This form should be used for all taxonomic proposals. Please complete all those modules that are applicable (and then delete the unwanted sections). For guidance, see the notes written in blue and the separate document "Help with completing a taxonomic proposal"

Please try to keep related proposals within a single document; you can copy the modules to create more than one genus within a new family, for example.

MODULE 1: **TITLE, AUTHORS, etc**

Code assigned:	***2016.004aS***	(to be completed by ICTV officers)

Short title: Create 4 new species (*Cosavirus B, D, E, F*) in the genus *Cosavirus*
(e.g. 6 new species in the genus *Zetavirus*)

Modules attached (modules 1 and 11 are required)	**2** ☒ **3** ☐ **4** ☐ **5** ☐ **6** ☐ **7** ☐ **8** ☐ **9** ☐ **10** ☐ **11** ☒

Author(s):

Roland Zell, Eric Delwart, Alexander E. Gorbalenya, Tapani Hovi, Andrew M.Q. King, Nick J. Knowles, A. Michael Lindberg, Mark A. Pallansch, Ann C. Palmenberg, Gabor Reuter, Peter Simmonds, Tim Skern, Glyn Stanway and Teruo Yamashita

Corresponding author with e-mail address:

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List the ICTV study group(s) that have seen this proposal:

A list of study groups and contacts is provided at http://www.ictvonline.org/subcommittees.asp . If in doubt, contact the appropriate subcommittee chair (fungal, invertebrate, plant, prokaryote or vertebrate viruses)	*Picornaviridae* Study Group

ICTV Study Group comments (if any) and response of the proposer:

Date first submitted to ICTV: 15/06/2016
Date of this revision (if different to above):

ICTV-EC comments and response of the proposer:

MODULE 2: **NEW SPECIES**

creating and naming one or more new species.
If more than one, they should be a group of related species belonging to the same genus. All new species must be placed in a higher taxon. This is usually a genus although it is also permissible for species to be "unassigned" within a subfamily or family. Wherever possible, provide sequence accession number(s) for **one** isolate of each new species proposed.

Code	***2016.004aS***	(assigned by ICTV officers)

To create 4 new species within:

Genus:	***Cosavirus***
Subfamily:	
Family:	***Picornaviridae***
Order:	***Picornavirales***

Fill in all that apply.
- If the higher taxon has yet to be created (in a later module, below) write "**(new)**" after its proposed name.
- If no genus is specified, enter "**unassigned**" in the genus box.

Name of new species:	**Representative isolate: (only 1 per species please)**	**GenBank sequence accession number(s)**
Cosavirus B	human cosavirus B1 [2263]	FJ438907
Cosavirus D	human cosavirus D1 [5004]	FJ438908
Cosavirus E	human cosavirus E1 [Australia/81]	FJ555055
Cosavirus F	human cosavirus F1 [PK5006]	JN867758

Reasons to justify the creation and assignment of the new species:
- Explain how the proposed species differ(s) from all existing species.
  - If species demarcation criteria (see module 3) have previously been defined for the genus, **explain how the new species meet these criteria**.
  - If criteria for demarcating species need to be defined (because there will now be more than one species in the genus), please state the proposed criteria.
- Further material in support of this proposal may be presented in the Appendix, Module 11

Novel cosaviruses were detected in human faecal samples collected worldwide. No virus isolates are available.
The novel viruses exhibit the typical *Cosavirus* genome layout:

VPg+5'UTR$^{IRES\text{-}II}$[1A-1B-1C-1D-2A$^{NPG\downarrow P}$/2B-2C^{Hel}/3A-3B^{VPg}-3C^{Pro}-3D^{Pol}]3'UTR-poly(A)

The novel cosaviruses are distinuished from *Cosavirus A* by an aa divergence (number of amino acid differences per site from between sequences, p-distance) of 43-55% of the capsid proteins and 30-40% of 3CD (compare Tables 1, 2; Appendix). The amino acid identity of the known cosavirus genomes is greater 57%.

Species demarcation rules in the genus:
Members of a species in the genus *Cosavirus*:
- share greater than 65% aa identity in P1 (corresponds to <35% p-distance; Appendix Table 1)
- share greater than 95% aa identity in 3CD (<5% p-distance; Appendix Table 2).

Note:
1. Creation of *Cosavirus C* is pending due to incomplete virus sequence.
2. Kapusinszky et al. (2012) suggested inter-species recombination. Appendix Table 2 indicates two examples of such recombination events (JN867757, KM516909; highlighted in red).

MODULE 11: **APPENDIX**: supporting material

additional material in support of this proposal

References:

Kapoor A, Victoria J, Simmonds P, Slikas E,. Chieochansin T, Naeem A, Shaukat S, Sharif S, Alam MM, Angez M, Wang C, Shafer RW, Zaidi S, Delwart E. 2008. A highly prevalent and genetically diversified Picornaviridas genus in South Asian children. Proc. Natl. Acad. Sci. USA 105:20482-20487.

Holtz LR, Finkbeiner SR, Kirkwood CD, Wang D. 2008. Identification of novel picornavirus related to cosaviruses in a child with acute diarrhea. Virol. J. 5:159.

Kapusinszky B, Phan TG, Kapoor A, Delwart E. 2012. Genetic diversity of the genus *Cosavirus* in the family *Picornaviridae*: A new species, recombination and 26 new genotypes. PLoS ONE 7(5):e36685.

Dai XQ, Hua XG, Shan TL, Delwart E, Zhao W (2010) Human cosavirus infections in children in China. J. Clin. Virol. 48:228-229.

Blinkova O, Rosario K, Li L, Kapoor A, Slikas B, Bernadin F, Breitbart M, Delwart E. 2009. Frequent detection of highly diverse variants of cardiovirus, cosavirus, bocavirus, and circovirus in sewage samples collected in the United States. J. Clin. Microbiol. 47:3507-3513.

Stöcker A, Souza BFCD, Ribeiro TCM, Netto EM, Araujo LO, Corrêa JI, Almeida PS, de Mattos AP, Ribeiro Hda C Jr, Pedral-Sampaio DB, Drosten C, Drexler JF. 2012. Cosavirus infection in persons with and without gastroenteritis, Brazil. Emerg. Infect. Dis. 18(4):656-659.

Khamrin P, Chaimongkol N, Malasao R, Suantai B, Saikhruang W, Kongsricharoern T, Ukarapol N, Okitsu S, Shimizu H, Hayakawa S, Ushijima H, Maneekarn N. 2012. Detection and molecular characterization of cosavirus in adults with diarrhea, Thailand. Virus Genes 44:244-246.

Annex:

Include as much information as necessary to support the proposal, including diagrams comparing the old and new taxonomic orders. The use of Figures and Tables is strongly recommended but direct pasting of content from publications will require permission from the copyright holder together with appropriate acknowledgement as this proposal will be placed on a public web site. For phylogenetic analysis, try to provide a tree where branch length is related to genetic distance.

