**Supplementary file 4. All identified functional single nucleotide variants (SNVs) in the H3N2 virus with annotations.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pig ID** | **Treatment** | **Coding region** | **Site** | **Reference** | **Variant** | **Frequency (%)** | **Amino acid change** | **Mutation type** | **Functional description** | **Functional type** |
| 4467 | PRIME BOOST | M1 | 637 | G | A | 2.8 | V213I | Non\_Synonymous | M1 (C-terminal) vRNP binding region (Baudin, Petit, Weissenhorn, & Ruigrok, 2001) | Virus assembly, budding and release |
| 4486 | PRIME BOOST | M1 | 389 | T | C | 2.2 | L130P | Non\_Synonymous | M1 lipid/membrane binding region (Baudin et al., 2001; Gregoriades & Frangione, 1981) | Virus assembly, budding and release |
| 4499 | PRIME BOOST | M1 | 406 | G | A | 1.3 | G136R | Non\_Synonymous | M1 lipid/membrane binding region (Baudin et al., 2001; Z. Ye, Liu, Offringa, McInnis, & Levandowski, 1999)  | Virus assembly, budding and release |
| 4499 | PRIME BOOST | M1 | 551 | C | A | 1.3 | T184N | Non\_Synonymous | M1 (C-terminal) vRNP binding region (Baudin et al., 2001) | Virus assembly, budding and release |
| 4552 | PRIME BOOST | M1 | 43 | A | G | 3.4 | I15V | Non\_Synonymous | M1 (N-terminal) vRNP binding region (Baudin et al., 2001; Z. Ye et al., 1999) | Virus assembly, budding and release |
| 4552 | PRIME BOOST | M1 | 128 | T | C | 31 | M43T | Non\_Synonymous | M1 (N-terminal) vRNP binding region (Baudin et al., 2001; Z. Ye et al., 1999) | Virus assembly, budding and release |
| 4552 | PRIME BOOST | M1 | 529 | A | G | 1.5 | N177D | Non\_Synonymous | M1 (C-terminal) vRNP binding region (Baudin et al., 2001) | Virus assembly, budding and release |
| 4931 | PRIME BOOST | M2 | 836 | T | C | 1.1 | C50R | Non\_Synonymous | C50 is a palmitoylation site which associated with virus virulence in mouse and M2 cholesterol binding (Grantham et al., 2009; Schroeder, Heider, Möncke-Buchner, & Lin, 2005) | Determinant of pathogenicity, virulence and disease progression |
| 4934 | SINGLE LAIV | M1 | 476 | A | T | 1.1 | H159L | Non\_Synonymous | Associated with the virulence of H9 subtype virus in mice (Baudin et al., 2001; Hui, Smee, Wong, & Nayak, 2006; Z. Ye et al., 1999) | Determinant of pathogenicity, virulence and disease progression |
| 4934 | SINGLE LAIV | M1 | 590 | A | G | 1.1 | E197G | Non\_Synonymous | M1 (C-terminal) vRNP binding region (Baudin et al., 2001) | Virus assembly, budding and release |
| 4467 | PRIME BOOST | NP | 127 | A | G | 3.6 | M43V | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo, Valencia, & Portela, 1995; Biswas, Boutz, & Nayak, 1998; Elton, Medcalf, Bishop, Harrison, & Digard, 1999) | Viral genome/protein interaction |
| 4467 | PRIME BOOST | NP | 448 | A | G | 1.8 | R150G | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4467 | PRIME BOOST | NP | 878 | G | A | 1.1 | R293K | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4467 | PRIME BOOST | NP | 1244 | A | G | 1.4 | Q415R | Non\_Synonymous | Associated with NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999; Q. Ye, Krug, & Tao, 2006) | Viral genome/protein interaction |
| 4469 | PRIME BOOST | NP | 115 | T | C | 2.6 | F39L | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4469 | PRIME BOOST | NP | 1341 | G | C | 1 | M447I | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4479 | SINGLE LAIV | NP | 1288 | A | G | 1.2 | S430G | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | NP | 189 | A | G | 1.8 | I63M | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | NP | 401 | C | G | 39.2 | T134S | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | NP | 406 | A | C | 1.4 | I136L | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | NP | 469 | A | G | 1.2 | T157A | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4490 | NO VAC | NP | 293 | G | A | 2.4 | R98K | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4499 | PRIME BOOST | NP | 644 | C | A | 1.2 | T215K | Non\_Synonymous | Associated with PB2 interaction and NP nuclear localization (Elton, Medcalf, Bishop, & Digard, 1999; Weber, Kochs, Gruber, & Haller, 1998) | Host-virus interaction machinery |
