

Table 2 Genes flanked by large repeat arrays.

Position	Size (bp)	Repeats	Flanking genes
1553919..1556594	2676	27 NIME, 1 REP 4, 1 REP 5, 2 Correia	NMA1643, <i>greA</i> ; transcription elongation factor
1812510..1815128	2619	23 NIME, 1 REP 3, 2 REP 4, 1 REP 5, 3 Correia	NMA1890, <i>opaB</i> ; opacity protein
1681455..1683933	2479	26 NIME, 2 Correia	NMA1740, <i>lbpB</i> ; lactoferrin-binding protein (IS1106) + NMA1742, <i>pyrG</i> ; CTP synthase
1960596..1962662	2067	19 NIME	NMA2023; possible polyamine permease substrate-binding protein
1967671..1969634	1964	26 NIME	NMA2025, <i>tbpB</i> ; transferrin-binding protein B
505282..507041	1760	18 NIME	NMA0527, <i>lgtB2</i> ; lacto-N-neotetraose biosynthesis glycosyl transferase
581995..583748	1754	16 NIME	NMA0608, <i>carA</i> ; carbamoyl phosphate synthase small subunit
1983654..1985348	1695	14 NIME, 2 REP 4, 2 REP 5, 3 Correia	NMA2041; conserved hypothetical
1140935..1142610	1676	14 NIME, 1 Correia	NMA1200; probable surface fibril protein
879810..881425	1616	12 NIME, 1 REP 3, 1 REP 4, 2 Correia	NMA0905, <i>iga</i> ; IgA1 protease
430852..432427	1576	12 NIME, 2 Correia	NMA0453, <i>fetA</i> ; probable ferric enterobactin receptor protein
367746..369287	1542	15 NIME, 1 Correia	NMA0397, <i>thiC</i> ; thiamine biosynthesis protein
			NMA0398, <i>porB</i> ; porin, outer membrane protein

207923..209435	1513	16 NIME	NMA0220; probable integral membrane protein	(IS1106) + NMA0222; probable peptide transporter
1625537..1626916	1380	6 NIME, 1 ATR, 1 REP 3, 1 REP 4, 2 Correia	NMA1699; conserved hypothetical	NMA1700; possible outer-membrane substrate-binding protein
862032..863384	1353	10 NIME, 1 ATR, 1 REP 4, 2 Correia	NMA0889, <i>era</i> ; probable GTPase	NMA0890, <i>trpF</i> ; probable N-(5'-phosphoribosyl) anthranilate isomerase
1058182..1059502	1321	13 NIME, 2 Correia	NMA1110; probable pilin	NMA1111; conserved hypothetical
1764829..1766013	1185	7 NIME, 1 REP 2, 1 Correia	NMA1817, <i>rnhA</i> ; ribonuclease HI	NMA1818; unknown
282418..283588	1171	12 NIME, 1 REP 3, 1 Correia	NMA0293, <i>pilC2</i> ; pilus-associated protein	NMA0295; probable periplasmic protein
462446..463583	1138	6 NIME, 1 REP 2, 1 REP 3, 1 REP 4, 2 Correia	NMA0477; possible p-aminobenzoate synthase	NMA0478; possible outer-membrane peptidase
1112875..1113986	1112	4 NIME	NMA1160; possible membrane protein	NMA1161; probable outer-membrane receptor protein
663490..664566	1077	6 NIME, 2 Correia	NMA0675, <i>recG</i> ; probable DNA helicase	NMA0676, <i>argC</i> ; probable N-acetyl-gamma-glutamyl-phosphate reductase
2036432..2037507	1076	10 NIME, 1 Correia	NMA2084, <i>putA</i> ; probable bifunctional proline dehydrogenase	(IS) + NMA2086, <i>xthA</i> ; exodeoxyribonuclease III
1549772..1550844	1073	3 NIME, 1 ATR, 1 REP 3, 2 Correia	NMA1640; possible aminopeptidase	NMA1642, <i>porA</i>
2123557..2124588	1032	14 NIME	NMA2175, <i>vapA</i> ; possible virulence-associated protein	NMA2176; unknown
457787..458805	1019	8 NIME, 1 REP 4, 2 Correia	NMA0475, <i>hpuA</i> ; haemoglobin-haptoglobin-utilization protein	NMA0476; possible periplasmic protein
603481..604489	1009	11 NIME, 1 Correia	NMA0622, <i>ileS</i> ; probable isoleucyl-tRNA synthetase	NMA0623, <i>isp</i> ; probable lipoprotein signal peptidase

**Table 3 Tandem repeat sequences indicating potential phase variable genes.**

Tandem repeat	Gene(s) affected	Status	Function
(G)14	NMA0048 ( <i>pglA</i> )	On	glycosyltransferase involved in pilin glycosylation
(GC)6	NMA0072 ( <i>pdxA</i> )	On	pyridoxal phosphate biosynthetic protein
(G)9	NMA0132A	On	unknown
(G)11	NMA0293 ( <i>pilC2</i> )	Off	pilus-associated protein
(G)9	Upstream of NMA0402 ( <i>truA</i> )	?	tRNA pseudouridine synthase; promoter?
(G)12	NMA0406	Off	probable acetyltransferase
(GC)6	NMA0419	On	conserved hypothetical
(C)10	NMA0475 ( <i>hpuA</i> )	On	haemoglobin-haptoglobin-utilization protein
(G)10	NMA0478	On	possible outer membrane peptidase
(C)13	NMA0609 ( <i>pilC1</i> )	On	pilus-associated protein
(G)10	NMA0619	On	possible lipopolysaccharide modification acyltransferase
(G)16	NMA0641	Off	possible glycosyl transferase
(AAACAAC)26	NMA0832	On	possible glycosyl transferase; translates to 9x NNKQQT repeats
(G)8	NMA1040	Off	type I restriction-modification system specificity protein
(G)11	1142347..1142357 (non-coding)	-	in DNA repeat array
(G)17	Upstream of NMA1251 ( <i>opcA</i> )	?	outer membrane protein; promoter
(G)9	NMA1427	Off	glycosyltransferase
(TTGGG)8	NMA1467	Off	type III restriction-modification system modification protein
(C)12	Upstream of NMA1642 ( <i>porA</i> )	?	porin; promotor
(CTTCT)7	NMA1676 ( <i>opaD</i> )	Off	outer membrane protein
(C)10	Upstream of NMA1792	?	unknown; promoter?
(CTTCT)8	NMA1890 ( <i>opaB</i> )	Off	outer membrane protein

(G)10	NMA1925 ( <i>hmbR</i> )	Off	haemoglobin receptor
(67 bp)3	NMA1996 ( <i>natD</i> )	Off	possible periplasmic type I secretion system protein
(CTTCT)11	NMA2043 ( <i>opaA</i> )	Off	outer membrane protein
(G)9	NMA2069	Off	cytoplasmic membrane protein
(GCTT)8	Upstream of NMA2175 ( <i>vapA</i> )	?	“virulence associated protein”; promoter?