

# Supplementary material

## High heterogeneity of Echoviruses in Brazilian children with acute gastroenteritis

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Figure S1

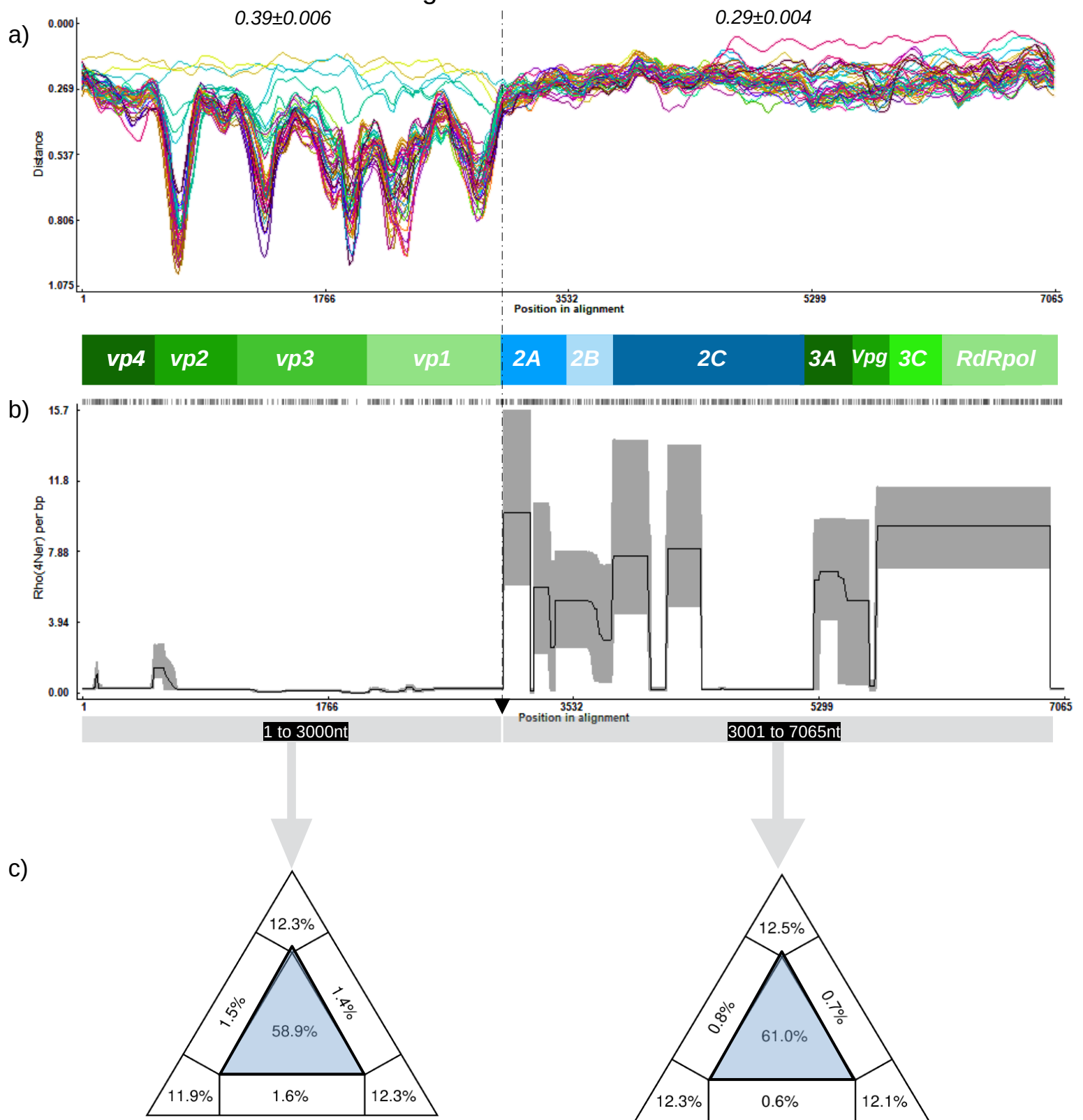


Figure S1. Nucleotide variability of echovirus polyprotein region. A) Nucleotide similarity plot of polyprotein genomic region of echoviruses. Each line represent one sequence included in this analysis (see Table S1 for the description of references sequences used). In the x-axis lines represent pair wise distances of each site in the alignment. The y-axis indicate the nucleotide position in the alignment. The vertical line indicate the position which the alignment was partitioned. Number above the lines are the mean genetic distances and their standard errors calculated in each partition. B) Recombination rates in the echovirus polyprotein. The dark line represents the calculated site-by-site recombination rate in the echovirus polyprotein and the gray area is the 95% credibility interval. Between a) and b) there is a diagram showing the genes of the echovirus polyprotein. c) Likelihood mapping of each partition. This approach shows the percentage of unresolved star-trees in the alignment in the center of the triangle. The higher this percentage, the more inferior is the alignment for phylogenetic inferences.

