

Amino Acid Sequence Alignment - Coronaviruses HKU1A/B, OC43, and Wuhan

HKU1B MFLIIFI-LPTTLAVIGDFNCTN--SFINDYNKTIPIRISEVDVVDVSLGLGTYVYVLRVYL
 HKU1A MLLIIFI-LPTTLAVIGDFNCTN--FAINDLNTTVPRISEYVVDVSYGLGTYVYLDREVYL
 OC43 MFLILLISLPTAFVIGDLKCTSDTSYINDKDTGPPPISTDTVDVTNGLGTYVYVLDREVYL
 Wuhan -MFVFLVLLFLVSSQCVNLTTRTQLPPAYTNSFTRGVYYPDKVFRSSVLSHSTQDIFLPPFF
 : : : : * * . : : : * : * : * : :

HKU1B NTTLLFTGYFPKSGANFRDLALKGSIYLSLTLWYKPPFLSDFNNGIFSKVKNTKLYVNNTL
 HKU1A NTTILFTGYFPKSGANFRDLSLKGTTYLSLTLWYQKPPFLSDFNNGIFSRVKNTKLYVNKTL
 OC43 NTTLFLNGYYPTSGSTYRNMALKGSVLLSRLWFKPPFLSDFINGIFAKVKNTKVIKDRVM
 Wuhan SNVTWFHAIHVSGTNGTKRFDNPVLPFNDGVYFASTEKSNIIIRGWIFGTTLDSKTQSLLI
 : : : * : * : :

HKU1B YSEFSTIVIGSVFVNTSYTIVVQP-----HNGILEITACQYTMCEYPHTVCKS
 HKU1A YSEFSTIVIGSVFINNSYTIIVVQP-----HNGVLEITACQYTMCEYPHTICKS
 OC43 YSEFPAITIGSTFVNTSYSVVQVPTINSTQDGYNKLQGLLEVSVCOYNMCEYPQTICH
 Wuhan VNNATNVVIVKVFCEQFCNDPFLGV-----YYHKNNKSWMESEFRVSSANNCT
 * : : : : * :

HKU1B -KGSIRNESWHIDSSEPLCLFKKNFTYNVSADWLYFHFYQERGVFYAYYADVGMPTTFLF
 HKU1A -KGSSRNESWHFDKSEPLCLFKKNFTYNVSTDWLYFHFYQERGTFYAYYADSGMPTTFLF
 OC43 NLGNHRKELWHLDTGVVSCLYKRNFTYDVNADYLYFHFYQEGGTFYAYFTDTGVVTKFLF
 Wuhan FEYVSQPFLLMDLEGGKQGNFKNLREIVFKNIDGYFKIYSKHTPINLVRDLPOGFSALEPILV
 : . . . : : : * : : : : : : * *

HKU1B SLYLGTILSHYYVMP-----LTCNAISSNTDNETLEYWVTPLSRRQYLLNFDEHGUITN
 HKU1A SLYLGTLLSHYYVLP-----LTCNAISSNTDNETLQYWVTPLSKRQYLLKFDNRGUITN
 OC43 NVYLGMAISHYYVMP-----LTCNSKVKN--GFTLEYWVTPLTSRQYLLAFNQDGIIFN
 Wuhan DLPIGINITRFQTLALHRSYLTIPGSSSGWTAGAAAYVYVGYLQPRFTFLIKYNNENGTITD
 . : * : : : : : * * : * * * * * : * * : : * * :

HKU1B AVDCSSSFLSEIQCKTQSFAPNTGVYDLSGFTVKPVATVYRRIPNLPDCDIDNWLNNVSV
 HKU1A AVDCSSSFFSEIQCKTKSLLPNTGVYDLSGFTVKPVATVHRRIPDLPDCDIDKWLNNFNV
 OC43 AVDCMSDFMSEIKCKTQSIAPPTGVYELNGYTVQPIADVRRKLNLPNCNIEAWLNKSV
 Wuhan AVDCALDPLSETKTLKSEFVEKGIYQTSNFRVQPTESIVRFPNITNLCPFGEVFNATRF
 * * * * . : * * : * . : * : . * * : . . . : * * : * : * : *