Fig. 1
P1

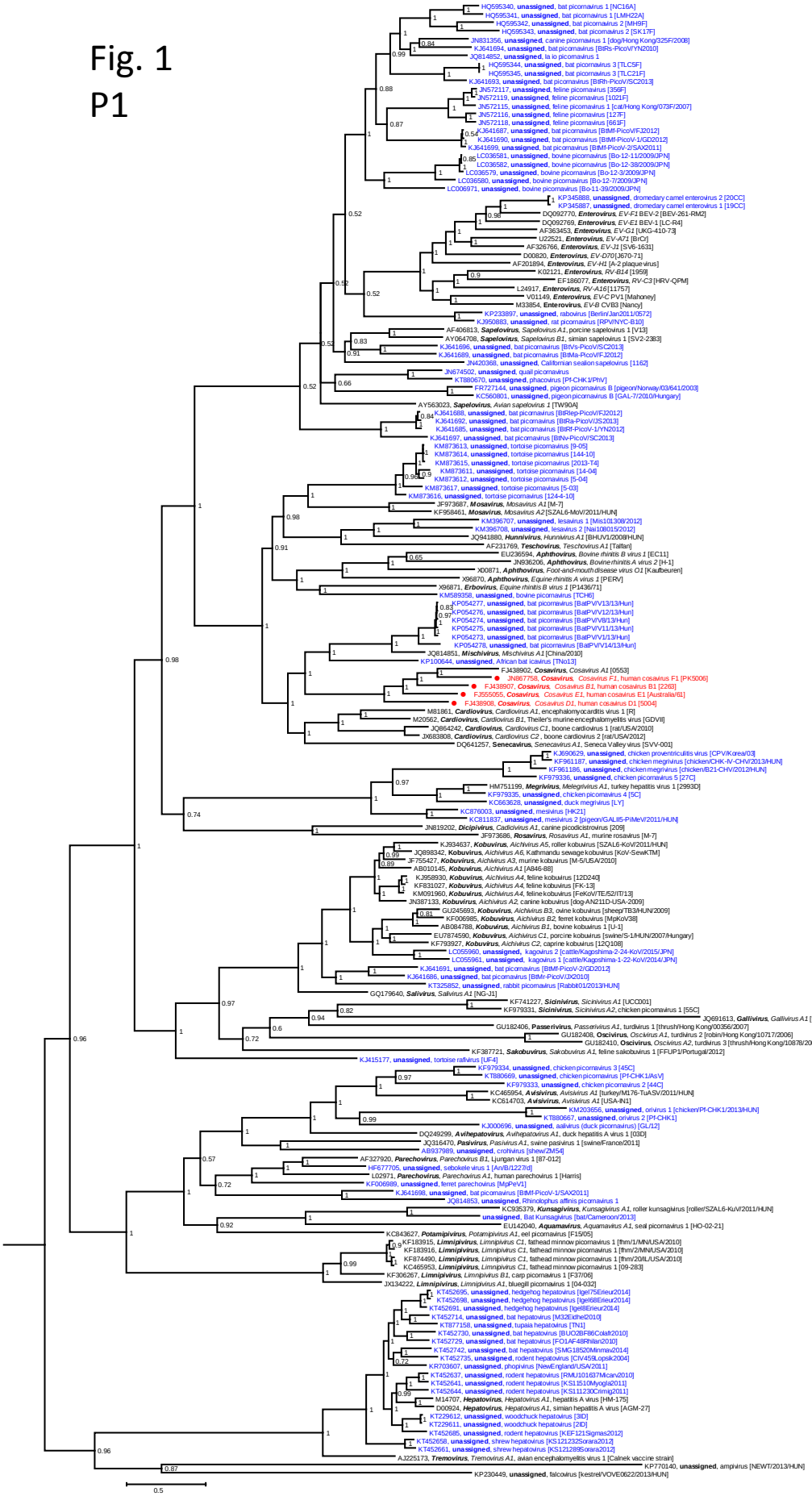
HQ595340, unassigned, bat picornavirus 1 [NC16A]
HQ595341, unassigned, bat picornavirus 1 [LMH22A]
HQ595342, unassigned, bat picornavirus 2 [MH9F]
HQ595343, unassigned, bat picornavirus 2 [SK17F]
JN831356, unassigned, canine picornavirus 1 [dog/Hong Kong/325F/2008]
KJ641694, unassigned, bat picornavirus [BtRs-PicoV/YN2010]
JQ814852, unassigned, la io picornavirus 1
HQ595344, unassigned, bat picornavirus 3 [TLC5F]
HQ595345, unassigned, bat picornavirus 3 [TLC21F]
KJ641693, unassigned, bat picornavirus [BtRh-PicoV/SC2013]
JN572117, unassigned, feline picornavirus [356F]
JN572119, unassigned, feline picornavirus [102F]
JN572115, unassigned, feline picornavirus 1 [cat/Hong Kong/073F/2007]
JN572116, unassigned, feline picornavirus [127F]
JN572118, unassigned, feline picornavirus [661F]
KJ641687, unassigned, bat picornavirus [BtMf-PicoV/FJ2012]
KJ641690, unassigned, bat picornavirus [BtMf-PicoV-1/GD2012]
KJ641699, unassigned, bat picornavirus [BtMf-PicoV-2/SAX2011]
LC036581, unassigned, bovine picornavirus [Bo-12-11/2009/JPN]
LC036582, unassigned, bovine picornavirus [Bo-12-38/2009/JPN]
LC036579, unassigned, bovine picornavirus [Bo-12-3/2009/JPN]
LC036580, unassigned, bovine picornavirus [Bo-12-7/2009/JPN]
LC006971, unassigned, bovine picornavirus [Bo-11-39/2009/JPN]
KP345888, unassigned, dromedary camel enterovirus 2 [20CC]
KP345887, unassigned, dromedary camel enterovirus 1 [19CC]
DQ092770, Enterovirus, EV-F1 BEV-2 [BEV-261-RM2]
DQ092769, Enterovirus, EV-E1 BEV-1 [LC-R4]
AF363453, Enterovirus, EV-G1 [UKG-410-73]
U22521, Enterovirus, EV-A71 [BrCr]
AF326766, Enterovirus, EV-J1 [SV6-1631]
D00820, Enterovirus, EV-D70[1670-71]
AF201894, Enterovirus, EV-H1 [A-2 plaque virus]
K02121, Enterovirus, RV-B14 [1959]
EF186077, Enterovirus, RV-C3 [HRV-QPM]
L24917, Enterovirus, RV-A16[11757]
V01149, Enterovirus, EV-C PV1 [Mahoney]
M33854, Enterovirus, EV-B CVB3 [Nancy]
KP233897, unassigned, rabovirus [BerlinJan2011/0572]
KJ950883, unassigned, rat picornavirus [RPV/NYC-B10]
AF406813, Sapelovirus, Sapelovirus A1, porcine sapelovirus 1 [V13]
AY064708, Sapelovirus, Sapelovirus B1, simian sapelovirus 1 [SV2-2383]
KJ641696, unassigned, bat picornavirus [BtVs-PicoV/SC2013]
KJ641689, unassigned, bat picornavirus [BtMs-PicoV/FJ2012]
JN420368, unassigned, Californian sealion sapelovirus [1162]
JN674502, unassigned, quail picornavirus
KT880670, unassigned, phacovirus [Pf-CHK1/PhV]
FR727144, unassigned, pigeon picornavirus B [pigeon/Norway/03/641/2003]
KC560801, unassigned, pigeon picornavirus B [GAL-7/2010/Hungary]
AY563023, Sapelovirus, Avian sapelovirus 1 [TW90A]
KJ641688, unassigned, bat picornavirus [BtRep-PicoV/FJ2012]
KJ641692, unassigned, bat picornavirus [BtRa-PicoV/JS2013]
KJ641685, unassigned, bat picornavirus [BtRf-PicoV-1/YN2012]
KJ641697, unassigned, bat picornavirus [BtNv-PicoV/SC2013]
KM873613, unassigned, tortoise picornavirus [9-05]
KM873614, unassigned, tortoise picornavirus [144-10]
KM873615, unassigned, tortoise picornavirus [2013-T4]
KM873611, unassigned, tortoise picornavirus [14-04]
KM873612, unassigned, tortoise picornavirus [5-04]
KM873617, unassigned, tortoise picornavirus [5-03]
KM873616, unassigned, tortoise picornavirus [124-4-10]
JF973687, Mosavirus, Mosavirus A1 [M-7]
KF958461, Mosavirus, Mosavirus A2 [SZAL6-MoV/2011/HUN]
KM396707, unassigned, lesavirus 1 [Mis101308/2012]
KM396708, unassigned, lesavirus 2 [Nai108015/2012]
JQ941880, Hunnivirus, HunniVirus A1 [BH/LV1/2008/HUN]
