**Table S8. DNA and amino acid sequences of antigens used**

|  |  |  |
| --- | --- | --- |
| **Antigen (locus)** | **DNA sequence (5’-3’, from the kpni restriction site to the hindiii restriction site) derived from *S. pnuemoniae* TIGR4** | **Amino acid sequence of the encoded antigen fragment** |
| **SpuA (SP\_0268)** | ggtaccggaagcgatgaaagtacgccaactacgaatgagccaaacaatcgtaacactacgactttagcccagcccttgacggatactgcggcaggcagtgggaaaaacgaatctgacatctcctcaccagggaacgccaacgcttcattagagaagacggaagaaaaacctgcgacggaaccaacgactccagcggcctcaccagccgatcctgctccacaaacgggccaagaccgcagtagtgagcccacgacctctacttcgccagtaacaaccgaaacgaaagcagaggagccaatcgaggacaactatttccgtattcacgtaaaaaaattgccggaggagaacaaggatgcacagggactgtggacttgggatgacgttgagaagccatccgagaactggcccaacggtgccttatcattcaaagatgccaaaaaagacgattacgggtattatctggatgtaaagttgaaaggagaacaagctaaaaagatttctttcctgattaataacaccgccggcaagaatttgacgggcgataaatccgtagaaaaattggtgcccaagatgaatgaagcatggttggatcaggactacaaagtgttcagttatgaaccccaaccggcagggaccgttcgtgttaactattaccgcaccgacgggaactatgacaaaaaatcactgtggtactggggggacgtaaaaaacccttctagtgcccaatggcctgacggtacggattttacagcaaccgggaagtatggtcgctatatcgacattccacttaatgaggcggcgcgtgaatttggattcctgttgttggacgaatccaaacagggggatgatgtgaagattcgtaaagaaaattataaatttacagaccttaagaatcattctcagatttttcttaaagacgatgatgagagcatttatacgaatccgtattatgtgcacgacattcgtatgacgggcgcacagcatgttgggaccagcagtattgaaagcagcttttccaccttagttggagcgaaaaaggaggacatcctgaagcatagcaatattacgaaccacttgggaaacaaggtaacaattacagacgtagcgattgatgaagctggaaaaaaggtgacctatagtggggacttctcggataccaagcacccctacacagtttcttataatagcgatcaatttacgaccaagacctcatggcgtctgaaggatgagacctatagttatgacggaaaacttggggctgatcttaaagaggaaggaaaacaagtagacttaactctttggtcaccgtctgccgataaggtatcagtcgttgtctacgacaagaatgatcccgacaaggttgttggtactgtggcgttagaaaaaggggagcgcggaacctggaagcaaacattagacagcaccaataaacttggtatcacagactttacggggtactactaccagtaccaaatcgaacgtcaaggaaagaccgtgcttgccctctgaaagctt | SDESTPTTNEPNNRNTTTLAQPLTDTAAGSGKNESDISSPGNANASLEKTEEKPATEPTT  PAASPADPAPQTGQDRSSEPTTSTSPVTTETKAEEPIEDNYFRIHVKKLPEENKDAQGLW  TWDDVEKPSENWPNGALSFKDAKKDDYGYYLDVKLKGEQAKKISFLINNTAGKNLTGDKS  VEKLVPKMNEAWLDQDYKVFSYEPQPAGTVRVNYYRTDGNYDKKSLWYWGDVKNPSSAQWPDGTDFTATGKYGRYIDIPLNEAAREFGFLLLDESKQGDDVKIRKENYKFTDLKNHSQIF  LKDDDESIYTNPYYVHDIRMTGAQHVGTSSIESSFSTLVGAKKEDILKHSNITNHLGNKVTITDVAIDEAGKKVTYSGDFSDTKHPYTVSYNSDQFTTKTSWRLKDETYSYDGKLGADLKEEGKQVDLTLWSPSADKVSVVVYDKNDPDKVVGTVALEKGERGTWKQTLDSTNKLGITDFTGYYYQYQIERQGKTVLAL |