HKU1B PSPLNWERRIFSNCFNLSTLLRLVHVDSFSCNNLDKSKIFGSCFNSITVDKFAIPNRRR
 HKU1A PSPLNWERKIFSNCFNLSTLLRLVHTDSFSCNNFDESKIYGSCFKSIVLDKFAIPNSRR
 OC43 PSPLNWERKTFSNCFNMSLSFSIQADSFTCNNIDAAKIYGMCFSSITIDKFAIPNGRK
 Wuhan ASVYAWNFKRISNCVADYSVLYNSASFSTFKYGVSPTKLNDLCEFNVYASVIRGDEV
 . * * * * : * * : * * : * * : * * : * * * *

HKU1B DDLQLGSSGFLQSSNYKIDISSSSCQLYYSPLLNVTINNFNPSSWNRRYGFGS---FN-
 HKU1A SDLQLGSSGFLQSSNYKIDTTSSSSCQLYYSPLAINVTINNYNPSSWNRRYGFNN---FN-
 OC43 VDLQLGNLGYLQSFNYRIDTTATSCQLYYNLPAANVSVSRFNPSTWNRKRFGFIEDSVFKP
 Wuhan RQIAPCQTGKIADYNYKLPDDFTGCVIAWNSNNLDSKVG-----
 : : * . * : . * * : : * : : : :

HKU1B -----VSSYDVVYSDFHCFVNSDFCPCADP-SVNSCVKSKPLSAICPAGTKYRHCDLDT
 HKU1A -----LSSHVSVYSRYCFVNNFPCAKP-SFASSCKSHKPPSASCPIGTNYRSCSTT
 OC43 RPAGVLTNHDVYQAHCFAKPNFCPCKLNGSCVGSVGPKNNGIGTGPAGTNYLTCDN--
 Wuhan -----GNYNLYRFLFRKSNLKPFERDISTEIQAGSTPCNGVEG-----
 . . . : * * :

HKU1B TLYVKNWCRCSCLPDPDISTYSPNT--CPQKKVVVGIGEHCPGLGINEEEKCGTQLN--HSS
HKU1A VLDHTDWCRCSCCLPDPITAYDPRS--CSQKSLVGVGEHCAGFGVDEEKCGVLDGSYNVS
OC43 -----LCTPDPITFKATGYTKCPQTKSLVGIGEHCSGLAVKSDYCG-----GNS
Wuhan -----FN

HKU1B CSCSPHAFGLGWSFDSCISNNRCNIFSNFIFNGINS GTTCSNDLLYSNTEVSTGVCVNYDL
HKU1A CLCSTDAFLGWSYDTCVSNRCNIFSNFILNGINS GTTCSNDLLQPNTVEVFTDVCVDYDL
OC43 CTCRPQAFGLGWSADSCLOQDKCNIFANFILHDVNSGLTCTDLOKANTDIILGVCVNYDL
Wuhan **CYFPLOS**YGFQPTNGVGYQPYRVVLS**FELLHAPAT**VCGP----KKS**TNLVKNKCV**NFN
* . : . : : . * : : . * : : . * : : . * : : .

HKU1B YGITGQGFKEVSAAYYNNWQNLLYDSNGNIIGFKDFLTNKTYTILPCYSGRVSAAFYQN
HKU1A YGITGQGFKEVSAVYNSWQNLLYDSNGNIIGFKDFVTNKTYNIFPCYAGRVSAAFHQN
OC43 YGILGQGFIVEVNATYNSWQNLLYDSNGNLYGFRDYITNRTFMIRSCYSGRVSAAFHAN
Wuhan **NGLTGTGVLTE**SNKKFLP-**FQQFGRDIADTTDAVRDPQ**TLLEILDITPC**SFGVSVITPGT**
* : * * : : * . : : * : : * . . . : * * . * . * * * . .