AF231769, Teschovirus, Teschovirus A1 [Talfan]
EU236594, Aphthovirus, Bovine rhinitis B virus 1 [EC11]
JN936206, Aphthovirus, Bovine rhinitis A virus 2 [H-1]
X00871, Aphthovirus, Foot-and-mouth disease virus O1 [Kaufbeuren]
X96870, Aphthovirus, Equine rhinitis A virus 1 [PERV]
X96871, Erbovirus, Equine rhinitis B virus 1 [P1436/71]
KM589358, unassigned, bovine picornavirus [TC46]
KP054277, unassigned, bat picornavirus [BatPV/V13/13/Hun]
KP054276, unassigned, bat picornavirus [BatPV/V12/13/Hun]
KP054274, unassigned, bat picornavirus [BatPV/V8/13/Hun]
KP054275, unassigned, bat picornavirus [BatPV/V11/13/Hun]
KP054273, unassigned, bat picornavirus [BatPV/V1/13/Hun]
KP054278, unassigned, bat picornavirus [BatPV/V14/13/Hun]
JQ814851, Mischivirus, Mischivirus A1 [China/2010]
KP100644, unassigned, African bat icavirus [TNo13]
FJ438902, Cosavirus, Cosavirus A1 [0553]
JN867758, Cosavirus, Cosavirus F1, human cosavirus F1 [PK5006]
FJ438907, Cosavirus, Cosavirus B1, human cosavirus B1 [2263]
FJ555555, Cosavirus, Cosavirus E1, human cosavirus E1 [Australia/81]
FJ438908, Cosavirus, Cosavirus D1, human cosavirus D1 [5004]
M81861, Cardiovirus, Cardiovirus A1, encephalomyocarditis virus 1 [R]
M20562, Cardiovirus, Cardiovirus B1, Theiler's murine encephalomyelitis virus [GDVII]
JQ864242, Cardiovirus, Cardiovirus C1, boone cardiovirus 1 [rat/USA/2010]
JX683808, Cardiovirus, Cardiovirus C2 , boone cardiovirus 2 [rat/USA/2012]
DQ641257, Senecavirus, Senecavirus A1, Seneca Valley virus [SVV-001]
KJ690629, unassigned, chicken proventriculitis virus [CPV/Korea/03]
KF961187, unassigned, chicken megrivirus [chicken/CHK-IV-CHV/2013/HUN]
KF961186, unassigned, chicken megrivirus [chicken/B21-CHV/2012/HUN]
KF979336, unassigned, chicken picornavirus 5 [27C]
HM751199, Megrivirus, Melegrivirus A1, turkey hepatitis virus 1 [2993D]
KF979335, unassigned, chicken picornavirus 4 [5C]
KC663628, unassigned, duck megrivirus [LY]
KC876003, unassigned, mesivirus [HK21]
KC811837, unassigned, mesivirus 2 [pigeon/GALII5-PiMeV/2011/HUN]
JN819202, Dicipivirus, Cadicivirus A1, canine picodicistrovirus [209]
JF973686, Rosavirus, Rosavirus A1, murine rosavirus [M-7]
KJ934637, Kobuvirus, Aichivirus A5, roller kobuvirus [SZAL6-KoV/2011/HUN]
JQ898342, Kobuvirus, Aichivirus A6, Kathmandu sewage kobuvirus [KoV-SewKTM]
JF755427, Kobuvirus, Aichivirus A3, murine kobuvirus [M-5/USA/2010]
AB010145, Kobuvirus, Aichivirus A1 [A846-88]
KJ958930, Kobuvirus, Aichivirus A4, feline kobuvirus [12D24]
KF831027, Kobuvirus, Aichivirus A4, feline kobuvirus [FK-13]
KM091960, Kobuvirus, Aichivirus A4, feline kobuvirus [FeKoV/TE/52/IT/13]
JN387133, Kobuvirus, Aichivirus A2, canine kobuvirus [dog-AN211D-USA-2009]
GU245693, Kobuvirus, Aichivirus B3, ovine kobuvirus [sheep/TB3/HUN/2009]
KF006985, Kobuvirus, Aichivirus B2, ferret kobuvirus [MpKoV38]
AB084788, Kobuvirus, Aichivirus B1, bovine kobuvirus 1 [U-1]
EU7874590, Kobuvirus, Aichivirus C1, porcine kobuvirus [swine/S-1/HUN/2007/Hungary]
KF79927, Kobuvirus, Aichivirus C2, caprine kobuvirus [2Q108]
LC055960, unassigned, kagovirus 2 [cattle/Kagoshima-2-24-KoV/2015/JPN]
LC055961, unassigned, kagovirus 1 [cattle/Kagoshima-1-22-KoV/2014/JPN]
KJ641691, unassigned, bat picornavirus [BtMf-PicoV-2/GD2012]
KJ641686, unassigned, bat picornavirus [BtMr-PicoV/DZ010]
KT325852, unassigned, rabbit picornavirus [Rabbit01/2013/HUN]
GQ179640, Salivirus, Salivirus A1 [NG-J1]
KF741227, Sicinivirus, Sicinivirus A1 [UCD01]
KF979331, Sicinivirus, Sicinivirus A2, chicken picornavirus 1 [55C]
