

MeV -----MDS-----LSVNO-----ILYPEVHLDSPIVTNKIVAILEYA-RVPHAYSLEDPTLCQNIKHLRNGFNSQMIINNVEVGNVSKLSRSPYAHSH-----IPY 87  
 HPIV3 -MDTE-----SNN-----GTVSD-----ILYPECHLNSPIVKGKIAQLHTTM-SLPQPYDMDDDSILVITRQKIKLNKLDRKQRSIRRLKLLTEKVSIDLKGYTF-----IRY 91  
 HPIV1 -MDKL-----EST-----QNSSD-----ILYPECHLNSPIVKSIAQLHLVLL-DINQPYDLKDNSIINITKYKIRNGGLSPRQIKIRSLGKILKQEIKDIDRYTF-----EPY 91  
 Nipah -----M-----ADE-----LSISD-----IIYPECHLDSPIVSGKLSAIEYA-QLKHNQPSDDKRLSENIRLNHLGKRKSILYLRQSKQGNVIRNNVKNLKEFHM-----IAY 88  
 Mumps -----M-----AGLNE-----ILLPEVHLNSPIVRYKLFYYILHG-QLPNDLEPPDDLGPLANQNKAIRAEESQVHARLKQIRVELIARIPLSRWTRSQRSEIAILIW 91  
 PIV5 -----M-----AGSRE-----ILLPEVHLNSPIVKKHLYYYILLG-NLPNEIDLDDLGPLHNQWNQIAHEESNLAQRLLVNRVFLITHIPDLRKGHWQEVVNVIL 91  
 RSV -MDPI-----ING-----NSAN-----VYLTDSYLKGVISFSECNAL-GSY-IFNPGYLNKNDYTNLISRQNLPIE-----HMLK-K-LNI TQSLISKYHKGEIK-----LEE 83  
 HMPV -MDP-----LNE-----STVN-----VYLPDSYLKGVISFSECNAL-GSC-LLKRPYLNKNDYTNLISRQNLPIE-----HMLK-K-LNI TQSLISKYHKGEIK-----LEE 83  
 VSV -MEVHDFETDEFNDFNEDDYATREFLNPDERRMTYLNHADYNLNSPLISDDIDNLRIRKFNLSLPIPSMWD-S-----KNWDGVL----- 75  
 RABV MLDPGEVYDDPIDPIELE---AEPRGTPIVPNILRNSDYNLNSPLIEDPARLMLEWLKTNRPYRMTLT-DNCSRSRFRVLK----- 77  
 EBOV -----MATQH-----TQYPDARLSSPILVQDCDLVTRAC-HLYSSYSYLNPO-----LRNCKLPKHRYRLK-YDVTVTKFLSDVPVA-----TLPI 73

MeV PNC-NQDLF-NI-----EDKESTRK-----IRELLKKGNSLYSKVSDKV--FQ-----CLRDTNSRLGLGS-----EL----REDIKEKIINL-- 152  
 HPIV3 PEM-SKEMF-KL-----HIPGINSK-----VTELLKADRTLRSQMTDGL--RD-----LWINVLSKLASKN-----DGSNYDLNEEINNIISKV-- 160  
 HPIV1 PIF-SLELL-RL-----DIPEICDK-----IRSFVSDRLRLESTRGFL--QE-----LWLNLIQLRQCVE-----GKGFDSFLKQDVIDISDI-- 160  
 Nipah PEC-NNTLF-SI-----TSQGMTSK-----LDNIMRKSFKAYNIISKV--IG-----MLQNITRNLTQD-----RRDEIINIHECRLGDL-- 157  
 Mumps PRI-LPILQ-AY-----DLRQSMQL-----PTVWEKLTQSTVNLSIDGL--ER-----VVLHISNQLTGPKNLFTSRAGQGAGDNCISPSTREL-- 166  
 PIV5 PRI-LPLIP-DF-----KINDQLPL-----LKNWDKLVKESCSVINAGT--SQ-----CQNLSYSLHTGRGNLFTSRRELSGDRD--IDLKTV-- 164  
 RSV PTYFQSLMPTYKMSSEQIATT-NLLKKIIRRAIEISDVKVYAILNKLGLKEDKDIKSNNQDQEDNSVITTIKDDI--LSAVKDNQSHLKAADKNSH-----TKQKDTIKTTLLKK 192  
 HMPV PVNMQHEIMKNV-----HSCLEL-TLLKQFLTRSKNISTLKLNMICDOWLQKST-------SD-D---TSI--L 131  
 VSV -----EMLTSC-----QANP-----ISTSQMHKMWSGLMSDN--HDASQG---YSFLHEVDKEAEITFDVVEVTFIRGWGNK-- 138  
 RABV -----DYFKKV-----DLGSL-----KVGMAAQSMISLWLYGAH--SESNRS---RRCIDLAHFYSKSSPIEKLNLLTGNRGLRI-----P-PEGV-- 150  
 EBOV DFI-VPVLLKAL-----SGNGFCVPEPCQQLFDEI IKYTM-----QDALFLKY-----YLNQVAQEDCVDEHF-----QEKI-- 136