Figure S2

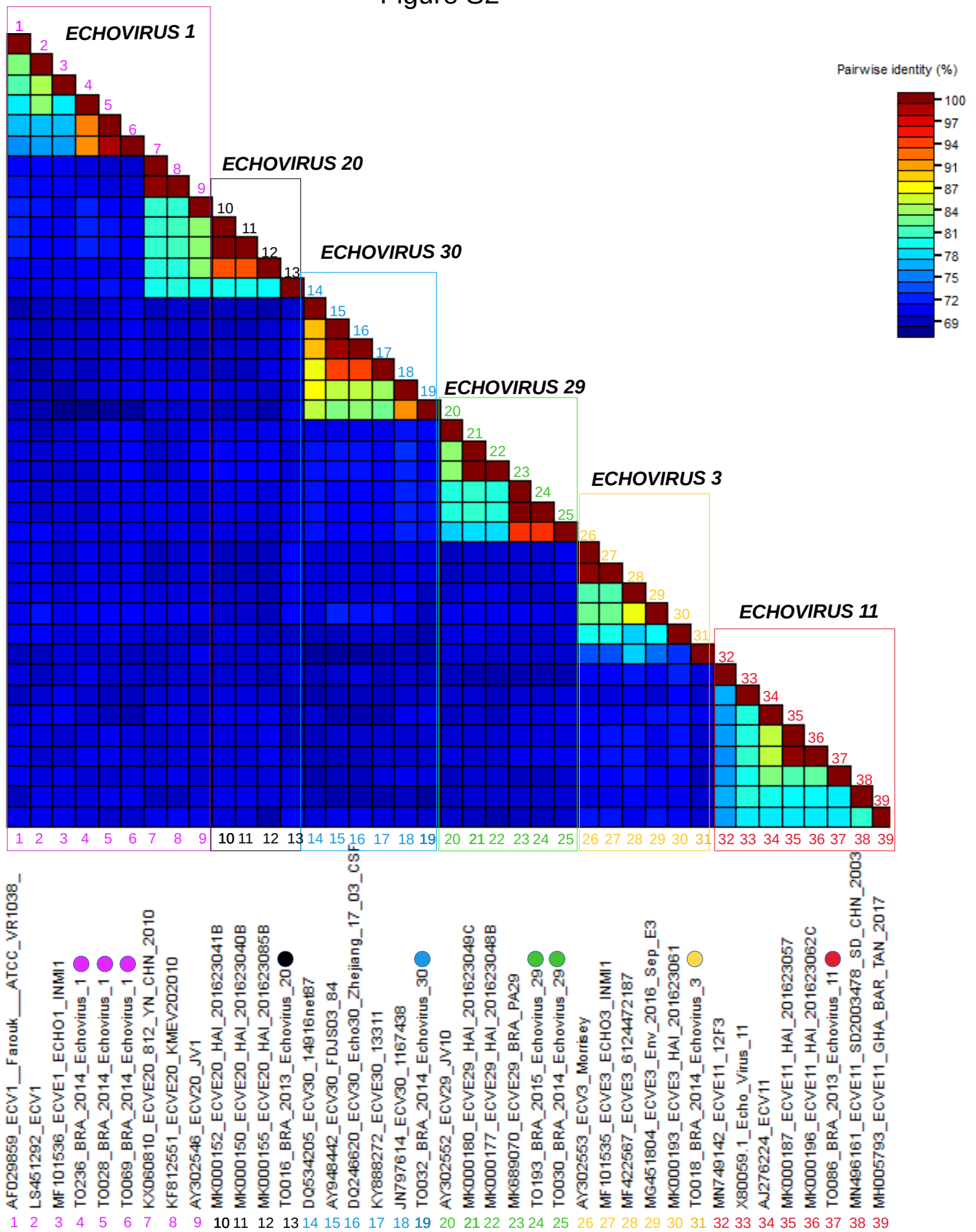


Figure S2. Nucleotide similarity matrix of echoviruses. The similarity of all pairs of sequences are indicated in colors according to the scale in the figure. Echovirus serotypes are indicated by colored rectangles (Magenta =serotype 1; black=serotype 20; light blue= serotype 30; gree= serotype 29; yellow=seroptype 3 and red=serotype 11). Sequences generated in this study are indicated by colored circles.