JQ691613, Gallivirus, Gallivirus A1 [turkey/M176/2011/HUN]
GU182406, Passerivirus, Passerivirus A1 , turdivirus 1 [thrush/Hong Kong/00356/2007]
GU182408, Oscivirus, Oscivirus A1, turdivirus 2 [robin/Hong Kong/10717/2006]
GU182410, Oscivirus, Oscivirus A2, turdivirus 3 [thrush/Hong Kong/10878/2006]
KF387721, Sakobuvirus, Sakobuvirus A1, feline sakobuvirus 1 [FFUP1/Portugal/2012]
KJ415177, unassigned, tortoise rafivirus [UF4]
KF979334, unassigned, chicken picornavirus 3 [45C]
KT880669, unassigned, chicken picornavirus [Pf-CHK1/AsV]
KF979333, unassigned, chicken picornavirus 2 [44C]
KC465954, Avisivirus, Avisivirus A1 [turkey/M176-TuASV/2011/HUN]
KC614703, Avisivirus, Avisivirus A1 [USA-IN1]
KM203656, unassigned, orivirus 1 [chicken/Pf-CHK1/2013/HUN]
KT880667, unassigned, orivirus 2 [Pf-CHK1]
KJ000696, unassigned, aalivirus (duck picornavirus) [GL/12]
DQ249299, Avihepatovirus, Avihepatovirus A1, duck hepatitis A virus 1 [03D]
JQ316470, Pasivirus, Pasivirus A1, swine pasivirus 1 [swine/France/2011]
AB937989, unassigned, crohivirus [shew/ZM54]
AF327920, Parechovirus, Parechovirus B1, Ljungan virus 1 [87-012]
HF677705, unassigned, sebokele virus 1 [Ari/B/1227/d]
L02971, Parechovirus, Parechovirus A1, human parechovirus 1 [Harris]
KF006989, unassigned, ferret parechovirus [MpPeV1]
KJ641698, unassigned, bat picornavirus [BtMf-PicoV-1/SAX2011]
JQ814853, unassigned, Rhinolophus affinis picornavirus 1
KC935379, Kunsagivirus, Kunsagivirus A1, roller kunsagivirus [roller/SZAL6-KuV/2011/HUN]
unassigned, Bat Kunsagivirus [bat/Cameroon/2013]
EU142040, Aquamavirus, Aquamavirus A1, seal picornavirus 1 [HO-02-21]
KC843627, Potamipivirus, Potamipivirus A1, eel picornavirus [F15/05]
KF183915, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/1/MN/USA/2010]
KF183916, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/2/MN/USA/2010]
KF874490, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/20IL/USA/2010]
KC465953, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [09-283]
KF306267, Limnipivirus, Limnipivirus B1, carp picornavirus 1 [F37/06]
JX134222, Limnipivirus, Limnipivirus A1, bluegill picornavirus 1 [04-032]
KT452695, unassigned, hedgehog hepatovirus [Igel75Erieur2014]
KT452698, unassigned, hedgehog hepatovirus [Igel68Erieur2014]
KT452691, unassigned, hedgehog hepatovirus [Igel8Erieur2014]
KT452714, unassigned, bat hepatovirus [M32Erihe2010]
KT877158, unassigned, tupaia hepatovirus [TN1]
KT452730, unassigned, bat hepatovirus [BUO2BFB6Colafr2010]
KT452729, unassigned, bat hepatovirus [FO1AF48Philan2010]
KT452742, unassigned, bat hepatovirus [SMG1852OMinimus2014]
KT452735, unassigned, rodent hepatovirus [CIV459Lopsik2004]
KR703607, unassigned, phopivirus [NewEngland/USA/2011]
KT452637, unassigned, rodent hepatovirus [RMU101637MCan2010]
KT452641, unassigned, rodent hepatovirus [KS1151OMyogla2011]
KT452644, unassigned, rodent hepatovirus [KS111230Crimig2011]
M14707, Hepatovirus, Hepatovirus A1, hepatitis A virus [HM-175]
D00924, Hepatovirus, Hepatovirus A1, simian hepatitis A virus [AGM-27]
KT229612, unassigned, woodchuck hepatovirus [3ID]
KT229611, unassigned, woodchuck hepatovirus [2ID]
KT452685, unassigned, rodent hepatovirus [KEF121Sigmas2012]
KT452658, unassigned, shrew hepatovirus [KS122J325crara2012]
KT452661, unassigned, shrew hepatovirus [KS121289Scrara2012]
AJ225173, Tremovirus, Tremovirus A1, avian encephalomyelitis virus 1 [Calnek vaccine strain]
KP770140, unassigned, ampivirus [NEWT/2013/HUN]
KP230449, unassigned, falcovirus [kestrel/VOVE0622/2013/HUN]
0.5