| 4552 | PRIME BOOST | NP | 203 | T | C | 1.3 | L68P | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | NP | 464 | T | C | 3.1 | V155A | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | NP | 731 | A | G | 1.6 | E244G | Non\_Synonymous | Associated with NP oligomerization (Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | NP | 839 | T | C | 1.4 | V280A | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | NP | 1373 | T | C | 1.3 | F458S | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 4931 | PRIME BOOST | NP | 362 | G | A | 1.4 | R121H | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4931 | PRIME BOOST | NP | 439 | A | G | 3 | T147A | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4945 | SINGLE LAIV | NP | 1117 | G | A | 2.2 | A373T | Non\_Synonymous | Associated with PB2 interaction and NP oligomerization (Biswas et al., 1998; Elton, Medcalf, Bishop, & Digard, 1999) | Viral genome/protein interaction |
| 5167 | NO VAC | NP | 181 | A | C | 2.8 | I61L | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 5184 | PRIME BOOST | NP | 388 | A | G | 3.6 | T130A | Non\_Synonymous | Associated with RNA and PB2 interaction (Albo et al., 1995; Biswas et al., 1998; Elton, Medcalf, Bishop, Harrison, et al., 1999) | Viral genome/protein interaction |
| 4467 | PRIME BOOST | NS1 | 637 | T | C | 15.9 | S213P | Non\_Synonymous | Associated with Crk/CrkL SH3 binding and CDK/ERK phosphorylation to meditate the host cell signaling (Hale, Barclay, Randall, & Russell, 2008; Hale et al., 2009) | Host-virus interaction machinery |
| 4469 | PRIME BOOST | NS1 | 309 | C | A | 3.7 | F103L | Non\_Synonymous | A F103L substitution in a H5N1 virus exhibit increased virulence and expand tissue-tropism in mice. Also associated with multiple host protein interactions to inhibit the processing the pre-mRNAs and host antiviral response (Aragón et al., 2000; Bornholdt & Prasad, 2006; Das et al., 2008; Hale, Barclay, et al., 2008; Hale, Randall, Ortín, & Jackson, 2008; Hale, Steel, et al., 2010; Kochs, García-Sastre, & Martínez-Sobrido, 2007; Noah, Twu, & Krug, 2003; Twu, Kuo, Marklund, & Krug, 2007) | Determinant of pathogenicity, virulence and disease progression |
| 4481 | SINGLE LAIV | NS1 | 251 | T | C | 4.4 | V84A | Non\_Synonymous | The deletion of the region confers increased virulence of virus in mice and chicken. Also involved in host protein interaction for viral protein production (Aragón et al., 2000; Bornholdt & Prasad, 2008; Long, Peng, Liu, Wu, & Liu, 2008) | Determinant of pathogenicity, virulence and disease progression |
| 4490 | NO VAC | NS1 | 572 | C | T | 1.4 | T191M | Non\_Synonymous | Associated with multiple host proteins interactions to meditate the host antiviral response (Bornholdt & Prasad, 2006; Das et al., 2008; Hale, Barclay, et al., 2008; Hale, Randall, et al., 2008) | Host-virus interaction machinery |
| 4490 | NO VAC | NS2 | 736 | A | C | 7.3 | K88N | Non\_Synonymous | NS2 nuclear localization region (Shimizu, Takizawa, Watanabe, Nagata, & Kobayashi, 2011) | Viral genome transportation, transcription and replication |
| 4552 | PRIME BOOST | NS1 | 41 | T | C | 8.7 | F14S | Non\_Synonymous | Associated with host proteins and dsRNA interactions to meditate the host antiviral response and IAV genome transportation (Cheng, Wong, & Yuan, 2009; Hale, Randall, et al., 2008; Yin et al., 2007) | Host-virus interaction machinery |
| 4552 | PRIME BOOST | NS1 | 256 | A | G | 1.3 | T86A | Non\_Synonymous | The deletion of the region confers increased virulence of virus (H1N1 and H5N1) in mice and chicken. Also involved in host protein interaction for viral protein production (Aragón et al., 2000; Bornholdt & Prasad, 2008; Long et al., 2008) | Host-virus interaction machinery |
| 4552 | PRIME BOOST | NS1 | 409 | A | G | 1.6 | I137V | Non\_Synonymous |  Involved in inhibiting the PI3K/Akt pathway and delay the host antiviral response (Ehrhardt et al., 2007; Gallacher et al., 2009; Hale, Jackson, Chen, Lamb, & Randall, 2006; Hale, Kerry, et al., 2010; Li, Yamakita, & Krug, 1998; Shin et al., 2007) | Host-virus interaction machinery |
