**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 | SDESTPTTNEPNNRNTTTLAQPLTDTAAGSGKNESDISSPGNANASLEKTEEKPATEPTTPAASPADPAPQTGQDRSSEPTTSTSPVTTETKAEEPIEDNYFRIHVKKLPEENKDAQGLWTWDDVEKPSENWPNGALSFKDAKKDDYGYYLDVKLKGEQAKKISFLINNTAGKNLTGDKSVEKLVPKMNEAWLDQDYKVFSYEPQPAGTVRVNYYRTDGNYDKKSLWYWGDVKNPSSAQWPDGTDFTATGKYGRYIDIPLNEAAREFGFLLLDESKQGDDVKIRKENYKFTDLKNHSQIFLKDDDESIYTNPYYVHDIRMTGAQHVGTSSIESSFSTLVGAKKEDILKHSNITNHLGNKVTITDVAIDEAGKKVTYSGDFSDTKHPYTVSYNSDQFTTKTSWRLKDETYSYDGKLGADLKEEGKQVDLTLWSPSADKVSVVVYDKNDPDKVVGTVALEKGERGTWKQTLDSTNKLGITDFTGYYYQYQIERQGKTVLAL |
| **TprX (SP\_1069)** | ggtaccggtcagaataacaaagatgagaaaaagattacaaagatcggagtgttacaattcgtttcgcacccatccttggatttgatttacaagggcatccaagacggattggccgaagagggatacaaagacgaccaggtaaaaattgattttatgaatagtgaaggcgaccaaagtaaggtcgccaccatgtcaaaacagcttgtggcgaatgggaacgatttagtagtaggcatcgctacaccggcagcacagggacttgcgtccgcaacaaaggacctgcccgtgattatggccgcaatcacagatccaatcggggctaatctggtgaaagacttgaagaaacctgggggaaatgtaaccggcgtgagtgaccacaacccggcgcagcagcaggtcgaactgattaaagctcttacgcccaacgtaaagacgattggtgctctgtattcgagttccgaggataattctaagacgcaagtcgaggaatttaaggcttacgccgagaaagccggccttaccgtggaaacctttgcggtgccatcgacaaatgagatcgccagcacagtcaccgtgatgacctctaaagtagacgctatttgggtgccgattgataacacaatcgcatcaggttttcctaccgtggtctcttcaaaccaaagttctaaaaaaccgatctacccatcagctaccgcgatggtagaggtcggcgggttggcttccgttgtcattgatcaacatgatcttggcgttgccacaggcaagatgatcgtacaggttttgaaaggagcaaaaccggcggatacccctgtcaatgtcttttccaccggcaagagcgttattaacaagaaaattgcacaagaactgggtattaccatccctgaatctgtactgaaagaagcagggcaggttatcgaatgaaagctt | QNNKDEKKITKIGVLQFVSHPSLDLIYKGIQDGLAEEGYKDDQVKIDFMNSEGDQSKVATMSKQLVANGNDLVVGIATPAAQGLASATKDLPVIMAAITDPIGANLVKDLKKPGGNVTGVSDHNPAQQQVELIKALTPNVKTIGALYSSSEDNSKTQVEEFKAYAEKAGLTVETFAVPSTNEIASTVTVMTSKVDAIWVPIDNTIASGFPTVVSSNQSSKKPIYPSATAMVEVGGLASVVIDQHDLGVATGKMIVQVLKGAKPADTPVNVFSTGKSVINKKIAQELGITIPESVLKEAGQVIE |
| **MetQ (SP\_0149)** | ggtaccggtgacaatgccaccacgattaaaattgctaccgtcaaccgctccggatctgaggaaaaacgctgggataaaatccaagaacttgtcaaaaaagacggaattacgttagaatttacagagttcacagactactctcaacccaacaaagcgacggcggatggggaagtggacttaaatgcgtttcagcactacaatttccttaacaactggaataaagagaatggaaaggatcttgttgctattgctgacacttatatttcgcccatccgcttgtactcaggattaaatggtagcgctaacaagtacacaaaggtcgaggatattcctgcaaatggcgaaattgcggttcctaatgacgccacgaacgaatcgcgtgctctttatctgcttcagtcggctggccttattaaactggatgtgagcggaacggcgttggcaacggttgcaaatattaaggaaaatcccaagaacttgaagatcacagaattggacgcctcacagaccgcgcgttcattaagtagtgttgacgcagccgtagtgaacaatacgtttgtcactgaggccaaattagactacaaaaagtcgcttttcaaggagcaggccgatgaaaacagtaagcaatggtataacattattgtcgctaaaaaagactgggagactagccccaaggctgacgctattaaaaaagttattgcagcataccacacagatgatgtcaagaaggtgattgaagaatcctctgatggtctggatcagccggtatggtgaaagctt | DNATTIKIATVNRSGSEEKRWDKIQELVKKDGITLEFTEFTDYSQPNKATADGEVDLNAFQHYNFLNNWNKENGKDLVAIADTYISPIRLYSGLNGSANKYTKVEDIPANGEIAVPNDATNESRALYLLQSAGLIKLDVSGTALATVANIKENPKNLKITELDASQTARSLSSVDAAVVNNTFVTEAKLDYKKSLFKEQADENSKQWYNIIVAKKDWETSPKADAIKKVIAAYHTDDVKKVIEESSDGLDQPVW |
| **LivJ (SP\_0749)** | ggtaccggtgtcaacacagcggggaactctgtggaagaaaagactattaaaattggtttcaatttcgaggagtcgggctccttagcggcgtacggtactgctgagcagaaaggagcccaacttgccgtcgatgagatcaacgcagctgggggcattgacggaaagcaaatcgaagtagtagataaggacaacaaaagtgagactgctgaagctgcaagcgtcaccaccaatctggtgacacaatcaaaggtttccgcggtcgtgggccctgcaacgtctggtgctaccgcagccgccgttgctaatgcaactaaggcaggtgttccattgatctcaccgtccgccactcaggatggtctgaccaagggtcaagactaccttttcatcgggacgtttcaagactccttccaaggcaaaattatctcgaattatgtcagcgaaaagctgaacgctaaaaaagttgttttatataccgacaacgcatccgattacgcgaaaggaattgcgaagtccttccgcgagtcatacaagggcgagatcgttgcggatgagacctttgttgcaggtgacacggactttcaagcagctcttacaaaaatgaagggaaaggactttgacgcgattgtagtccctggttattataatgaggcagggaagatcgtaaatcaggcacgcggtatgggcattgacaagccgattgttggcggggatggatttaacggcgaagagttcgtgcaacaggcgacagcggaaaaagcctcaaacatctactttattagcggattctccacgactgttgaggtaagcgcgaaagctaaggcgttccttgatgcgtatcgcgctaagtataacgaagagccatcgacattcgcggccttagcgtacgattcggttcatttggtggcaaacgctgctaaaggtgcgaagaactcgggtgagattaaagacaatttggcgaagactaaagactttgagggggtcactggtcagactagctttgacgcggatcacaacacggtaaagactgcatatatgatgactatgaataatggaaaggtggaagcggctgaggtcgtaaaaccatgaaagctt | VNTAGNSVEEKTIKIGFNFEESGSLAAYGTAEQKGAQLAVDEINAAGGIDGKQIEVVDKDNKSETAEAASVTTNLVTQSKVSAVVGPATSGATAAAVANATKAGVPLISPSATQDGLTKGQDYLFIGTFQDSFQGKIISNYVSEKLNAKKVVLYTDNASDYAKGIAKSFRESYKGEIVADETFVAGDTDFQAALTKMKGKDFDAIVVPGYYNEAGKIVNQARGMGIDKPIVGGDGFNGEEFVQQATAEKASNIYFISGFSTTVEVSAKAKAFLDAYRAKYNEEPSTFAALAYDSVHLVANAAKGAKNSGEIKDNLAKTKDFEGVTGQTSFDADHNTVKTAYMMTMNNGKVEAAEVVKP |
| **AliA (SP\_0366)** | ggtaccggttctggctccggctccagcacaaaaggggaaaagaccttctcatatatttacgaaaccgatccagataacctgaattaccttactactgctaaggctgcaacggctaatattacgtctaacgtggtcgatggattgttagaaaatgatcgctacggaaactttgtgccgtctatggccgaagattggtccgtatctaaggatggtttgacttacacgtacaccattcgtaaagacgccaaatggtacacctcagaaggcgaggaatatgcagcagtcaaagcccaggacttcgttacagggctgaagtacgcagccgacaaaaaaagcgatgctctgtacctggtacaggaatcaatcaagggcctggatgcttacgtgaaaggcgaaatcaaagacttcagtcaggtcggcattaaggccctggatgaacaaactgtccagtacacgttgaataaaccagaatctttttggaatagcaaaacgacaatgggtgtgctggcgcccgtaaacgaagagtttttaaattctaagggcgatgattttgccaaggccaccgaccctagttctctgctgtacaatggaccgtatttattgaagtctatcgtgaccaaatcgtccgtagaatttgcgaaaaaccctaattattgggataaggataacgtccacgtggacaaagtaaaacttagcttttgggatggccaagacacatcgaagccggcggaaaactttaaggacgggtcgttgacggccgcgcgtttatacccgacatccgcatcctttgctgagctggaaaagagcatgaaggataacatcgtttatacgcaacaggactcaatcacgtacttagttgggacgaatattgatcgccaatcctacaagtacacgagcaaaacaagcgacgagcagaaagcgagtacaaaaaaggctttgttaaataaggacttccgccaagccatcgcgtttggatttgaccgcaccgcctatgcgtcccagttgaacggacagaccggggcgtcgaagattcttcgcaatctgtttgtccctcccacatttgtacaggctgacggcaaaaatttcggagatatggtaaaagaaaagttagtgacctacggtgacgaatggaaagatgtgaacttggcggattcccaagatggtttgtataacccggaaaaggccaaagcagaatttgctaaagcaaaatccgcattacaagcagagggggtgcaatttccgatccaccttgatatgcccgtagaccaaacggctaccacaaaggtgcagcgcgtgcaatcaatgaagcagagccttgaggctactttaggagcggacaatgtgattattgacatccaacaactgcaaaaagacgaagttaacaatattacatattttgcggagaacgcggccggggaagactgggatctgtccgataacgtggggtggggaccagactttgcggacccgagcacttacttagatattattaagcctagcgtcggcgagagcacaaagacctacttggggtttgatagtggggaagataacgtcgcggcaaagaaggtcggcttatacgactacgaaaagctggttactgaagcaggcgacgagacaacagacgttgcaaaacgttacgataaatatgctgctgcccaagcatggcttactgactctgcgcttattatcccaactacctcgcgcacgggccgtccaatcctgtccaaaatggtgcctttcactatcccatttgcgttgtccggcaataagggaacctctgagcccgttttgtataagtacctggagcttcaggataaagcagttactgtggacgaatatcaaaaggcccaagaaaagtggatgaaagagaaggaagagtctaacaaaaaggcacaggaagacttggctaagcacgtaaaatgaaagctt | SGSGSSTKGEKTFSYIYETDPDNLNYLTTAKAATANITSNVVDGLLENDRYGNFVPSMAEDWSVSKDGLTYTYTIRKDAKWYTSEGEEYAAVKAQDFVTGLKYAADKKSDALYLVQESIKGLDAYVKGEIKDFSQVGIKALDEQTVQYTLNKPESFWNSKTTMGVLAPVNEEFLNSKGDDFAKATDPSSLLYNGPYLLKSIVTKSSVEFAKNPNYWDKDNVHVDKVKLSFWDGQDTSKPAENFKDGSLTAARLYPTSASFAELEKSMKDNIVYTQQDSITYLVGTNIDRQSYKYTSKTSDEQKASTKKALLNKDFRQAIAFGFDRTAYASQLNGQTGASKILRNLFVPPTFVQADGKNFGDMVKEKLVTYGDEWKDVNLADSQDGLYNPEKAKAEFAKAKSALQAEGVQFPIHLDMPVDQTATTKVQRVQSMKQSLEATLGADNVIIDIQQLQKDEVNNITYFAENAAGEDWDLSDNVGWGPDFADPSTYLDIIKPSVGESTKTYLGFDSGEDNVAAKKVGLYDYEKLVTEAGDETTDVAKRYDKYAAAQAWLTDSALIIPTTSRTGRPILSKMVPFTIPFALSGNKGTSEPVLYKYLELQDKAVTVDEYQKAQEKWMKEKEESNKKAQEDLAKHVK |
| **PcsB (SP\_2216)** | ggtaccggtgaaaccacggacgataaaatcgcggcacaggacaataaaattagtaatctgacggcacagcaacaggaagcccaaaagcaagtggatcaaattcaagagcaagtgtccgcaattcaggcagagcagagcaatttgcaggccgagaatgatcgcctgcaagctgagtccaagaaacttgagggagaaatcactgaactttccaagaacatcgtgtctcgcaaccagtcattagaaaagcaagcccgttcggcgcaaaccaatggcgctgtgacatcatacatcaataccatcgttaattctaaatctatcactgaagccatttcccgcgtggcagcaatgtccgaaatcgtatcagcaaataacaagatgcttgagcaacagaaggcggataagaaggctatctctgaaaaacaagtagcaaacaatgacgcaatcaacacagtcattgcgaaccagcaaaagttagccgatgacgcgcaagccttaactacgaagcaagctgagctgaaagccgccgaactgagtttggcggctgaaaaagctacggcagagggagaaaaagctagtttattagagcaaaaagccgctgcggaagcggaagcacgcgcagcggctgtggctgaggcggcttataaagagaagcgtgcttctcaacaacaatcggtactggcttctgctaataccaatcttactgcacaagtgcaagcagtatcagaaagtgcggcagctccagtgcgcgcgaaggtacgcccgacctacagtacaaatgcgagttcatatccaatcggggaatgcacttggggagttaagaccttagcaccgtgggcaggcgattactgggggaatggtgcccaatgggctacgagcgccgcagcggcgggctttcgcactggttcaacgccccaggttggggcgattgcatgttggaacgacggaggatacggtcacgtcgccgtcgtaacagcggttgaatcgacaacccgtattcaggtgtctgagagtaattatgccggtaaccgcacgattggcaatcatcgtggatggttcaaccccaccacaacgagtgaaggcttcgtcacctatatctacgcggattgaaagctt | ETTDDKIAAQDNKISNLTAQQQEAQKQVDQIQEQVSAIQAEQSNLQAENDRLQAESKKLEGEITELSKNIVSRNQSLEKQARSAQTNGAVTSYINTIVNSKSITEAISRVAAMSEIVSANNKMLEQQKADKKAISEKQVANNDAINTVIANQQKLADDAQALTTKQAELKAAELSLAAEKATAEGEKASLLEQKAAAEAEARAAAVAEAAYKEKRASQQQSVLASANTNLTAQVQAVSESAAAPVRAKVRPTYSTNASSYPIGECTWGVKTLAPWAGDYWGNGAQWATSAAAAGFRTGSTPQVGAIACWNDGGYGHVAVVTAVESTTRIQVSESNYAGNRTIGNHRGWFNPTTTSEGFVTYIYAD |
| **AdcAII (SP\_1002)** | Ggtaccggtcagactggaaagggtatgaaaatcgtaacttctttttatccaatttacgctatggtcaaggaggtatccggtgatctgaacgatgtgcgtatgatccagagcagtagtggaatccattcctttgaaccatccgccaatgatattgccgccatctacgatgcagacgtgttcgtttaccattcccatacgctggaatcctgggcgggcagtttagatccgaatctgaagaaaagcaaggttaaggtacttgaggcttccgagggtatgactctggaacgtgtacccggattggaggacgtcgaggcgggcgacggcgttgacgagaagaccctttacgatcctcacacctggttggaccctgaaaaggcaggtgaggaggcccagatcatcgctgataaactgagtgaggtcgattctgaacataaggagacgtaccagaagaatgcccaagcctttatcaagaaagctcaggagttaaccaaaaaattccaaccgaagtttgaaaaggcaacgcagaagactttcgttacacagcacaccgcgttctcctatctggctaagcgtttcggattaaaccagttgggtattgcagggattagcccggagcaagagccatcgccgcgccaacttacagagatccaggagtttgttaagacatataaggtaaaaaccatttttacggaatcgaatgccagctcgaaggtagcagagacgttagtaaagtctacaggcgtcggactgaaaactctgaatcctctggagtcagatcctcaaaacgataagacttacttggagaatttggaagaaaacatgtccattcttgccgaggaattaaagtgaaagctt | QTGKGMKIVTSFYPIYAMVKEVSGDLNDVRMIQSSSGIHSFEPSANDIAAIYDADVFVYHSHTLESWAGSLDPNLKKSKVKVLEASEGMTLERVPGLEDVEAGDGVDEKTLYDPHTWLDPEKAGEEAQIIADKLSEVDSEHKETYQKNAQAFIKKAQELTKKFQPKFEKATQKTFVTQHTAFSYLAKRFGLNQLGIAGISPEQEPSPRQLTEIQEFVKTYKVKTIFTESNASSKVAETLVKSTGVGLKTLNPLESDPQNDKTYLENLEENMSILAEELK |