Figure 1 (previous page): Phylogenetic analyses of picornavirus P1 using Bayesian tree inference (MrBayes 3.2). 178 picornavirus sequences were retrieved from GenBank. Presented are GenBank accession numbers, ***genus names***, *species names* and *types*. If available, common names and designations of isolates [in square brackets] are given. Yet unassigned viruses are printed in blue. Proposed name is printed in red and indicated by a dot (●). Numbers at nodes indicate posterior probabilities obtained after 6,000,000 generations. The optimal substitution model (GTR+G+I) was determined with MEGA 5. The scale indicates substitutions/site.

Fig. 2
3CD


KJ958930, Kobuvirus, Aichivirus A4, feline kobuvirus [12D240]
KM091960, Kobuvirus, Aichivirus A4, feline kobuvirus [FeKoV/TE/52/IT/13]
KF831027, Kobuvirus, Aichivirus A4, feline kobuvirus [FK-13]
JN887133, Kobuvirus, Aichivirus A2, canine kobuvirus 1 [dog-AN211D-USA-2009]
JF755427, Kobuvirus, Aichivirus A3, murine kobuvirus 1 [M-5-USA-2010]
AB010145, Kobuvirus, Aichivirus A1 [A846-88]
JQ898342, Kobuvirus, Aichivirus A6, Kathmandu sewage kobuvirus [KoV-SewKTM]
KJ934637, Kobuvirus, Aichivirus A5, roller kobuvirus [SZAL6-KoV/2011/HUN]
AB084788, Kobuvirus, Aichivirus B1, bovine kobuvirus 1 [U-1]
GU245693, Kobuvirus, Aichivirus B3, ovine kobuvirus [sheep/TB3/HUN/2009]
KF006985, Kobuvirus, Aichivirus B2, ferret kobuvirus [ferret/MpKoV38/NL/2010]
EU787450, Kobuvirus, Aichivirus C1, porcine kobuvirus 1 [swS-1/HUN/2007]
KF793927, Kobuvirus, Aichivirus C2, caprine kobuvirus [12Q108]
LC055960, unassigned, kagovirus 2 [cattle/Kagoshima-2-24-KoV/2015/JPN]
LC055961, unassigned, kagovirus 1 [cattle/Kagoshima-1-22-KoV/2014/JPN]
GQ179640, Salivirus, Salivirus A1 [hu/NG-J1/Nigeria/2007]
JQ691613, Gallivirus, Gallivirus A1 [turkey/HUN/M176/2011]
GU182406, Passerivirus, Passerivirus A1, turdivirus 1 [thrush/Hong Kong/00356/2007]
KF741227, Sicinivirus, Sicinivirus A1 [chicken/UCC001/Eire]
KF979331, Sicinivirus, Sicinivirus A1 [ChPV-1/chicken/55C/Hong Kong/2008]
KF387721, Sakobuvirus, Sakobuvirus A1 [FFUP1/Portugal/2012]
KJ641686, unassigned, bat picornavirus [BtMf-PicoV/2X2010]
KJ641691, unassigned, bat picornavirus [BtMf-PicoV-2/GD2012]
KT325852, unassigned, rabbit picornavirus [Rabbit01/2013/HUN]
GU182408, Oscivirus, Oscivirus A1, turdivirus 2 [robin/Hong Kong/10717/2006]
GU182410, Oscivirus, Oscivirus A2, turdivirus 3 [robin/Hong Kong/108787/2006]
KJ415177, unassigned, tortoise rafivirus [UF4]
KF961186, unassigned, chicken megrivirus [chicken/B21-CHV/2012/HUN]
KF961187, unassigned, chicken megrivirus [chicken/CHK-IV-CHV/2013/HUN]
KJ690629, unassigned, chicken proventriculitis virus [CPV/Korea/03]
HM751199, Megrivirus, Melegrivirus A1, turkey hepatitis virus [2993D]
KF979336, unassigned, chicken picornavirus 5 [27C]
KF979335, unassigned, chicken picornavirus 4 [5C]
KC663628, unassigned, duck megrivirus [LY]
KC811837, unassigned, pigeon mesivirus 2 [pigeon/GALII5-PiMeV/2011/HUN]
KC876003, unassigned, mesivirus 1 [HK21]
JN819202, Dicipivirus, Cadicivirus A1, canine picodicistrovirus [209]
JF973686, Rosavirus, Rosavirus A1 [mouse/USA/M-7/2010]
KP054278, unassigned, bat picornavirus [BatPV/V14/13/Hun]
KP054276, unassigned, bat picornavirus [BatPV/V12/13/Hun]
KP054275, unassigned, bat picornavirus [BatPV/V11/13/Hun]
KP054277, unassigned, bat picornavirus [BatPV/V13/13/Hun]
KP054274, unassigned, bat picornavirus [BatPV/V8/13/Hun]
KP054273, unassigned, bat picornavirus [BatPV/V1/13/Hun]
JQ814851, Mischivirus, Mischivirus A1 [bat/China/2010]
KP100644, unassigned, African bat icavirus [TNo13]
M20562, Cardiovirus, Cardiovirus B1, Theiler's murine encephalomyelitis virus [GDVII]
M81861, Cardiovirus, Cardiovirus A1, encephalomyocarditis virus 1 [R]
JQ864242, Cardiovirus, Cardiovirus C1, Boone cardiovirus 1 [rat/USA/2010]
JX683808, Cardiovirus, Cardiovirus C2, Boone cardiovirus 2 [rat/USA/2012]
DQ641257, Senecavirus, Senecavirus A1, Seneca Valley virus 1 [cc/US/SVV-001]
FJ438908, Cosavirus, Cosavirus D1, human cosavirus D1 [5004]
FJ555055, Cosavirus, Cosavirus E1, human cosavirus E1 [Australia/61]
FJ438907, Cosavirus, Cosavirus B1, human cosavirus B1 [2263]
FJ438902, Cosavirus, Cosavirus A1 [0553]
JN867758, Cosavirus, Cosavirus F1, human cosavirus F1 [PK5006]
EU236594, Aphthovirus, Bovine rhinitis B virus 1 [EC11]
JN936206, Aphthovirus, Bovine rhinitis A virus 2 [H-1]
X00871, Aphthovirus, Foot-and-mouth disease virus O1 [Kaufbeuren]
X96870, Aphthovirus, Equine rhinitis A virus 1 [PERV]
KM396707, unassigned, lesavirus 1 [Mis101308/2012]
KM396708, unassigned, lesavirus 2 [Nai108015/2012]
JQ941880, Hunnivirus, Hunnivirus A1 [cattle/HUN/2008]
AF231769, Teschovirus, Teschovirus A1, porcine teschovirus 1 [Talfan]
X96871, Erbovirus, Erbovirus A1, equine rhinitis B virus 1 [P1436/71]
KM588358, unassigned, bovine erbo-like picornavirus [TCH6]
KM873613, unassigned, tortoise picornavirus [9-05]
KM873614, unassigned, tortoise picornavirus [144-10]
KM873615, unassigned, tortoise picornavirus [2013-T4]
KM873612, unassigned, tortoise picornavirus [5-04]
KM873611, unassigned, tortoise picornavirus [14-04]
KM873616, unassigned, tortoise picornavirus [124-4-10]
KM873617, unassigned, tortoise picornavirus [5-03]
JF973687, Mosavirus, Mosavirus A1 [mouse/M-7/USA/2010]
KF958461, Mosavirus,Mosavirus A2 [SZAL6-MoV/2011/HUN]
JN572117, unassigned, feline picornavirus [356F]
JN572119, unassigned, feline picornavirus [1021F]
JN572115, unassigned, feline picornavirus [cat/Hong Kong/073F/20079
JN572116, unassigned, feline picornavirus [127F]
JN572118, unassigned, feline picornavirus [661F]
KJ641687, unassigned, bat picornavirus [BtMf-PicoV/FJ2012]
