:NC_015215, 2:NZ_GL698429, 3:NZ_AEUW02000001, 4:NZ_AOCD01000153, 5:AEWY01000003, 6:NZ_AOC E01000112, 7:NC_021213, 8:NC_006448, 9:AEQQ01000050, 10:CP003295, 11:NC_021175
<i>Klebsiella</i>	71	1	1:NC_013951
<i>Lactobacillus</i>	47	20	1:NC_015602, 2:ACLM01000020, 3:NC_021235, 4:NC_015214, 5:NC_010609, 6:NZ_BACP01000056, 7:NZ_KB644915, 8:NZ_BACN01000068, 9:NC_014106, 10:NZ_GL575016, 11:ACGH01000012, 12:ACHN0100004 8, 13:ACGT01000005, 14:CP002461, 15:NZ_BAC001000009, 16:NZ_GL872382, 17:NZ_BACR01000045, 18 :NZ_AEOS01000240, 19:NZ_AHYZ01000112, 20:NZ_GL573154
<i>Mycobacterium</i>	45	5	1:NC_011896, 2:NZ_AJF101000060, 3:NC_021192, 4:NZ_ANPD01000034, 5:CP003491
<i>Bacillus</i>	32	7	1:NC_006270, 2:NC_014976, 3:CP003017, 4:NC_010180, 5:NZ_AJRJ01000051, 6:CP002927, 7:NC_0098 48
<i>Escherichia</i>	27	2	1:NZ_BAFF01000003, 2:NC_010558
<i>Xanthomonas</i>	26	4	1:AE008922, 2:NZ_CAPJ01000396, 3:NC_013722, 4:NZ_AGDB01000215
<i>Streptomyces</i>	19	13	1:NZ_ANSJ01000037, 2:NZ_AHBF01000011, 3:NZ_CM001015, 4:CP002047, 5:NZ_AJSZ01000210, 6:AROY 01000536, 7:NZ_AOHP01000162, 8:NZ_AGBF01000190, 9:NZ_DS999647, 10:NZ_AORZ01000064, 11:BA00 0030, 12:NZ_ADXA01000021, 13:NZ_AJJM01000167
<i>Leuconostoc</i>	10	3	1:NZ_AEIZ01000018, 2:CP003839, 3:NZ_CAGE01000005
<i>Enterobacter</i>	10	2	1:CP005991, 2:NZ_GL892086
<i>Pantoea</i>	7	1	1:NC_013956
<i>Citrobacter</i>	6	1	1:NZ_ANAV01000008
<i>Serratia</i>	6	1	1:ADBY01000045
<i>Selenomonas</i>	5	3	1:ACKT01000013, 2:ACLA01000014, 3:NZ_ALJR01000025
<i>Pectobacterium</i>	4	1	1:NZ_ABVY01000021
<i>Actinomyces</i>	4	2	1:NZ_GL985606, 2:GL877176
<i>Cronobacter</i>	4	1	1:NC_013282
<i>Clostridium</i>	4	2	1:NC_011837, 2:NC_003030
<i>Paenibacillus</i>	4	2	1:NZ_AFW01000056, 2:CP003107
<i>Chloroflexus</i>	3	1	1:NC_010175
<i>Corynebacterium</i>	3	3	1:NC_012590, 2:ACGE01000080, 3:NZ_AFIZ01000001
<i>Arthrobacter</i>	3	3	1:NC_008711, 2:NZ_BAEG01000083, 3:NC_011886
<i>Staphylococcus</i>	3	3	1:NZ_CAJL01000012, 2:NZ_ALWK01000004, 3:NC_007350
<i>Rubrivivax</i>	2	1	1:NZ_AEWG01000063
<i>Saccharomonospora</i>	2	2	1:NC_013159, 2:NZ_AHGX01000043
<i>Pseudomonas</i>	2	2	1:CP000094, 2:NZ_CM001763
<i>Saccharopolyspora</i>	2	2	1:NC_009142, 2:NZ_GL877878
<i>Dialister</i>	2	1	1:NZ_GL878519
<i>Brevibacterium</i>	2	2	1:NZ_AMSP01000006, 2:NZ_AAGP01000014
<i>Mannheimia</i>	2	1	1:NC_021082
<i>Clavibacter</i>	2	1	1:NC_010407
<i>Pelagibacter</i>	2	2	1:NC_007205, 2:NZ_DS995298
<i>Peptoniphilus</i>	1	1	1:NZ_JH165061
<i>Caldilinea</i>	1	1	1:AP012337
<i>Shigella</i>	1	1	1:NZ_AKNF01000196
<i>Blastococcus</i>	1	1	1:NC_016943
<i>Erwinia</i>	1	1	1:NC_014306
<i>Plesiocystis</i>	1	1	1:NZ_ABCS01000038
<i>Dinoroseobacter</i>	1	1	1:CP000832
<i>Sporolactobacillus</i>	1	1	1:NZ_AFVQ01000089
<i>Tetrasphaera</i>	1	1	1:NZ_HF570956
<i>Weissella</i>	1	1	1:NZ_AEKT01000057