MeV --GVYMHSSQWFEPF-----LWFVTKTEMRSVIKSQTH-----TCHRRR-HTPVFFTGSSVELLISRDLV-----AIIS-----KESQHVY 221  
 HPIV3 --HTAYKSDKWYNPF-----KTWFTIKYDMRRRLQKARNE---VTFNMG-KDYNLLEDQKNLLIHPELV-----LILD-----KQNYNGY 229  
 HPIV1 --TDKYNKNTWYRPF-----LTWFSIKYDMRWQKNSG---NHLDVS--NSHNFLDCKSYLIIIRDLV-----LILN-----KLKLTGY 229  
 Nipah --GKNMSQSKWYECF-----LWFVTIKTEMRVIAKNSQK---PKFRSD-SCI IHMRDKS TEI LLNPNLI-----CIFKSD---KTGKKCY 228  
 Mumps --SQIWFNNEWSGPV-----KTWLMIKYMRQLITNQKT--G---ELT-DLVTIVDTRSTLCIITPELV-----ALYS-----NEHKALT 233  
 PIV5 --VAAWHSDWKRIS-----DFWIMIKFQMRQLIVRQTD---H--NDS-DLITYIENREGIIIITPELV-----ALFN-----TENHTLT 231  
 RSV LMCSMQHPPSWL-----IHWFNLYTKLNNILTQYRSNE-V-KNHGFTLIDNQTLGSGQFI-----LNQYGCIVYH---KELKRIT 262  
 HMPV SFIDVEFIPSWV-----SNWFSNWYNLKLILFEFRRE-E-V-IRTSILC--RSLGLKLVFI-----VSSYGCIVKS-----NKSRRV 199  
 VSV --IEYIKKERTDSFK--ILAYLCQKFLDLHKLTLILNAVSEVLELNLARTFKGVRR---SSHGNICIRVPSLPGPTFISEGWA-----YFKKLDI 224  
 RABV --LSCLERVDYDNAFRYLAN YSSYLFHVHVTILYMNALDWEDEKTIILALW-KDLTS---VDIGKDLVKFDQIWGLLIVTKDFV-----YSQSSNC 236  
 EBOV --LSSIQGNEFLHQM-----FFWYDLAILTRRGLNLRNGRSRSTWFVHD-DLIDILGYGTVFVKIPI SMLPLTQGI PHAAMDWYQASVFKQAVGHTHIVS 230

MeV YLTFELVLMYCDVIEGRMTET--AMTIDARYAEL-----LGRVRYMVKLIDGFFPALGNPTYQIVAMLEPLSLAYL-QLRDITVEL---RGAFNLHCFTTEIHDVLDQNG---F 321  
 HPIV3 LITPELVLMYCDVIEGRWNISA--CAKLDPKLQSM-----YQKGNLWEVIDKLFPMGEKTFDVISLLEPLALSII-QTHDPVKQL---RGAFNLHVLSSEMELIFESRE---S 329  
 HPIV1 VLTPELVLMYCDVIEGRWNMS--AGRLDKRSSKI-----TYKGELWELIDSLFPLNGEDVYNIISLLEPLSLALI-QLDDPVTNL---KGAFMRHVLTELHTILIKDN---I 329  
 Nipah YLTFEMLVLMYCDVIEGRMMET--TIKS DIKYQPL-----ISRSNALWGLIDPLFPVMGNRIYNIIVSMIEPLVLALL-QLKDEARIL---RGAPLHHCIKEMHQEELSEC---F 328  
 Mumps YLTFEMLVMTDMLLEGRLNVSS--LCTASHYLSPL-----KKRIEILLTVDDLALMGDKYGVGVSSLESFVYQL-QYGDVPIDI---KGTFFYGCINEILLDLLEDN---I 333  
 PIV5 YMTFEIVLMVSDMYEGRHNILS--LCTVSTYLNPL-----KKRITYLLSLVDNLAFAQIGDVAVNI IALLESFVYQL-QMSDPIPEL---RGQFHAFVCSBILDALRGTN---S 331  
 RSV VTTYNQFLTWKDISLSRLNCL--ITWISNCLNTLNKSLGLRCGNNVILTQFLYGDCLILKLPHNDFYIIKEVEGFI MSLI-LNITEEDQF---RRKRFYNSMLNNITDAANKKQKNLL 376  
 HMPV FFTYQQLTWDKVDLSRFNANF--CIWVSNSLNEQEGGLGRSLNQLGMLTNKLYETVDYMLSCLNCGEFSLVKEFEGFIMSEI-LRITEHAQF---STRFRNTLLNGLTDQLTKLNKR 313  
 VSV LMDRNLVMDKVIIGRMQTVLMSVCRIDNLFSEQ-----DIFSLNIIYRIGDKIVERGNGFSDIKMVEPICNLKMLKLAERSRPLVQPPPHFNHIKTSVDEGAK-ID--- 329  
 RABV LFDARNYLMKDLFSLRFSNLMVLLSPPERPYSDD-----LISQLCQLYIAGDQVLMCGNGSYEVYIKILEPYYVNSLVQRAEKFRPLIHSIGDPPVFIKDKVSQLEETFG--- 342  
 EBOV VSTADVLIMCKDLITCRFNTTL--ISKIAEIEDPVCS DYP---NFKIVSMLYQS GDYLLSILGSDGYKI IKFLEPLCLAKI--QLCSKYTER---KGRFLTQMHLAVNHTLEIETEMRA 339

MeV SDE-----G---T---YHELIEALDYIFITDDIHLTGEIFSFFRSFGHPREAVTAAENVRKYMNQPKVIVYETLKMKGHAIFCGII--INGYDRRHGGSWPPLTLP LHAADTIR 422  
 HPIV3 IKE-----F---L---SVDYIDKILDIFDKSTIDEIAEIFSFFRTFGHPPLEASIAAEKVRKYMYIEKQKLDFTINKCHAI FCTII--INGYRERHGGQWPPVLPDHAHEFII 430  
 HPIV1 YTD-----S---E---ADSIMESLIKIFRETSIDEKAEIFSFRTFGHPLEAITAADKVRTMYSKKIILKTLYECHAI FCTII--INGYRERHGGQWPPCEFPNHVCLLEK 430  
 Nipah TDQ-----K---I---RSMFIDLLSILNIDNILLAEFFSFFRTFGHPLEIAEKVAEKVREHMLDQVLEYPIMKAHAIFCGTI--INGYDRRHGGAWPPLYLPAHASKHII 432  
 Mumps FTE-----E---E---ANKVLLDLSQFDNLSPDLTAELLCIMRLWGHPPPLTASQAASKVRESMCAPKVLDFOITMKTAFFHAIL--INGYRRSHGIWPPPTLHGNAKPSLI 434  
 PIV5 FTQ-----D---E---LRTVTNLLISPQQLTDPDLTAELLCIMRLWGHPPPLTASQAAGKVRESMCAGKVLDFPTIMKTAFFHFTIL--INGYRRKHGGWPPPLNPGNASKGLT 432  
 RSV SRVCHTLLDKTVSDNI INRWIILLSKFLKLIKLAGDNLNLSELYFLRIFGHMPVDERQAMDAVKINCNETKFYLLSSLSMLRGAFIYRI--IKGFVNNY--NRWPTLRNAIVLP LRLW 494  
 HMPV LRVHSTVLENN---DYPMEVVLKLLGDTLRICKLLINKNLENAEYIFRIFGHMPVDERQAMDVAKLNNETKILRLESLETGAFILRI--IKGFVNNY--KRWPKIKNLKVL SKRW 429  
 VSV --R-----G-----IRFLHD---QIMS VKTVDLTVIYGSFRHWGHPFYDYTTGLEKLSQVTMCKDIDVSY--AKALASDLARIVLFOQFNH--KKWVNGDLLPHDHPK 423  
 RABV --P-----C-----ARRFFR---ALDQFDNIHDLVFPVFCYRHWGHPYI DYRKGLSKLYDQVHLLKMDIKSY--QECLASDLARRILRWFQDKY--SKWYLSRFLARDHPLT 436  
 EBOV LKP-----S---QAQKIREFHRT--LIRLEMTQQCCLFISIQKHGHPVHLHSETAIQKVKKHATVLAALKRPIVIFETYCVFKYSI--AKHYFDSQ--GSWYVSTSDRNLTPGLN 440