# Figure S3

■ Number\_contigs  
■ Contigs\_length

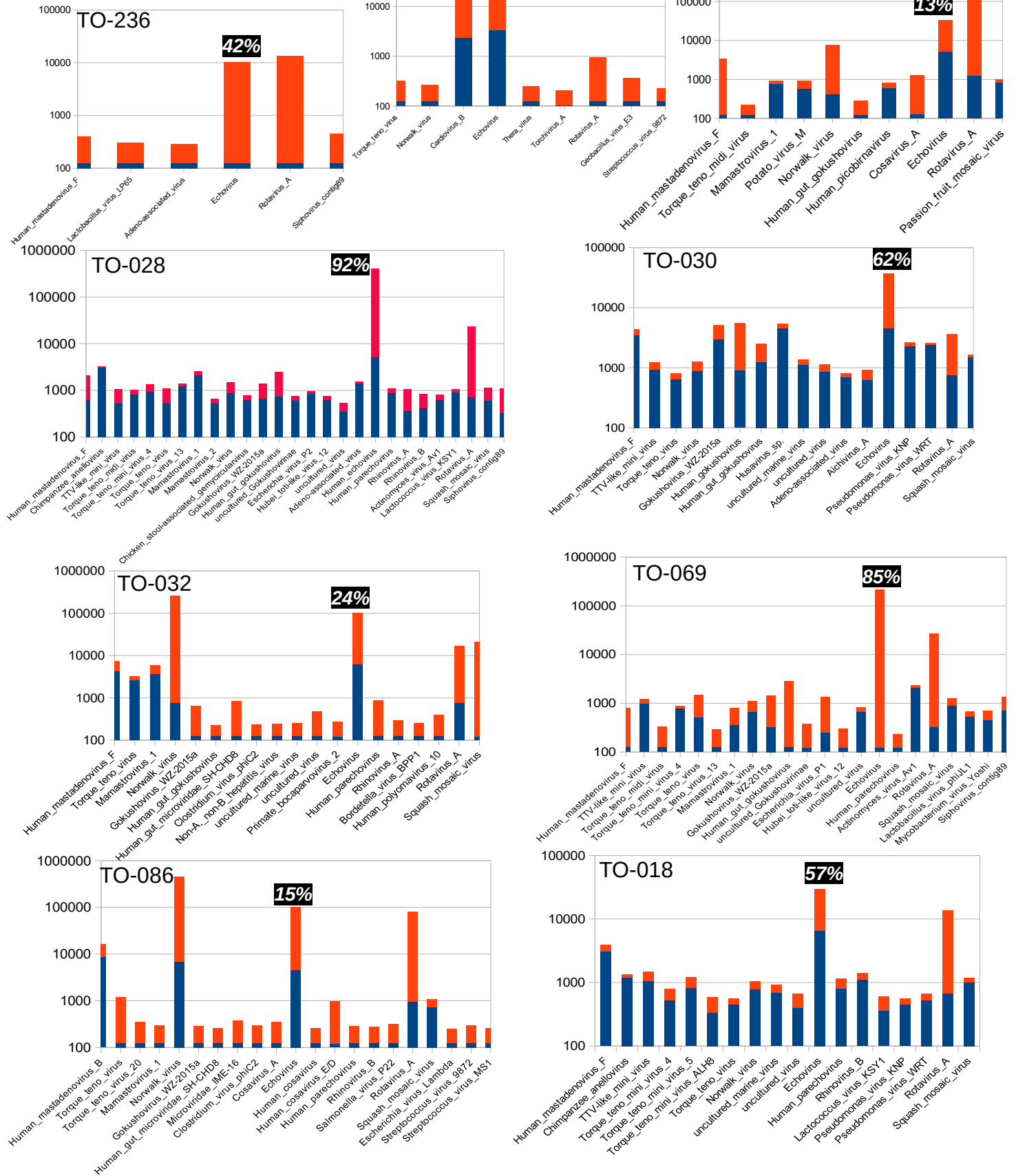


Figure S3. Amount of other viruses present in samples where Echoviruses were detected in this study. The y-axis is in log scale and show the number of reads (red) and contig length (blue) of viruses detected in each sample. Numbers in the dark rectangles are the percentage of echovirus contigs detected in each sample.