KJ641699, unassigned, bat picornavirus [BtMf-PicoV-2/SAX2011]
KJ641690, unassigned, bat picornavirus [BtMf-PicoV-1/GD2012]
HQ595344, unassigned, bat picornavirus [TLC5F]
HQ595345, unassigned, bat picornavirus [TLC21F]
KJ641693, unassigned, bat picornavirus [BtRh-PicoV/SC2013]
HQ595340, unassigned, bat picornavirus [NC16A]
HQ595341, unassigned, bat picornavirus [LMH22A]
HQ595342, unassigned, bat picornavirus [MH9F]
HQ595343, unassigned, bat picornavirus [SK17F]
JQ814852, unassigned, ta io picornavirus 1
KJ641694, unassigned, bat picornavirus [BtRs-PicoV/YN2010]
JN831356, unassigned, canine picornavirus [dog/Hong Kong/325F/2008]
LC036579, unassigned, bovine picornavirus [Bo-12-3/2009/JPN]
LC036581, unassigned, bovine picornavirus [Bo-12-11/2009/JPN]
LC036580, unassigned, bovine picornavirus [Bo-12-7/2009/JPN]
LC036582, unassigned, bovine picornavirus [Bo-12-38/2009/JPN]
LC006971, unassigned, Bovine picornavirus [Bo-11-39/2009/JPN]
AF406813, Sapelovirus, Sapelovirus A1, porcine sapelovirus 1 [V13]
AY064708, Sapelovirus, Sapelovirus B1, simian sapelovirus 1 [SV2-2383]
KJ641696, unassigned, bat picornavirus [BtVs-PicoV/SC2013]
KJ641689, unassigned, bat picornavirus [BtMs-PicoV/FJ2012]
AY563023, Sapelovirus, Avian sapelovirus 1 [TW90A]
JN420368, unassigned, Californian sealion sapelovirus [1162]
KJ641688, unassigned, bat picornavirus [BtRlep-PicoV/FJ2012]
KJ641692, unassigned, bat picornavirus [BtRa-PicoV/JS2013]
KJ641685, unassigned, bat picornavirus [BtRf-PicoV-1/YN2012]
KJ641697, unassigned, bat picornavirus [BtNv-PicoV/SC2013]
M33854, Enterovirus, EV-B CV-B3 [Nancy]
AF326766, Enterovirus, EV-J1 [SV6-1631]
D00820, Enterovirus, EV-D70 [J670-71]
V01149, Enterovirus, EV-C PV1 [Mahoney]
U22521, Enterovirus, EV-A71 [BrCr]
KP345888, unassigned, Dromedary camel enterovirus 2 [20CC]
KP345887, unassigned, Dromedary camel enterovirus 1 [19CC]
DQ092770, Enterovirus, EV-F1 BEV-2 [BEV-261 RM2]
DQ092769, Enterovirus, EV-E1 BEV-1 [LC-R4]
AF363453, Enterovirus, EV-G1 [UKG/410/73]
AF201894, Enterovirus, EV-H1 [A-2 plaque virus]
L24917, Enterovirus, RV-A16 [11757]
EF186077, Enterovirus, RV-C3 [HRV-QPM]
K02121, Enterovirus, RV-B14 [1959]
KP233897, unassigned, rabovirus [Berlin/Jan2011/0572]
KJ950883, unassigned, rat picornavirus [rat/NYC-B10/USA/2010]
FR727144, unassigned, pigeon picornavirus B [pigeon/Norway/03/641/2003]
KC560801, unassigned, pigeon picornavirus B [GAL-7/2010/Hungary]
FR727145, unassigned, pigeon picornavirus A [pigeon/Norway/03/603-7/2003]
JN674502, unassigned, quail picornavirus 1 [quail/-HUN/2010]
KT880670, unassigned, phacovirus [Pf-CHK1/PhV]
KP230449, unassigned, falcovirus [kestrel/VOVE0622/2013/HUN]
KJ641684, unassigned, bat picornavirus [BtRf-PicoV-2/YN2012]
KT452637, unassigned, rodent hepatovirus [RMU101637Micarv2010]
KT452641, unassigned, rodent hepatovirus [KS11510Myogla2011]
KT452644, unassigned, rodent hepatovirus [KS111230Crimig2011]
KT229612, unassigned, woodchuck hepatovirus [3ID]
KT229611, unassigned, woodchuck hepatovirus [2ID]
KT452685, unassigned, rodent hepatovirus [KEF121Sigmas2012]
M14707, Hepatovirus, Hepatovirus A1, hepatitis A virus [HM-175]
D00924, Hepatovirus, Hepatovirus A1, simian hepatitis A virus [AGM-27]
KT452658, unassigned, shrew hepatovirus [KS121232Sorara2012]
KT452661, unassigned, shrew hepatovirus [KS121289Sorara2012]
KT452695, unassigned, hedgehog hepatovirus [Igel7Erieur2014]
KT452698, unassigned, hedgehog hepatovirus [Igel8Erieur2014]
KT452691, unassigned, hedgehog hepatovirus [Igel8Erieur2014]
KT452714, unassigned, bat hepatovirus [M32Eidhel2010]
KT877158, unassigned, tupaia hepatovirus [TNi1]
KT452730, unassigned, bat hepatovirus [BUC2BF86Colafr2010]
KT452729, unassigned, bat hepatovirus [FO1AF48Rhilan2010]
KR703607, unassigned, phopivirus [NewEngland/USA/2011]
KT452742, unassigned, bat hepatovirus [SMC18520Mminmav2014]
KT452735, unassigned, rodent hepatovirus [CIV459Lopsik2004]
AJ225173, Tremovirus, Tremovirus A1, avian encephalomyelitis virus 1 [Calnek vaccine strain]
KF183915, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/1/MN/USA/2010]
KF183916, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/2/MN/USA/2010]
KF874490, Limnipivirus, Limnipivirus C1, fathead minnow picornavirus 1 [fhm/20/IL/USA/2010]
KF306267, Limnipivirus, Limnipivirus B1, carp picornavirus 1 [F37/06]
JX134222, Limnipivirus, Limnipivirus A1, bluegill picornavirus 1 [04-032]
KC843627, Potamipivirus, Potamipivirus A1, eel picornavirus 1 [F15/05]
KJ641698, unassigned, bat picornavirus [BtMf-PicoV-1/SAX2011]
AF327920, Parechovirus, Parechovirus B1, Ljungan virus 1 [87-012]
HF677705, unassigned, sebokele virus 1 [An/B/12271/d]
L02971, Parechovirus, Parechovirus A1, human parechovirus 1 [Harris]
KF006989, unassigned, ferret parechovirus [ferret/MpPeV1/NL]
JQ316470, Pasivirus, Pasivirus A1 [swine/France/2011]
AB937989, unassigned, crohivirus 1 [shrew/2M54/Zambia/2012]
KC465954, Avisivirus, Avisivirus A1 [turkey/M176-TuASV/2011/HUN]
KC614703, Avisivirus, Avisivirus A1 [turkey/USA/IN1/2010]
KF979334, unassigned, chicken picornavirus 3 [45C]
KT880669, unassigned,chicken picornavirus [Pf-CHK1/AsV]
KF979333, unassigned, chicken picornavirus 2 [44C]
KJ000696, unassigned, aalivirus [duck/GL/12/China/2012]
KM203656, unassigned, orivirus 1 [chicken/Pf-CHK1/2013/HUN]
KT880667, unassigned, orivirus 2 [Pf-CHK1]
DQ249299, Avihepatovirus, Avihepatovirus A1, duck hepatitis A virus 1 [03D]
KC935379, Kunsagivirus, Kunsagivirus A1 [roller/SZAL6-KuV/2011/HUN]
unassigned, bat kunsagivirus
EU142040, Aquamavirus, Aquamavirus A1, seal picornavirus 1 [HO-02-21]
KP770140, unassigned, ampivirus [NEWT/2013/HUN]
0.5