| **TprX (SP\_1069)** | ggtaccggtcagaataacaaagatgagaaaaagattacaaagatcggagtgttacaattcgtttcgcacccatccttggatttgatttacaagggcatccaagacggattggccgaagagggatacaaagacgaccaggtaaaaattgattttatgaatagtgaaggcgaccaaagtaaggtcgccaccatgtcaaaacagcttgtggcgaatgggaacgatttagtagtaggcatcgctacaccggcagcacagggacttgcgtccgcaacaaaggacctgcccgtgattatggccgcaatcacagatccaatcggggctaatctggtgaaagacttgaagaaacctgggggaaatgtaaccggcgtgagtgaccacaacccggcgcagcagcaggtcgaactgattaaagctcttacgcccaacgtaaagacgattggtgctctgtattcgagttccgaggataattctaagacgcaagtcgaggaatttaaggcttacgccgagaaagccggccttaccgtggaaacctttgcggtgccatcgacaaatgagatcgccagcacagtcaccgtgatgacctctaaagtagacgctatttgggtgccgattgataacacaatcgcatcaggttttcctaccgtggtctcttcaaaccaaagttctaaaaaaccgatctacccatcagctaccgcgatggtagaggtcggcgggttggcttccgttgtcattgatcaacatgatcttggcgttgccacaggcaagatgatcgtacaggttttgaaaggagcaaaaccggcggatacccctgtcaatgtcttttccaccggcaagagcgttattaacaagaaaattgcacaagaactgggtattaccatccctgaatctgtactgaaagaagcagggcaggttatcgaatgaaagctt | QNNKDEKKITKIGVLQFVSHPSLDLIYKGIQDGLAEEGYKDDQVKIDFMNSEGDQSKVAT  MSKQLVANGNDLVVGIATPAAQGLASATKDLPVIMAAITDPIGANLVKDLKKPGGNVTGVSDHNPAQQQVELIKALTPNVKTIGALYSSSEDNSKTQVEEFKAYAEKAGLTVETFAVPST  NEIASTVTVMTSKVDAIWVPIDNTIASGFPTVVSSNQSSKKPIYPSATAMVEVGGLASVVIDQHDLGVATGKMIVQVLKGAKPADTPVNVFSTGKSVINKKIAQELGITIPESVLKEAGQVIE |
| **MetQ (SP\_0149)** | ggtaccggtgacaatgccaccacgattaaaattgctaccgtcaaccgctccggatctgaggaaaaacgctgggataaaatccaagaacttgtcaaaaaagacggaattacgttagaatttacagagttcacagactactctcaacccaacaaagcgacggcggatggggaagtggacttaaatgcgtttcagcactacaatttccttaacaactggaataaagagaatggaaaggatcttgttgctattgctgacacttatatttcgcccatccgcttgtactcaggattaaatggtagcgctaacaagtacacaaaggtcgaggatattcctgcaaatggcgaaattgcggttcctaatgacgccacgaacgaatcgcgtgctctttatctgcttcagtcggctggccttattaaactggatgtgagcggaacggcgttggcaacggttgcaaatattaaggaaaatcccaagaacttgaagatcacagaattggacgcctcacagaccgcgcgttcattaagtagtgttgacgcagccgtagtgaacaatacgtttgtcactgaggccaaattagactacaaaaagtcgcttttcaaggagcaggccgatgaaaacagtaagcaatggtataacattattgtcgctaaaaaagactgggagactagccccaaggctgacgctattaaaaaagttattgcagcataccacacagatgatgtcaagaaggtgattgaagaatcctctgatggtctggatcagccggtatggtgaaagctt | DNATTIKIATVNRSGSEEKRWDKIQELVKKDGITLEFTEFTDYSQPNKATADGEVDLNAF  QHYNFLNNWNKENGKDLVAIADTYISPIRLYSGLNGSANKYTKVEDIPANGEIAVPNDAT  NESRALYLLQSAGLIKLDVSGTALATVANIKENPKNLKITELDASQTARSLSSVDAAVVN  NTFVTEAKLDYKKSLFKEQADENSKQWYNIIVAKKDWETSPKADAIKKVIAAYHTDDVKK  VIEESSDGLDQPVW |