# Table S1 List of 351 reference sequences in this study

| Genbank ID Serotype/Sequence name           | Genbank ID Serotype/Sequence name      | Genbank ID Serotype/Sequence name        |
|---------------------------------------------|----------------------------------------|------------------------------------------|
| AY036579 ECV7/Wallace                       | MK000193 ECVE3/HA/2016-23061           | HM775882 ECV5/Kor06-ECV5-253cn           |
| AY036578 ECV7/UMMC                          | MK000192 ECVE19/HA/2016-23053          | AF311938 ECV30/Bastianni                 |
| AB501332 ECVE13                             | MK000191 ECVE19/HA/2016-23052          | MK689070 ECVE29/BRA/PA-29                |
| AB501331 ECVE13                             | MK000190 ECVE11/HA/2016-23060          | MN657230 ECVE11/E11-NHP-RD31             |
| AF317694 ECV18/Metcalf                      | MK000189 ECVE6/HA/2016-23059           | MH830353 ECVE6/E6-366/HB/CHN/2015        |
| MF101536 ECVE1/ECHO1_INMI1                  | MK000188 ECVE6/HA/2016-23058           | KT965725 ECVE33/YNK35/CHN/2013           |
| MF101535 ECVE3/ECHO3_INMI1                  | MK000187 ECVE11/HA/2016-23057          | AB647326 ECVE3/OC10-798                  |
| KX139460 ECVE25/Jena/V10308/10              | MK000186 ECVE3/HA/2016-23056           | AB647325 ECVE3/OC10-774                  |
| KX139459 ECVE25/Jena/AN1380/10              | MK000185 ECVE6/HA/2016-23055           | AB647324 ECVE3/OC10-731                  |
| KX139458 ECVE18/Jena/AN1389/10              | MK000184 ECVE19/HA/2016-23054          | AB647323 ECVE3/OC10-571                  |
| KX139457 ECVE18/Jena/AN1384/10              | MK000183 ECVE6/HA/2016-23051B          | AB647322 ECVE3/OC10-540                  |
| KX139456 ECVE18/Jena/AN1371/10              | MK000182 ECVE3/HA/2016-23051A          | AB647321 ECVE3/OC10-532                  |
| KX139455 ECVE18/Jena/AN1370/10              | MK000180 ECVE29/HA/2016-23049C         | AB647320 ECVE3/OC10-492                  |
| KX139454 ECVE18/Jena/AN1367/10              | MK000179 ECVE7/HA/2016-23049B          | AB647319 ECVE3/OC10-487                  |
| KX139453 ECVE18/Jena/AN1366/10              | MK000178 ECVE6/HA/2016-23049A          | AB647318 ECVE3/OC10-478                  |
| KX139452 ECVE18/Jena/AN1365/10              | MK000175 ECVE19/HA/2016-23047          | AB647317 ECVE3/OC10-448                  |
| KX139451 ECVE18/Jena/AN1363/10              | MK000172 ECVE6/HA/2016-23045           | AB647316 ECVE3/OC10-380                  |
| KX139450 ECVE18/Jena/AN1362/10              | MK000171 ECVE6/HA/2016-23044           | KU379646 ECVE33/YNA12/CHN/2013           |
| KX139449 ECVE18/Jena/V10517/10              | MK000170 ECVE6/HA/2016-23043           | KY828852 ECVE18/A86/YN/CHN/2016          |
| KX139448 ECVE18/Jena/V10245/10              | MK000169 ECVE19/HA/2016-23042B         | KY828851 ECVE18/A83/YN/CHN/2016          |
| KX139447 ECVE18/Jena/V10227/10              | MK000168 ECVE6/HA/2016-23042A          | KX619440 ECVE6/RA/E6/Ahvaz/Iran/2011     |
| KX139446 ECVE18/Jena/ST9524/10              | MK000167 ECVE6/HA/2016-23035           | JX976773 ECVE30/E30SD2010CHN             |
| AY167107 ECV19/K/542/81                     | MK000166 ECVE6/HA/2016-23034           | JX976772 ECVE25/E25SD2010CHN             |
| AY167106 ECV11/Mor/M/82                     | MK000165 ECVE19/HA/2016-23037E         | JX976771 ECVE6/E6SD11CHN                 |
| AY167105 ECV11/Kust/86                      | MK000164 ECVE19/HA/2016-23037D         | AB705311 ECVE6                           |
| AY167104 ECV11/Kar/87                       | MK000162 ECVE6/HA/2016-23037B          | AB705310 ECVE6                           |