<i>Coralloccoccus</i>	1	1	1:CP003389
<i>Granulibacter</i>	1	1	1:NC_008343
<i>Planococcus</i>	1	1	1:NZ_AJYB01000042
<i>Brevibacillus</i>	1	1	1:NC_012491
<i>Oscillibacter</i>	1	1	1:AP012044
<i>Halobacillus</i>	1	1	1:NZ_ANPF01000013
<i>Centipeda</i>	1	1	1:NZ_GL892076
<i>Modestobacter</i>	1	1	1:F0203431
<i>Rheinheimera</i>	1	1	1:NZ_BAFK01000013
<i>Hylemonella</i>	1	1	1:NZ_AEGR01000052
<i>Nocardiosis</i>	1	1	1:CP003788
<i>Acidobacterium</i>	1	1	1:NC_012483
<i>Ilumatobacter</i>	1	1	1:NC_020520
<i>Salmonella</i>	1	1	1:FR877557
<i>Janibacter</i>	1	1	1:NZ_CH672413
<i>Acidaminococcus</i>	1	1	1:CP003058
<i>Nakamurella</i>	1	1	1:NC_013235
<i>Kitasatospora</i>	1	1	1:AP010968
<i>Macroccoccus</i>	1	1	1:NC_011999
<i>Kineosphaera</i>	1	1	1:NZ_BAHD01000020
<i>Raoultella</i>	1	1	1:NC_021066
<i>Exiguobacterium</i>	1	1	1:NC_010556
<i>Brachybacterium</i>	1	1	1:NZ_AGBX01000007
<i>Propionibacterium</i>	1	1	1:NC_019395
<i>Mobilicoccus</i>	1	1	1:NZ_BAFE01000089
<i>Amycoliticoccus</i>	1	1	1:NC_015564
<i>Microclunatus</i>	1	1	1:NC_015635
<i>Kosakonia</i>	1	1	1:NZ_JH725436
Total	533	144	

Table S2. The reference sequences for *mmuM* gene mapping

Genus	<i>mmuM</i> number	Cluster number	Reference sequence accession number
<i>Streptococcus</i>	134	16	1:AEQQ01000050, 2:NC_012925, 3:AP012336, 4:NZ_AEUW02000002, 5:NC_006449, 6:AEKN01000006, 7:NZ_AGBV01000004, 8:NZ_GL982563, 9:NC_021175, 10:CP003295, 11:NC_015215, 12:NZ_AEUW02000001, 13:NZ_AOCD01000153, 14:NZ_GL698429, 15:NZ_AOCE01000112, 16:GL698449
<i>Klebsiella</i>	71	3	1:NC_013951, 2:APWG01000155, 3:NZ_AMPJ01000047
<i>Lactobacillus</i>	47	20	1:NC_015602, 2:NZ_GL573154, 3:NZ_BACP01000056, 4:ACLM01000020, 5:NC_007929, 6:NZ_GL872382, 7:CP002461, 8:ACGZ02000030, 9:NZ_BACN01000068, 10:NC_021235, 11:NZ_BAC001000009, 12:NZ_GL575016, 13:NC_015214, 14:NZ_BACR01000045, 15:NC_006814, 16:NZ_AEOS01000240, 17:ACHG01000196, 18:ACKR01000173, 19:ACGH01000012, 20:NZ_AHYZ01000112
<i>Mycobacterium</i>	45	6	1:NZ_ANPD01000034, 2:NZ_AJFI01000060, 3:CP003491, 4:NC_011896, 5:NZ_AFWW02000005, 6:NC_009565
<i>Bacillus</i>	32	8	1:NZ_AJRJ01000051, 2:NC_006270, 3:NC_020272, 4:NZ_AOTY01000005, 5:CP003017, 6:NZ_JH600284, 7:NC_009848, 8:NC_010180
<i>Escherichia</i>	27	1	1:NZ_BAFF01000003
<i>Xanthomonas</i>	26	6	1:AE008922, 2:NC_006834, 3:NZ_CAPJ01000396, 4:NC_013722, 5:NZ_AGDB01000215, 6:NZ_AJRZ01000096
<i>Streptomyces</i>	19	15	1:CP002047, 2:AROY01000536, 3:NZ_AGBF01000190, 4:NC_003888, 5:NZ_ANSJ01000037, 6:NZ_CM001015, 7:NZ_AOHP01000162, 8:NZ_AORZ01000064, 9:BA000030, 10:NZ_ADXB01000305, 11:NZ_AJJM01000167, 12:NZ_AJSZ01000210, 13:NZ_JH725387, 14:NZ_DS999647, 15:NZ_AHBF01000011
<i>Enterobacter</i>	10	3	1:CP005991, 2:CP002824, 3:NZ_GL892086
<i>Leuconostoc</i>	10	4	1:CP002898, 2:NZ_CAGF01000002, 3:NZ_AEIZ01000018, 4:CP003839
<i>Pantoea</i>	7	2	1:NC_013956, 2:NC_014562
<i>Citrobacter</i>	6	1	1:NC_009792
<i>Serratia</i>	6	3	1:NC_009832, 2:ADBY01000045, 3:NZ_AORJ01000064