| **LivJ (SP\_0749)** | ggtaccggtgtcaacacagcggggaactctgtggaagaaaagactattaaaattggtttcaatttcgaggagtcgggctccttagcggcgtacggtactgctgagcagaaaggagcccaacttgccgtcgatgagatcaacgcagctgggggcattgacggaaagcaaatcgaagtagtagataaggacaacaaaagtgagactgctgaagctgcaagcgtcaccaccaatctggtgacacaatcaaaggtttccgcggtcgtgggccctgcaacgtctggtgctaccgcagccgccgttgctaatgcaactaaggcaggtgttccattgatctcaccgtccgccactcaggatggtctgaccaagggtcaagactaccttttcatcgggacgtttcaagactccttccaaggcaaaattatctcgaattatgtcagcgaaaagctgaacgctaaaaaagttgttttatataccgacaacgcatccgattacgcgaaaggaattgcgaagtccttccgcgagtcatacaagggcgagatcgttgcggatgagacctttgttgcaggtgacacggactttcaagcagctcttacaaaaatgaagggaaaggactttgacgcgattgtagtccctggttattataatgaggcagggaagatcgtaaatcaggcacgcggtatgggcattgacaagccgattgttggcggggatggatttaacggcgaagagttcgtgcaacaggcgacagcggaaaaagcctcaaacatctactttattagcggattctccacgactgttgaggtaagcgcgaaagctaaggcgttccttgatgcgtatcgcgctaagtataacgaagagccatcgacattcgcggccttagcgtacgattcggttcatttggtggcaaacgctgctaaaggtgcgaagaactcgggtgagattaaagacaatttggcgaagactaaagactttgagggggtcactggtcagactagctttgacgcggatcacaacacggtaaagactgcatatatgatgactatgaataatggaaaggtggaagcggctgaggtcgtaaaaccatgaaagctt | VNTAGNSVEEKTIKIGFNFEESGSLAAYGTAEQKGAQLAVDEINAAGGIDGKQIEVVDKD  NKSETAEAASVTTNLVTQSKVSAVVGPATSGATAAAVANATKAGVPLISPSATQDGLTKG  QDYLFIGTFQDSFQGKIISNYVSEKLNAKKVVLYTDNASDYAKGIAKSFRESYKGEIVAD  ETFVAGDTDFQAALTKMKGKDFDAIVVPGYYNEAGKIVNQARGMGIDKPIVGGDGFNGEEFVQQATAEKASNIYFISGFSTTVEVSAKAKAFLDAYRAKYNEEPSTFAALAYDSVHLVAN  AAKGAKNSGEIKDNLAKTKDFEGVTGQTSFDADHNTVKTAYMMTMNNGKVEAAEVVKP |
| **AliA (SP\_0366)** | ggtaccggttctggctccggctccagcacaaaaggggaaaagaccttctcatatatttacgaaaccgatccagataacctgaattaccttactactgctaaggctgcaacggctaatattacgtctaacgtggtcgatggattgttagaaaatgatcgctacggaaactttgtgccgtctatggccgaagattggtccgtatctaaggatggtttgacttacacgtacaccattcgtaaagacgccaaatggtacacctcagaaggcgaggaatatgcagcagtcaaagcccaggacttcgttacagggctgaagtacgcagccgacaaaaaaagcgatgctctgtacctggtacaggaatcaatcaagggcctggatgcttacgtgaaaggcgaaatcaaagacttcagtcaggtcggcattaaggccctggatgaacaaactgtccagtacacgttgaataaaccagaatctttttggaatagcaaaacgacaatgggtgtgctggcgcccgtaaacgaagagtttttaaattctaagggcgatgattttgccaaggccaccgaccctagttctctgctgtacaatggaccgtatttattgaagtctatcgtgaccaaatcgtccgtagaatttgcgaaaaaccctaattattgggataaggataacgtccacgtggacaaagtaaaacttagcttttgggatggccaagacacatcgaagccggcggaaaactttaaggacgggtcgttgacggccgcgcgtttatacccgacatccgcatcctttgctgagctggaaaagagcatgaaggataacatcgtttatacgcaacaggactcaatcacgtacttagttgggacgaatattgatcgccaatcctacaagtacacgagcaaaacaagcgacgagcagaaagcgagtacaaaaaaggctttgttaaataaggacttccgccaagccatcgcgtttggatttgaccgcaccgcctatgcgtcccagttgaacggacagaccggggcgtcgaagattcttcgcaatctgtttgtccctcccacatttgtacaggctgacggcaaaaatttcggagatatggtaaaagaaaagttagtgacctacggtgacgaatggaaagatgtgaacttggcggattcccaagatggtttgtataacccggaaaaggccaaagcagaatttgctaaagcaaaatccgcattacaagcagagggggtgcaatttccgatccaccttgatatgcccgtagaccaaacggctaccacaaaggtgcagcgcgtgcaatcaatgaagcagagccttgaggctactttaggagcggacaatgtgattattgacatccaacaactgcaaaaagacgaagttaacaatattacatattttgcggagaacgcggccggggaagactgggatctgtccgataacgtggggtggggaccagactttgcggacccgagcacttacttagatattattaagcctagcgtcggcgagagcacaaagacctacttggggtttgatagtggggaagataacgtcgcggcaaagaaggtcggcttatacgactacgaaaagctggttactgaagcaggcgacgagacaacagacgttgcaaaacgttacgataaatatgctgctgcccaagcatggcttactgactctgcgcttattatcccaactacctcgcgcacgggccgtccaatcctgtccaaaatggtgcctttcactatcccatttgcgttgtccggcaataagggaacctctgagcccgttttgtataagtacctggagcttcaggataaagcagttactgtggacgaatatcaaaaggcccaagaaaagtggatgaaagagaaggaagagtctaacaaaaaggcacaggaagacttggctaagcacgtaaaatgaaagctt | SGSGSSTKGEKTFSYIYETDPDNLNYLTTAKAATANITSNVVDGLLENDRYGNFVPSMAE  DWSVSKDGLTYTYTIRKDAKWYTSEGEEYAAVKAQDFVTGLKYAADKKSDALYLVQESIK  GLDAYVKGEIKDFSQVGIKALDEQTVQYTLNKPESFWNSKTTMGVLAPVNEEFLNSKGDD  FAKATDPSSLLYNGPYLLKSIVTKSSVEFAKNPNYWDKDNVHVDKVKLSFWDGQDTSKPA  ENFKDGSLTAARLYPTSASFAELEKSMKDNIVYTQQDSITYLVGTNIDRQSYKYTSKTSD  EQKASTKKALLNKDFRQAIAFGFDRTAYASQLNGQTGASKILRNLFVPPTFVQADGKNFG  DMVKEKLVTYGDEWKDVNLADSQDGLYNPEKAKAEFAKAKSALQAEGVQFPIHLDMPVDQTATTKVQRVQSMKQSLEATLGADNVIIDIQQLQKDEVNNITYFAENAAGEDWDLSDNVGWGPDFADPSTYLDIIKPSVGESTKTYLGFDSGEDNVAAKKVGLYDYEKLVTEAGDETTDVAKRYDKYAAAQAWLTDSALIIPTTSRTGRPILSKMVPFTIPFALSGNKGTSEPVLYKYLEL  QDKAVTVDEYQKAQEKWMKEKEESNKKAQEDLAKHVK |
| **PcsB (SP\_2216)** | ggtaccggtgaaaccacggacgataaaatcgcggcacaggacaataaaattagtaatctgacggcacagcaacaggaagcccaaaagcaagtggatcaaattcaagagcaagtgtccgcaattcaggcagagcagagcaatttgcaggccgagaatgatcgcctgcaagctgagtccaagaaacttgagggagaaatcactgaactttccaagaacatcgtgtctcgcaaccagtcattagaaaagcaagcccgttcggcgcaaaccaatggcgctgtgacatcatacatcaataccatcgttaattctaaatctatcactgaagccatttcccgcgtggcagcaatgtccgaaatcgtatcagcaaataacaagatgcttgagcaacagaaggcggataagaaggctatctctgaaaaacaagtagcaaacaatgacgcaatcaacacagtcattgcgaaccagcaaaagttagccgatgacgcgcaagccttaactacgaagcaagctgagctgaaagccgccgaactgagtttggcggctgaaaaagctacggcagagggagaaaaagctagtttattagagcaaaaagccgctgcggaagcggaagcacgcgcagcggctgtggctgaggcggcttataaagagaagcgtgcttctcaacaacaatcggtactggcttctgctaataccaatcttactgcacaagtgcaagcagtatcagaaagtgcggcagctccagtgcgcgcgaaggtacgcccgacctacagtacaaatgcgagttcatatccaatcggggaatgcacttggggagttaagaccttagcaccgtgggcaggcgattactgggggaatggtgcccaatgggctacgagcgccgcagcggcgggctttcgcactggttcaacgccccaggttggggcgattgcatgttggaacgacggaggatacggtcacgtcgccgtcgtaacagcggttgaatcgacaacccgtattcaggtgtctgagagtaattatgccggtaaccgcacgattggcaatcatcgtggatggttcaaccccaccacaacgagtgaaggcttcgtcacctatatctacgcggattgaaagctt | ETTDDKIAAQDNKISNLTAQQQEAQKQVDQIQEQVSAIQAEQSNLQAENDRLQAESKKLEGEITELSKNIVSRNQSLEKQARSAQTNGAVTSYINTIVNSKSITEAISRVAAMSEIVSAN  NKMLEQQKADKKAISEKQVANNDAINTVIANQQKLADDAQALTTKQAELKAAELSLAAEKATAEGEKASLLEQKAAAEAEARAAAVAEAAYKEKRASQQQSVLASANTNLTAQVQAVSESAAAPVRAKVRPTYSTNASSYPIGECTWGVKTLAPWAGDYWGNGAQWATSAAAAGFRTGSTPQVGAIACWNDGGYGHVAVVTAVESTTRIQVSESNYAGNRTIGNHRGWFNPTTTSEGFVTYIYAD |
| **AdcAII (SP\_1002)** | Ggtaccggtcagactggaaagggtatgaaaatcgtaacttctttttatccaatttacgctatggtcaaggaggtatccggtgatctgaacgatgtgcgtatgatccagagcagtagtggaatccattcctttgaaccatccgccaatgatattgccgccatctacgatgcagacgtgttcgtttaccattcccatacgctggaatcctgggcgggcagtttagatccgaatctgaagaaaagcaaggttaaggtacttgaggcttccgagggtatgactctggaacgtgtacccggattggaggacgtcgaggcgggcgacggcgttgacgagaagaccctttacgatcctcacacctggttggaccctgaaaaggcaggtgaggaggcccagatcatcgctgataaactgagtgaggtcgattctgaacataaggagacgtaccagaagaatgcccaagcctttatcaagaaagctcaggagttaaccaaaaaattccaaccgaagtttgaaaaggcaacgcagaagactttcgttacacagcacaccgcgttctcctatctggctaagcgtttcggattaaaccagttgggtattgcagggattagcccggagcaagagccatcgccgcgccaacttacagagatccaggagtttgttaagacatataaggtaaaaaccatttttacggaatcgaatgccagctcgaaggtagcagagacgttagtaaagtctacaggcgtcggactgaaaactctgaatcctctggagtcagatcctcaaaacgataagacttacttggagaatttggaagaaaacatgtccattcttgccgaggaattaaagtgaaagctt | QTGKGMKIVTSFYPIYAMVKEVSGDLNDVRMIQSSSGIHSFEPSANDIAAIYDADVFVYH  SHTLESWAGSLDPNLKKSKVKVLEASEGMTLERVPGLEDVEAGDGVDEKTLYDPHTWLDPEKAGEEAQIIADKLSEVDSEHKETYQKNAQAFIKKAQELTKKFQPKFEKATQKTFVTQHT  AFSYLAKRFGLNQLGIAGISPEQEPSPRQLTEIQEFVKTYKVKTIFTESNASSKVAETLVKSTGVGLKTLNPLESDPQNDKTYLENLEENMSILAEELK |