| AY167103 ECV11/Hun/90                       | MK000154 ECVE6/HA/2016-23085A          | AB705308 ECVE6                           |
| EF066392 ECV30/TW/3182/01                   | MK000153 ECVE7/HA/2016-23084           | HM031191 ECV25/HN-2                      |
| EF066391 ECV30/TW/2513/01                   | MK000152 ECVE20/HA/2016-23041B         | HM777023 ECV18/Kor05-ECV18-054cn         |
| JN797614 ECV30/1167438                      | MK000149 ECVE19/HA/2016-23040A         | AF524867 ECV9/DM                         |
| MN597954 ECVE11/Sewage6-1-1/GD.GZ/CHN/2019  | MK000148 ECVE19/HA/2016-23039B         | AF524866 ECV9/Barty                      |
| MN597953 ECVE11/Sewage15-2-1/GD.GZ/CHN/2019 | MK000146 ECVE20/HA/2016-23038B         | DQ246620 ECV30/Echo30/Zhejiang/17/03/CSF |
| MN597952 ECVE11/HFMD1311-GD-CHN-2018        | MH484075 ECVE30/20L                    | AF162711 ECV30/Bastianni                 |
| MN597951 ECVE11/Sewage4-2-1/GD.GZ/CHN/2019  | MH484074 ECVE30/19L                    | AF083069 ECV5                            |
| MN597950 ECVE11/Sewage34-1-1/GD.GZ/CHN/2018 | MH484073 ECVE30/18L                    | AY302559 ECV7/Wallace                    |
| MN153799 ECVE30/USA/2015/CA-RGDS-1046       | MH484072 ECVE30/15L                    | AY302558 ECV6/D'Amori                    |
| KP294524 ECVE11/520K/YN/CHN/2010            | MF990305 ECVE14/ETH_P19/E14_2016       | AY302557 ECV4/Pesacek                    |
| AB501330 ECVE13                             | MF990301 ECVE18/ETH_P12/E18_2016       | AY302556 ECV33/Toluca-3                  |
| AB501329 ECVE13                             | MF990295 ECVE27/ETH_P8/E27_2016        | AY302555 ECV32/PR-10                     |
| MW015064 ECVE11/E1108                       | MF990293 ECVE16/ETH_P4/E16_2016        | AY302554 ECV31/Caldwell                  |
| MW015063 ECVE11/E1107                       | MF990292 ECVE19/ETH_P3/E19_2016        | AY302553 ECV3/Morrissey                  |
| MW015062 ECVE11/E1106                       | MH005794 ECVE6/GHA#136CEN#136UDW/2017  | AY302552 ECV29/JV-10                     |
| MW015061 ECVE11/E1105                       | MH005793 ECVE11/GHA#137BAR#137TAN/2017 | AY302551 ECV27/Bacon                     |
| MW015060 ECVE11/E1104                       | MH005792 ECVE13/GHA#138VOL#138KRN/2017 | AY302550 ECV26/Coronel                   |
| MW015059 ECVE11/E1103                       | MH005791 ECVE6/GHA#139CEN#139ASE/2017  | AY302549 ECV25/JV-4                      |
| MW015058 ECVE11/E1102                       | MH005790 ECVE11/GHA#140UER#140PUS/2017 | AY302548 ECV24/DeCamp                    |
| MW015057 ECVE11/E1101                       | MG571850 ECVE7                         | AY302547 ECV21/Farina                    |
| MT350224 ECVE18/E18/JXY2-2/2019             | MG571848 ECVE7                         | AY302546 ECV20/JV-1                      |
| MN832718 ECVE18/QD10/SD/CHN/2019            | MF422580 ECVE9/61253-70985             | AY302545 ECV2/Cornelis                   |
| MN832717 ECVE18/QD9/SD/CHN/2019             | MF422579 ECVE6/61252-70738             | AY302544 ECV19/Burke                     |
| MN737190 ECVE18/QD5-C/SD/CHN/2019           | MF422578 ECVE30/63039-1999             | AY302543 ECV17/CHHE-29                   |
| MN737188 ECVE18/QD7/SD/CHN/2019             | MF422577 ECVE30/63037-1463             | AY302542 ECV16/Harrington                |
| MN737187 ECVE18/QD6/SD/CHN/2019             | MF422576 ECVE30/61251-440              | AY302541 ECV15/CH                        |
| MN737186 ECVE18/QD5/SD/CHN/2019             | MF422575 ECVE30/61250-858              | AY302540 ECV14/Tow                       |
| MN737185 ECVE18/QD4/SD/CHN/2019             | MF422572 ECVE3/63040-70881             | AY302539 ECV13/Del                       |