| 4934 | SINGLE LAIV | NS1 | 455 | A | G | 2.2 | E152G | Non\_Synonymous | E152 is required for masking the nuclear export signal activity. Also involved in inhibiting the PI3K/Akt pathway and delay the host antiviral response (Bornholdt & Prasad, 2006; Das et al., 2008; Ehrhardt et al., 2007; Hale, Barclay, et al., 2008; Hale, Randall, et al., 2008) | Viral genome transportation, transcription and replication |
| 5167 | NO VAC | NS1 | 239 | C | T | 1.3 | T80I | Non\_Synonymous | The deletion of the region confers increased virulence of virus (H1N1 and H5N1) in mice and chicken (Bornholdt & Prasad, 2008; Long et al., 2008; Seo, Hoffmann, & Webster, 2002) | Determinant of pathogenicity, virulence and disease progression |
| 5174 | NO VAC | NS1 | 157 | G | T | 1.1 | D53Y | Non\_Synonymous | Associated with host proteins and dsRNA interactions to meditate the host antiviral response and IAV genome transportation (Cheng et al., 2009; Hale, Randall, et al., 2008; Yin et al., 2007) | Host-virus interaction machinery |
| 4499 | PRIME BOOST | HA | 14 | T | C | 2.4 | I5T | Non\_Synonymous | Hemagglutinin signal peptide region (Air, 1979) | Viral genome transportation, transcription and replication |
| 4479 | SINGLE LAIV | PA | 1783 | A | G | 1.2 | M595V | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | PA | 193 | T | C | 17.3 | S65P | Non\_Synonymous | Involved in suppressing the host protein synthesis and enhance the viral protein production (Desmet, Bussey, Stone, & Takimoto, 2013) | Host-virus interaction machinery |
| 4490 | NO VAC | PA | 1987 | A | G | 1.7 | R663G | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | PA | 803 | T | C | 1.3 | L268P | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | PA | 1268 | T | C | 2.3 | M423T | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | PA | 1363 | G | A | 5.2 | A455T | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | PA | 1576 | T | C | 3.7 | S526P | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4552 | PRIME BOOST | PA | 1805 | T | C | 1.2 | V602A | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4931 | PRIME BOOST | PA | 881 | A | G | 1.1 | D294G | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4931 | PRIME BOOST | PA | 1030 | G | A | 8.6 | E344K | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4934 | SINGLE LAIV | PA | 1183 | A | G | 9.2 | S395G | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4934 | SINGLE LAIV | PA | 1963 | C | T | 1.7 | L655F | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4934 | SINGLE LAIV | PA | 2129 | T | C | 2 | F710S | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 5166 | SINGLE LAIV | PA | 1574 | T | C | 1 | F525S | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 5167 | NO VAC | PA | 2014 | C | A | 3.8 | L672I | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 5179 | NO VAC | PA | 1678 | C | T | 1.4 | P560S | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 5185 | PRIME BOOST | PA | 1662 | A | G | 1.1 | I554M | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 5185 | PRIME BOOST | PA | 2120 | T | C | 9.2 | F707S | Non\_Synonymous | PA (C-terminal) - PB1(N-terminal) binding region (He et al., 2008) | Viral genome/protein interaction |
| 4481 | SINGLE LAIV | PB1 | 2110 | T | C | 1.1 | S704P | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole, Medcalf, Elton, & Digard, 2007; Sugiyama et al., 2009; Toyoda, Adyshev, Kobayashi, Iwata, & Ishihama, 1996) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | PB1 | 2162 | G | A | 1.6 | R721K | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole et al., 2007; Sugiyama et al., 2009; Toyoda et al., 1996) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | PB1 | 2224 | G | A | 1.2 | E742K | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole et al., 2007; Sugiyama et al., 2009; Toyoda et al., 1996) | Viral genome/protein interaction |
| 4551 | PRIME BOOST | PB1 | 632 | G | A | 99.9 | R211K | Non\_Synonymous | PB1 nuclear localization region | Viral genome transportation, transcription and replication |
| 4552 | PRIME BOOST | PB1 | 613 | A | G | 9 | I205V | Non\_Synonymous | PB1 nuclear localization region | Viral genome transportation, transcription and replication |
