

Table S3 primer list

Primer name	Sequence(5'→3')	Related information
VirBp-B1-SpeI-F	CCCCTAGTCACTTTCCAGCGATGACATGA	Universal primers of pRL4 and single amino acid substitution mutants
VirB3-XhoI-R	TCTCCTCGAGTTACGCCATTCTCTCCCT	
VirB2-up-SacI-sense	TTAAGAGCTCGCAGAACCAGGCTCAAGC	Generate <i>virB2</i> -up fragment for pJQ- <i>virB2</i>
VirB2-up-SpeI-anti	TCTACTAGTGCATCGCATTATTGCGGACCT	
VirB2-down-SpeI-sense	TAATACTAGTGGCAAACGCTGACTGGAGG	Generate <i>virB2</i> -down fragment for pJQ- <i>virB2</i>
VirB2-down-XhoI-anti	TAAGCTCGAGGTCATTGCGAAGGAGTTT	
VirB2-P44A-Sense	GCATTTTCTCCTCTGGGGCAGCCGC	Generate VirB2-P44A
VirB2-P44A-Anti	GCGGCTGCCCCAGAGGAGAAAATGC	
VirB2-A45V-Sense	GCCGGTTGCGGCCCAATCTGCAGGT	Generate VirB2-A45V
VirB2-A45V- Anti	ACCTGCAGATTGGGCCGCAACCGGC	
VirB2-A47V-Sense	GCGGTCCAATCTGCAGGTGGCG	Generate VirB2-A47V
VirB2-A47V- Anti	CGCCACCTGCAGATTGGACCGC	
VirB2-S49A-Sense	GCCCAAGCAGCAGGTGGCGGCACTG	Generate VirB2-S49A
VirB2-S49A- Anti	CAGTGCCGCCACCTGCTGCTTGGGC	
VirB2-G51A-Sense	CCAATCTGCAGCTGGCGGCACTGAC	Generate VirB2-G51A
VirB2-G51A- Anti	GTCAGTGCCGCCAGCTGCAGATTGG	
VirB2-D55A-Sense	TGGCGGCACTGCCCCAGCCACAATG	Generate VirB2-D55A
VirB2-D55A- Anti	CATTGTGGCTGGGGCAGTGCCGCCA	
VirB2-P56A-Sense	GGCACTGACGCCGCCACAATGGTTA	Generate VirB2-P56A
VirB2-P56A- Anti	TAACCATTGTGGCGGCGTCAGTGCC	
VirB2-I63A-Sense	ACAATGGTTAACAACGCATGCACGTTTATC	Generate VirB2-I63A
VirB2-I63A- Anti	GATAAACGTGCATGCGTTGTTAACCATTGT	
VirB2-C64A-Sense	TTAACAACATAGCCACGTTTATCCT	Generate VirB2-C64A
VirB2-C64A-anti	AGGATAAACGTGGCTATGTTGTTAA	
VirB2-I67A-Sense	TATGCACGTTTGCCCTTGGTCCGTT	Generate VirB2-I67A
VirB2-I67A- Anti	AACGGACCAAGGGCAAACGTGCATA	
VirB2-G69A-Sense	CGTTTATCCTTGCTCCGTTCCGGCCA	Generate VirB2-G69A
VirB2-G69A- Anti	TGGCCGAACGGAGCAAGGATAAACG	