MeV NAQASGEGLT-HEQCVDNWKSFAGVRF GCFMPLSLSDDLTYMALKD KALALQREWDSVPYKPEFLRYDP-----PKGTGSRRLVDVFLNDSFDPYDMIMYVVS GAYLHDPFENL 530  
 HPIV3 NAYGSNSAIS--YENAVDYYQSF IGKFNKFIEPQLDEDLTYIMDKKALSPKKSNDVTPYASNLLYRT-----NASNESRRLVEVFIADSKFDPHQILDYVSEGDWLD DDFENI 538  
 HPIV1 NAQGSNSAIS--YECAVDNYSSIFIGFKLFIEPQLDEDLTYIMDKKALSPRKAADSVPYDSDNYLYKV-----PESEETRLIEVFINDNNFPEDII NVYESGEWLND DDFENI 538  
 Nipah RLKNSGESLT--IDDCVKNWESFCGIPQDFCMEKLKSDLSMYMCKALSPKDEWDSVYPREVLSTYTP-----PKSTPERLVDVFNDFENFDPYNMLEYLVS GAYLEDDQFN 537  
 Mumps EMRHDNSELK--YEYVLNKWSISMLRIHKCFDASPEDLSIFMKDKAISCPQDWMGVFRRLSIKQRYR-----AHRPLPQSFNRRLLNFLNDEDDRDPDIKELEYVTSGEYLRDPEFCA 548  
 PIV5 ELMNNDTEIS--YEF TLKHWEVSLIKFKKCFDADAGEELSIFMKDKAISAPKQDWMVFRRLSIKQRHQ-----HQVPLPNPNRLLNFLNDDGKDFPNVLEQYVTSGEYLRD DDFCA 614  
 RSV TYYKLNLYSLLELTERDILVLSGLRFRYRFRLPKVDLEMI INDKAISPPKNIWTSFPRNYPMSHIQNYIEHEKLFSESDKSRVLEYLNDKFNCECDLNCVYNYSYLNNPNHVV 614  
 HMPV MYFAKKNYPSQLELSEQDFLELAAIQFEQFVPEKTNLEMVLDNKAISPPKRIWSVYKPYLPETIKNRYLETFNADSLKTRRVLEYLNDKFNKFKELKSVVYRQYELNDKHEIV 549  
 VSV SHVKENTWPT--AAQVQDFGDKWHELPLIKCFEIPDLLDPSIIYSDKSHSMNRSEVLKVRMNP-----NTPIPSKKVLOTMLDTKATNWEFKLEIDE--KGLD DDLII 525  
 RABV PYIKTQTWPP--KHIVDVLGDTWHKLPITQIFEPESMDPSEILDDKHSFTRRRLASWLSENR-----GGVPVSEKVIITALSKEPNVNRPRELFSIDL--GGLPDEDLII 538  
 EBOV SYIKRNQFPP--LPMIKELLWFEYHLDPFLFTKISDLSIFIKDRATAVERTCDWAVFEPNVLYGNP-----PHKFBTKRVPEQFLQENPNSTENVLSYAKQLEYLPLQYRNF 548

RdRP Motif F

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (618-627).

RdRP Motif A

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (718-887).

RdRP Motif B

RdRP Motif C

RdRP Motif D

RdRP Motif E

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (834-903).

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (939-1008).

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (1041-1109).

PRNTase Motif A

Table with 5 columns: Protein Name (MeV, HPIV3, HPIV1, Nipah, Mumps, PIV5, RSV, HMPV, VSV, RABV, EBOV), Conserved Sequence, and Position (1157-1230).

PRNTase Motif B

PRNTase Motif C

|       |  |      |
|-------|--|------|
| MeV   | EVPDVLSEMRGHLIRRHETCVICE--CGSVNYGWFFVPSGCQLDDID-----KETSSLRVPYIGSTTDERMDKLAFLVRAVPSR--SLR SAVRIATVYSWAYGDDSSWNEAWL--LAR  | 1264 |
| HPIV3 | ETPDLELLSGLVITGSEHCKICYSSDGTNPTYTMWYLPNGIKIGSAE-----TGLSSLRVYFGSVTDERSEAQLGYIKNLSK--PAKAAIRIAMYITWAFGNDEISWMEASQ--IAQ    | 1266 |
| HPIV1 | ETPDPLELLRGSFIEGSEVCKFCRSEGNMPTYWFYLPNDIDLDTLS-----NGSPAIRIPYFGSATDERSEAQLGYVKNLSK--PAKAAIRIAMVYTWAYGTDEISWMEAL--IAQ     | 1266 |
| Nipah | EVPDALEAMVGRYITGSELECCI--QNTMYGWFFVPRDSQLDQVD-----KEHSSIRVYPYVGGSTDERSDIKLGNVVRPTK--ALRSAIRIATVYTWAYGDNDECWYEAWY--LAS    | 1323 |
| Mumps | ETPDPIELVHGKILIGSDECEHCS--SGDDKFTWFFLPKGI RLDNDP-----ASNPPIRVYPYIGSKTDERVASMAYIKGASV--SLKSALRAGVYIWFAGDTEESWQDAYE--LAS   | 1274 |
| PIV5  | ETPDPIETAGALIVGSGYCCQCA--AGDNRFTWFFLPSGIEIGGDP-----RDNPPIRVYPYIGSRDERRVASMAYIRGASS--SLKAVLRAGVYIWFAGDTEENWDALD--LSH      | 1268 |
| RSV   | TSPSIMYTMDIKYTTST-----ISSGIIIE--KYNVNSLRTRGERGTPKPVWVGSTQEKKMPYVNRQVLTQ--KQRQDIDLAKLDVYVYASIDNKDDEFMEE--LSI              | 1314 |
| HMPV  | TSPSITTCMDVIYATSS-----HLKGIIIE--KFSTDRTRTQRGRQPKSPWVGSTQEKKLVVYNRQILSK--QOREQLEAIGKMRVYKGTPLGRLLRNLK--ICL                | 1239 |
| VSV   | TVPHLEML--GPQHRKTEPCAPCNTS--G----FNYVSVHCPDGIHD-----VFSRGRPLPAYLGSKSTESTILQPWERESKVPLIKRATRRLRDAISWFVEPDSKLAMTILSNHSL    | 1207 |
| RABV  | TVPHPSEML--GLLPKSSISCTCGATGGG----NPRVSVSVLPSFDQ-----SFFSRGLPKYGLSSTMSQTQLHFAWEKVTVNHHVVKRALSLKESINWFITRDSNLDAQALIRNIMSL  | 1220 |
| EBOV  | TLPCMIEQKVFVWLKPYEQPCQCSNA--KQPGGKFFVSVAVKHHIVSAWPNASRISWITIGDIPYIGSRATEDIKGQPAIKPKCPSA--ALREALASRLTWVTOGSSNSDLLIKP--FLE | 1245 |

