**Table S1. GenBank Accession number of influenza A wt viruses and HYRs analyzed in this study**

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| --- | --- | --- |
| **GenBank Acc #**  | **Wild type and HYRs details** | **Gene** |
| **H1N1 High Yield Donor Virus** |
| CY033584  | A/Puerto Rico/8/1934  | PB2 |
| CY033583 | A/Puerto Rico/8/1934  | PB1 |
| CY033582 | A/Puerto Rico/8/1934  | PA |
| CY033580 | A/Puerto Rico/8/1934  | NP |
| CY033578 | A/Puerto Rico/8/1934  | M |
| CY033581 | A/Puerto Rico/8/1934  | NS |
| **H1N1 Wild Type and HYRs** |
| CY033605 | A/Texas/36/1991 | PB2 |
| CY033655 | A/Texas/36/1991 | HA |
| CY033601 | A/Texas/36/1991 | NP |
| CY033600 | A/Texas/36/1991 | NA |
| CY033654 | A/X-113 (X-31B-Texas/36/1991) | PB2 |
| CY033599 | A/X-113 (X-31B-Texas/36/1991) | PB1 |
| CY033598 | A/X-113 (X-31B-Texas/36/1991) | PA |
| CY033593 | A/X-113 (X-31B-Texas/36/1991) | HA |
| CY033596 | A/X-113 (X-31B-Texas/36/1991) | NP |
| CY033595 | A/X-113 (X-31B-Texas/36/1991) | NA |
| CY033594 | A/X-113 (X-31B-Texas/36/1991) | M |
| CY033597 | A/X-113 (X-31B-Texas/36/1991) | NS |
| CY033620 |  A/Beijing/262/1995 | PB1 |
| CY033614 |  A/Beijing/262/1995 | HA |
| CY033616 |  A/Beijing/262/1995 | NA |
| CY044316 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | PB2 |
| CY044315 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | PB1 |
| CY044314 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | PA |
| CY044309 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | HA |
| CY044312 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | NP |
| CY044311 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | NA |
| CY044310 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | M |
| CY044313 | A/X-127 (Puerto Rico/8/1934-Beijing/262/1995) | NS |
| CY035126 |  A/St. Petersburg/8/2006 | HA |
| CY035128 |  A/St. Petersburg/8/2006 | NA |
| CY034131 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | PB2 |
| CY034130 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | PB1 |
| CY034129 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | PA |
| CY034124 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | HA |
| CY034127 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | NP |
| CY034126 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | NA |
| CY034125 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | M |
| CY036928 | A/NYMC X-163 (NYMC X-157-St.Petersburg/8/2006) | NS |
| CY036926 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | PB2 |
| CY036925 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | PB1 |
| CY036924 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | PA |
| CY036919 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | HA |
| CY036922 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | NP |
| CY036921 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | NA |
| CY036920 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | M |
| CY035123 | A/NYMC X-163A (NYMC X-157-St.Petersburg/8/2006) | NS |
| CY035125 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | PB2 |
| CY035124 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | PB1 |
| CY035123 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | PA |
| CY035118 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | HA |
| CY035121 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | NP |
| CY035120 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | NA |
| CY035119 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | M |
| CY035122 | A/NYMC X-163B (NYMC X-157-St.Petersburg/8/2006) | NS |
| **H1N1-SOIV Wild Type and HYRs** |
| CY044371 |  A/New Jersey/11/1976  | PB1 |
| CY044365 |  A/New Jersey/11/1976 | HA |
| CY044367 |  A/New Jersey/11/1976 | NA |
| CY062634  | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | PB2 |
| CY062633 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | PB1 |
| CY062632 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | PA |
| CY062627 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | HA |
| CY062630 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | NP |
| CY062629  | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | NA |
| CY062628 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | M |
| CY062631 | A/X-53(Puerto Rico/8/1934-New Jersey/11/1976) | NS |
| CY035037 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | PB2 |
| CY035036 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | PB1 |
| CY035035 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | PA |
| CY035030 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | HA |
| CY035033 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | NP |
| CY035032 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | NA |
| CY035031 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | M |
| CY035034 | A/X-53a(Puerto Rico/8/1934-New Jersey/11/1976) | NS |
| **2009 H1N1pdm HYRs** |
| CY058508 | A/NYMC X-179 (NYMC X-157-California/07/2009) | PB2 |
| CY058509 | A/NYMC X-179 (NYMC X-157-California/07/2009) | PB1 |
| CY058510 | A/NYMC X-179 (NYMC X-157-California/07/2009) | PA |
| CY058511 | A/NYMC X-179 (NYMC X-157-California/07/2009) | HA |
| CY058512 | A/NYMC X-179 (NYMC X-157-California/07/2009) | NP |
| CY058513 | A/NYMC X-179 (NYMC X-157-California/07/2009) | NA |