| **PrtA (SP\_0641)** | ggtaccggagacacatctagctctgaagatgctttaaacatctctgataaagaaaaagtagcagaaaataaagagaaacatgaaaatatccatagtgctatggaaacttcacaggattttaaagagaagaaaacagcagtcattaaggaaaaagaagttgttagtaaaaatcctgtgatagacaataacactagcaatgaagaagcaaaaatcaaagaagaaaattccaataaatcccaaggagattatacggactcatttgtgaataaaaacacagaaaatcccaaaaaagaagataaagttgtctatattgctgaatttaaagataaagaatctggagaaaaagcaatcaaggaactatccagtcttaagaatacaaaagttttatatacttatgatagaatttttaacggtagtgccatagaaacaactccagataacttggacaaaattaaacaaatagaaggtatttcatcggttgaaagggcacaaaaagtccaacccatgatgaatcatgccagaaaggaaattggagttgaggaagctattgattacctaaagtctatcaatgctccgtttgggaaaaattttgatggtagaggtatggtcatttcaaatatcgatactggaacagattatagacataaggctatgagaatcgatgatgatgccaaagcctcaatgagatttaaaaaagaagacttaaaaggcactgataaaaattattggttgagtgataaaatccctcatgcgttcaattattataatggtggcaaaatcactgtagaaaaatatgatgatggaagggattattttgacccacatgggatgcatattgcagggattcttgctggaaatgatactgaacaagacatcaaaaactttaacggcatagatggaattgcacctaatgcacaaattttctcttacaaaatgtattctgacgcaggatctgggtttgcgggtgatgaaacaatgtttcatgctattgaagattctatcaaacacaacgttgatgttgtttcggtatcatctggttttacaggatgaaagctt | DTSSSEDALNISDKEKVAENKEKHENIHSAMETSQDFKEKKTAVIKEKEVVSKNPVIDNNTSNEEAKIKEENSNKSQGDYTDSFVNKNTENPKKEDKVVYIAEFKDKESGEKAIKELSSLKNTKVLYTYDRIFNGSAIETTPDNLDKIKQIEGISSVERAQKVQPMMNHARKEIGVEEAIDYLKSINAPFGKNFDGRGMVISNIDTGTDYRHKAMRIDDDAKASMRFKKEDLKGTDKNYWLSDKIPHAFNYYNGGKITVEKYDDGRDYFDPHGMHIAGILAGNDTEQDIKNFNGIDGIAPNAQIFSYKMYSDAGSGFAGDETMFHAIEDSIKHNVDVVSVSSGFTG |
| **PsaA (SP\_1650)** | ggtaccggtgcttccggcaaaaaggatactacaagcggtcaaaaattaaaagtggttgcaactaattctatcatcgcagacatcactaaaaatatcgctggcgataagattgatcttcatagtatcgttcctattgggcaagatccgcacgaatatgaacctttacctgaggacgtaaaaaagacgtccgaggcgaatctgattttctataacgggattaacctggaaactggtggcaatgcttggtttacaaagttagtcgagaatgctaagaaaacggagaataaagactactttgccgtcagtgacggagttgatgtaatttatttagagggtcaaaacgaaaaaggcaaggaggaccctcacgcctggttaaacttagagaatggcattatctttgctaaaaacatcgctaagcaattaagtgccaaagatccaaataacaaagagttctacgaaaagaatctgaaagagtatacggacaaactggataaacttgataaggagtcgaaagataaatttaacaagattcccgcagagaaaaaattaattgtgacgtccgagggggcttttaagtatttcagtaaagcctatggtgtgccaagcgcctacatttgggaaatcaacaccgaggaagaaggcacccccgagcaaattaagacattggtagaaaaattacgtcagactaaagttccgagtttgtttgtggagtcatcggttgatgaccgcccaatgaagactgtgagccaagatactaacatccctatctatgcccaaatcttcaccgattcgattgctgagcaaggcaaggaaggagactcttactacagtatgatgaaatacaacctggataagatcgctgagggcttagctaaatgaaagctt | ASGKKDTTSGQKLKVVATNSIIADITKNIAGDKIDLHSIVPIGQDPHEYEPLPEDVKKTSEADLIFYNGINLETGGNAWFTKLVENAKKTENKDYFAVSDGVDVIYLEGQNEKGKEDPHAWLNLENGIIFAKNIAKQLSAKDPNNKEFYEKNLKEYTDKLDKLDKESKDKFNKIPAEKKLIVTSEGAFKYFSKAYGVPSAYIWEINTEEEGTPEQIKTLVEKLRQTKVPSLFVESSVDDRPMKTVSQDTNIPIYAQIFTDSIAEQGKEGDSYYSMMKYNLDKIAEGLAK |