<i>Selenomonas</i>	5	3	1:ACKT01000013, 2:ACLA01000014, 3:NZ_AENV01000002
<i>Actinomyces</i>	4	2	1:GL877176, 2:NZ_GL985606
<i>Clostridium</i>	4	2	1:CP002118, 2:NC_011837
<i>Cronobacter</i>	4	1	1:NC_009778
<i>Paenibacillus</i>	4	3	1:CP003107, 2:NZ_AFHW01000056, 3:HE577054
<i>Pectobacterium</i>	4	1	1:NZ_ABVY01000021
<i>Arthrobacter</i>	3	3	1:NC_011886, 2:NC_008711, 3:NZ_BAEG01000083
<i>Chloroflexus</i>	3	2	1:NC_011831, 2:NC_010175
<i>Corynebacterium</i>	3	3	1:NZ_AFIZ01000001, 2:NC_012590, 3:ACGE01000080
<i>Staphylococcus</i>	3	3	1:NZ_CAJL01000012, 2:NC_007350, 3:NZ_ALWK01000004
<i>Brevibacterium</i>	2	2	1:NZ_AAGP01000014, 2:NZ_AMSP01000006
<i>Clavibacter</i>	2	1	1:NC_009480
<i>Dialister</i>	2	1	1:NZ_GL878519
<i>Mannheimia</i>	2	1	1:NZ_DS264608
<i>Pseudomonas</i>	2	2	1:CP000094, 2:NZ_CM001763
<i>Rubrivivax</i>	2	1	1:AP012320
<i>Saccharomonospora</i>	2	2	1:NC_013159, 2:NZ_AHGX01000043
<i>Saccharopolyspora</i>	2	2	1:NZ_GL877878, 2:NC_009142
<i>Pelagibacter</i>	2	2	1:NZ_DS995298, 2:NC_007205
<i>Acidaminococcus</i>	1	1	1:CP003058
<i>Acidobacterium</i>	1	1	1:NC_012483
<i>Amycolicococcus</i>	1	1	1:NC_015564
<i>Blastococcus</i>	1	1	1:NC_016943
<i>Brachybacterium</i>	1	1	1:NZ_AGBX01000007
<i>Brevibacillus</i>	1	1	1:NC_012491
<i>Caldilinea</i>	1	1	1:AP012337
<i>Centipeda</i>	1	1	1:NZ_GL892076
<i>Corallococcus</i>	1	1	1:CP003389
<i>Dinoroseobacter</i>	1	1	1:CP000832
<i>Erwinia</i>	1	1	1:NC_014306
<i>Exiguobacterium</i>	1	1	1:NC_010556
<i>Granulibacter</i>	1	1	1:NC_008343
<i>Halobacillus</i>	1	1	1:NZ_ANPF01000013
<i>Hylemonella</i>	1	1	1:NZ_AEGR01000052
<i>Ilumatobacter</i>	1	1	1:NC_020520
<i>Janibacter</i>	1	1	1:NZ_CH672413
<i>Kineosphaera</i>	1	1	1:NZ_BAHD01000020
<i>Kitasatospora</i>	1	1	1:AP010968
<i>Macrococcus</i>	1	1	1:NC_011999
<i>Microclunatus</i>	1	1	1:NC_015635
<i>Mobilicoccus</i>	1	1	1:NZ_BAFE01000089
<i>Modestobacter</i>	1	1	1:F0203431
<i>Nakamurella</i>	1	1	1:NC_013235
<i>Nocardiopsis</i>	1	1	1:CP003788
<i>Oscillibacter</i>	1	1	1:AP012044
<i>Peptoniphilus</i>	1	1	1:NZ_JH165061
<i>Planococcus</i>	1	1	1:NZ_AJYB01000042
<i>Plesiocystis</i>	1	1	1:NZ_ABCS01000038

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<i>Propionibacterium</i>	1	1	1:NC_019395
<i>Rheinheimera</i>	1	1	1:NZ_BAFK01000013
<i>Salmonella</i>	1	1	1:FR877557
<i>Sporolactobacillus</i>	1	1	1:NZ_AFVQ01000089
<i>Tetrasphaera</i>	1	1	1:NZ_HF570956
<i>Weissella</i>	1	1	1:NZ_AEKT01000057
<i>Shigella</i>	1	0	-
<i>Raoultella</i>	1	0	-
<i>Kosakonia</i>	1	0	-
Total	533	160	

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