| CY058514 | A/NYMC X-179 (NYMC X-157-California/07/2009) | M |
| CY058515 | A/NYMC X-179 (NYMC X-157-California/07/2009) | NS |
| CY058516 | A/NYMC X-179A (NYMC X-157-California/07/2009) | PB2 |
| CY058517 | A/NYMC X-179A (NYMC X-157-California/07/2009) | PB1 |
| CY058518 | A/NYMC X-179A (NYMC X-157-California/07/2009) | PA |
| CY058519 | A/NYMC X-179A (NYMC X-157-California/07/2009) | HA |
| CY058520 | A/NYMC X-179A (NYMC X-157-California/07/2009) | NP |
| CY058521 | A/NYMC X-179A (NYMC X-157-California/07/2009) | NA |
| CY058522 | A/NYMC X-179A (NYMC X-157-California/07/2009) | M |
| CY058523 | A/NYMC X-179A (NYMC X-157-California/07/2009) | NS |
| **H2N2 Wild Type and HYRs** |
| CY036822 |  A/Korea/426/1968 | PB2 |
| CY036821 |  A/Korea/426/1968 | PB1 |
| CY036815 |  A/Korea/426/1968 | HA |
| CY036818 |  A/Korea/426/1968 | NP |
| CY036817 |  A/Korea/426/1968 | NA |
| CY037302 | A/(Puerto Rico/8/1934-Korea/426/1968) | PB2 |
| CY037301 | A/(Puerto Rico/8/1934-Korea/426/1968) | PB1 |
| CY037300 | A/(Puerto Rico/8/1934-Korea/426/1968) | PA |
| CY037295 | A/(Puerto Rico/8/1934-Korea/426/1968) | HA |
| CY037298 | A/(Puerto Rico/8/1934-Korea/426/1968) | NP |
| CY037297 | A/(Puerto Rico/8/1934-Korea/426/1968) | NA |
| CY037296 | A/(Puerto Rico/8/1934-Korea/426/1968) | M |
| CY037299 | A/(Puerto Rico/8/1934-Korea/426/1968) | NS |
| CY044331 |  A/Japan/305/1957 | PB1 |
| CY044325 |  A/Japan/305/1957 | HA |
| CY044328 |  A/Japan/305/1957 | NP |
| CY044327 |  A/Japan/305/1957 | NA |
| CY044324 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | PB2 |
| CY044323 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | PB1 |
| CY044322 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | PA |
| CY044317 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | HA |
| CY044320 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | NP |
| CY044319 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | NA |
| CY044318 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | M |
| CY044321 | A/X-135(Puerto Rico/8/1934-Japan/305/1957) | NS |
| **H3N2 Wild Type and HYRs** |
| CY044308 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | PB2 |
| CY044307 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | PB1 |
| CY044306 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | PA |
| CY044301 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | HA |
| CY044304 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | NP |
| CY044303 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | NA |
| CY044305 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | M |
| CY044302 | A/X-31B(Puerto Rico/8.1934-Aichi/2/1968) | NS |
| CY033606 |  A/Beijing/32/1992 | HA |
| CY033608 |  A/Beijing/32/1992 | NA |
| CY036814 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | PB2 |
| CY036813 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | PB1 |
| CY036812 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | PA |
| CY036807 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | HA |
| CY036810 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | NP |
| CY036809 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | NA |
| CY036808 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | M |
| CY036811 | A/X-117(Puerto Rico/8/1934-Beijing/32/1992) | NS |
| CY034115 |  A/Wyoming/03/2003 | PB2 |
| CY034114 |  A/Wyoming/03/2003 | PB1 |
| CY034113 |  A/Wyoming/03/2003 | PA |
| CY034108 |  A/Wyoming/03/2003 | HA |
| CY034110 |  A/Wyoming/03/2003 | NA |
| CY033637 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | PB2 |
| CY033636 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | PB1 |
| CY033635 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | PA |
| CY033630 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | HA |
| CY033633 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | NP |
| CY033632 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | NA |
| CY033631 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | M |
| CY033634 | A/NYMC X-149C6(Puerto Rico/8/1934-Wyoming/03/2003) | NS |
| CY033644 |  A/New York/55/2004 | PB1 |
| CY033638 |  A/New York/55/2004 | HA |
| CY033640 |  A/New York/55/2004  | NA |
| CY095717 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | PB2 |
| CY095716 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | PB1b |
| CY095715 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | PB1a |
| CY095714 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | PA |
| CY095709 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | HA |
| CY095712 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | NP |
| CY095711 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | NA |
| CY095710 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | M |
| CY095713 | A/NYMC X-157 (Puerto Rico/8/1934-New York/55/2004) | NS |
| CY035013 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | PB2 |
| CY035012 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | PB1 |
| CY035011 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | PA |
| CY035006 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | HA |
| CY035009 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | NP |
| CY035008 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | NA |