| MK000232 ECVE11/HA/2017-23083B              | MF422570 ECVE3/61247-622               | FJ172447 ECV4/AUS250G                    |
| MK000231 ECVE7/HA/2017-23083A               | MF422569 ECVE3/61246-70294             | U16283 ECV6                              |
| MK000230 ECVE13/HA/2017-23082B              | MF422567 ECVE3/61244-72187             | EF634316 ECV11/D207                      |
| MK000229 ECVE7/HA/2017-23082A               | MF422565 ECVE25/61242-1563             | X84981 ECV9                              |
| MK000227 ECVE6/HA/2016-23077A               | MF422564 ECVE25/61241-70868            | KT353720 ECVE30/1-B4-TW                  |
| MK000226 ECVE20/HA/2016-23076B              | EF155423 ECVAMS573                     | MN749146 ECVE18/12J3                     |
| MK000224 ECVE13/HA/2016-23075               | EF155422 ECVAMS721                     | MN749143 ECVE18/12G5                     |
| MK000223 ECVE7/HA/2016-23074                | X92886 ECV9                            | MN166092 ECVE18/USA/2015/CA-RGDS-1049    |
| MK000222 ECVE13/HA/2016-23073               | AJ577594 ECV11 ROU-9191                | MF678320 ECVE9/NSW-V32-2008-ECHO9        |
| MK000221 ECVE13/HA/2016-23072               | AJ577590 ECV11FIN-0666                 | MF678316 ECVE7/NSW-V28-2007-ECHO7        |
| MK000219 ECVE19/HA/2017-23081A              | AJ577589 ECV11/HUN-1108                | MF678296 ECVE25/NSW-V07-2007-ECHO25      |
| MK000217 ECVE6/HA/2017-23080A               | MH745407 ECVE19/NGR_2014               | MF554740 ECVE4/2F5                       |
| MK000216 ECVE19/HA/2017-23079               | DQ534205 ECV30/14916net87              | KX808644 ECVE3/JSev001                   |
| MK000215 ECVE13/HA/2017-23078B              | MK791152 ECVE11/2017-122-R2            | KJ957190 ECVE25/E25/2010/CHN/BJ          |
| MK000213 ECVE11/HA/2016-23071               | MK791151 ECVE6/78R2                    | KP266571 ECVE30/2002-59                  |
| MK000212 ECVE19/HA/2016-23070B              | MK791150 ECVE3/123-R2                  | KP266570 ECV7/2001-31                    |
| MK000211 ECVE11/HA/2016-23070A              | MH732737 ECVE7/Ibadan_NGR_2010         | KP266568 ECVE6/2005-29-1                 |
| MK000210 ECVE20/HA/2016-23069               | KX641241 ECVE6/K843/YN/CHN/2013        | KC897073 ECVE30/2012EM161                |
| MK000209 ECVE20/HA/2016-23068B              | KX641240 ECVE6/K727/YN/CHN/2013        | KF042343 ECVE6/2012EM100                 |
| MK000208 ECVE6/HA/2016-23068A               | KY792585 ECVE19/PDV_BLR_IN             | KF042342 ECVE6/2012EM95                  |
| MK000207 ECVE19/HA/2016-23067B              | KX060810 ECVE20/812/YN/CHN/2010        | JQ929657 ECVE6/FIN09-NPA                 |
| MK000206 ECVE3/HA/2016-23067A               | KP036484 ECVE24/PZ18G/JS/20120703      | JX854435 ECVE30/ECV30/GX10/05            |
| MK000203 ECVE11/HA/2016-23065B              | KJ765699 ECVE7/DH22G/JS/2012           | JQ729993 ECV6/FJLY2010327                |
| MK000201 ECVE19/HA/2016-23064B              | JQ801739 ECV6/KM57-09                  | HM185056 ECV6/Echo6/Henan/127/2008       |
| MK000200 ECVE11/HA/2016-23064A              | JN596587 ECVE9/MSH/KM812/2010          | HM185055 ECV6/Echo6/Henan/116/2008       |
| MK000199 ECVE19/HA/2016-23063B              | AF465518 ECV2/Cornelis                 | MW080377 ECVE30/TL7C/NM/CHN/2016         |
| MK000198 ECVE6/HA/2016-23063A               | AF465517 ECV6/Charles                  | MW080372 ECVE30/TL12C/NM/CHN/2016        |
| MK000197 ECVE19/HA/2016-23062D              | AF465516 ECV7/Wallace                  | MN215884 ECVE18/LJ/0530/2019             |
| MK000196 ECVE11/HA/2016-23062C              | JN704615 ECV30/Kor08-ECV30             | MN496161 ECVE11/SD2003-478/SD/CHN/2003   |