Figure 2 (previous page): Phylogenetic analyses of picornavirus 3CD gene regions using Bayesian tree inference (MrBayes 3.2). 178 sequences were retrieved from GenBank. Presented are GenBank accession numbers, ***genus names***, *species names* and *types*. If available, common names and designations of isolates [in square brackets] are given. Yet unassigned viruses are printed in blue. Proposed names are printed in red and indicated by a dot (●). Numbers at nodes indicate posterior probabilities obtained after 4,750,000 generations. The optimal substitution model (GTR+G+I) was determined with MEGA 5. The scale indicates substitutions/site.

Table 1: Estimates of Evolutionary Divergence between P1 Sequences

[1] FJ438902_Cosavirus A1_strain_HCosV-A1_0553_(orf)
[2] JN867759_Cosavirus A19_HCosV-A19_strain_PK6187_(orf)
[3] JN867756_Cosavirus A20_HCosV-A20_strain_NG263_(orf)
[4] AB920345_Cosavirus A26_HCosV-A26_strain_10928/2012/JPN_(orf)
[5] FJ438907_Cosavirus B1_HCosaV-B1_2263_(orf)
[6] KM516909_Cosavirus B2_HCosV-B2_JMY-2014_isolate_Cosa-CHN/JMY-2014_(orf)
[7] FJ438908_Cosavirus D1_HCosV-D1_5004_(orf)
[8] KJ194505_Cosavirus D6_HCosV-D6_isolate_Amsterdam/1994_(orf)
[9] FJ555055_Cosavirus E1_HCosV-E1_Australia/81_(orf)
[10] JN867757_Cosavirus E2_HCosV-E2_strain_NG385_(orf)
[11] JN867758_Cosavirus F1_HCosV-F1_strain_PK5006_(orf)
[12] JQ864242_Cardiovirus C1_Boone_cardiovirus_isolate_BCV-1
[13] JX683808_Cardiovirus C1_Boone_cardiovirus_isolate_BCV-2
[14] M81861_Cardiovirus A_EMCV-1_R
[15] M20562_Cardiovirus B_TMEV_GDVII
[16] DQ641257_Senecavirus A1_SVV_SVV-001
[17] JQ814851_Mischivirus_A1
[18] X96870_ERAV_PERV
[19] X00871_FMDV_O1K
[20] EU236594_BRBV-1_EC11
[21] JN936206_BRAV-2_H-1
[22] X96871_Erbovirus A1_ERBV1-P1436-71
[23] AF231769_Teschovirus A1_PTV1-Talfan
[24] JQ941880_Hunnivirus A1 BHUV1/2008/HUN
[25] JF973687_Mosavirus A1
[26] KF958461_Mosavirus A2N

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]	[26]
[1]	0.0000																									
[2]	0.3368	0.0000																								
[3]	0.3431	0.2246	0.0000																							
[4]	0.3442	0.3462	0.3064	0.0000																						
[5]	0.4421	0.4621	0.4343	0.4377	0.0000																					
[6]	0.4353	0.4559	0.4399	0.4531	0.3497	0.0000																				
[7]	0.5302	0.5479	0.5119	0.5254	0.5123	0.5000	0.0000																			
[8]	0.5065	0.5326	0.4988	0.5136	0.4894	0.4876	0.1841	0.0000																		
[9]	0.4579	0.4775	0.4619	0.4480	0.4302	0.4476	0.4865	0.4688	0.0000																	
[10]	0.4508	0.4526	0.4231	0.4419	0.4170	0.4139	0.5012	0.4894	0.3361	0.0000																
[11]	0.4000	0.4050	0.3812	0.3738	0.4200	0.4353	0.5118	0.5112	0.4682	0.4400	0.0000															
[12]	0.6538	0.6768	0.6582	0.6667	0.6645	0.6583	0.6653	0.6601	0.6592	0.6702	0.6574	0.0000														
[13]	0.6506	0.6676	0.6454	0.6516	0.6462	0.6589	0.6625	0.6501	0.6501	0.6505	0.6510	0.1383	0.0000													
[14]	0.6610	0.6701	0.6478	0.6606	0.6619	0.6671	0.6688	0.6571	0.6606	0.6580	0.6602	0.5032	0.4862	0.0000												
[15]	0.6442	0.6482	0.6308	0.6409	0.6539	0.6449	0.6735	0.6671	0.6385	0.6550	0.6551	0.4875	0.4661	0.3838	0.0000											
[16]	0.6991	0.7016	0.6904	0.6915	0.6918	0.6762	0.7065	0.6958	0.7029	0.6900	0.6972	0.6594	0.6586	0.6546	0.6481	0.0000										
[17]	0.6538	0.6671	0.6436	0.6746	0.6466	0.6553	0.6684	0.6579	0.6346	0.6529	0.6684	0.6265	0.6203	0.6044	0.5937	0.6684	0.0000									
[18]	0.7348	0.7421	0.7135	0.7331	0.7086	0.7159	0.7355	0.7175	0.7218	0.7091	0.7240	0.7133	0.7063	0.6879	0.6853	0.6952	0.6954	0.0000								
[19]	0.7415	0.7578	0.7400	0.7434	0.7430	0.7478	0.7504	0.7548	0.7412	0.7489	0.7334	0.7114	0.6983	0.7007	0.6950	0.7100	0.7128	0.6212	0.0000							
[20]	0.7574	0.7589	0.7486	0.7627	0.7514	0.7422	0.7556	0.7514	0.7327	0.7210	0.7447	0.7360	0.7266	0.7051	0.6960	0.7266	0.7167	0.6152	0.5379	0.0000						
[21]	0.7809	0.7781	0.7581	0.7678	0.7601	0.7563	0.7768	0.7698	0.7714	0.7697	0.7504	0.7528	0.7397	0.7304	0.7251	0.7355	0.7417	0.6561	0.5617	0.5463	0.0000					
[22]	0.7094	0.7018	0.6897	0.7043	0.6859	0.6821	0.7011	0.6993	0.6803	0.6937	0.6883	0.6824	0.6735	0.6680	0.6714	0.6772	0.6732	0.6645	0.6841	0.6872	0.6882	0.0000				
[23]	0.7589	0.7595	0.7589	0.7562	0.7516	0.7556	0.7533	0.7441	0.7640	0.7523	0.7415	0.7126	0.7092	0.7279	0.7126	0.7471	0.7510	0.7307	0.7616	0.7403	0.7842	0.7364	0.0000			
[24]	0.7524	0.7634	0.7521	0.7466	0.7497	0.7359	0.7493	0.7424	0.7548	0.7548	0.7352	0.7007	0.6945	0.6780	0.6995	0.6957	0.7091	0.7223	0.7221	0.7205	0.7348	0.7071	0.6437	0.0000		
[25]	0.7055	0.7004	0.6873	0.6880	0.6897	0.6899	0.6959	0.6945	0.6731	0.6809	0.6694	0.6640	0.6560	0.6622	0.6520	0.6861	0.6808	0.6762	0.6936	0.7015	0.7197	0.6366	0.7109	0.6986	0.0000	
[26]	0.7089	0.7106	0.7019	0.6997	0.7040	0.7016	0.6914	0.6954	0.6824	0.6874	0.6802	0.6773	0.6630	0.6605	0.6529	0.7001	0.6893	0.7091	0.7176	0.7103	0.7188	0.6496	0.7181	0.7060	0.3299	0.0000

The number of amino acid differences per site from between sequences are shown. The analysis involved 26 amino acid sequences. The coding data was translated assuming a Standard genetic code table. All ambiguous positions were removed for each sequence pair. There were a total of 1065 positions in the final dataset. Evolutionary analyses were conducted in MEGA5 [1].