PRNTase Motif D

PRNTase Motif E

|       |   |             |      |
|-------|---|-------------|------|
| MeV   | QRANVLSLELRVITPISTLSTNLALHRLDRST--QVKYSGTSLVRV--ARYT--TISNDNLFSVI--S--DKKVDNFIYQQGMLLGLVLETLFRLEKDTGSSNTVHLHVE--T     | DCCVIMPIDHF | 1378 |
| HPIV3 | TRANFTLDNLKILTPVATSNLNSHRLKDTAT--QMKFSSTSLVR--SRFI--TMSNDNSIKE--ANETKDTNLIIYQQIMLTGLSVFEYFLRLEKTTGHPNIVMHLHIE--DE     | CEICESFNDP  | 1380 |
| HPIV1 | TRANLSLENLKLTPVSTSNLNSHRLKDTAT--QMKFSSTSLVR--SRFI--TISNDNMLAKE--AGESKDTNLVYQQIMLTGLSLFFFNMRKYQGLSKPMLHLHLN--NK        | CCIIIESPQEL | 1380 |
| Nipah | QRVNIDLVLKAITPVSNTNLNSHRLKDKST--QKFAGSVLNRV--SRVY--NISNDNLDFRI--EGEKVDTNLIIYQQAMLGLSVLEKFRRLRLEDDYNGIYHLHVK--DN       | CCVKEVADVQ  | 1437 |
| Mumps | TRVNLTLQQLSLTPLPSTANLVHRLDDGTT--QLKFTPASSYAF--SSYV--HISNDCQVLEI--DDQVDTSDNLIIYQQVMITGLALIE TWNNPPI N FSVYETTLHLHTG--S | CCIRPVESC   | 1388 |
| PIV5  | TRVNITLQQLSLTPLPSTANLTHRLDDGTT--TLKFTPASSYTF--SSFT--HISNDEQYLTII--NDKTADSNIIYQQLMITGLGILETWNNPPI NRTFEESTLHLHTG--A    | SCVRPVDSCI  | 1382 |
| RSV   | GTLGLTYEKAKLFPQYLSVNYLHRLTVSSR--PCEFPASIPAYRTNINYPDTSPINRLTE--KYGDEDDIIVFQNCISFGLSLMSVVEQFT--NVCPNRIILIPKLENI         | IHLMKPPIFTG | 1429 |
| HMPV  | GSLGSIYKCVKPLRPFMSVNYLHRLTVSSR--PMEFASPVAYRTNINYPDTSPINRLTE--RFGNEDINLVFQNAISGCSIVSVVEQLT--GRSFKQLVLIPLQLEE           | IDIMPPPVFG  | 1354 |
| VSV   | TGEEWTKR--QHGL--FKRTGSALHRFS--TSRMSHGFGASQSTAAL--TRLM--ATTDTMRDL--C--DQNFDFLFQATLLYAQIIT--T--VARDGWITSCDHYHIA--C      | KSLRPIBIEIT | 1310 |
| RABV  | TGPDFLEAEAVP--FKRTGSALHRFS--KARYSEGGYSSVCNPLN--SHIS--VSTDTMSDL--T--DQGNKYDPMFQPLMLYAQTWTWSEL--VQRDTRLRDSTHFWHLR--C    | NRCVRPIDDVT | 1328 |
| EBOV  | ARVNLVQEILOQMPSHYS--GNIVHRYNDQYS--PHSFANMRMNSNATRLI--VSTNTLGEFGSGGC--QSARSDNIIYFQNVINYAVALFDIKFRNTEATDIQYNRAHLHLT--K  | CCREVPAYQ   | 1360 |