| 4552 | PRIME BOOST | PB1 | 2208 | G | T | 1.4 | K736N | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole et al., 2007; Sugiyama et al., 2009; Toyoda et al., 1996) | Viral genome/protein interaction |
| 4931 | PRIME BOOST | PB1 | 571 | A | G | 1.2 | M191V | Non\_Synonymous | PB1 nuclear localization region | Viral genome transportation, transcription and replication |
| 4934 | SINGLE LAIV | PB1 | 2270 | A | G | 1.4 | K757R | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole et al., 2007; Sugiyama et al., 2009; Toyoda et al., 1996) | Viral genome/protein interaction |
| 5167 | NO VAC | PB1 | 2095 | T | C | 1.1 | F699L | Non\_Synonymous | PB1 (C-terminal) - PB2 (N-terminal) binding region (Poole et al., 2007; Sugiyama et al., 2009; Toyoda et al., 1996) | Viral genome/protein interaction |
| 5184 | PRIME BOOST | PB1 | 713 | G | A | 2.1 | R238K | Non\_Synonymous | Promoter binding site for influenza polymerse (Jung & Brownlee, 2006) | Viral genome transportation, transcription and replication |
| 5185 | PRIME BOOST | PB1 | 758 | A | G | 1.1 | Y253C | Non\_Synonymous | PB1 nuclear localization region | Viral genome transportation, transcription and replication |
| 4467 | PRIME BOOST | PB2 | 1030 | G | A | 1.2 | V344M | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4467 | PRIME BOOST | PB2 | 1097 | T | C | 1.9 | V366A | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4479 | SINGLE LAIV | PB2 | 2216 | G | T | 1.2 | R739L | Non\_Synonymous | PB2 nuclear localization region (Mukaigawa & Nayak, 1991) | Viral genome transportation, transcription and replication |
| 4481 | SINGLE LAIV | PB2 | 985 | A | G | 1.4 | T329A | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4481 | SINGLE LAIV | PB2 | 1027 | G | A | 1 | E343K | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4481 | SINGLE LAIV | PB2 | 1079 | A | G | 1.1 | Y360C | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4481 | SINGLE LAIV | PB2 | 1088 | T | C | 1 | F363S | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4486 | PRIME BOOST | PB2 | 29 | T | A | 25.4 | L10Q | Non\_Synonymous | PB2 (N-terminal) – PB1 (C-terminal) binding region (Sugiyama et al., 2009) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | PB2 | 82 | A | G | 1.2 | M28V | Non\_Synonymous | PB2 (N-terminal) – PB1 (C-terminal) binding region (Sugiyama et al., 2009) | Viral genome/protein interaction |
| 4486 | PRIME BOOST | PB2 | 1205 | T | C | 1.3 | M402T | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4486 | PRIME BOOST | PB2 | 1483 | G | A | 4.9 | V495I | Non\_Synonymous | PB2 nuclear localization region (Mukaigawa & Nayak, 1991) | Viral genome transportation, transcription and replication |
| 4486 | PRIME BOOST | PB2 | 2257 | A | G | 1.8 | R753G | Non\_Synonymous | PB2 nuclear localization region (Tarendeau et al., 2007) | Viral genome transportation, transcription and replication |
| 4490 | NO VAC | PB2 | 1396 | G | A | 16.8 | D466N | Non\_Synonymous | PB2 nuclear localization region and cap-binding region with m7GTP (Guilligay et al., 2008; Mukaigawa & Nayak, 1991) | Viral genome transportation, transcription and replication |
| 4499 | PRIME BOOST | PB2 | 1273 | A | G | 1.5 | N425D | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 4499 | PRIME BOOST | PB2 | 2221 | T | C | 1.8 | S741P | Non\_Synonymous | PB2 nuclear localization region (Mukaigawa & Nayak, 1991) | Viral genome transportation, transcription and replication |
| 4552 | PRIME BOOST | PB2 | 766 | G | A | 1.6 | D256N | Non\_Synonymous | Associated with the influenza polymerase activity of the RNP expressed (Manzoor et al., 2009) | Viral genome transportation, transcription and replication |
| 4945 | SINGLE LAIV | PB2 | 1062 | A | G | 2.1 | I354M | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |
| 5174 | NO VAC | PB2 | 2218 | G | T | 1.2 | D740Y | Non\_Synonymous | PB2 nuclear localization region (Mukaigawa & Nayak, 1991) | Viral genome transportation, transcription and replication |
| 5185 | PRIME BOOST | PB2 | 1106 | G | A | 1.6 | R369K | Non\_Synonymous | PB2 cap-binding region with m7GTP (Guilligay et al., 2008) | Viral genome transportation, transcription and replication |

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