P1:	intra-typic	observed aa divergence of cosaviruses: -	⇒	aa identity: -
	inter-typic (within species)	observed aa divergence of cosaviruses: 22-35%	⇒	aa identity: 65-78%
	between species	observed aa divergence of cosaviruses: 37-55%	⇒	aa identity: 45-63%
	between genera	observed aa divergence of cosaviruses: >63%	⇒	aa identity: <37%

Table 2: Estimates of Evolutionary Divergence between 3CD Sequences

[1] FJ438902_Cosavirus A1_HCoSV-A1_0553
[2] JN867759_Cosavirus A19_HCosV-A19_strain_PK6187_(orf)
[3] JN867756_Cosavirus A20_HCosV-A20_strain_NG263_(orf)
[4] AB920345_Cosavirus A26_HCosV-A26_strain_10928/2012/JPN_(orf)
[5] FJ438907_Cosavirus B1_HCoSV-B1
[6] KM516909_Cosavirus B2_HCosV-B2_JMY-2014_isolate_Cosa-CHN/JMY-2014_(orf)
[7] FJ438908_Cosavirus D1_HCoSV-D1
[8] KJ194505_Cosavirus D6_HCosV-D6_isolate_Amsterdam/1994_(orf)
[9] FJ555055_Cosavirus E1_HCoSV-E1
[10] JN867757_Cosavirus E2_HCosV-E2_strain_NG385_(orf)
[11] JN867758_Cosavirus F1_HCoSV_F1_PK5006
[12] M81861_Cardiovirus A1_EMCV-R
[13] M20562_Cardiovirus B1_TMEV_GDVII
[14] JQ864242_Cardiovirus C1_Boone_cardiovirus_1_isolate_rat/USA/2010
[15] JX683808_Cardiovirus C1_Boone_cardiovirus_2_isolate_rat/USA/2012
[16] DQ641257_Senecavirus A1_SVV-1_cc/US/SVV-001
[17] JQ814851_Mischivirus A1_M._schreibersii_picornavirus_1_bat/China/2010
[18] X96870_ERAV_PERV_P2P3
[19] X00871_FMDV_O1Kaufbeuren
[20] EU236594_BRBV-1_EC11
[21] JN936206_BRAV-2_H-1
[22] X96871_Erbovirus A1_ERBV-1_P1436/71
[23] AF231769_Teschovirus A1_PTV-1_Talfan
[24] JF973687_Mosavirus A1_mouse/M-7/USA/2010
[25] KF958461_Mosavirus A2_strain_SZAL6-MoV/2011/HUN
[26] JQ941880_Hunnivirus A1_HuV-A1_cattle/HUN/2008

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]	[26]
[1]	0.0000																									
[2]	0.0135	0.0000																								
[3]	0.0405	0.0495	0.0000																							
[4]	0.0150	0.0195	0.0480	0.0000																						
[5]	0.3042	0.3057	0.3072	0.3057	0.0000																					
[6]	0.3910	0.3925	0.3850	0.3940	0.3750	0.0000																				
[7]	0.3368	0.3353	0.3308	0.3414	0.3148	0.3368	0.0000																			
[8]	0.3383	0.3368	0.3293	0.3414	0.3148	0.3338	0.0481	0.0000																		
[9]	0.3444	0.3414	0.3368	0.3444	0.3343	0.3714	0.2241	0.2180	0.0000																	
[10]	0.3414	0.3398	0.3323	0.3444	0.3208	0.3383	0.0496	0.0421	0.2286	0.0000																
[11]	0.3308	0.3278	0.3248	0.3338	0.3605	0.3750	0.3614	0.3690	0.3705	0.3690	0.0000															
[12]	0.5890	0.5890	0.5951	0.5936	0.5975	0.5966	0.5920	0.5874	0.6043	0.5982	0.6104	0.0000														
[13]	0.5936	0.5967	0.5967	0.5936	0.6159	0.6104	0.6088	0.6088	0.6149	0.6164	0.6119	0.4030	0.0000													
[14]	0.5894	0.5879	0.5939	0.5970	0.6191	0.6227	0.6076	0.6045	0.6121	0.6136	0.6061	0.4481	0.4716	0.0000												
[15]	0.7010	0.6977	0.7138	0.7074	0.7323	0.7203	0.6977	0.6977	0.7042	0.7010	0.7235	0.5367	0.5647	0.0282	0.0000											
[16]	0.5881	0.5897	0.5942	0.5851	0.6073	0.6003	0.5927	0.5942	0.6049	0.6033	0.6064	0.4879	0.4918	0.5135	0.6234	0.0000										
[17]	0.6067	0.6082	0.6112	0.6097	0.6106	0.5961	0.6006	0.6036	0.6188	0.6082	0.6036	0.5076	0.5397	0.5388	0.6519	0.5164	0.0000									
[18]	0.6280	0.6250	0.6296	0.6280	0.6290	0.6280	0.6235	0.6204	0.6159	0.6220	0.6260	0.6108	0.6031	0.5866	0.6883	0.6073	0.6277	0.0000								
[19]	0.6284	0.6254	0.6299	0.6269	0.6248	0.6390	0.6344	0.6299	0.6375	0.6375	0.6329	0.6343	0.6627	0.6357	0.7089	0.6201	0.6617	0.5314	0.0000							
[20]	0.6273	0.6242	0.6288	0.6273	0.6282	0.6288	0.6258	0.6258	0.6258	0.6288	0.6288	0.6174	0.6490	0.6265	0.7134	0.6103	0.6431	0.5452	0.3985	0.0000						
[21]	0.6420	0.6420	0.6420	0.6420	0.6445	0.6390	0.6375	0.6299	0.6390	0.6360	0.6526	0.6495	0.6506	0.6447	0.7215	0.6346	0.6447	0.5602	0.4174	0.4125	0.0000					
[22]	0.6747	0.6778	0.6747	0.6778	0.6848	0.6853	0.6702	0.6702	0.6657	0.6762	0.6914	0.6423	0.6507	0.6466	0.7325	0.6586	0.6417	0.6425	0.6716	0.6637	0.6503	0.0000				
[23]	0.6817	0.6817	0.6848	0.6832	0.6854	0.6827	0.6796	0.6827	0.6765	0.6843	0.6791	0.6583	0.6662	0.6909	0.7680	0.6528	0.6605	0.6625	0.6687	0.6703	0.6995	0.6606	0.0000			
[24]	0.6866	0.6897	0.6866	0.6943	0.6903	0.7000	0.6846	0.6877	0.6877	0.6908	0.6963	0.6615	0.6554	0.6753	0.7641	0.6799	0.6565	0.6467	0.6692	0.6753	0.6723	0.6965	0.7008	0.0000		
[25]	0.6897	0.6912	0.6897	0.6928	0.6995	0.7092	0.7031	0.7062	0.6969	0.7092	0.7040	0.6631	0.6600	0.6891	0.7708	0.6861	0.6748	0.6513	0.6723	0.6677	0.6692	0.7011	0.6992	0.1872	0.0000	
[26]	0.7088	0.7072	0.7072	0.7088	0.7156	0.6975	0.6991	0.6991	0.6975	0.7022	0.7211	0.6605	0.6626	0.6912	0.7662	0.6687	0.6508	0.6821	0.6789	0.6865	0.6942	0.6657	0.5745	0.6918	0.6888	0.0000

The number of amino acid differences per site from between sequences are shown. The analysis involved 26 amino acid sequences. The coding data was translated assuming a Standard genetic code table. All ambiguous positions were removed for each sequence pair. There were a total of 726 positions in the final dataset. Evolutionary analyses were conducted in MEGA5 [1].

3CD:	intra-typic	observed aa divergence of cosaviruses: -	⇒	aa identity: -
	inter-typic (within species)	observed aa divergence of cosaviruses: >5%	⇒	aa identity: >95%
	between species	observed aa divergence of cosaviruses: 30-40%	⇒	aa identity: 60-70%
	between genera	observed aa divergence of cosaviruses: >58%	⇒	aa identity: <42%