|       |  |      |
|-------|--|------|
| MeV   | RIFSSRKLELAELCTNPLIYD N APLIDRATRLYTO--SHRR--H--LVEFVTTWSTPQLYHILAKSTALSMDLVTKFEKDHMEISALIGDDDDINSFITEFLLIEPRLFTIY                           | 1486 |
| HPIV3 | HINPESTLELIRY P ESNEFIYDKDPLKVDLSRLMVI--KDHS--Y--TIDMNYWDTDI IH AISICTAITIADTMSQLDRDNLKEIIVIANDDDDINSLITFEFLDILVFLKT                         | 1488 |
| HPIV1 | NIEPRSTLDEITQENNKLIYDPPDKIDLELFSKV--KDVV--H--TIDMNYWSDDEI IRATSICTAMTADTMSQLDRDNLKEIALINDDDINSLITEFMVIDIPFLCST                               | 1488 |
| Nipah | QVDAELPIPEYTEVDN NH LIYD P D P VSEIDCSRLSNQ--ESKS--R--ELDFPLWSTEELHDAKATAVQTVLEIITKADKVLQHLAIDSDDNINSLITFEFLVDPDEFALY                        | 1545 |
| Mumps | VNEPLLVPVFINVPMQNKVVDPEPLSLEMEKIEDI--AYQT--R--IGGLDQIPLLEKIPPLLAHLAKQMVNSITGLDEATSIVNDAVAVQADYTSNWISECCYTYIDSVFVY                            | 1496 |
| PIV5  | LSEALTVPKPHITVPYSNKVFDEDEPLSEYETA KLESL--SFOA--Q--LGNIDAVDMTGKLLTLLSQFTARQIINATGLDES V SLTNDIAVASDVSVNWI SEC MYTKLDEL FMA                    | 1490 |
| RSV   | ---DVDIHKLKQVIQKQHMFLPKISLTQYVELFLSNKTKLKGSHVNSNLILA H K I S D Y F H N T I I Q--LSTNLAGHWILIIQ--LMKDSKGI FEKDWGEYITD H M F I N L K V F P N A | 1537 |
| HMPV  | ---KFNYKLVDKI TSDQHIFSPDKIDMLTLGKMLMPTIKGQ--KTDQFLNKRENYFHGNLIESSLAALACHWCGLIT--EQCIENNI FKKDWGDGFSIDHAFMDFKFLCV                             | 1459 |
| VSV   | LDS-----SMDYTPPDVSVHLKTRWRNGE SGWQE I --KQIYPLBGNWNKLAPAQS Q V G R C I G F L Y G D L A-----YRKSTHAEDSS-----LF--                              | 1387 |
| RABV  | LET-----SQIFEPFDVSKRISRMVSGAVPHFQRL--PDIRLRP GDFESLGRKSHHIGSAQGLLSIVL-----AIHDSGYNDGT-----IF--   | 1405 |
| EBOV  | LTYTSTLELDELTRYRENEIYDNLKGLGNLNI SFDNPFQG--K--RLNIEDLIRLPHLSGELAKTLMQSIIS--DSNNSSTDPISSGELRSFTHFLTYPKIGLLYS                                  | 1467 |

|       |   |              |      |
|-------|---|--------------|------|
| MeV   | LGQCAAINWAFDVHYHRPSGKYQ-----MCELLSFLSRMSKGVFKVLVNALSHPKIYKFFWHCGIIEPHIGPSLDA---QNLHTTVCNMVYTCYMTYD LLL L N E--E                                   | ELEFTFL      | 1592 |
| HPIV3 | FGGLLVNQFATYLSKIEGRDL-----IWYIMRTLDRDTHSILKVLSNALSHPKVFKRWFDCGVLPNIYGPNTAS---QDQIKLALSICEYSLDLFMREWLNQ---V  | SLEIYI       | 1592 |
| HPIV1 | FGGILINQFAYSLYGLNIRGRDE-----IWGVVIRIKDTS H AVKLVSNALSHPKIFKRFWDAGVVEPVYGPNLNS---QDKILLAISVCEYSDVLFMRDWDQEG--                                      | IPLEIFI      | 1592 |
| Nipah | LGQSIAIKWAFIHHRRPRGRHT-----MVDLSDLSNTSKHTYKVLNSALSHPRVFKRVNCGLLPTQGPYILHQ---QDFEKLSQNLVSTYMIYLMNN---C--   | DFKYPPFI     | 1649 |
| Mumps | SGWALLLELSYQMYLRIQGIQG-----ILDYVYMTLRIPGMAITGISSTISHPRILRRCINLDVIAPIINSPHIAS---LDYTKLSIDAVMWGTKQVLTNISQG--  | IDYEIVV      | 1600 |
| PIV5  | CGWELLLELSYQMYLRVVGWNS-----IVDYSYMLRIRPGAALNNLSTLSHPKLFRRAINQDIAVPLNAPHFAS---LDYIKMSVDAIILWGCKRVINVLNSG--   | GDLELVV      | 1594 |
| RSV   | YKTYLFLKHYG--GKARLECDM-----NTSDLLCVLELIDSYSYKMSKVFEQKVIKYLSDQASLHVRWKGCHS-----F---KLWFLKRLNV-----   | 1617         |      |
| HMPV  | FKTKLLCSWSQG--GKNIKDEDI-----VDE--SIDKLLRIDNTFWRMFSKVMFEPKVKKRIMLYDVKFSLVGYIG-----F---KNWFIEQLRS-----  | 1538         |      |
| VSV   | -----PLSI--QGRIRGRGFLKGLLDGLMRA S C C Q V I H R R S L A H L K R P A N A Y V G L I Y - L I D K L S V S P P F L S D-----TRSGP--                     | IRDELETIPHKI | 1469 |
| RABV  | -----PVNI--YGKVSPPRDYRGLARGVLIGSSICFLTRMTNINRPLELVSQVISY--ILLRDLNHPSLYIM-----LRPS--LARGEIFSIPQKI  | 1487         |      |
| EBOV  | FGAFVSYLGNITILRKTLLTDN-----FLYLYTTQIHNLPHRSRLIKLPTPKFASVMSRLMSIDPHFSIYIGGAAGDRGLS DAARFLR L T S I S S F L T F V K E W I I N R G T I V P L W I V Y | 1579         |      |