| CY035007 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | M |
| CY035010 | A/NYMC X-157A (Puerto Rico/8/1934-New York/55/2004) | NS |
| CY035117 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | PB2 |
| CY035116 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | PB1 |
| CY035115 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | PA |
| CY035110 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | HA |
| CY035113 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | NP |
| CY035112 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | NA |
| CY035111 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | M |
| CY035114 | A/NYMC X-157B (Puerto Rico/8/1934-New York/55/2004) | NS |
| CY034123 |  A/Wisconsin/67/2005 | PB2 |
| CY034122 |  A/Wisconsin/67/2005 | PB1 |
| CY034121 |  A/Wisconsin/67/2005 | PA |
| CY034116 |  A/Wisconsin/67/2005 | HA |
| CY034119 |  A/Wisconsin/67/2005 | NP |
| CY034118 |  A/Wisconsin/67/2005 | NA |
| CY034120 |  A/Wisconsin/67/2005 | NS |
| CY033653 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | PB2 |
| CY033652 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | PB1 |
| CY033651 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | PA |
| CY033646 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | HA |
| CY033649 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | NP |
| CY033648 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | NA |
| CY033647 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | M |
| CY033650 | A/NYMC X-161 (Puerto Rico/8/1934-Wisconsin/67/2005) | NS |
| CY036918 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | PB2 |
| CY036917 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | PB1 |
| CY036916 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | PA |
| CY036911 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | HA |
| CY036914 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | NP |
| CY036913 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | NA |
| CY036912 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | M |
| CY036915 | A/NYMC X-161A (Puerto Rico/8/1934-Wisconsin/67/2005) | NS |
| CY045843 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005) | PB2 |
| CY045842 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | PB1 |
| CY045841 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | PA |
| CY045836 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | HA |
| CY045839 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | NP |
| CY045838 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | NA |
| CY045837 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | M |
| CY045840 | A/NYMC X-161B (Puerto Rico/8/1934-Wisconsin/67/2005 | NS |
| CY035029 |  A/Brisbane/10/2007 | PB2 |
| CY035028 |  A/Brisbane/10/2007 | PB1 |
| CY035027 |  A/Brisbane/10/2007 | PA |
| CY035022 |  A/Brisbane/10/2007 | HA |
| CY035025 |  A/Brisbane/10/2007 | NP |
| CY035024 |  A/Brisbane/10/2007 | NA |
| CY035026 |  A/Brisbane/10/2007 | NS |
| CY035021 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | PB2 |
| CY035020 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | PB1 |
| CY035019 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | PA |
| CY035014 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | HA |
| CY035017 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | NP |
| CY035016 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | NA |
| CY035015 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | M |
| CY035018 | A/NYMC X-171(Puerto Rico/9/1934-Brisbane/10/2007) | NS |
| CY035141 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | PB2 |
| CY035140 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | PB1 |
| CY035139 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | PA |
| CY035134 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | HA |
| CY035137 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | NP |
| CY035136 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | NA |
| CY035135 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | M |
| CY035138 | A/NYMC X-171A(Puerto Rico/9/1934-Brisbane/10/2007) | NS |
| CY035149 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | PB2 |
| CY035148 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | PB1 |
| CY035147 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | PA |
| CY035142 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | HA |
| CY035145 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | NP |
| CY035144 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | NA |
| CY035143 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | M |
| CY035146 | A/NYMC X-171B(Puerto Rico/9/1934-Brisbane/10/2007) | NS |
| CY058500 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | PB2 |
| CY058501 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | PB1 |
| CY058502 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | PA |
| CY058503 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | HA |
| CY058504 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | NP |
| CY058505 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | NA |
| CY058506 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | M |
| CY058507 | A/NYMC X-175C(Puerto Rico/9/1934-Brisbane/10/2007) | NS |