HKU1B --SSSPALLYRNLKCSYVLNN-ISFISQPF-----YFDSYLGCVLNAVNLTSYSVS
HKU1A --ASSLALLYRNLKCSYVLNN-ISLATQP-----YFDSYLGCVFNADNLTDSVS
OC43 --SSEPALLFRNIKCNVFNNSLTRQLQPIN-----YFDSYLGCVVNAYNSTAISVQ
Wuhan **NTSNQVAVLYQDVNCTEVPVAIHADQLTE**TWRVYSTGSNV**FQTRAGCLIGA**EHVN--NSY
* . . * : : : : * . * : * * : : * * : : * : : * : . .

HKU1B SCDLRMGSGFCIDYALPSS---RRKRRGISSPYRFVTFEPFNVSFVND SVETVGGFLFEIQ
HKU1A SCALRMGSGFCVDYNSSPSSSSRRKRRSISAS YRFVTFEPFNVSFVND SIESVGGLYEIK
OC43 TCDLTVGSGYCVDYS-----KNRRSRGAIITTYRFTNFEPFTVNSVND SLEPVGGLYEIQ
Wuhan **ECDIPIGAGICAS**YQTQTN----**SPRRARS**VSASQSI IAYTMSLGAEN**SVAYSNN**---SIA
* : * : * * * . * * . : : : * *

S1/S2

HKU1B IPTNFTIAGHEEFIQTSSPKVTIDCSAFVCSNYAACHDLLSEYGTFCDNINSILNEVNDL
HKU1A IPTNFTIVGQEEFIQTNSPKVTIDCSLFVCSNYAACHDLLSEYGTFCDNINSILDEVNGL
OC43 IPSEFTIGNMEEFIQTSSPKVTIDCAAFVCGDYAACKSOLVEYGSFCDNINA I L TEVNEL
Wuhan **IPTNFTI**SVTTE**ILPVSMTKTSVDC**MYIC**GDSTEC**SNL**LLQYGSFC**TQLN**RALT**GI AVE
* : : * : * * * . * : : . * : : * : : * : . * : * : * : * : * : * : *

HKU1B LDITQLQVANALMQGVTLSSNLNTNLHSDVDNIDFKSLLGCLGSQCG-SSRSRLEDLLF
HKU1A LDTTQLHVADTLMQGVTLSSNLNTNLHFDVDNINFKSLVGCLGPHCG-SSRSRFFEDLLF
OC43 LDTTQLQVANANLMNGVTLSKTKLDGVNFVDDINFSPVLGCLGSECKASSRSAIEDLLF
Wuhan **QDKNTQEVFAQVKQ**-----IYKTPPIKDFGGFN**ESQILPDP**----SKP**SKRSFI**EDLLF
* . . * : : : : * . : : . . * * * : * * * *

HKU1B NKVKLSVDVGFVEAYNNCTGGSEIRDLLCVQSFNGIKVLPPI LSETQISGYTTAATVAAMF
HKU1A DKVKLSVDVGFVEAYNNCTGGSEIRDLLCVQSFNGIKVLPPI LSESQISGYTTAATVAAMF
OC43 DKVKLSVDVGFVEAYNNCTGGAEIRDLCVQSYKGIKVLPPLLSENQISGYTTAATSASLF
Wuhan **NKVTLADAGEIKQYGDCLG**DIAARD**LICAKFNGLT**VLPP**LTDEMI**AQ**YTS**ALLAGTIT
* : * : * : * : * : * : * : * : * : * : * : * : * : * : * : * : *

HKU1B PPWSAAAG----VPFSLNVQYRINGLVGVTMDVLNKNQKLIANAFNKALLSIQNGFTATNS
HKU1A PPWSAAAG----IPFSLNVQYRINGLVGVTMDVLNKNQKLIATAFNALLSIQNGFSATNS
OC43 PLWTAAG----VPFYLNQYRINGLVGVTMDVLSQNQKLIANAFNNALYAIQEGFDATNS
Wuhan **SGWTFGAGAALQIP**AMQMA**YRFNGIGVT**Q**NVLYE**NOKLIAN**QFN**SAIG**IQ**DSLSS**IAS**
* . * : * * : * : * : * : * : * : * : * : * : * : * : * : * : * : *