|       |   |                    |      |
|-------|---|--------------------|------|
| MeV   | CESDEEDVVPDRFDNI----QAKHLCLVLADLYCQPGTCTPPI RGLRPVE--KCAVLT D H I K A E A R L S P-----AGSSWNINPIVDHYS C S L T Y L R R-----G--   | SIKQIR--LRVD--     | 1687 |
| HPIV3 | CDSDMEVANDRRQAF-----ISRHL S F V C C L A E I A F G P N L L N L T Y L E - R L D L L K Q Y L E L N I K E D P-----TLKYVQISGLLIKSPSTVTYVRR--                                 | T--AIKYL R--IRGI-- | 1687 |
| HPIV1 | CDNDPHIAEMRKL SF-----LARHLAYLCSLAIEAFKGPKLESMTLSLE--RDLLKQYLELNIKEDP-----ILRYSQTLGLVIKIPFSTLTIYSK--   | S--SIKVL R--VRGI-- | 1687 |
| Nipah | AEQDETVINLREDII--TSKHLCVIIDL Y ANH H K P P W I D L N P Q E - K I C V L R D F I S K S R H M D T-----SSRSWNTSDLFVIFYASLYLRR--G--  | IKQLR--IRQV--      | 1744 |
| Mumps | PSesQLT L S D R V L N L-----VARKLSLAI I W A N Y N Y P P K V G M S P E D - K C A L T T H L I Q V E V H E I Q I E K T N I R R M I E P K L T A Y P S N L F Y L S R-----K-- | LLNAIR--DSEE--     | 1701 |
| PIV5  | TSEDSLILSDRSMNL-----IARKLTLLSLIHNNLELPKIKGFS P D E - K C F A L T E F L R K V V N S G L S S I E N L S N F M Y N V E N P R L A A F A S N N Y L T R-----K--                | LNSIR--DTES--      | 1695 |
| RSV   | -----AFTVCPWV V N I D Y H P T H M K A I L T Y I D L V R - M G L I N I D - R I H I K N K H K F N D E F Y T S N L F I Y I N F S D N T H L L T K H I R I A N S E L E N N - | 1701               |      |
| HMPV  | -----AELHEIPWIVNAEGDLVEIKSIKIYQLIE--QSLFLR--I-----TVLNYT DMAHALTRLIRKKLM-----   | 1596               |      |
| VSV   | PTS--YPTSNRDMGVIRNY---FKYQCRLIEKGYRS-----HYSQWLFSVDSLIDFI-----GPFSISTLLQLIY-----KPLFSGDKKNELRELANLS   | 1552               |      |
| RABV  | PAA--YPTTMKEGNSILCYLQHVLR Y E R E I T A ---S P-----ENDWLWIFSDFRSAKMTY-----LSLITYQSHELLLQVR-----ERLNSKSMRDLRQLSSLM   | 1573               |      |
| EBOV  | PLEGQNPTP--VNNF--LYQIVELLV--HD-----SS-RQAFKTTISDHVPHD-----NLVYTCKTASNFPFHASLAWRS-----R--HRNSNRKYLARDSST--   | 1661               |      |

|       |  |                       |      |
|-------|--|-----------------------|------|
| MeV   | -----P-----GFIF-----DALA-----EVNVSQPKV-----G--SNNISNMS--I---KDFRPHDDVAKLLKDI NT-----                                 | 1734                  |      |
| HPIV3 | -----SPP-----EIID--DWDP--ED-----ENMLDNIVK-----SISDNCKNDKNGK--INNFWGLAKKNYQVLKIRSI TSD--SDN-----                      | NN                    | 1752 |
| HPIV1 | -----GIP-----EVLE--DWDP--AD-----SMLLDNITA-----EVQHNP--LKKNE--RTPFWGLRVSKVQLRRLRGYEEI--KRE-----                       | ER                    | 1750 |
| Nipah | -----T-----EVVD--TTML--RD-----NIIVENPPI--KTG--VLDIRGCT--I--YNL-----EELISMNPK-----                                    | 1789                  |      |
| Mumps | -----GQF-----LIAS--YNSF--GYLE-----PILMESK-----IFSLSSSESASLSE--PDFILNLESEASLEKYLSPSL-----                             | 1760                  |      |
| PIV5  | -----GQV-----AVTS--YYESL--EYID-----SLKLTPH-----VPGTSCIEDDSLCT--NDYIWIIESANLEKYPIPN S-----                            | 1754                  |      |
| RSV   | -----Y--NKLYHPTPETLE-----NILANPIKS--NDKKTLDNYCIGKNVDSI--MLPLLSN--KKLIKSSAMIR--TN--                                   | YSKQDLVNLFP MVV I D R | 1778 |
| HMPV  | -----NALLTPI-----SSPMVNL--TQVID-----PTTQLDYFPKITFER  | 1632                  |      |
| VSV   | SLLRSGEGEWEDIHVK--FFT--KDI-----LLCPEERHACK--FGIAKDNNDKMSYPPWGR--ESRG--TI-----ERLNSKSMRDLRQLSSLM                      | 1609                  |      |
| RABV  | RQVLGGHGEDTLESDDNIQRLL--KDSL--RR--TRWVDQEVRRHAARTMTGDYSPNKKVSRKVGCESEWC--SAQQ--VA-----ERLNSKSMRDLRQLSSLM             | 1643                  |      |
| EBOV  | -----GSS'TNNSDGHIERSEQE'QTRDPHGDTEARNLQLQMSHEIKRTTIPQENTHQGPSQSLSDSACGTANPKLFLDRSRHNK--FQDHNSAKREGHQISHRVLPFFFTLSQTR | 1773                  |      |

MeV -----SKHNLPL-----ISGGSLANYE-----IHAFRR-IGLNSACAYKAVEISTLIRRCLEPGEDGLFLGEGSGSMLITYKEILKLNKCF--YNSGVANSRSG----- 1820  
HPIV3 GL-----DVSTGG-----LTLPOGGNYL-----SHQLRL-FGINSTSLKALELSQILMKEVNDKDRFLFLGEGAGAMLACYDATLGPVAVNY--YNSGLNITDVIG----- 1840  
HPIV1 -----GRSGVG-----LTLPPDGRYL-----SHQLRL-FGINSTSLKALELYLLNPLVNDKDRFLFLGEGAGAMLACYDATLGPVAVNY--YNSGVNSCDLNG----- 1836  
Nipah -----SSSKKI-----FNLNSKPSVE-----NHKYRR-IGLNSSSCYKALNLSPLIQRYLPSGAQRLFIGEGSGSMMLLYQSTLPGQISF--YNSGIDGDYIPG----- 1875  
Mumps -----LMTAEN-----MDNPPFPQPL-----HHVLRP-LGLSSTSWYKTI SVLNYISHMKISDGAHLYLAEGSGASMSLIETFLPGETIW--YNSLFSNGENPP----- 1846  
PIV5 -----PEDDSN-----FHNFKLNAPS-----HHTLRP-LGLSSTAWYKISCCRYLERLKLPGQDHLIAEGSGASMTIIEYLFPGRKIY--YNSLFSNGENPP----- 1840  
RSV IIDHSGMTAKSNQLYTTTSHQISLVHNSH-----SLYCMPLPWHHINRFNFVFSSTGCKISIEYILKD-LKIKDPCIAFIEGEGAGNLLLRVVELLHPDIRIYRSLKDCNDHSL----- 1886  
HMPV LKNYDTS-----SNYAKGLKTR-----NYMILLPQWVHNRVNFVFSSTGCKVSLKTCIGKLMKDLNPKVLYFIEGEGAGNWMARTACE--YPDIKFVYRSLKDDLDHNY----- 1728  
VSV -----TTPVYVYTTTPYKMLEMPPRIQNPLLSGIRL-GQLPTGAHYKIRSILHG--MGIHYRDFLSCGDGSGGMTAALLREN-VHSRGI FNSLLELSGSM----- 1702  
RABV -----VSTSANPAPVSELDIRALSKRFPQNLISGLRV-VQWATGAHYKLPILDD--LNVFPLSLCLVVDGSGGIGRAVLNMF-PDAKLVFNSLLEVDLMA----- 1736  
EBOV QL-----TSSNES-----QTQDEISKYLR-----QLRSVIDTTVYCRF-TGIVSSMHYKLEDEVLEWIESF--KSAVTLAEEGEGAGALLIQYQ--VKTLP-FMTLATESSIESEIVSGMT 1873