| **PrtA (SP\_0641)** | ggtaccggagacacatctagctctgaagatgctttaaacatctctgataaagaaaaagtagcagaaaataaagagaaacatgaaaatatccatagtgctatggaaacttcacaggattttaaagagaagaaaacagcagtcattaaggaaaaagaagttgttagtaaaaatcctgtgatagacaataacactagcaatgaagaagcaaaaatcaaagaagaaaattccaataaatcccaaggagattatacggactcatttgtgaataaaaacacagaaaatcccaaaaaagaagataaagttgtctatattgctgaatttaaagataaagaatctggagaaaaagcaatcaaggaactatccagtcttaagaatacaaaagttttatatacttatgatagaatttttaacggtagtgccatagaaacaactccagataacttggacaaaattaaacaaatagaaggtatttcatcggttgaaagggcacaaaaagtccaacccatgatgaatcatgccagaaaggaaattggagttgaggaagctattgattacctaaagtctatcaatgctccgtttgggaaaaattttgatggtagaggtatggtcatttcaaatatcgatactggaacagattatagacataaggctatgagaatcgatgatgatgccaaagcctcaatgagatttaaaaaagaagacttaaaaggcactgataaaaattattggttgagtgataaaatccctcatgcgttcaattattataatggtggcaaaatcactgtagaaaaatatgatgatggaagggattattttgacccacatgggatgcatattgcagggattcttgctggaaatgatactgaacaagacatcaaaaactttaacggcatagatggaattgcacctaatgcacaaattttctcttacaaaatgtattctgacgcaggatctgggtttgcgggtgatgaaacaatgtttcatgctattgaagattctatcaaacacaacgttgatgttgtttcggtatcatctggttttacaggatgaaagctt | DTSSSEDALNISDKEKVAENKEKHENIHSAMETSQDFKEKKTAVIKEKEVVSKNPVIDNN  TSNEEAKIKEENSNKSQGDYTDSFVNKNTENPKKEDKVVYIAEFKDKESGEKAIKELSSL  KNTKVLYTYDRIFNGSAIETTPDNLDKIKQIEGISSVERAQKVQPMMNHARKEIGVEEAI  DYLKSINAPFGKNFDGRGMVISNIDTGTDYRHKAMRIDDDAKASMRFKKEDLKGTDKNYWLSDKIPHAFNYYNGGKITVEKYDDGRDYFDPHGMHIAGILAGNDTEQDIKNFNGIDGIAPNAQIFSYKMYSDAGSGFAGDETMFHAIEDSIKHNVDVVSVSSGFTG |
| **PsaA (SP\_1650)** | ggtaccggtgcttccggcaaaaaggatactacaagcggtcaaaaattaaaagtggttgcaactaattctatcatcgcagacatcactaaaaatatcgctggcgataagattgatcttcatagtatcgttcctattgggcaagatccgcacgaatatgaacctttacctgaggacgtaaaaaagacgtccgaggcgaatctgattttctataacgggattaacctggaaactggtggcaatgcttggtttacaaagttagtcgagaatgctaagaaaacggagaataaagactactttgccgtcagtgacggagttgatgtaatttatttagagggtcaaaacgaaaaaggcaaggaggaccctcacgcctggttaaacttagagaatggcattatctttgctaaaaacatcgctaagcaattaagtgccaaagatccaaataacaaagagttctacgaaaagaatctgaaagagtatacggacaaactggataaacttgataaggagtcgaaagataaatttaacaagattcccgcagagaaaaaattaattgtgacgtccgagggggcttttaagtatttcagtaaagcctatggtgtgccaagcgcctacatttgggaaatcaacaccgaggaagaaggcacccccgagcaaattaagacattggtagaaaaattacgtcagactaaagttccgagtttgtttgtggagtcatcggttgatgaccgcccaatgaagactgtgagccaagatactaacatccctatctatgcccaaatcttcaccgattcgattgctgagcaaggcaaggaaggagactcttactacagtatgatgaaatacaacctggataagatcgctgagggcttagctaaatgaaagctt | ASGKKDTTSGQKLKVVATNSIIADITKNIAGDKIDLHSIVPIGQDPHEYEPLPEDVKKTS  EADLIFYNGINLETGGNAWFTKLVENAKKTENKDYFAVSDGVDVIYLEGQNEKGKEDPHA  WLNLENGIIFAKNIAKQLSAKDPNNKEFYEKNLKEYTDKLDKLDKESKDKFNKIPAEKKL  IVTSEGAFKYFSKAYGVPSAYIWEINTEEEGTPEQIKTLVEKLRQTKVPSLFVESSVDDR  PMKTVSQDTNIPIYAQIFTDSIAEQGKEGDSYYSMMKYNLDKIAEGLAK |