# Table S1 List of 351 reference sequences in this study (cont.)

| Genbank ID Serotype/Sequence name            | Genbank ID Serotype/Sequence name          |
|----------------------------------------------|--------------------------------------------|
| MH043137 ECVE7/RIGVIR                        | MN749159 ECVE11/10S1                       |
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| MH043135 ECVE7/98-60628                      | MN145871 ECVE6/EchoE6/22/ZJ/CHN/2018       |
| MH043134 ECVE7/98-59065                      | LC416536 ECVE30                            |
| MH043133 ECVE7/98-57213                      | LC416535 ECVE30                            |
| MH043132 ECVE7/Wallace                       | LC416534 ECVE30                            |
| MG720261 ECVE18/E18-HeB15-54498/HeB/CHN/2015 | LC416533 ECVE30                            |
| MG720260 ECVE18/E18-HeB15-54462/HeB/CHN/2015 | MK652137 ECVE11/USA/2018-23090             |
| MG720259 ECVE18/E18-398/HeB/CHN/2015         | MK652136 ECVE24/VEN/2018-23086             |
| MG720258 ECVE18/E18-393/HeB/CHN/2015         | MK800121 ECVE25/USA/2018-23126             |
| MG720257 ECVE18/E18-291/HeB/CHN/2015         | MH144605 ECVE9/11-2042-1                   |
| MG720256 ECVE18/E18-221/HeB/CHN/2015         | MH118026 ECVE25/10-4339-2                  |
| MK532311 ECVE25/USA/CA/RGDS-2017-1010        | MK159694 ECVE7/Nigeria/AFP/2014            |
| MK580458 ECVE9/USA/CA/RGDS-2017-1011         | MH752989 ECVE11/USA/MI/2016-23031          |
| MK238483 ECVE30/USA/2017/CA-RGDS-1005        | MH752986 ECVE9/USA/MI/2004-23028           |
| MF083154 ECVE12/K1529/YN/CHN/2013            | MG451810 ECVE7/Env_2017_Jan_E-7            |
| MF083153 ECVE12/K624/YN/CHN/2013             | MG451806 ECVE7/Env_2016_Sep_E-7b           |
| MF083152 ECVE12/K605/YN/CHN/2013             | MG451805 ECVE7/Env_2016_Sep_E-7a           |
| KY888274 ECVE30/14-397                       | MG451804 ECVE3/Env_2016_Sep_E-3            |
| KY888273 ECVE30/13-759                       | KX610685 ECVE9/UW1                         |
| KY888272 ECVE30/13-311                       | KY645964 ECVE30/16-110                     |
| KY981581 ECVE11/9368/ISR/1998                | KX810066 ECVE2/USA/2013-19511              |
| KY981580 ECVE11/9310/ISR/1998                | KX681481 ECVE9/UW0                         |
| KY981579 ECVE11/9295/ISR/1998                | KU355273 ECVE7/40/Longyou/ZJ               |
| KY981578 ECVE11/8640/ISR/1998                | KP289441 ECVE14/E14/P968/2013/China        |
| KY981577 ECVE11/8416/ISR/1997                | KP289440 ECVE14/E14/P843/2013/China        |
| KY981576 ECVE11/8108/ISR/1996                | KP289439 ECVE6/E6/P735/2013/China          |
| KY981575 ECVE11/8098/ISR/1996                | KP289436 ECVE16/E16/P85/2013/China         |
| KY981574 ECVE11/7676/ISR/1996                | AF029859 ECV1_#364Farouk/_ATCC_VR-1038#364 |