MeV -----QRELAPYPSEVG-----LVEHRMGV---GNIVKVLFNRPPEVTVWVGSIDCFNFIVSN--IPTSSVGF IHSDIETLPNKDTIEKLEELAAILLSMA---LLLGKIGSILVIK-LMPFSG 1923  
HPIV3 -QRELKIFPSEVS-----LVGKGLGNVTQILNRVVLVFNPNPSTWIGNMECESLWSE--LNDKSGILVHCDMEGAIKSEETVLEHEHYSVIRIT---YLGDDDDVVLVSK-IIPPTIT 1947  
HPIV1 -QRELNIYPSEVA-----LVGKGLNVTSLCQRVKVLFNPNPSTWIGNMECESLWSE--LQNNSIGIHCMEGEGHKDQVVLHEHYSVIRIA---YLVGDKDVLVSK-IAPRLG 1943  
Nipah -QRELKLPSEYS-----IAEDPSLAGKLGVLVPLFNRPETTWIGNLDSEYIINR--TAGRSIGLVHSDMESGIDKNVEEILVEHSHLSIA---INVMEDGLLVSK-IAYTPG 1982  
Mumps -QRNFAPLPTQFIESVYRILQAGIAAGSGVQSFYPLWNGNSDITDLSTKTSVEYIHK--VGADTCALVHVDLEGVPGSMNSMLERAQVHALLIT---VTVLKPGGLLILK-ASWEPF 1959  
PIV5 -QRNYAMPPTQFIESVYRILQAGIAAGSGVQSFYPLWNGNSDITDLSTKTSVEYIHK--VGADTCALVHVDLEGVPGSMNSMLERAQVHALLIT---VTVLKPGGLLILK-ASWEPF 1953  
RSV -----PIEFLR-----LYNGH-INIDYGEN-----LTIPTADATNINHSYL-HI--KFAEPISLFCDAELSVTVNNSKIIIEWSKHVRCKCYCSSVNC-M-LIVK-YHAQDD 1979  
HMPV -----PLEYQR-----VIGELSRIIDSGEG-----LSMETTADQKTHWDLI-HR--VSKDALLITLCAEAFKDRDDFFKMVILWRKHVLSCRICCTTYGTD-LYLFKAK-YHAKDC 1823  
VSV --RGASPEPPSALET-----LGGD-----K-SRCVNETCWEYPSDLCDPRTWDYFLRLKAGLGLQIDLIVMDMEVRDSSSTLSKIETNVRNYVHR-----ILDEQGVLYKTYGTYIC 1802  
RABV --SGTHPLPPSAIMR-----GGND-----IVSRVIDLDSIWEKPSDLRNLATWQYQSVQKQVNSYDILICDAEVTDIASINRI TLLMSDFAL-----SIDGPLYLVFKTYGTMVL 1836  
EBOV TPRMLLPVMSKPHN-----DQIEIILNNSASQITDITNPTWFKDQRAR--L-PKQVEVITMDAETTENINRSKLYEAVYKILLHH---IDPSVLA--VVLK-VFLSDT 1968

MeV DFWQGFISYVGSYHREVNLVYPRYSNFISTESYLVMTDLKANRLMNEKIKQOIIESSVRTSPLGHLHLSIKQLSICQAI--VGGAVSR-GDI-----NPILKLTPIEQVLISCLGAI 2035  
HPIV3 PNWSRILYLYKLYWVDVSIISLKTSPASTELYLISKDAYCTIMEPESEVLSKLRSLLEENLLKWIILSKRNEWHLHEIKE-----G-----ERDYGVMPYPHMAIQIFGFQI 2055  
HPIV1 TDWTKQLSLYLRWRDVLIVLKTSPASTEMYLISKDKSDIIEEDSNTVLANLLPLSKEDSIKIEKWILVEKAKVHDWVRELKE-----G-----SASSGMLRPYHQAQIQIFGFEP 2051  
Nipah FPI SRLFNMYRSYFGLVLCFVYSPNDSTEVYLLCLQKTVKTIIPPQRVLEHSDLHDEVNDQGITSVIFKIKNSQSKQFHEDLKKYHYI-DQP-----FFVPTKITSDEQVLLQAGLKL 2096  
Mumps NRSFSLTILWQFFSTIRILRSSYSDPNNHVEYI IATLAVDPTTSS--FTTALNRARTLNEQGFS--LIPPELVSEYWRRRVEQGQIQDRIDKVISCEVRDQYLADNIILOAGGTP 2073  
PIV5 TRFSTLITFLWCYFERITVLRSTYSDPANHEVYLICITLANFAFQT--VSQATGMAMTLDQGF--LISPERRINQYWDGHLKQERIVAEADKVVLENALFNSSDNELILKCGGTP 2067  
RSV ID--FKL---DNITILKTYVCLGSKLGSSEVYLVLITGIPANIPVFNVV-QNAKLIL-SRTKNFI-----MPKK-----ADK-E----- 2045  
HMPV NV--KLP---FFVRSVATFIMQGSKLSGSECYILLTLGHNSLPCHEGI-QNSKMKI-AVCNDFY-----AAKK-----LDN-K----- 1889  
VSV ESEKNAVITLIGPMFKTVDLVQTEFSSQTSSEVYMVCKGLKLLDEPN-P-DWSS-----INESWKNLYAFQSSQEQEFARA-KKVSTYFTLTGIPIS---QFIPDPFVNIETMLQIQIFGVPT 1910  
RABV NPNYKAIQHLNRAFPVSTVGTFTQVTSFSSSELYLRFKSRGKFFRDAE-YLTSST----LREMSLVLFCNCSPPKSEMORA-RSLNYQDLVRGFPE---EISINPNYEMIIITLIDSDVES 1945  
EBOV EGMLWLDNLAFFATGYLKTQVTSARNSSEWYLCITNFLTSTRKMPHQN-----HLSCKQVILTALQLOIQRSPYHLSHLTQYADCELHLS-----YIRLGFPS 2063