VirB2-P70A-Sense	TTATCCTTGGTGCCTTCGGCCAGTC	Generate
VirB2-P70A- Anti	GACTGGCCGAAGGCACCAAGGATAA	VirB2-P70A
VirB2-F71A-Sense	TCCTTGGTCCGGCTGGCCAGTCACT	Generate
VirB2-F71A- Anti	AGTGACTGGCCAGCCGGACCAAGGA	VirB2-F71A
VirB2-G72A-Sense	TTGGTCCGTTCGCCAGTCACTCGC	Generate
VirB2-G72A- Anti	GCGAGTGAAGTGGGCGAACGGACCAA	VirB2-G72A
VirB2-Q73A-Sense	GTCCGTTCCGGCGCATCACTCGCTGTT	Generate
VirB2-Q73A- Anti	AACAGCGAGTGATGCGCCGAACGGAC	VirB2-Q73A
VirB2-L78A-Sense	CACTCGCTGTTGCTGGCATCGTGGC	Generate
VirB2-L78A- Anti	GCCACGATGCCAGCAACAGCGAGTG	VirB2-L78A
VirB2-I80A-Sense	CGCTGTTCTTGGCGCTGTGGCCATCGGAA	Generate
VirB2-I80A- Anti	TTCCGATGGCCACAGCGCCAAGAACAGCG	VirB2-I80A
VirB2-I85A-Sense	GCCATCGGAGCCTCCTGGATGTTTCG	Generate
VirB2-I85A- Anti	CGAACATCCAGGAGGCTCCGATGGC	VirB2-I85A
VirB2-W87A-Sense	TCGGAATCTCCGCCATGTTCCGGTCG	Generate
VirB2-W87A- Anti	CGACCGAACATGGCGGAGATTCCGA	VirB2-W87A
VirB2-M88A-Sense	CGGAATCTCCTGGGCTTTCGGTCCG	Generate
VirB2-M88A- Anti	GCGACCGAAAGCCCAGGAGATTCCG	VirB2-M88A
VirB2-F89A-Sense	AATCTCCTGGATGGCCGGTCCGCGCT	Generate
VirB2-F89A- Anti	AGCGCGACCGGCCATCCAGGAGATT	VirB2-F89A
VirB2-R91A-Sense	CTGGATGTTCCGGTGTCTTCACTCGGT	Generate
VirB2-R91A- Anti	ACCGAGTGAAGCAGCACCGAACATCCAG	VirB2-R91A
VirB2-L94A-Sense	GTCGCGCTTCCAGCCGGTCTCGTTGC	Generate
VirB2-L94A- Anti	GCAACGAGACCGGCTGAAGCGCGAC	VirB2-L94A
VirB2-V100A-Sense	TCGTTGCCGGCGCAGTCGGCGGCAT	Generate
VirB2-V100A- Anti	ATGCCGCCGACTGCGCCGGCAACGA	VirB2-V100A
VirB2-G103A-Sense	GCGTCGTCCGGCGCTATTGTCATCAT	Generate
VirB2-G103A- Anti	ATGATGACAATAGCGCCGACGACGC	VirB2-G103A
VirB2-I104A-Sense	TCGTCCGGCGGCGCTGTCATCATGTT	Generate
VirB2-I104A- Anti	AACATGATGACAGCGCCGCCGACGA	VirB2-I104A
VirB2-M107A-Sense	GGCATTGTCATCGCTTTTGGAGCCAGC	Generate
VirB2-M107A- Anti	GCTGGCTCCAAAAGCGATGACAATGCC	VirB2-M107A
VirB2-F108A-Sense	ATTGTCATCATGGCTGGAGCCAGCTTCC	Generate
VirB2-F108A- Anti	GGAAGCTGGCTCCAGCCATGATGACAAT	VirB2-F108A
VirB2-A110G-Sense	TCATGTTTGGAGGCAGCTTCTGGG	Generate
VirB2-A110G- Anti	CCCAGGAAGCTGCCTCCAAACATGA	VirB2-A110G
VirB2-L113A-Sense	GAGCCAGCTTCGCAGGCAAAACGCT	Generate

VirB2-L113A- Anti	AGCGTTTTGCCTGCGAAGCTGGCTC	VirB2-L113A
VirB2-K115A-Sense	GCTTCCTGGGCGCAACGCTGACTGG	Generate
VirB2-K115A- Anti	CCAGTCAGCGTTGCGCCCAGGAAGC	VirB2-K115A
VirB2-G119A-Sense	CAAAACGCTGACTGCTGGTGGCTAATGA	Generate
VirB2-G119A- Anti	TCATTAGCCACCAGCAGTCAGCGTTTTG	VirB2-G119A
VirB2-G119C-Sense	CAAAACGCTGACTTGCGGTGGCTAATGA	Generate
VirB2-G119C- Anti	TCATTAGCCACCGCAAGTCAGCGTTTTG	VirB2-G119C
VirB2-G120A-Sense	ACGCTGACTGGAGCTGGCTAATGAATGA	Generate
VirB2-G120A- Anti	TCATTCATTAGCCAGCTCCAGTCAGCGT	VirB2-G120A
VirB2-G121A-Sense	CTGACTGGAGGTGCTTAATGAATGATCG	Generate
VirB2-G121A- Anti	CGATCATTCATTAAGCACCTCCAGTCAG	VirB2-G121A