| KY981573 ECVE11/7482/ISR/1995                | LS451292 ECV1                              |
| KY981572 ECVE11/6067/ISR/1993                | X80059 ECV11                               |
| KY981571 ECVE11/5960/ISR/1993                | AJ276224 ECV11                             |
| KY981570 ECVE11/5824/ISR/1992                | MK000155 ECVE20_HAI/2016-23085B            |
| KY981569 ECVE11/5789/ISR/1992                | AY948442 ECV30_FDJS03_84                   |
| KY981568 ECVE11/1541/ISR/1999                | KF878942 ECVE30_KM/A363/09                 |
| KY981567 ECVE11/1513/ISR/1999                | MK000177 ECVE29_HAI/2016-23048B            |
| KY981566 ECVE11/1512/ISR/1999                | JQ979292 ECV1                              |
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| KY981564 ECVE11/1373/ISR/1999                |                                            |
| KY981563 ECVE11/1315/ISR/1999                |                                            |
| KY981562 ECVE11/1096/ISR/1999                |                                            |
| KY981561 ECVE11/1000/ISR/1999                |                                            |
| KY981560 ECVE11/675/ISR/1999                 |                                            |
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| KY981558 ECVE11/535/ISR/1999                 |                                            |
| KY981557 ECVE11/23/ISR/1997                  |                                            |
| KX774483 ECVE25/E25/ZE-wly/Zhejiang/CHN/2005 |                                            |
| KX527626 ECVE11/ISO_VR_Echo11                |                                            |
| KX767786 ECVE18/E18-314/HB/CHN/2015          |                                            |
| KM388538 ECVE3/HNWY-01                       |                                            |
| KM024043 ECV3/Morrissey                      |                                            |
| KP099941 ECVE25/XM0297                       |                                            |
| KP202389 ECVE7/3988/09                       |                                            |
| KF812551 ECVE20/KM-EV20-2010                 |                                            |
| KC238668 ECVE9/DM34                          |                                            |
| KC238667 ECVE9/DM33                          |                                            |
| MN481500 ECVE21/553/YN/CHN/2013              |                                            |
| KT353725 ECVE6/2-D5-TW                       |                                            |
| KT353724 ECVE6/2-C2                          |                                            |
| KT353723 ECVE3/2-E6-TW                       |                                            |
| MK800120 ECVE30/USA/2018-23125               |                                            |
| MT347976 ECVE25/USA/2016-19521               |                                            |