MeV NGPKLCKELIHHDVA-SGQDGLLNSIL---ILYRELARF--K-DNQRSQGMFHAY--PVLVSSRQRELVSRITRKFVGHILLYS--GN-RKLINRFIQNLK-----SGYVLVDLH--- 2134  
HPIV3 NLNHLAKEFLSTPDL-TNINNI IQSFQRTTKDVLFEWINITHD-DKRHKLGCRYNIF--PLKNGKLRLLSRRLVLSWISLSLSTRLLTG-RFPDEKFEHRAQ-----TGYVSLADT--- 2162  
HPIV1 NLNKLKCRDFLSTLNI-VDTKNCIITFDRVLRDITFEWTRIKDV-DKLRITCKYDLY--PLRDSGKLVISRRLVISWIALSMSTRLVGT-SFPDMKFESRLQ-----LGVVISSR--- 2158  
Nipah NGPEILKSEISYDIG-SDINTLRDITII---IMLNEAMNY--F-DDNRSPSHLEPY--PVLERTRIKTIMNRVTKKVIYVSLIKFKDTRK-SSELYHIKNNIR-----RKVLILDFR--- 2197  
Mumps STR---KWLDPDY--PSFNELQSEMARLITIHLEKVEVEILKG-QSSDHDTLFTSY--NVGPLGKINTIILRLIVERILMYTVRNWCILP-TQTRLTLRQSIIE-----LGEFRLRDVITP 2179  
PIV5 NAR---NLIDIEPV-ATFIEFEQLICTMLTTHLKEIIDITRS-GTQDYESLTLTPY--NLGLLGIKISTIVRLLTERILNHTIRNWLILP-PSLRMIVKQDLE-----FGIFRITSILNS 2173  
RSV SIDANIKSLPFLCYPTIKKGIN-TAL-----SKLKSUVSGDILSYSIAGRNEVFSNK--LINHKMNI-----LKWFNHVLNFRS-----T----- 2119  
HMPV SIEANCKSLSLGRIPINKKELD-RQR-----RLLT--LQSNHSSVATVGGSKITISK--WLTNKASTI-----IDWLEHILNSPK-----G----- 1961  
VSV GVSHAAALKSSDRP-----ADLLTIS---LFYMAII---SYNNINHRVGPPIP--NPP-SDGI---A-----QNVGIAITGISFWLSLMEKDIPLYQQCLAV----- 1991  
RABV FLVHKMVDLLELQR-----GTLKVA---IIIAIMIVFSNRVFNVSPLTDPSPF--PPS-DPKI---I-----RHFNICST--MMYLSLALGDVPSFARLHDL----- 2029  
EBOV -LE---KVLYHRYNLVDSKRGPLVSIQHLAHLRAEIRELTND-YNQR-QSRTQTYHFTRTAKGRITKLVNDYKLFLLIVQALKH--NG-T-WQAEFKKLPVLSVCNRFYHIRDC--- 2170

MeV -QNI-----FVKNLKSEKQIIMTGLIKREWVFKVTV-----KETKEWYKLVGYSALIKD----- 2183  
HPIV3 -DLESKL--LSKNIIKNYRECI--GS--ISYWFLT-----KEIKILMKLIGGAKLLGIPRQYKEPEEQLL-EHYNQHDEFDID----- 2233  
HPIV1 -EIKNLRV--ISKIVIDKFEDII--HS--VTRYRFLT-----KEIKILMKILGAVKLFGARQMSVDITNI--DTSDSIQ----- 2223  
Nipah -SKL-----MTKTLPKGMQERREKSGFEKVVIVDLSN-----REVKIWKIIGYISII----- 2244  
Mumps MEILKLSPNRKYLKALNQSTFNHLMGE--TSDILLNR-----AYQRIKWAIGCVIYCFGLLTPDVEDSERIDID-NDTPDYDIHG--DII----- 2261  
PIV5 DRFLKLSPNRKYLAQTLTQYIRKLEB--DCNIDLTR-----PIQRIKWAIGCVIYCFGLLTPDVEDSERIDID-NDTPDYDIHG--DII----- 2255  
RSV -----ELNHNHLYMVESTYPYLS-----ELLNSLTT-----NELKKLIKITGSLLYNFHNE----- 2165  
HMPV -----ELNYDFEALENTYPNMI-----KLIDLNGN-----AEIKKLIKVTGYMLVSKK----- 2005  
VSV -----IQSPFIRWEAVSVKGGYKQKWSTRGDG-LPKDTRISDSLAPIGNWIRLSLELVRNQVRLNPFNEILFNQLCRTVDNHLKWSNLR--RNTGMIEWINRRISKEDRSIL 2095  
RABV -----YNRPIITYFRKQVIRGNVYLSWSWSDTSSVFKRVACNSLSLSSHWIRLIYKIVKTRRLVGSIKDLSREVERHLLHRYNRWITLEDIRSRSSLLDYS-----CL 2127  
EBOV -----NCEERFLVQT-----LYLHRMQD-----SEVKLIERLTGLLSLFPDGLYRFD----- 2212

MeV ----- 2183  
HPIV3 ----- 2233  
HPIV1 ----- 2223  
Nipah ----- 2244  
Mumps ----- 2261  
PIV5 ----- 2255  
RSV ----- 2165  
HMPV ----- 2005  
VSV MLKSDLHEENSWRD 2109  
RABV ----- 2127  
EBOV ----- 2212