HKU1B ALAKIQSVVNANAQALNSLLQQLFNKFGAIISSSLQEILSRLDNLEAQVQIDRLINGRLTA
HKU1A ALAKIQSVVNSNAQALNSLLQQLFNKFGAIISSSLQEILSRLEDAEAQVQIDRLINGRLTA
OC43 ALVKIQAVVNANAQALNSLLQQLSNRFGAISASLQEILSRLEDAEAQVQIDRLINGRLTA
Wuhan **ALGKLQDVVNQNAQALNTL**VKQLSS**NFGAIS**SV**INDILSRLDKVEAEVQIDRLITGRI**QS
* * * : * * * * * : * : * * * : * : * * * : * : * * * : * * * : * * * : *

HKU1B LNAYVSQQLSDITLIKAGASRAIEKVNCEVKSQS PRINFCGNGNHILSLVQNAPYGLLFI
 HKU1A LNAYVSQQLSDISLVKFGAALAMEKVNCEVKSQS PRINFCGNGNHILSLVQNAPYGLLFM
 OC43 LNAYVSQQLSDSTLVKFSAAQAMEKVNCEVKSQSSRINFCGNGNHIIISLVQNAPYGLYFI
 Wuhan LQTYVTOOLIRAAEIRASANLAATKMSECVLGOSKFVDFCGKGHLMSFPSAPHGVVEL
 *.:**:* ** : : . * * *.:*** . ** *.:***:* *.:* : *.*.*: *

HKU1B HFSYKPTSFKTVLVSPGLCLSGDRGIAPKQGYFIKQNSWMTGSSYYYYPEPISDKNVVF
 HKU1A HFSYKPI SFKTVLVSPGLCISGDVGIAPKQGYFIKHNDHWMFTGSSYYYYPEPISDKNVVF
 OC43 HFSYVPTKYVTARVSPGLCIAGDRGIAPKSGYFVNVNNTWMYTGSGYYYYPEPITENNVVV
 Wuhan HVTYVPAQEKNFTTAPAICHDG-KAHFFREGVEVSNGTHWFVTQRNFYEPQITTDNTFV
 .: * . . :*.:* * . *.:* *.: . * : * .:* * : * : .*...

HKU1B MNSCSVNFTKAPFIYLNNSIPNLSDFEAEFSLWFKNHTSIAPNLTFNSH-INATFLDLYY
 HKU1A MNTCSVNFTKAPLVLYLNHSVPKLSDFESELSHWFKNQTSIAPNLTLNLHTINATFLDLYY
 OC43 MSTCAVNYTKAPYVMLNTSIPNLPDFKEELDQWFKNQTSVAP--DLSLDYINVTFLDLQV
 Wuhan SGNCDVVIGIVNNTVDPLQPELDSEFKELDKYFKNHTSPDVDLGDISG-INASVVNIQK
 ..* * . : *:* .*: *.: :***:** **.:*.:*:

HKU1B EMNVIQESIKSLNSSFINLKEIGTYEMYVKWPWYIWLLIVILFIIFLMILFFICCTGCG
 HKU1A EMNLIQESIKSLNNSYINLKDIGTYEMYVKWPWYVWLLISFSFIIFLVLLFFICCTGCG
 OC43 EMNRLQEAIKVLNQSINLKDIGTYEYYVKWPWYVWLLICLAGVAMLVLLFFICCTGCG
 Wuhan EIDRLNEVAKNLNESLIDLQELGKYEQYIKWPWYIWLGFIAGLIAIVMVTIMLCCMTSC
 .: : * **.* *.:*.:*.* ** *.:***:* ** : : : : : : :* * *

HKU1B --SACFSKCHNCCDEYGGHNDVFIKASHDD--
 HKU1A --SACFSKCHNCCDEYGGHDFVIKTSHDD--
 OC43 --TSCFKKCGGCCDDYTG YQELVIKTSHDD--
 Wuhan SCLKGCCSCGSCCKFDEDDSEPVLKGVKLHYT
 . * .** . : *:* : .

Green = Identity
 Purple = cleavage site between S1 (attachment) and S2 (fusion) subunits
 Underline = Receptor Binding Domain in Wuhan
 Double Underline = Receptor Binding Motif (Core) in Wuhan